AfricaMaVal

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Summary

In-depth case studies will be developed for ten countries, including the six countries required by the call: DRC, Senegal, Zimbabwe, Mozambique, Gabon, Namibia and additionally Tanzania, Madagascar, Morocco and South-Africa. These case studies will cover the content of the seven firsts WP, according to the national level context. Short reports will be written for each case studies (+ appendices) and the synthesis will be done.

Approval

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Horizon Europe Framework Programme (HORIZON)

D9.3 – Introduction to the in-depth country case studies

WP9 - Task 9.4

Date [31/01/2024]

C. Zammit[1]

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Table of Contents

1. Extended Critical Raw Materials (ECRM) supply potential of each *country* 9
1.1. Inventory of the ECRM 9
1.1.1 Geological setting 10
1.1.2 Known Ore deposits and occurrences 10
1.2. Prospectivity and mineral high potential mapping 10
1.2.1 Selection of the ECRM for mineral prospectivity 10
1.2.2 Mineral high potential areas 10
1.3. Ore processing and refining capacities 10
2. Assessment of the ECRM value chain 11
2.1. Characterisation of the value chain for primary and secondary raw materials 11
2.1.1 List of the mining and recycling projects 12
2.1.2 Existing ESG indicators 13
2.1.3 Status of economic links between the formal and informal sectors 14
2.2. Identification of the bottlenecks along the value chain 14
2.2.1 List of the main bottlenecks and the links between them 14
3. Investment/financing prospects for ECRM projects in each country 15
3.1. Fiscal, legislative and regulatory context for in-country financings 15
3.2. Macroeconomic context for in-country financings 15
3.3. Political context for in-country financings 16
4. Assessment of social, environmental, and governance challenges 16
4.1. Country-level assessment and context 16
4.1.1. Context 16
4.1.2. Mineral/mining policies, industry policies 16
4.1.3. Mining regulations 17
4.1.4. Taxation and royalties 17
4.1.4. Land-use and mineral rights 18

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4.1.5. Environment 18
4.1.6. Societal and community aspects, cultural heritage 19
4.1.7. Public health and safety 20
4.2. Mining practices *vs.* Environmental, Social and Governance goals 20
4.2.1 Environmental challenges 20
4.2.2 Socio-economic issues 20
4.2.3 What would be the best practices for a responsible mining? 20
5. Business network between the European Union and the 10 *countries* 21
5.1. Assessment of the upstream and downstream business ecosystem 21
5.1.1 Context, formal and informal players 21
5.1.2 Relationships at local or regional levels 21
5.2. Building new B2B relations 21
5.2.1 Promoting local content and enabling mining cluster actors 22
5.2.2 Strengthening African mining clusters 22
6. Energy and digital transition: develop a strategy for the EU and Africa Partnership 22
7. Opportunities for responsible investments 23
7.1. Proposal of projects to be presented as fact sheets in WP7 24
Identification of individual exploration, mining and refining projects 24
7.2. ASM sector country profiles 24
Country profiles on ASM sector developments and investment 24

Keywords

ECRM, Mineral potential, Ore processing, Refining capacities, Recycling units, Value chain, Primary raw material, Secondary raw material, Bottlenecks, Finance, Investment, Sustainability, ESG, Land-use, Taxation, Mining regulation, Mining policies, Child labour, Responsible extraction, DRC, Senegal, Zimbabwe, Mozambique, Gabon, Namibia, Tanzania, Madagascar, Morocco, South-Africa, Pan-African.

Abbreviations and Acronyms

Acronym	Description
B2B	Business to Business
CEMAC	Economic and Monetary Community of Central Africa
ECOWAS	Economic Community of West African States
ECRM	Extended Critical Raw Materials
EITI	Extractive Industries Transparency Initiative
ESG	Environmental, social and governance
EU	European Union
FDI	Foreign Direct Investment
FX	Forex Exchange
GDP	Gross Domestic Product
GDPR	General Data Protection Regulation
MPM	Mineral Potential Mapping
RF	Random Forest
SADC	Southern African Development Community
UEMOA/WAEMU	West African Economic and Monetary Union

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Executive Summary

The aim of the task 9.4 is to implement all the work packages of the project at a national level with ten country case studies: Democratic Republic of Congo, Senegal, Zimbabwe, Mozambique, Gabon, Namibia, Tanzania, Morocco, Madagascar and South Africa. From November 2022 to November 2023, in-depth case studies were carried out for these countries, more specially to collect local information for AfricaMaVal work packages 1 to 6. This will lead to add value to the AfricaMaVal WP5 up to WP7 and bring contacts, materials and guidance for the B2B network, the strategy to develop the ECRM chain dedicated to the energetic transition and at last elaborating the project opportunities to co-develop the whole value chain in Africa.
Five members of the consortium were in charge of the 10 case studies, as listed hereafter:

- BRGM for Senegal, Gabon and Madagascar;
- BGR for DRC and Namibia;
- DMT KB for Tanzania and South Africa;
- LNEG for Mozambique and Morocco, and
- MADI for Zimbabwe.

The case study reports provide the reader with an overview of the key aspects regarding mineral resources, supporting regulations and institutions, as well as any related provisions in the prospecting of Critical Raw Materials (CRM). These reports are an integral part of the larger AfricaMaVal project and, in that context, provide countries overviews specifically aimed at European Union (EU) investors and decision-makers.

AfricaMaVal is focusing on the minerals and metals present in the fourth list of CRM for the EU as well as on Copper (Cu), Nickel (Ni), Tin (Sn) and Manganese (Mn) that are particularly pertinent considering Africa's geological potential and their critical status in the digital and energy twin transitions. For each country, we will have an assessment of the mineral potential linked with the geological context.

The assessment will also include value chain for these critical minerals therefore activities such as exploration, extraction, processing, and recycling will be evaluated.

Fiscal regulation as well as the macroeconomic and political context will be scanned to give an overview of the country regime.

ESG regulations and challenges will be depicted for the investors to better understand the background and questions to address when it comes to launch activities on the ground.

A list of downstream to upstream actors related to the mining sector will assist deciders to build their Business to Business network.

The country profiles will try to address the needs of the EU green deal according to the country strategies and planning.

Eventually, these reports will underline some project opportunities or recommendations.

The task 9.4 was led by the BRGM, and followed the steps detailed hereafter:

From June 2022 to October 2022: elaboration of the "Template of the Case Studies" with all the partners leading the WPs and the partners involved in the case studies. Update of the timeline in link with the shift of the deadline for the D9.1 (+ 2 months).

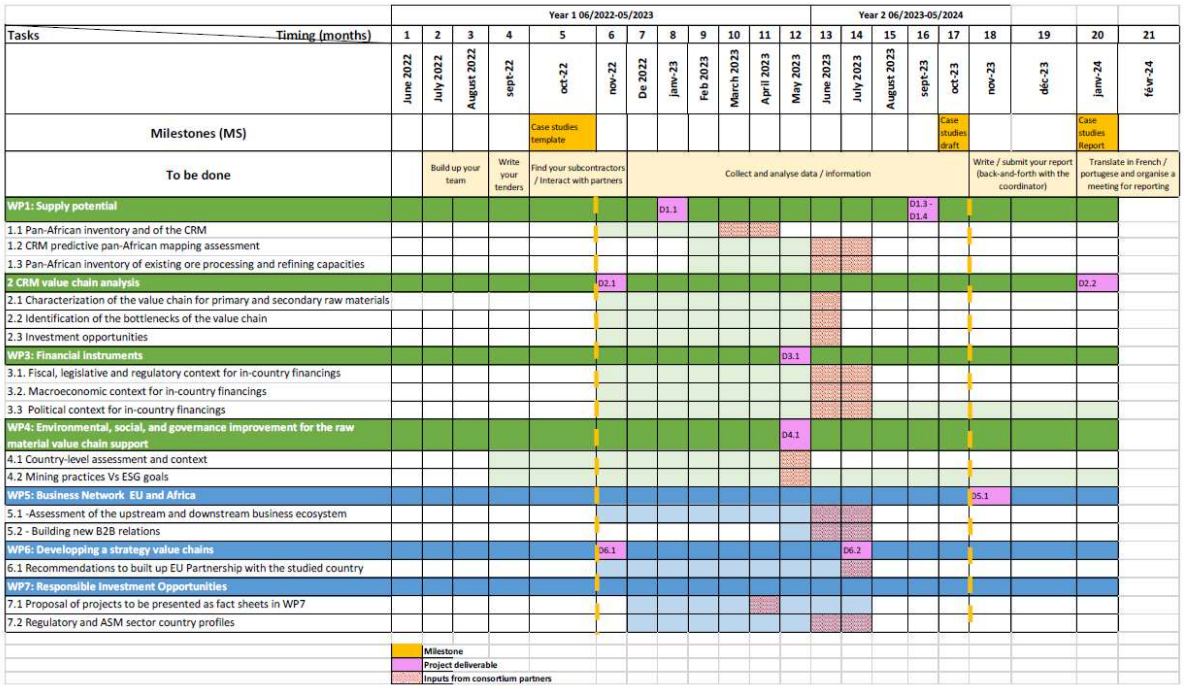


Figure 1: Gantt for the Case Studies

November 2022 to March 2023: as the Country Case Studies were not supposed to be only desk studies and as the collection of information from the ground was a must, the need of local subcontractors had undoubtedly become unavoidable. To find the convenient potential subcontractors, we had to go through many steps as:

- elaboration of the Terms of References for the contracting phase;
- selection of trustful contactors in each country;
- in-country visit for face-to-face meetings with private contractors, EU delegations, Ministry of Mines, Geological Surveys, Chamber of Mines, Big4

January 2023 to March 2023: After the in-country visits, subcontractors were identified and then, another process was launched:

- Tendering phase and contracting phase with private subcontractors;
- From January 2023 onwards: monthly Progress Meetings with all the partners in charge of Country Case Studies. Some dedicated work packages sessions (as WP1 for prospectivity mapping) and interaction with transversal activities as ASM or regulatory country profiles tasks (Levin Sources and AHK).
- Elaboration of a dashboard for the monitoring of the actions (with a clear flexibility according to the strategy of each partner).

From March 2023: Compilation phase for all the Case Studies with, as one of the main goals, the prospectivity mapping (ranking the ECRM and selection of area for the mapping).

From June 2023: communication between the partners in charge of the case studies and the leaders of the work packages to get the validation of the objectives and findings.

From July 2023: analysis of the dataset and information gathered within the first months of the exercise, writing of the first draft of the Case Studies reports.

From August 2023: instruction given to all the participants to fill the Case Study reports, with the assistance, if needed, of the WPs leaders.

From October 2023: last meetings dedicated to the content of the reports and last WPs interactions regarding the goals and inputs.

From end of November 2023: submission of the Case Study reports to the leader of the task 9.4 (BRGM) for reviewing.

December 2023 onwards: back and forth interactions between the partners involved in the task and the BRGM and finalization of most of the reports (8 out of 10) on the 22nd of December.

Wording

Mineral prospectivity: “Mineral potential mapping is concerned with quantifying and mapping the likelihood that mineral deposits are present in a study area. It is synonymous to mineral prospectivity mapping, which is concerned with quantifying and mapping the likelihood that mineral deposits may be found by exploration in a study area.”

1. Extended Critical Raw Materials (ECRM) supply potential of each *country*

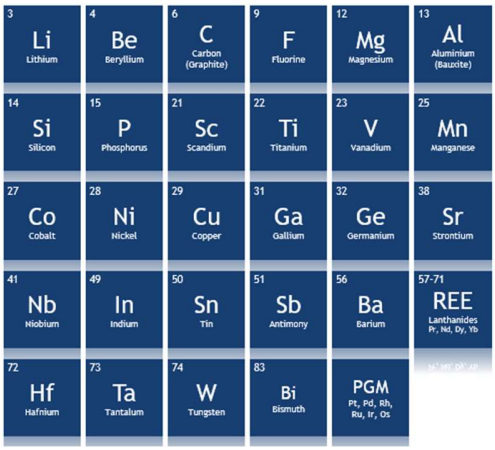
1.1. Inventory of the ECRM

The Extended Critical Raw Materials or ECRM are the focus of AfricaMaVal.

These ECRM include:

- All but 2 of the 30 Critical Raw Materials included on the Fourth European Critical Raw Materials List dated September 2020 (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0474) except for coking coal and natural rubber.
- The following additional commodities: Copper, Nickel, Tin and Manganese. Copper, Nickel and Manganese are on the list of "Strategic Raw Materials" which forms part of the Annex 1 to the European Critical Materials Act dated March 2023. Tin is a particularly pertinent commodity in the context of Africa's geological potential, is essential for electronics and electrification, and may also have a further use as a performance enhancer in lithium-ion batteries and certain cathodes. Tin is on the International Energy Agency's List of Critical Minerals (2022) and the US Geological Survey's 2022 List of Critical Minerals.

The list of ECRM is therefore included below:



They include:

- Antimony (Sb), Baryte, Bauxite, Beryllium (Be), Bismuth (Bi), Borate, Cobalt (Co), Copper (Cu), Fluorspar, Gallium (Ga), Germanium (Ge), Hafnium (Hf), Indium (In), Lithium (Li), Magnesium (Mg), Manganese (Mn), Natural graphite, Nickel (Ni), Niobium (Nb), Coking coal, Phosphate rock, Phosphorus (P), Silicon metal (Si), Scandium (Sc), Strontium (Sr), Tantalum (Ta), Tin (Sn), Titanium (Ti), Tungsten (W), Vanadium (V);
- HREEs-Heavy Rare Earth Elements: (Dysprosium-Dy, Erbium-Er, Europium-Eu, Gadolinium-Gd, Holmium-Ho, Lutetium-Lu, Terbium-Tb, Thulium-Tm, Ytterbium-Yb, Yttrium-Y);

- LREEs-Light Rare Earth Elements: (Cerium-Ce, Lanthanum-La, Neodymium-Nd, Praseodymium-Pr, Samarium-Sm); and
- PGM-Platinum Group Metals: (Iridium-Ir, Osmium-Os, Palladium-Pd, Platinum-Pt, Rhodium-Rh, Ruthenium-Ru).

1.1.1 Geological setting

The mineral resource endowment of the countries is favoured by its geological setting. For each country, we reviewed the various geological contexts and highlighted the conditions that are farourable to the formation of ore bodies or associated deposits.

1.1.2 Known Ore deposits and occurrences

The inventory of the known ore deposits and occurrences was partly provided by the task 1.1 led by LNEG. In the framework of the case studies, some partners managed to get additional information from their subcontractors or local actors to get a better understanding of the main occurrences in the country.

1.2. Prospectivity and mineral high potential mapping

1.2.1 Selection of the ECRM for mineral prospectivity

For each country, only the main commodities were selected for Mineral Potential Mapping (MPM) to demonstrate the principle of the method.

1.2.2 Mineral high potential areas

The MPM was performed by BRGM and LNEG, using the disc-based association (DBA) grid method coupled with Random Forest (RF) method (Vella, 2022[1]); the algorithm applying these principles has been labelled "FAMME" by the author. The method is based on the analysis of the local spatial associations of geological variables and features of various natures to describe the relationships between the predictors and the mineralizations. This allows the identification of geological environments in the study area around each node of the DBA grid, and the integration of either quantitative or non-quantitative spatial data. In a second step, RF classification is used to perform a generalisation of complex geological environments and features and evaluate their likelihood to host potential occurrences of mineralisation by giving a score between 0 (low potential) and 1 (high potential).

On top of this approach, additional information was sometimes brought from the local subcontractors with expertise from the local experts or governments.

1.3. Ore processing and refining capacities

This task was accomplished through the efforts of the consortium members involved in task 1.3, but it was also supplemented by information from the desk-study analysis and local subcontractors. As a matter

[1] Vella, A., 2022. Mise en évidence des environnements géologiques minéralisés par une nouvelle approche de cartographie prédictive Data-driven. PhD dissertation, Université d'Orléans

of fact, processing and refining capacities are still very limited in Africa, except in South Africa and DRC which are major mining countries.

2. Assessment of the ECRM value chain

Through this chapter, we assessed the development of the ECRM value chain in each country.

2.1. Characterisation of the value chain for primary and secondary raw materials

Characterizing the value chain for primary and secondary raw materials requires an examination and understanding of the method by which resources are extracted, processed and utilized. This characterisation assists in identifying key participants, activities, and potential areas for improvement.

To characterize the value chain for primary and secondary raw materials, it is essential to identify key stakeholders, assess environmental and social impact at each stage, and identify opportunities for resource efficiency, sustainable practices, and innovation. It is crucial to take into account variables like environmental sustainability, circular economy principles, and social responsibility in the characterisation process.

Although it is urged that African nations step up their efforts to look for ECRM, the sector is not yet integrated into most of the local or global value chains (African Development Bank - AfDB, 2021). The early stages of the ECRM sector's development are often characterized by little to no local production, recycling, or value addition.

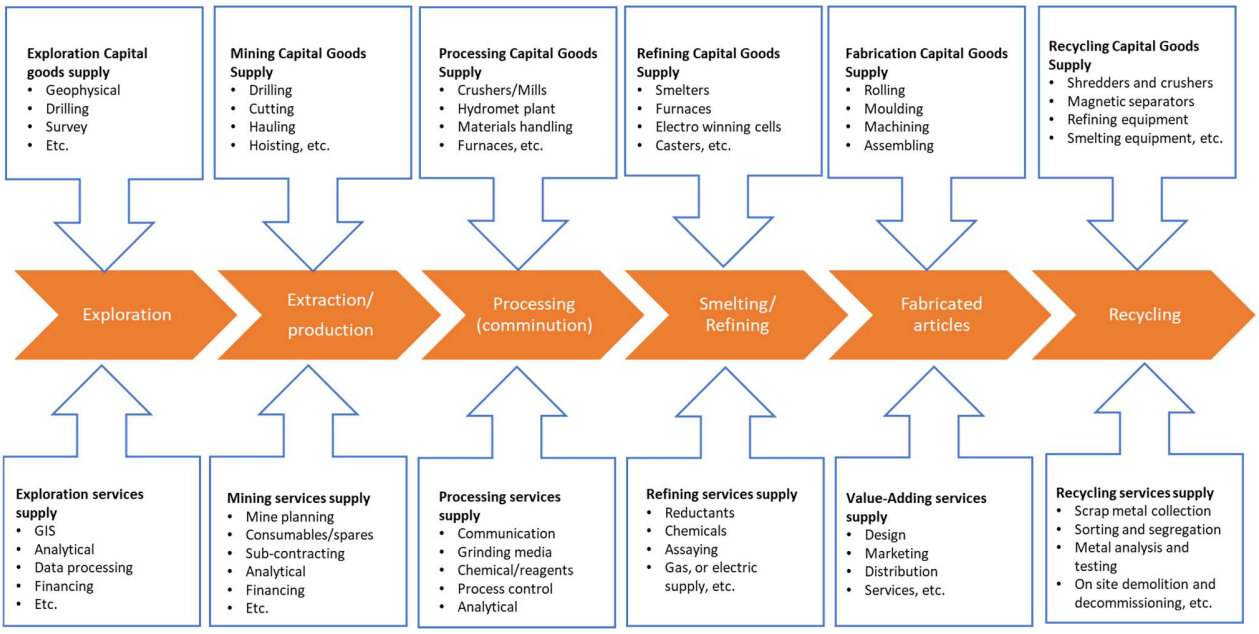


Figure 1 Schematic diagram of the general mineral value chain and the various linkages at each stage. Modified after Jourdan (2016).

2.1.1 List of the mining and recycling projects

This section covers the whole mining process from exploration to mining production, and recycling activities (as concentration/ processing and refining capacities were part of 1.3). This exercise was assisted by DMT who provided as part of their deliverable 2.1, project factsheets to fill with desktop studies or local contractors. A synthetic list of projects is available in the public case studies reports, and a detailed appendix is released as a confidential report, for some of the countries.

SUBJECT (numbered) *Guiding notes to each question are provided in italics* **a.** Numbered sub-items to be completed as part of the full info sheet	**Response/ content and notes** *Expand each section as needed to insert tables/ graphs, images, maps, etc*
1. Project Title/ Name	
2. Main Commodity and by-products	
3. Locality a. Country, City/Town, Village b. Describe access route to the site in words c. Coordinates d. Include locality map (+ access route and state of transport infrastructure)	
4. Ownership a. Company name b. Partnerships, JV, investors, etc. c. Contact details (include web page, if available) d. Contact details e. Web page	
5. Stage of development *(exploration, development, extraction, processing, recycling, abandoned, PFS, FS, etc),* a. Status (Operational, non-operation, Care and maintenance, on hold – state reasons if non-operational), b. Development Plans c. Licensing (e.g. legal compliance, EIA, ISO certification, ESG certification, export permits, emissions permits, etc)	
6. Geology and mineralisation potential (local) *(support with maps or other data as available)*	
7. Mineral Resources and Reserves *How are mineral reserves and resources stated, e.g.: NI43-101, JORC?* a. Production b. LoM	
8. Value chain a. Insert a value chain map/ graph / drawing of this mineral in its current use and market b. Taken from exploration to finished product, where does this project sit? (Refer to the Value Chain diagram above) c. Describe any cross-border interactions *(e.g. mineral imported from elsewhere and only processed here, or*	

exported as raw mineral from here to a processing plant elsewhere) d. Who are the current target markets?	
9. **Capacity/ Access and Infrastructure**: a. Economic b. Policy c. Infrastructure (water, electricity, transport, etc.) d. Technology e. Skills f. Environment g. Social h. ESG components (*Complete list under ESG Indicators*)	
10. Opportunities for growth/development and support required *(Financial, technical, skills, etc.) This is the project owner's own statement of how they see themselves participating in the market – what do they see as constraints, how do they want to grow market share, etc?*	
11. References *(all sources used in compiling this data – include web links and proper references to print media or other materials*)	

2.1.2 Existing ESG indicators

As part of the WP2 dedicated to the actors of the whole ECRM value chain, the ESG indicators table was designed by DMT within the first months of the project to drive the needs and objectives. The table hereafter gave the listing of the main ESG indicators to take into account in the framework of the in-depth country study.

ESG indicators (From question 9 h) *For each item, indicate if the operation has this or not, and record details as appropriate*	**Response** *Y/N response only*	**Details** *(If Yes, record the details, reference)*
Air quality management plan *(Dust, GHG)*		
Waste management plan *(slurries, dump sites)*		
Surface water / groundwater management plan *(contamination, treatment, reuse)*		
Mine water / sump management plan *(contamination, treatment, reuse)*		
Noise & vibration management plan		
Non-destructive exploitation plan		
Management plan for energy and material consumption		
Biodiversity management plan *(ecosystem, protected areas, species, vegetation clearance)*		
Mine closure plan (*land reclamation, decommissioning, remediation)*		
Workplace management plan (*imbalance, discrimination, inequalities*		
Social management plan *(inclusion of vulnerable groups, indigenous people, human right / land defenders, social-cultural understanding / heritages; community development projects (water, infrastructure, hygiene, medical care, emergency, education), community involvement; poverty, hunger, thirst, housing*		
Land use management plan *(acquisition, forced relocation*		

Management plan for high-risk areas *(child labour, education, forced labour)*		
Human & Resource management plan *(bargaining, unions, grievance, remuneration, contracts, benefits, training, working hours and conditions)*		
OHS management plan *(risk and safety management plan, PPE, hazardous work, training, rehabilitation facilities, hazardous substances / work / conditions)*		
Emergency response plan *(medical preparedness and care, infrastructure plan (lightning, communication)*		
Construction and Maintenance management plan *(tailing dams, equipment, geological / (rock) mechanical failures)*		
Safety and Security management plan *(infrastructure plan (traffic), e.g. security plan, training for security personnel*		
Business Integrity Plan *(anti-corruption and bribery, criminal machination (revenues & payments), ownership and management structures), illegal mining activities*		
Stakeholder management plan (*consultation, engagement, grievance mechanism, disclosure)*		
Supplier management plan *(social impact (abusive practices, financial flows, site security, poverty, health problems, forced relocation, working contracts & conditions, accommodation, environmental impact (biodiversity), high risk areas (financial flows, violent conditions, child labour, forced labour)*		

2.1.3 Status of economic links between the formal and informal sectors

Economic linkages between formal and informal sectors are already established in many African countries with tribute mining being noticeable in the mining sector. Opportunities for informal businesses and individuals to contribute to and benefit from the mineral industry by supplying necessary resources, equipment, expertise, and support services exists in the minerals industry.

2.2. Identification of the bottlenecks along the value chain

The identified bottlenecks have been compiled from data from the World Bank (Government Effectiveness & Control of Corruption; Logistics Performance Index) and the Fraser Institute through several pertinent and scored indicators. This analysis was completed by the screening of the infrastructure network, its strength and weakness.

2.2.1 List of the main bottlenecks and the links between them

The WGI provide valuable insights into the quality of governance across various dimensions, including rule of law, government effectiveness, regulatory quality, and control of corruption. These indicators offer a broader context for assessing the socio-political environment in which critical minerals are extracted, processed, and traded. By considering governance factors, analysts can gauge the stability, transparency, and efficiency of regulatory frameworks, minimizing the risks associated with geopolitical instability, corruption, and inadequate legal structures. The scoring goes from -2.5 to 2.5, with -2.5 reflecting a negative governance environment.

The screening of the infrastructure focus on roads, rail, ports and energy for most of the countries with slight adjustments.

3. Investment/financing prospects for ECRM projects in each country

This chapter gives an overview of the fiscal, macroeconomic and political context dedicated to the mining sector. Guidance from HCF had been given to all the partners involved in the in-depth studies for an aligned objective and homogeneous results.

3.1. Fiscal, legislative and regulatory context for in-country financings

This section covers many topics as:

- Convertibility, transfer (Can a company easily convert local currency into hard currency? Can a company transfer funds abroad? Are there any costs involved in the process? Is there a requirement to repatriate funds in-country?);
- Interest and dividend to Withholding tax (WHT) (Is interest subject to a WHT? Is dividend subject to a WHT? Which double taxation agreements allow WHT to be reduced to 0 %?);
- Thin cap rules and interest deductibility (Are shareholder loans allowed? Is there a restriction on the amount of interest that can be deductible?);
- Foreign/local currency accounts (offshore/onshore) (Can the company hold offshore accounts? Can the company hold onshore accounts in hard currency?);
- Arbitration (Is international arbitration allowed? Is there any local arbitration available? How is it enforced?).

This section might sometimes be overlapping the WP4 Mining regulation section.

- Existence of a mining code (Is there a mining code in place? How long has it been in place? Has it been followed to date? Are there any discussions about a future update?);
- Incentives for mining and processing (royalty rates, tax exemptions, etc.);
- Authorisation requirements and process (time, costs, nature and degree of requirements, especially in relation to international standards);
- Income tax (tax rate and exemptions, interest deductibility);

3.2. Macroeconomic context for in-country financings

This section cover many topics as:

- GDP and its breakdown by major sector/source of GDP – any potential risk there: over-reliance on one sector, future outlook?;
- FDI. Has the flow of FDI been steady? Are there any impediments to FDI? What is the outlook on FDI?;
- FX and inflation. Historical volatility in FX and inflation. What is the current monetary policy of the said country? What is the outlook in terms of FX and inflation?;

- Sovereign debt. Is the country expected to default on its debt? How much does it represent of its GDP? (Statista https://www.statista.com/statistics/1223393/national-debt-in-relation-to-gdp-in-sub-saharan-africa-by-country/, Moody's, Fitch, S&P);
- Regional economic alliances/uniform regulatory, accounting, legal frameworks as these may facilitate trade and foster a business-friendly environment;
- Restrictions on imports/exports and overview of time and costs relating to customs clearance.

3.3. Political context for in-country financings

This section provides an overview of the political context to shape the financing and restrict financing/investment options including:

- Ownership requirements (nationals, government, local trusts ownership. Is it free carry?;
- Country's position in the international arena – involvement in regional treaties, compliance with certain standards (ILO, EITI), sanctions;
- Situation on the ground and outlook: Expropriation, looming elections, strikes, civil war, sentiment for/against mining in country.

4. Assessment of social, environmental, and governance challenges

This chapter aims to undertake a review of the pertinent minerals policies, regulations, agreements on community engagement and consultation, land ownership and mineral rights, land-use and tenure, health and safety of workforces and communities, environmental management, and regulation across the case study countries, as well as the distribution/attribution and use of royalties. This activity was carried out by AWIMA as part of the AfricaMaVal WP4, task 4.1 from August 2022 to May 2023. Results from the deliverable 4.1 had been, sometimes, amended by additional data from the field or literature (desk study).

4.1. Country-level assessment and context

4.1.1. Context

This section is a short introduction to the main ESG regulation and challenges.

4.1.2. Mineral/mining policies, industry policies

This section might provide the following information:

- Which laws regulate ownership and group structures?
- Are there any requirements in relation to the holding of equity in exploration and mining projects by local people e.g., is an investor required to allocate or cede shares to local owners?
- Are there any special rules or restrictions applicable to foreign investors?
- Identify any rights that the State may have e.g., does the State have any rights to equity in mining projects?
- Are there any requirement for listing on the local stock exchange
- Are there any requirements to beneficiate/process minerals mined within the country?
- Are there any restrictions on the export of minerals?
- Are there any statutory consents required to dispose of rights to explore and mine?

- Are there any restrictions on disposals of controlling interests in entities holding exploration or mining rights?

4.1.3. Mining regulations

This section might provide the following information:

- How are exploration licenses granted, what mechanisms are applied?
- How are mining licenses granted, what mechanisms are applied?
- Are there administrative appeals in the mining law?
- What requirements exist for community and stakeholder consultation during the permitting processes?
- Are the mining codes and standards comparable to those in the EU?
- Are there assurance and verification systems in place to ensure implementation of the mining standards?
- What are the laws, policies, requirements for provisions pertaining to mine closure and remediation, including the provisions of bonds?
- What are the law and policies pertaining to mine care and maintenance?
- What are the instruments and means for monitoring regulatory compliance of mining and exploration operations?
- Are there laws, regulations, or rules in place the type of tailings storage or disposal?
- Are there any regulations on wastes and residues containing Naturally Occurring Radioactive Materials (NORM), e.g. Tantalum waste, Tin slags?
- Is the regulator for NORM different from the mining or environmental regulator?
- What are the means to sanction non-compliance?
- Which organisation is responsible for monitoring regulatory compliance?
- Are there any legal requirements for the procurement of local goods and services by mining operations?

4.1.4. Taxation and royalties

Policies on taxation and royalties can be decisive elements to attract or deter foreign investment, but are also important instruments to ensure that a fair share of the wealth generated by extraction remains in the source country. An important governance aspect is also, whether the respective policies and regulations are stable and predictable and are implemented in a transparent way.

This section might provide the following information:

- Are there special rules applicable to the taxation of exploration and mining companies?
- Is the transfer of mining rights subject to the payment of taxes?
- Are there any royalties payable to the State over and above any taxes?
- Are there restrictions on repatriating profits for foreign investors?
- What systems are in place to administrate and manage the collection of the taxes?
- Is there a set percentage of profits that the mining sector is mandated to reinvest into the sector?
- Are there any provisions for (foreign) investors, such as tax exemptions, tax holidays, tax reductions?
- What are the regulations or systems in place for the reinvestment of taxes and mining royalties into the local mining communities, for example, reinvestment into local infrastructure enhancements (utilities, roads)?

- What are the systems in place for reinvestment of tax revenue into education of local ASM communities and promotion of better and safer mining practices?
- What are the tax/royalty rules pertaining to mines under care and maintenance?

4.1.4. Land-use and mineral rights

This section might provide the following information:

- Which are the relevant land-use planning and zoning regulations?
- Are maps available that clearly indicate the zoning and protected areas?
- What are the rights of the holder of an exploration right or mining right to use the surface necessary or incidental to an exploration or mining operation?
- Are there any native land titles or regulations that have implications for exploration and the mining industry?
- Are there provisions for Free Prior and Informed Consent (FPIC) when acquiring land for mining from the people?
- Is there a constitution that has an impact upon rights to prospect and mine?
- Are there restrictions in place on the use of specific equipment or heavy machinery for ecological or habitat protection reasons?
- Are there any land-use restrictions with respect to the type of mining method?
- Are there any specific regulations that prevent or limit exploration or mining near to or in protected areas (ecological sensitive areas, nature reserves, Natura 2000 sites, cultural heritage sites, etc.)?
- Are any sites in the country inscribed on UNESCO World Natural Heritage List?

4.1.5. Environment

This section might provide the following information:

- Which are the relevant laws on the protection of biodiversity including forest protection?
- Which are the laws on wetland protection?
- If the country is a signatory to certain United Nations conventions pertaining to the environment, how is compliance monitored and non-compliance sanctioned?
- Are there regulatory requirements to have emergency preparedness plans and response programmes in place and are these revised regularly?
- Which are the laws on air emissions to the environment for operations and extractive waste management sites including tailings dams?
- Which are the laws on soil protection?
- What are the regulations for soil monitoring downstream from mining activities or around extractive waste management sites, including tailings dams, recontamination by eroded material or dust?
- Are there any policies in place on climate change resilience of operational or closed/ remediated sites?
- What are the laws and regulations for (hazardous, non-hazardous) extractive waste management (disposal, re-use)?
- Are mining operations required to periodically review their environmental and extractive waste management plans?

- Which are the policies and regulations on mine-closure and environmental remediation of closed or abandoned mines (mining legacies)?
- Are there regulatory provisions for the life-cycle management of extractive operations that cover the long-term management of extractive waste (stewardship) and community sustainability after the end of mining?
- Are there regulatory provisions the reprocessing of legacy tailings stored/disposed on site?
- Are there any laws or regulations on energy consumption in mining operations?
- Are there any specific regulations related to the use of renewable energy in mining operations?

4.1.6. Societal and community aspects, cultural heritage

Communities are affected by extractive operations in a wide variety of ways. There can be both, positive and negative impacts. This section might provide the following information:

- Is there any legislation on the protection of information (as EU GDPR)?
- What are the regulatory provisions, if any, for public participation in decision-finding processes, e.g. permitting, on extractive operations?
- Are there any specific regulations related to involvement of local communities in order to perceive economic benefits or incentives to mining activities?
- Are there any regulatory provisions for complaints and arbitration?
- Is there any artisanal mining and what is the percentage contribution to GDP?
- Is artisanal mining integrated into the regular economy or untaxed and unregulated?
- Are there data/statistics on jobs (primary/secondary) in the mining sector?
- Is there information on social conflicts in the mining areas?
- Are there any regulatory provisions for fostering actions that enhance social inclusion, protect the members of community involved in the artisanal mining?
- Are there any requirements or programmes to ensure awareness raising and access to information for the local community?
- Are there any regulatory provisions for indigenous workforce participation?
- Are there any regulatory or policy provisions to encourage mining companies to provide for training in local communities and to encourage their participation in related economic activities?
- Are there any regulatory provisions for the protection of the workforce's human rights?
- Are there any specific regulations related to female workforce participation (gender mainstreaming)?
- Are there any specific regulations related to the prevention of child labour?

Extraction projects may affect sites of tangible or intangible cultural heritage, such as archaeological sites or sites of spiritual value.

- Which are the laws and policies on the protection of such cultural heritage?
- Are any sites in the country inscribed on UN World Cultural Heritage List?
- Are there laws, regulations or standards of practice for what to do should any archaeological or fossil remains be encountered during mining activities?

4.1.7. Public health and safety

Extractive operations can have significant off-site effects and impacts. To a great extent these are covered by the relevant environmental legislation, but certain aspect may be covered by other bodies of legislation.

- Which is the legislation that covers the protection of the public from emission?
- Is the mining-related traffic on public roads regulated in any specific way?
- Are potentially affected stakeholders consulted and involved in the development and maintenance of emergency preparedness planning?
- Are there any requirements for public disclosure and access to information, at least for the immediate communities of the possible dangers or health impact in place?
- Are local community members monitored for potential long-term health impacts and are any specific compensation schemes in place?

4.2. Mining practices *vs.* Environmental, Social and Governance goals

Environmental, social, and governance (ESG) considerations have become increasingly important in the mining sector in Africa, even though the ESG framework is still in its early stages of development in some of the countries. As seen in the previous section, legal and regulatory frameworks are implemented to promote sustainable development and address ESG issues in the mining industry.

4.2.1 Environmental challenges

In this section, information might address the following environmental challenges:

- Tailings and waste management
- Site rehabilitation
- Biodiversity
- Quality of water, soil and air

4.2.2 Socio-economic issues

This section might address the following social-economic challenges:

- Influx of outside workers,
- Gender balance,
- Child labour,
- Working conditions in the ASM sector are appalling and unsafe,
- Conflicts between ASM and LSM,
- Corruption.

4.2.3 What would be the best practices for a responsible mining?

ESG (Environmental, Social and Governance) practices are increasingly expected by stakeholders, including investors, customers, civil society. In some countries, initiatives and projects that illustrate good ESG practices in the mining sector will be highlighted as kind of “best practices”

For this section, insights from the subcontractors and the partners in charge of the in-depth studies might address ESG experiments and innovative ideas.

5. Business network between the European Union and the 10 *countries*

5.1. Assessment of the upstream and downstream business ecosystem

The mining sector encompasses both formal and informal players across the upstream and downstream segments of the business ecosystem. The following reports present an overview of these players.

5.1.1 Context, formal and informal players

The relevant institutions for the development of a network around the ECRMs cannot be established without the existing institutional framework such as governmental institutions (Ministries, Mining and geological departments), chamber of mines, state-owned enterprises. foreign-owned LSM companies are important formal upstream players. In addition to small- or large-scale mining companies, ASM cooperatives occupy a semi-formal space. Then, informal upstream players first of all include ASM engaged in manual or semi-mechanised mining activities.

Formal downstream players include mineral refiners, which often also relate to large mining companies. Processing of raw ore into concentrates (tin, tantalum) or chemical intermediate products (cobalt hydroxide) are however, part of the upstream sector. Manufacturers and end users, such as companies in electronics, automotive and construction industries are important downstream players. However, almost all of these players situated outside of the studied countries.

Informal downstream players include craftsmen which may create jewellery, ornaments and other handicrafts for local and regional markets. However, these players are very few in number in the studied countries.

5.1.2 Relationships at local or regional levels

This section will highlight the connection of each country to the Regional Economic Communities (RECs) such as ECOWAS, SADC, CEMAC, UEMOA/WAEMU…

These initiatives aim to promote economic cooperation, trade and development among participating countries.

In some countries, Special Economic Zones had been initiated, focusing on the mining and processing of electric vehicle-relevant commodities and related products along the value chain.

5.2. Building new B2B relations

For building B2B relations, the partners in charge of the country case study are encouraged to organise an in-country workshop at the end of the study. One of the objective of these in-depth studies is to extend

our list of formal and informal players with whom the project will interact at the launching of the B2B platform.

5.2.1 Promoting local content and enabling mining cluster actors

To improve the framework conditions for European and African companies and organisations to co-create new value, businesses, products and services by transforming the ways they interact, hereafter Geoscience/mining related accredited education and training programmes are listed. A number of structures offers training courses of varying quality in the field of mining (as mining engineering, geology, metallurgy, mineral resource management, mining safety, the environment and sustainable development). In this section, we will get an overview of the:

- **Relevant institutions** for each country described in the case studies, for the development of an Africa-focused critical minerals network (considering the technological, environmental, economic and social dimensions) bringing together research, academia, industry and governmental stakeholders, to facilitate international collaboration;
- **Geoscience/mining** related accredited education and training programmes in the country with relevant information on their programmes and courses;
- **Relevant organisations** across the African continent and in Europe to host interns and apprentices with upstream and downstream players in the extractive industry.

5.2.2 Strengthening African mining clusters

This section might provide the following information:

- **Existing alternative financing models (**e.g. micro-credit or crowdfunding**);**
- **List of the upstream and downstream companies** to contribute to a special basket fund **(Corporate Social Investment fund) for funding training and networking activities.**

6. Energy and digital transition: develop a strategy for the EU and Africa Partnership

This section first provides a general strategy for an EU-Africa partnership focussing on energy and digital transition followed by information on ongoing actions. This section might provide the following information:

- **List of partnerships/projects**: ongoing EU-funded, African, national public funded innovation, education, cooperation, upscaling, capacity building projects (projects/partnerships dealing with responsible sourcing, CRM, with synergies to the objectives or approaches to AfricaMaVal project);
- List of the **existing platforms and networks** active in the studied country, between the country and Europe or on any other continent;
- **Country's strategy** to achieve responsible sourcing, known roadmaps, plans, etc. How do these match the needs of the twin transition? How is responsible sourcing national strategy to support national goals? Where are the biggest opportunities in a general way, to be then deeper described

in the next chapter? What are the main strategic focus areas for each country case? Where does the focus lie in the ECRM value chain? For instance, national strategy, road map from ministries or national agencies;

- What are the **targets and goals set in the country's national context**, out of those and prior chapters, where are the challenges, risks, and opportunities to establish a European-African Partnership? Where do these partnerships could play a role to enable responsible sourcing? (For instance, a specific region, specific focus in value chain, supporting infrastructures);
- Recommendations to build up the EU Partnership with the studied country.

Backed by EU support, **private sector entities, could**:

- Invest in renewable energy infrastructure (e.g., solar, hydroelectric power plants);
- Facilitate the transfer of EU's renewable energy technology;
- Upgrade and expand the electricity grid to reach underserved areas;
- Introduce smart grid solutions for efficiency and reliability in energy distribution;
- Collaborate on capacity-building programs to train local workforce in renewable energy technologies and management;
- Invest in expanding and improving telecommunication networks, including broadband infrastructure;
- Promote initiatives for digital inclusion, ensuring access to technology and digital education across the country;
- Assist the African countries in implementing e-government solutions;
- Support the digitisation of healthcare and education systems;
- Collaborate on establishing robust data security and privacy regulations, fostering a secure digital ecosystem;
- Offer training and expertise in cybersecurity to safeguard digital infrastructure.

The **partnership framework should consider**:

- Private-Public-Partnerships (PPPs) between EU private sector firms and the country government to ensure sustainable investment and operational excellence;
- Joint investment funds or facilities can be established to support projects aligned with the transition goals;
- Policy alignment between the EU and the country to facilitate smooth implementation of projects and regulatory coherence;
- Sustainable Development Goals (SDG) to ensure that energy and digital transition projects contribute to sustainable development, social inclusion, and environmental protection.

7. Opportunities for responsible investments

The main objectives of this section is to develop a short list of local industrial exploration or mining projects.

7.1. Proposal of projects to be presented as fact sheets in WP7

Identification of individual exploration, mining and refining projects

The partners involved in the country case studies (and their local subcontractors) were asked to identify eight priority projects in the country related to the exploration, mining or refining of ECRM.

Each project to be proposed shall fulfil the following minimum requirements described hereafter:

1. **Credible ECRM resource** estimate available (note: the project does not necessarily have to be very big, but it is important to demonstrate that the ECRM resources have been determined in a credible and reliable way);

2. **Sufficient availability of credible project-specific information on economics and ESG features**. This typically refers to studies such as scoping studies, preliminary economic assessments, pre-feasibility and feasibility studies (JORC, NI43-101, PERC, SAMREC, CIM, SME, etc.-compliant as far as possible), environmental and social impact assessments, permit details and supporting documents, company reports containing project-specific information, credible internal reports (that may not be published) or credible third party reports (e.g., independent audits).

3. The project operator is **seeking investment or financing**. Note this may refer to project development, project expansion, or optimising certain aspects of a project (e.g. to improve ESG performance);

4. Part of the project's current or anticipated future **ECRM production is potentially available to the EU industry**. Projects where owners or offtake partners exclusively direct the large majority of project ECRM production to third countries outside of the EU may not be considered.

Projects meeting these requirements shall be documented in a shortlist comprising at least the following project-specific information: project name, operator, major owner(s), main commodity and co-/by-products, administrative address and geographic location (precise and verified geographic coordinates), project development stage, project status, ore resources (and reserves, when available), detailed list of all available information (full report references), and comments/recommendations by the country case study partner.

7.2. ASM sector country profiles

Country profiles on ASM sector developments and investment

As part of Task 7.5 in WP7, Levin Sources prepared country profiles on the national ASM ECRM sector and associated investment opportunities.

Levin Sources continued worked on the 15 country profiles outlining the ASM sector for ECRMs and related investment opportunities' areas. Based on the outcomes of Deliverable 1.4, the Levin Sources team has developed a plan to prepare profiles on the following countries: Burundi, Cameroon, **DRC**, Ethiopia, Ivory Coast, **Madagascar**, **Morocco**, **Mozambique**, Nigeria, Republic of Congo, Rwanda, **Tanzania**, Uganda, Zambia, and Zimbabwe. Therefore, some of the 10 countries had not been screened by Levin Sources and information had been collected through local subcontractors.

To the extent possible and based on available information, each country focused analysis looked into the following areas:

- **ASM sector profile**: understanding the major characteristics of the sector, which minerals are produced and the socio-economic relevance of ASM production for ECRM.
- **Value chain overview**: outlining the value chain activities that take place in the focus country, and which financing mechanisms already exist supporting ASM production of ECRM or other commodities.
- **Challenges, investment needs and opportunities**: considering the characteristics of ECRM ASM production and the major challenges of the sector in the scope countries, this section represents the core section of the analysis trying to draw which investments are most needed and whether existing opportunities can be identified.

Conclusion

The conclusion will highlight the strengths and the pitfalls of the countries under study, considering their resources, the level of development of their value chain, regulatory, environmental, and societal framework, as well as the current geopolitical and economic context. The conclusion should provide insights into the development or improvement of mining activities, taking into account the imperatives of good governance and sustainable mining.

Guidance on investment opportunities across the entire value chain or specific segments, as well as institutional support, may be suggested.

References

List of references

Horizon Europe Framework Programme (HORIZON)

D9.3 – Democratic Republic of the Congo case study

WP9 - Task 9.4

Date [08/01/2024]

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Table of Contents

1. Extended Critical Raw Materials supply potential of the DRC 13
1.1. Inventory of the ECRM 13
1.1.1 Geological setting 13
1.1.2 Known Ore deposits and occurrences 16
1.2. Prospectivity and mineral high potential mapping 18
1.2.1 Selection of the ECRM for mineral prospectivity 18
1.2.2 Mineral high potential areas 19
1.3. Ore processing and refining capacities 26
2. Assessment of the ECRM value chain 28
2.1. Characterisation of the value chain for primary and secondary raw materials 28
2.1.1 List of the mining and recycling projects 28
2.1.2 Existing ESG indicators 32
2.1.3 Status of economic links between the formal and informal sectors 33
2.2. Identification of the bottlenecks along the value chain 35
2.2.1 List of the main bottlenecks and the links between them 35
3. Investment/financing prospects for ECRM projects in the DRC 38
3.1. Fiscal, legislative and regulatory context for in-country financings 38
3.1.1 Fiscal framework for mining investment (due to the Finance Law 2015) 38
3.1.2 Legislative framework for mining investments 42
3.2. Macroeconomic context for in-country financings 43
3.2.1 Overview 43
3.2.2 Gross Domestic Production dynamics 45
3.2.3 Foreign Direct Investment trajectories 47
3.2.4 Foreign exchange fluctuations and inflation undulations 48
3.2.5 Sovereign debt burdens 50
3.2.6 Intricacies of import and export mechanisms 51
3.3. Political context for in-country financings 54

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4. Assessment of social, environmental, and governance challenges 57
4.1. Country-level assessment and context 57
4.1.1. Context 57
4.1.2. Mineral/mining policies, industry policies 57
4.1.3. Mining regulations 58
4.1.4. Taxation and royalties 59
4.1.5. Land-use and mineral rights 60
4.1.6. Environment 61
4.1.7. Societal and community aspects, cultural heritage 63
4.1.8. Public health and safety 65
4.2. Mining practices *vs.* Environmental, Social and Governance (ESG) goals 66
4.2.1 Environmental challenges 66
4.2.2 Socio-economic issues 67
4.2.3 What would be the best practices for a responsible mining? 68
5. Business network between the European Union and the DRC 70
5.1. Assessment of the upstream and downstream business ecosystem 70
5.1.1 Context, formal and informal players 70
5.1.2 Relationships at local or regional levels 71
5.2. Building new B2B relations 73
5.3. Promoting local content and enabling mining cluster actors 73
6. Energy and digital transition: develop a strategy for the EU and Africa Partnership 76
7. Opportunities for responsible investments 80
7.1. Identification of individual exploration, mining and refining projects 80
7.2. Artisanal and small-scale mining 81
Appendix 92
A1.2. Prospectivity and mineral high potential mapping 92
A1.2.1 Geological framework used for prospectivity mapping 92

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List of Figures

Figure 1: Geological map of the DRC 13
Figure 2: Map of the ECRM mineral occurrences. Major ECRM ore deposits and minor occurrences are displayed as big dots (indiscriminated). Bi = bismuth, Mn = manganese, Ni = nickel, Cr = chromium, Phos = phosphorus, PGE = platinum group elements. 17
Figure 3: Example of confusion matrix for Ta-Nb-Sn-W favourability model. 20
Figure 4: Selection of favourability cells (FP and TP) for copper and cobalt (threshold > 0.5). 22
Figure 5: Selection of favourability cells (FP and TP) for lithium (threshold > 0.7). 23
Figure 6: Selection of favourability cells (FP and TP) for tin, tantalum, niobium and tungsten (threshold > 0.47). 24
Figure 7: Gross Domestic Product Growth Rates, in percentage (World Bank 2023c). 45
Figure 8: Contribution to the Real GDP Growth, inclusive extractive economy (left) and exclusive extractive economy (right) (IMF 2023). 46
Figure 9: Foreign Direct Investment inflows into DRC, absolute values in billion US$ (left) and as % of GDP (right) (World Bank 2023c). 47
Figure 10: Exchange rate trends from 2021 to 2024 in CDF per US dollar (BCC 2023). 49
Figure 11: Monthly Inflation and Exchange rates, 2019-2021 in percent (left) and CDF/USD (right) (World Bank 2022b). 49
Figure 12: Annual targets and actual annual average values of inflation (IMF 2023). 50
Figure 13: External Sector Developments, 2017-23 showing (left) the export of goods and (right) the import of goods as percent of GDP (IMF 2023). 52
Figure 14: DRC's top (top) export and (bottom) import partners in 2022 (UN Comtrade 2023). 53
Figure 15: Revenue sharing through fiscal decentralisation. 65
Figure 16. Geology map of the DRC showing important domains hosting the LSUs for the predictive maps as well as ECRM occurrences. Modified after Fernandez-Alonso et al. (2015). 93

List of Tables

Table 1: The applied parameters for the MPM's of DRC. "no" = not used for the analysis. 19
Table 2: Results of data driven mineral potential mapping in DRC applying the FAMME algorithm. 20
Table 3: Democratic Republic of Congo national exploration priority areas. 26

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Table 4: List of processing facilities in the Democratic Republic of Congo. Note the list may not be complete/up to date due to the highly dynamic business development in Haut-Katanga and Lualaba. 28
Table 5: List of exploration, mining (operating) and "recycling" (tailings) projects in the DRC and their project status 32
Table 6: Comparison of the ratings concerning raw material governance and investor attractiveness by different international agencies. 35
Table 7: Authorisation requirements and process 39
Table 8: Income Tax, Withholding Tax 40
Table 9: Double tax treaties and reduced rates Treaties 40
Table 10: DRC Economic Fact Sheet. 44
Table 11: Royalty rates per mineral category. 59
Table 12. Examples of organisations currently engaged in the DRC mining, environment or energy sector. 75
Table 13: Projects to be proposed for fact sheets in WP7. 81
Table 14. Summary table showing the location of the various lithostratigraphic units in the major geological domains of the DRC. The LSU codes used to produce the predictive maps are indicated in the code field. 94

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Abbreviations and Acronyms

Acronym	Description
ADF	Allied Democratic Forces
AfCFTA	African Continental Free Trade Area
AFD	French Development Agency
AHK	Southern African German Chamber of Commerce and Industry
ARISE IIP	ARISE Integrate Industrial Platform
ASM	Artisanal and small-scale mining
B2B	Business to business
BCC	Central Bank of Congo
BGR	German Federal Institute for Geosciences and Natural Resources
C4D	Cobalt for Development
CAEB	African Centre of Excellence in Battery Manufacturing
CAMI	Mining Cadastre Office
CDF	Congolese franc
CEEC	National Certification Agency for Exports
CEPGL	Economic Community of the Great Lakes Countries
CIF	Value for duty
CMOC	China Molybdenum Corporation
CNMC	China Nonferrous Metal Mining Group
COMESA	Common Market for Eastern and Southern Africa
CPS	Provincial Monitoring Committee
CTC	Certified trading chains
CTCPM	Technical Coordination and Mining Planning Unit
DBA	Disc-Based Association
DG-ECHO	European Commission's humanitarian aid and civil protection department
DPEM	Mining Environmental Agency
DRC	Democratic Republic of Congo
ECCAS	Economic Community of Central African States

ECRM	Extended critical raw materials (as defined for AfricaMaVal project)
EDF	European Development Fund
EIB	European Investment Bank
EITI	Extractive Industries Transparency Initiative
EPRM	European Partnership for Responsible Minerals
ERG	Eurasian Resources Group
ESG	Environmental, social and governance
ESIA	Environmental and social impact Assessment
EU	European Union
EV	Electric vehicle
FARDC	Armed Forces of the Democratic Republic of the Congo
FCA	Fair Cobalt Alliance
FDI	Foreign direct investment
FEC	Congolese Federation of Enterprises
FMO	Dutch Finance Agency for Developing Countries
FOMIN	Mining Fund for Future Generations
FX	Foreign exchange
GDP	Gross domestic product
GIZ	German International Cooperation
ICGLR	International Conference on the Great Lakes Region
IDAK	Provincial Monitoring Committee of the former Katanga region
IDAKI	Provincial Monitoring Committee of the Kivu region
IMF	International Monetary Fund
IPIS	International Peace Information Service
IRMA	Initiative for Responsible Mining Assurance
iTSCi	Tin Supply Chain Initiative
JV	Joint venture
KfW	German Credit Institute for Reconstruction
LSM	Large-scale mining
LSUs	Lithostratigraphic units

MONUSCO	United Nations Organisation Stabilisation Mission in the Democratic Republic of the Congo
NGO	Non-governmental organisation
OECD	Organisation for Economic Co-operation and Development
OHADA	Organisation for the Harmonisation of Business Law in Africa
PPP	Private-Public-Partnership
RMI	Responsible Mining Initiative
SADC	Southern African Development Community
SAEMAPE	Assistance and Support Service for Artisanal and Small-Scale Mining (formerly SAESSCAM)
SDG	Sustainable Development Goals
SEZ	Special Economic Zone
SGN-C	Geological Survey of the Congo
Sicomines	Chinese-Congolese Company of Mines
SMB	Bisunzu Mining Company
SME	Small and medium entreprises
SMI	Small and medium industries
SNCC	National Railway Company of Congo
SNEL	National Electricity Society of Congo
RF	Random Forest
UAE	United Arab Emirates
UCNDK	University of Nature Conservation and Development
UN	United Nations
UNIGOM	University of Goma
UNIKIN	University of Kinshasa
UNIKIS	University of Kisangani
UNIKOL	University of Kolwezi
UNILU	University of Lubumbashi
UNIMBA	University of Mbandaka
UOB	Official University of Bukavu

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UOR-Butembo	Official University of Ruwenzori
VAT	Value-added Tax
WHT	Withholding tax
WP	Work package
ZEA	Artisanal mining zone

Wording

Mineral prospectivity: "Mineral potential mapping is concerned with quantifying and mapping the likelihood that mineral deposits are present in a study area. It is synonymous to mineral prospectivity mapping, which is concerned with quantifying and mapping the likelihood that mineral deposits may be found by exploration in a study area."

Keywords

ECRM, Mineral potential, Ore processing, Refining capacities, Value chain, Primary raw material, Secondary raw material, Bottlenecks, Finance, Investment, Sustainability, ESG, Land-use, Taxation, Mining regulation, Mining policies, Responsible sourcing, DRC, Pan-African

Executive Summary

This report provides the reader with an overview of the key aspects regarding mineral resources, supporting regulations and institutions, as well as any related provisions in the prospecting of Critical Raw Materials (CRMs) in Democratic Republic of Congo (DRC). The report is an integral part of the larger AfricaMaVal project and, in that context, provides this country overview specifically aimed at European Union (EU) investors and decision-makers.

The DRC is characterised by an enormous mineral wealth and has a very long mining tradition. As of 2022, the country is the world's largest producer of cobalt and the second-largest producer of copper, together with Peru. The country is also significantly endowed in diamonds, gold and uranium relating to vast historic (no recent uranium production) and recent production. AfricaMaVal is focusing on the minerals and metals present in the fourth list of CRMs for the EU as well as on copper (Cu), nickel (Ni), tin (Sn) and manganese (Mn) that are particularly pertinent considering Africa's geological potential and their critical status in the digital and energy twin transitions. Within this context, the DRC has significant resources in copper, cobalt, manganese, lithium, tin, tungsten, tantalum (the "3Ts"), and niobium (mostly associated with tantalum) as well as germanium and gallium as possible by-products of zinc mining.

This report gives an overview of the geological setting and Extended CRM (ECRM) endowment of the DRC. It shows the value chain and potential investment opportunities in this value chain, as at present the majority of raw materials is only mined, concentrated and exported afterwards. We will also present insights into the regulations for financing, including taxation and royalties and give an overview about the macroeconomic context of the DRC. Besides these financial issues we will also present an assessment of the social, environmental and governance challenges of the DRC, which includes mining practices vs. environmental, social and governance (ESG) goals.

This also relates to the lack of implementation of certain legal and regulatory provisions in terms of transparency. There are a number of international industrial mining standards as well as due diligence initiatives, which address a broad range of ESG aspects and a few of them (focusing on artisanal mining and due diligence) have been specifically designed based on the situation in the DRC. The revision of the legal framework for the mining sector in 2018 and the new mining sector strategy of 2023, however, show that the state is committed to ensuring that the country's natural resources benefit its people.

Artisanal and small-scale (ASM) mining holds an important place in the mining sector of the DRC, with at least 0.5 million and up to one million artisanal miners, most of whom are working in the gold sector. Artisanal mineral commodities include cobalt and copper, the 3Ts as well as non-ECRMs such as gold, diamonds and gemstones (tourmaline). A number of mine sites in the DRC

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show variable degrees of mechanisation and may hence be classified as semi-industrial in practice, even though this is not a formal legal definition.

There are a number of measures in place to formalise the ASM sector, including the establishment of the state service SAEMAPE. This service is responsible for ASM monitoring, the legal obligation to work in cooperatives, the registration of miners and traders and the establishment of artisanal mining zones ("ZEA"). However, the implementation of these measures is always a challenge. Currently, investment in the ASM mine infrastructure is very low. However, the DRC's artisanal 3T sub-sector could be a straightforward investment target to increase the country's artisanal ECRM production. Several mine sites appear to have sufficient production potential to justify semi-mechanisation. However, apart from the geological and economic uncertainties, it should be noted that there may be conflicts and tensions with local cooperatives, as semi-mechanisation is associated with the loss of jobs for unskilled labour.

DRC is a well-known mining jurisdiction with a modern mining law, a good geological database and increasing efforts to enforce environmental regulations and improve working conditions, especially in the ASM sector. On the other hand, there are some bottlenecks in the DRC, in particular the inadequate road and railway network, the frequent power outages and electricity supply shortages, as well as the ongoing conflicts in eastern Congo.

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1. Extended Critical Raw Materials supply potential of the DRC

1.1. Inventory of the ECRM

1.1.1 Geological setting

Due to its high endowment with a range of raw materials, both ECRM and precious commodities such as gold and diamonds, the DRC is sometimes described as a 'geological scandal'. The following geological description focuses on the main metallogenic provinces where critical raw materials occur. The major geological units are displayed in Figure 1:

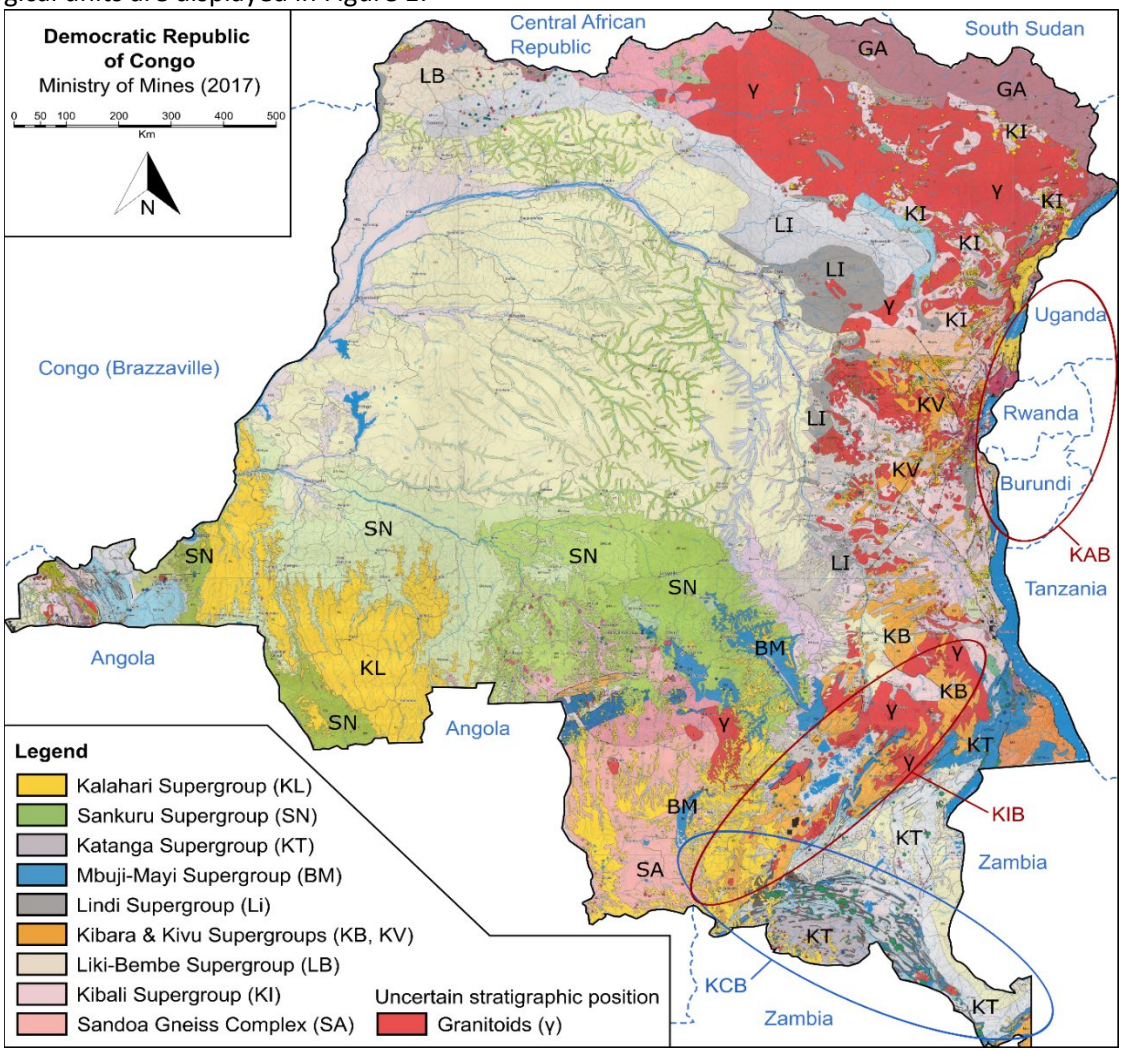

Figure 1: Geological map of the DRC[1]

Katanga Copperbelt: The Neoproterozoic Central African Copperbelt stretches on both sides of the border between Zambia and Democratic Republic of Congo (Figure 1). In the DRC, it is

[1] . Modified from the DRC Ministry of Mines (2017) focusing on the major critical raw materials-bearing lithological units. Locations of the Katanga Copperbelt (KCB) and Kibara belt (KIB) and the Karagwe-Ankole belt (KAB) are also shown.

referred to as Katanga Copperbelt. It hosts one of the world's greatest concentration of stratiform Cu-Co deposits, including world-class deposits, such as Kamoto, Mutanda and Tenke-Fungurume. The USGS (2023) lists DRC-hosted reserves of 31 million tons of copper and 4 million tons of cobalt – this corresponds to 3.5% of the world's copper and 48% of the world's cobalt reserves, respectively. Current combined reserves and resources as registered in S&P Capital IQ (S&P 2023a) for individual DRC exploration and mining projects comprise 135 million tons of copper and 13 million tons of cobalt. The Copperbelt refers to the Katanga supracrustal sedimentary succession (Katanga Supergroup; Figure 1), which is 5-10 km thick and commonly sub-divided into three major lithostratigraphic units, namely the Roan, Nguba and Kundelungu Groups (François 1974; 1995). The stratiform Copperbelt Cu-Co orebodies occur in the Roan Group (i.e., in the Mines and Mwashya Subgroups; Cailteux et al. 2005). The Mines Subgroup (Congolese side) within the Roan Group represents a transgressive succession deposited in a reducing evaporitic environment comprising dolomitic shales and dolomites (Cailteux 1994). The Cu-Co orebodies occur in the lower part of these successions and the stratiform mineralisation was deposited before the Lufilian compressional tectonics affected the orebodies (Cailteux and Kampunzu 1995). Due to lithostratigraphic and regional tectonic controls, there is a trend from the rather Cu-rich, Co-poor Zambia-type deposits in the south to the more Co- and less Cu-enriched deposits of the Congo-type in the north of the Copperbelt (Oosterbosch 1962; François 1973, 1974; Cailteux 1994 and references therein).

Besides the primary sulphide deposits, oxidised cobalt minerals, i.e. heterogenite, are concentrated as "cobalt caps" along the top of silicified dolomite inselbergs (e.g., Kawama, Kasompi, Luiswishi). The supergene cobalt enrichment process is part of a regional process of residual ore formation that also forms world-class "manganese cap" deposits in western Katanga (southern part of the Kasaï Craton).

Kasaï Craton (Related provinces: Sankuru, Kasaï-Central, Kasaï-Oriental, Lomami, Lualaba): The Kasaï Craton is located in the central south of the DRC (Figure 1). It is composed of Archean gabbros and charnockites in the south as well as Neoproterozoic carbonate formations in the north (Cahen et al. 1984). The craton is host to several mineral commodities: (i) The Mbuji-Mayi District (Figure 1) hosts significant diamond deposits, which have been a major source of gem-quality as well as industrial diamonds for many years; these have been worked as artisanal, semi-mechanised and industrial mines. The diamonds are hosted by kimberlite pipes, which intruded the crystalline basement (granites, gneisses, schists). Due to weathering of the kimberlite pipes, the sedimentary cover may contain secondary diamond deposits (de Wit and Jelsma 2015). (ii) The Lutshatsha and Nkonko mafic and ultramafic complexes comprise serpentinite, derived from dunite and harzburgite and yield significant potential for nickel and chromium mineralisation of laterite style (Philippe et al. 2018). The economic potential of these areas is currently unclear since the Kasai province has not been well explored, except for diamonds. (iii) The Kisenge-

Kamata Basin in the southern part of the Kasaï Craton is host to Paleoproterozoic sedimentary manganese mineralisation. These sediments are also significantly enriched in Cu, Co, Ni, Zn and other accessory metals (V, Mo, Ga; De Putter et al. 2018). Similar processes which led to the formation of “cobalt caps” in the Copperbelt, also formed the manganese “black earths” (world-class manganese oxide caps) of Kisenge-Kamata that are exploited by both industrial and artisanal mining (Decrée et al. 2010).

Kibali Gold Belt (related provinces: North Kivu, Ituri): The Kibali Gold Belt is located in the north-eastern part of the DRC extending throughout the Kilo-Moto regions (Ituri province) (Figure 1). The Moto and Kilo areas have initially been mined at the Moto placer deposits in the Kibali River and the Kilo placer deposits east of the river. The Belt is composed of over two billion years old greenstone belts, which were intruded by granitoids. Both lithologies are spatially and genetically associated with quartz vein- and shear zone-hosted gold mineralisation. With the Kibali gold mine, the belt hosts the largest gold deposit in Africa outside of South Africa (Tack et al. 2010; Bird 2016). The province is also host to diamonds, niobium and tantalum occurrences.

Kibara belt: The north-northeast-south-southwest trending Mesoproterozoic Kibara Belt is located in the eastern part of the Democratic Republic of Congo and extends across the provinces of North and South Kivu, Maniema and the former Katanga province (Figure 1), as well as the neighbouring countries of Burundi, Rwanda, western Tanzania and western Uganda (e.g., Pohl et al. 2013). The Kibara belt represents one of the largest Ta-Nb(-Sn-W) provinces in the world. Deposits in this region have been mined since Belgian colonial times. Due to the somewhat erratic, small size of many deposits, which are usually developed as artisanal and small-scale mining sites, tantalum(-niobium) reserves and resources are rarely defined (Schütte & Näher 2020). It is thus not possible to provide a robust estimate for the DRC’s tantalum resources, but the metallogenic potential is underlined by the fact that the country has been the major global tantalum mine producer for the past 20 years.

The Kibara belt primarily consists of Palaeo- to Mesoproterozoic (1,780 to 1,375 Ma) clastic sedimentary rocks that are intruded by multiple generations of igneous rocks, namely granitoids, mafic rocks and layered mafic-ultramafic complexes and the so-called "tin granites" (Tack et al. 2010; Melcher et al. 2017). Only the tin granites are associated with Ta-Sn-W (Li-Be-P) mineralisation, which ranges in age from ~1,020 to ~930 Ma (Dewaele et al. 2011; Melcher et al., 2015) and which is hosted by variably zoned pegmatites of variable size (Hulsbosch et al. 2014). The most fractionated (i.e., Li-Ta-rich) pegmatites are rather distal to the tin granite outcrops. Many pegmatite ore bodies have small tonnages but often contain tantalum, niobium and tin in economic concentrations to allow artisanal and small-scale mining activities. The strong weathering and associated alluvial or eluvial enrichment supports these mining activities but at the same time makes these deposits less attractive lithium targets. At the southern end of the Kibara belt, the Manono deposit (e.g., Dewaele et al. 2016) is exceptional in size, with unusually

thick pegmatite dykes and a present total ore tonnage of 412 million tons (S&P 2023b), the largest undeveloped pegmatite deposit in the world. While Manono has historically been mined as a tin deposit, it is now considered a lithium deposit (with low tin and tantalum) and total reserves and resources of 6.7 million tons of contained Li_2O.

In addition to the aforementioned metallogenetic provinces, the DRC government has designated other zones of particular relevance for future exploration in its strategic planning.

Equateur Region: The Equateur Region comprises the provinces Bas-Uélé, North-Ubangi and South-Ubangi. Neoproterozoic migmatites, dolerites, quarzites and carbonates of the Lindi and Liki-Bembe Supergroups (Figure 1) are hosts to different kinds of mineralisation, including gold, diamonds, rare earths, tin, tantalum and tungsten.

Kwango et Congo-Central Region: This region is located in the west of the DRC and comprises the provinces of Kwango, Kinshasa and Congo-Central (Figure 1). Gneisses, sandstones, carbonates, quarzites, schists and sediments of the East Congo and Sankuru Supergroups (Figure 1) are hosts to gold mineralisation, diamonds (e.g. of the Bas-Congo kimberlite field) (De Wit and Jelsma 2015), limestone for concrete as well as phosphate, aluminium, copper and vanadium mineralisation.

1.1.2 Known Ore deposits and occurrences

As of 2022, the country is the world's largest producer of cobalt and the second-largest producer of copper, together with Peru (USGS 2023). The DRC has significant resources in copper, cobalt, diamonds, gold, uranium, zinc (with possible by-products germanium and gallium), manganese, lithium, tin, tungsten, tantalum (the "3Ts"), and niobium (mostly associated with tantalum). Artisanal and small-scale mining (ASM) holds an important place in the mining sector of the DRC, with at least 0.5 million and up to one million artisanal miners, most of whom are working in the gold sector; older estimates of two million artisanal miners in the DRC continue being cited in the literature but are no longer up to date, as they reflected a boom in diamond mining about 15-20 years ago that is no longer in place as such. Artisanal mineral commodities include cobalt and copper, the 3Ts as well as non-ECRM such as gold, diamonds and gemstones (tourmaline). Industrial mining focuses on the copper-cobalt sector but also comprises few gold mines and a tin mine. A number of mine sites in the DRC show variable degrees of mechanisation and may hence be classified as semi-industrial in practice, even though this is not a formal legal definition.

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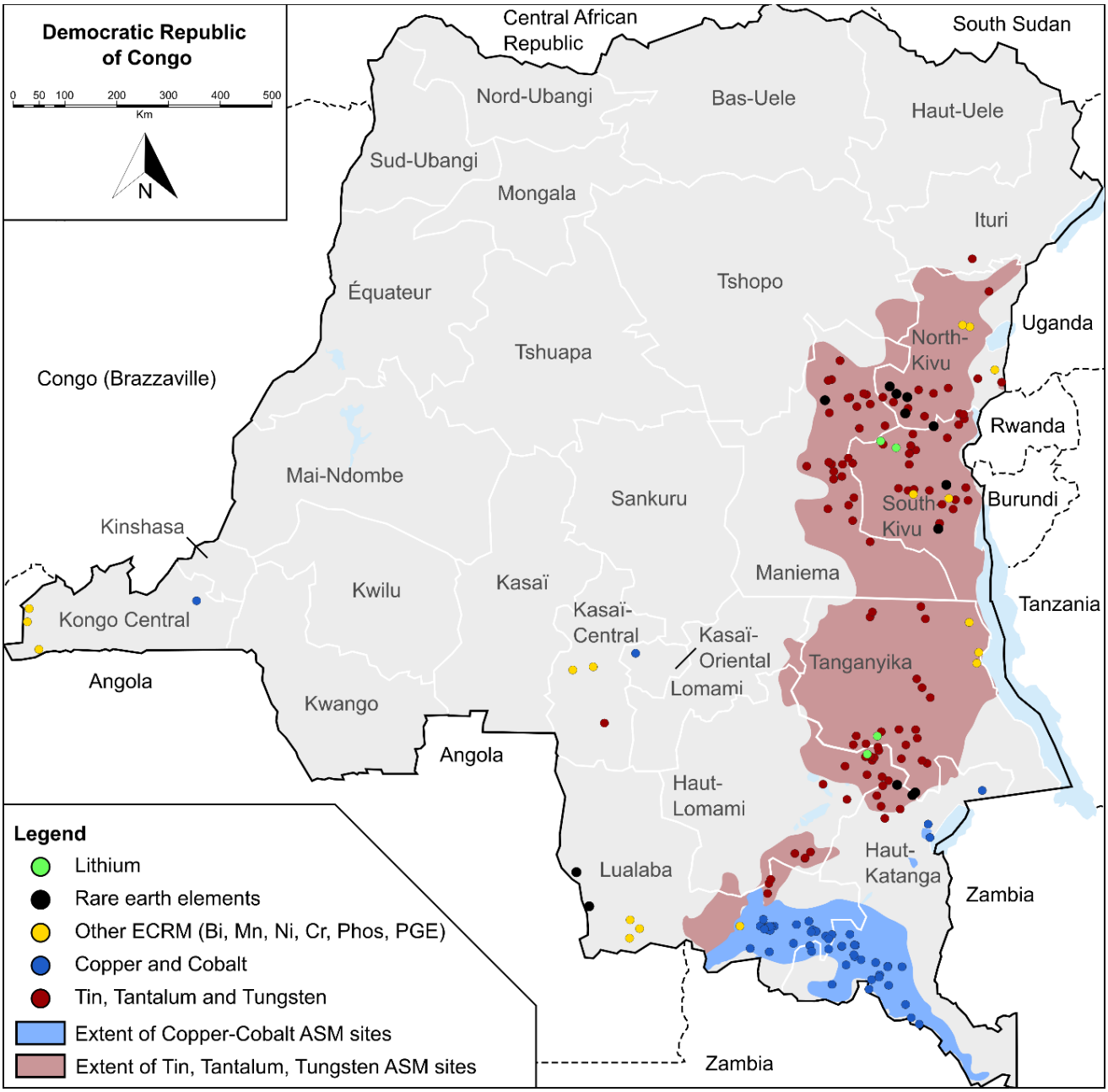

Figure 2: Map of the ECRM mineral occurrences. Major ECRM ore deposits and minor occurrences are displayed as big dots (indiscriminated). Bi = bismuth, Mn = manganese, Ni = nickel, Cr = chromium, Phos = phosphorus, PGE = platinum group elements[2].

The complete inventory of known ore deposits and occurrences is displayed in Figure 2. These only comprise ECRMs as main commodity or co-/by-product. The data have two major sources: (1) The AfricaMaVal dataset include major ore deposits as well as mineral occurrences (Figure 2), as known from field campaigns etc. (247 data points). (2) The second dataset (2798 data points) originates from open data provided by the International Peace Information Service (IPIS; IPIS

[2] Data provided by AfricaMaVal (WP1), IPIS (2023) and BGR (2022).

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2023) and is represented by the extents of copper-cobalt (Katanga-Lualaba area) and tin-tantalum and tungsten (eastern DRC) ASM sites, respectively, in Figure 2. These mine sites have been visited by IPIS, BGR and others since 2009. Given the past or present artisanal exploitation of these sites, each of them is indicative of the geological occurrence of the mined commodity.

1.2. Prospectivity and mineral high potential mapping

This task was carried out by BRGM. The geological framework developed for the predictive approach is based on the geological map by Fernandez-Alonso et al. (2015). The lithostratigraphic units (LSUs) model has been modified and adapted to take into account the diversity of granitoid-type terrains that were previously undifferentiated on the GIS database, among which the Mesoproterozoic Kibaran and Archean Uélé granitoids. 112 LSUs were used to carry out the predictive analysis, spread across 17 domains, reflecting the complexity of DRC geological history, which have led to the deposition of specific mineral resources. Details of the LSUs distributed across the different domains are shown in Table 14 (Appendix), the occurrences of the most important domains hosting the LSUs are shown in Figure 1 and Figure 16. Table 14 (Appendix), and the "Africamaval code" have been produced using the LSUs information (ranging from the Supergroup to the Formation) together with the age of the unit.

1.2.1 Selection of the ECRM for mineral prospectivity

Among the thirty ECRMs present in DRC, three groups of commodities were selected for mineral potential mapping (MPM) to demonstrate the principle of the method: Cu-Co, Sn-Ta-Nb-W and Li. These three groups were tested at a scale of 1:2.5M and a specific zoom have been proposed for the Cu-Co group on the Lufilian arc (Copperbelt). The lack of homogeneous geoscientific data (e.g., aerial geophysics, satellite data, soil and stream geochemistry) and the relatively low resolution of the geological map used for this study (1:2.5M) implies only limited interest of the weakly constrained mineral potential maps for exploration. There was no use to illustrate this for the whole range of ECRM's.

The MPM was performed using the disc-based association (DBA) grid method coupled with Random Forest (RF) method (Vella, 2022); the algorithm applying these principles has been labelled "FAMME" by the author. The method is based on the analysis of the local spatial associations of geological variables and features of various natures to describe the relationships between the predictors and the mineralization. This allows the identification of geological environments in the study area around each node of the DBA grid, and the integration of either quantitative or non-quantitative spatial data. In a second step, RF classification is used to perform a generalisation of complex geological environments and features and evaluate their likelihood to host potential occurrences of mineralisation by giving a score between 0 (low potential) and 1 (high potential).

The data for the MPM of DRC comprised the following elements:

- SIG-Afrique mineral resources database (BRGM, 2023);
- IPIS database on artisanal and small-scale mining in eastern DRC (IPIS, 2023)
- S&P Global database on mining projects (S&P Global, 2023)
- 1:2,500,000 DRC Geological map (Fernandez-Alonzo et al., 2015).

The DBA grid for predictive modelling is mainly defined by four parameters:

- d: Size of cell – d;
- R: Search radius buffer for lithologies – R;
- R1-occ: Search radius buffer for mineral occurrences;
- R2-fault: Search radius buffer for faults.

To maximise the grid resolution while minimising overlaps and cells with only one lithology, the parameters of DBA grid for the four selected commodities in individual areas of interest (AOI) used in this study are as indicated in Table 1.

Predictivity parameters	Cu-Co	Sn-Ta-Nb-W	Li (Be)	Cu-Co Lufilian Arc
Occurrences	531	1 678	16	378
d (m)	5 000	5 000	5 000	1 000
R (m)	10 000	10 000	10 000	2 000
R1-occ (m)	5 000	5 000	5 000	1 000
R2-fault (m)	no	no	no	1 000
Cells number	93 876	93 876	93 876	192 127

Table 1: The applied parameters for the MPM's of DRC. "no" = not used for the analysis.

1.2.2 Mineral high potential areas

Four mineral potential maps were produced for the eight ECRM's Cu-Co, Sn-Ta-Nb-W, Li at 1:2.5M, and Cu-Co with a zoom on the Lufilian arc (Copperbelt). The results of the DBA-RF (TN, FN, FP, TP = confusion matrix) with the critical parameters for the assessment of the model are shown in Figure 3 and Table 2. The final maps are presented in the appendix.

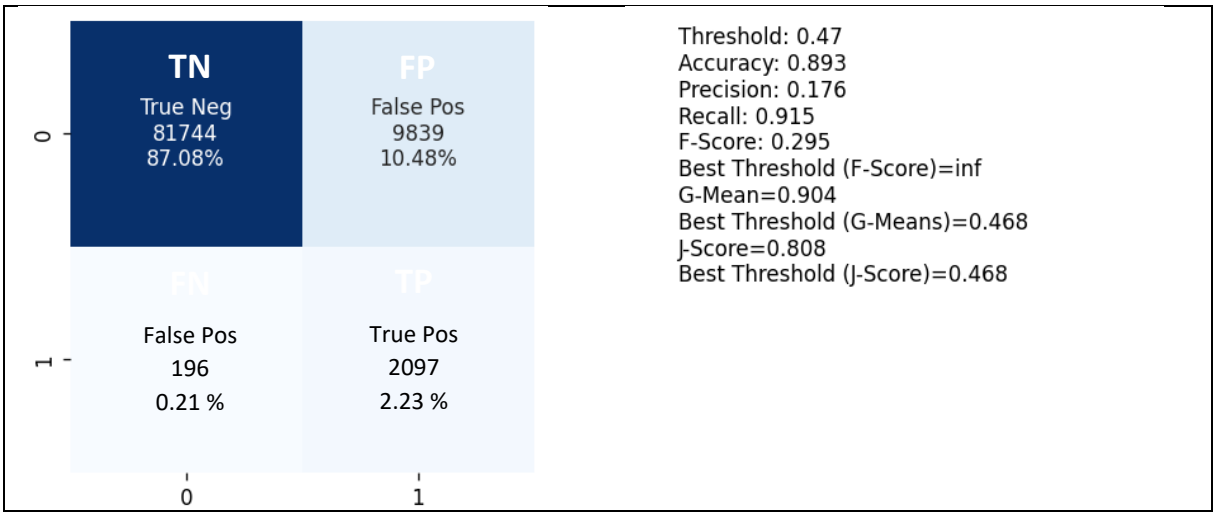

Figure 3: Example of confusion matrix for Ta-Nb-Sn-W favourability model.

Model[3]	TN	FN	FP	TP	TPR	FPR	PPA (%)	Acc.	J-score	Thresh.
Ta-Nb-Sn-W	81 744 *(87.08 %)*	196 *(0.21 %)*	9 839 *(10.48 %)*	2 097 *(2.23 %)*	0.91	0.11	12.71 %	0.89	0.807	0.47
Li	91 900 *(87.08 %)*	0 *(0 %)*	1 951 *(2.08 %)*	25 *(0.03 %)*	1.00	0.02	2.10 %	0.98	0.979	0.7
Cu-Co	88 538 *(94.31 %)*	270 *(0.29 %)*	4 308 *(4.59 %)*	760 *(0.81 %)*	0.74	0.05	5.40 %	0.95	0.691	0.5
Cu-Co Lufilian Arc	152 479 *(76.36 %)*	757 *(0.39 %)*	36 077 *(18.78 %)*	2 814 *(1.46 %)*	0.9	0.19	20.24 %	0.81	0.597	0.5

Table 2: Results of data driven mineral potential mapping in DRC applying the FAMME algorithm.

Copper and Cobalt (Cu-Co):

Copper is found in more than 700 minerals and cobalt in around 70 minerals. The most important ores of copper include native copper, chalcocite, chalcopyrite, bornite and covellite. Minor copper minerals are malachite, cuprite, tenorite and azurite. From the other side, the most important cobalt minerals include cobaltite, glaucodot, skutterudite and erythrite. Nine minerals incorporate both copper and cobalt, including carrollite, gobelinite and kolwezite.

Known for the resources of cobalt and copper, data available to test the Cu-Co favourability in DRC is based on more than 530 occurrences. Thanks to this relatively rich occurrence database,

[3] True Positive (TP) and True Negative (TN) correspond to the number of grid cells, which are correctly predicted by the RF model (i.e. mineralised and non-mineralised cells, respectively). Inversely, False Positive (FP) and False Negative (FN) correspond to the number of grid cells, which are incorrectly predicted by the RF model (i.e. mineralised instead of non-mineralised cells and non-mineralised instead of mineralised cells, respectively). FP indicate cells with high mineral potential, which so far are not indicated in the mineral occurrences database. From these data the following useful parameters are calculated: True positive rate (TPR, also "recall") = TP/(TP+FN) ; False positive rate (FPR) = FP/(FP+TN) ; Percentage of prospective area (PPA) = (TP+FP)/All ; Accuracy = (TP+TN)/All and J-score = TPR - FPR.

the production of favourability maps has made it possible to produce the DBA-RF model with an accuracy of 95.1% (Table 2; for a threshold of 0.5). This DBA-RF model indicates that about 4.5% (4308 cells) of DRC has potential for Cu-Co. The resulting MPM shows, as expected, that the most favourable region is located in the south-eastern DRC, in the Lufilian Arc/Copperbelt, and associated to the Neoproterozoic Katanga Supergroup. Analysis of the Cu-Co favourability shows that the statistically most favourable factors are, in decreasing order, linked to the Nguba Group: NP2_Kt_Ngu (and in particular the "grand conglomérat" of the Mwale sub-group: NP2_Kt_N_1), the Roan Group: NP_Kt_Roa (succession of carbonate and shale), and the Kundelungu group: NP1_Kt_K1 (dolomitic siltstone and fine sandstone). To the northwest of DRC, some potential is expressed in relative restricted zone mostly associated to the Likibembe Supergroup: MP_LB (schists and metasandstone). Finally, the eastern part of DRC, close to the borders with Burundi and Rwanda, shows a relatively low potential, with neither a specific deposit pattern nor a lithostratigraphic affinity having been identified. However, analysis of the information linked to the occurrences that can explain this favourability, shows that this potential could either be linked to a Mesoproterozoic structural control, and origin of these occurrences could be associated to the gold prospecting around the Archean greenstone belt system.

The focus was set on the Katanga region (Figure 4) to emphasise the special nature of this region in terms of Cu-Co favourability. It allows to propose a MPM with a DBA-RF model showing an accuracy of ~81 and indicate that ~19 of the regions have a potential of Cu-Co. Pattern of favourability is significantly the same where the statistically most favourable factors are; in decreasing order linked to the Nguba Group: NP2_Kt_Ngu (and in particular the "grand conglomérat" of the Mwale sub-group: NP2_Kt_N_1), the Roan Group: NP_Kt_Roa (succession of carbonate and shale), and the Kundelungu group: NP1_Kt_K1 (dolomitic siltstone and fine sandstone).

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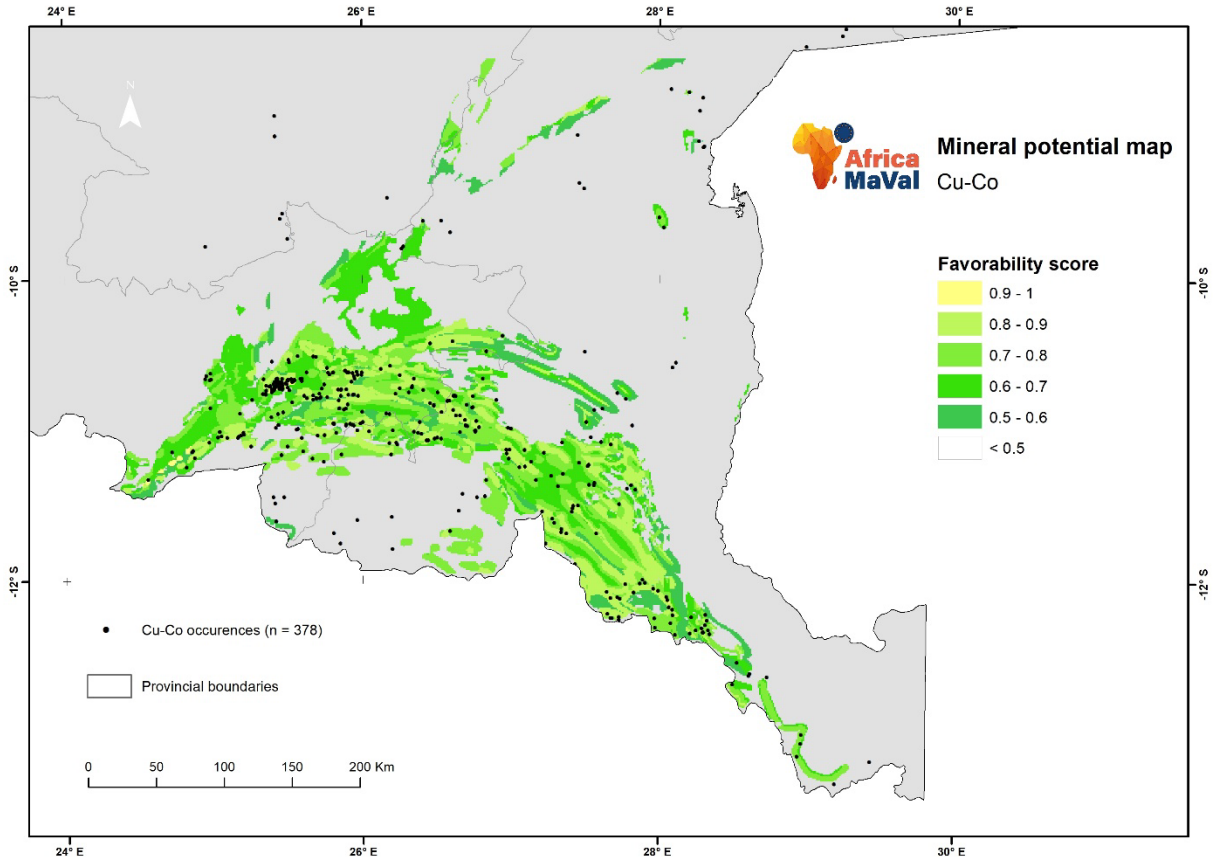

Figure 4: Selection of favourability cells (FP and TP) for copper and cobalt (threshold > 0.5).

This favourability test should be considered in the light of the available data and therefore, in the context of the DRC, the over-representation of Copperbelt, both in terms of occurrences and of details of geological knowledge. The few regions that show potential outside of the Copperbelt, i.e. the east of the DRC, the north-west and, to a lesser extent, the south-west, should of course be favoured in order to improve the available dataset and statistically balance the dataset on a national scale. Better geological maps produced at scales that allow us to refine our knowledge in terms of lithology and geological history (e.g. a 1:250K map), together with geochemical prospecting campaigns in these regions, could greatly improve these favourability maps.

Lithium (Li): Lithium is incorporated in several magmatic minerals mostly found in lithium pegmatites or rare-metal granites. The most important lithium minerals are amblygonite, lepidolite, petalite and spodumene. In DRC, 16 occurrences are recorded in the database used to generate the favourability map, especially around the Manono-Kitotolo district on the boundary between the provinces of Tanganyika and Haut-Lomani where several Li-Sn-Nb-Ta pegmatites are known (Dewaele et al. 2016). Another cluster of occurrences is located in the centre of the Kibara Belt in the Sud-Kivu province.

The DBA-RF model (for a threshold >0.7) has an accuracy of ~98% (Table 2) and indicates that 2.1% of DRC (1,976 cells) are prospective for lithium deposits (Figure 5). Statistically, the most

favourable factors are in decreasing order (without taking into account alluvial and superficial formations): MP_MKB_GK__ (Mesoproterozoic Kibarian granitic suite), hS_KA_Luk__ (Paleozoic Lukuga Group), PP2_RU___ (Paleoproterozoic Ruzizi Supergroup) and MP_KV___ (Mesoproterozoic Kivu Supergroup).

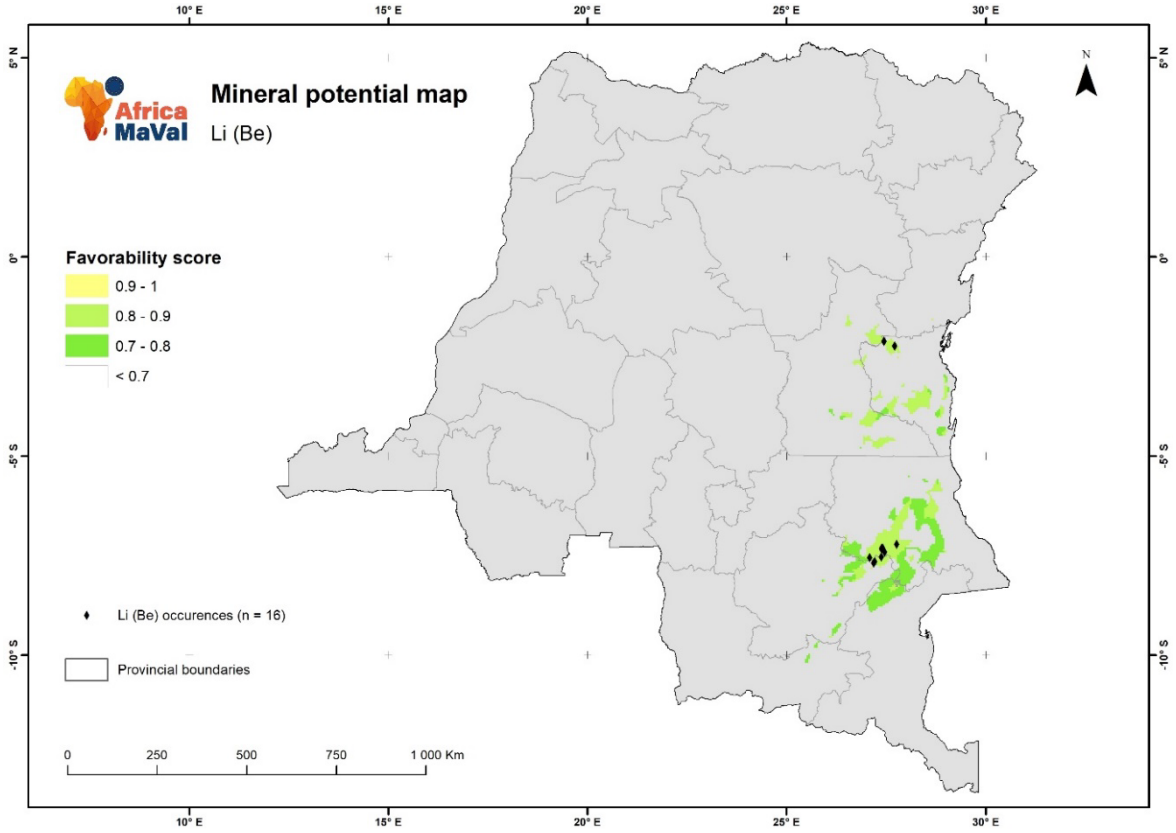

Figure 5: Selection of favourability cells (FP and TP) for lithium (threshold > 0.7).

In term of cartography, the most favorauble cells present a significant extension due to their link with the Mesoproterosoic Kibarian granites. These results must be qualified taking into account the following elements:

- the lack of geological constraints of the lithostratigraphic units model used;
- the absence of detail on the different granite environments (all the granites of the Kibara belt being coded in the same way);
- lithium occurrences are associated with pegmatites or little intrusions of rare-metal granites which are not mapped at this scale.

The same problems of statistical processing and mineral predictivity apply to other elements present in pegmatites (e.g. Be, Sn, Ta-Nb, etc.). To more accurately define the mineral potential of lithium (and associated raw materials) and target the relevant areas of interest, better resolution data (1:200,000 scale and higher) should be used to refine the geological model used.

Tin, Tantalum, Niobium and Tungsten (Sn-Ta-Nb-W): Tin (Sn), tantalum (Ta), niobium (Nb) and tungsten (W) are critical raw materials mainly associated with oxide minerals, such as cassiterite,

columbite-tantalite (or “coltan”) and wolframite, respectively. These commodities are present in magmatic environments associated with pegmatites, quartz-veins or rare metal granites and are particularly represented in eastern DRC.

To generate the mineral potential map, 1,678 known occurrences were used, from the BRGM database (SIG Afrique) for historical occurrences and from the IPIS database for the most recent sites. This database was particularly useful and provided reliable input data to carry out this predictive mapping work.

The DBA-RF model (for a threshold > 0.47) has an accuracy of ~89% (Table 2) and confirms the Sn-Ta-Nb-W potential of DRC with 12.71 % of Congolese territory (11,936 cells) which are prospective for this type of mineralisation (Figure 6).

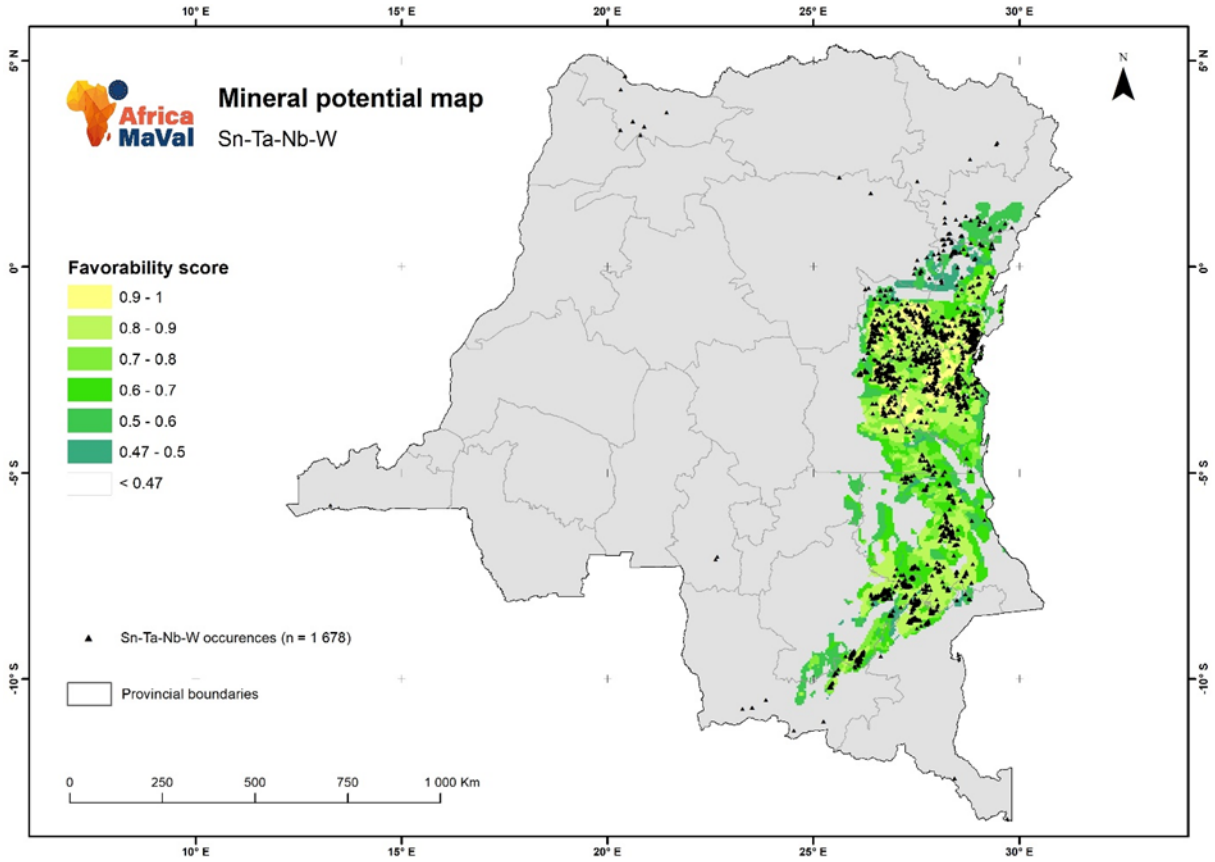

Figure 6: Selection of favourability cells (FP and TP) for tin, tantalum, niobium and tungsten (threshold > 0.47).

In term of cartography, the MPM shows without surprise that high potential areas are mainly located around known occurrences in the eastern DRC, along the Rwenzori-Kibara Belt. The most favourable geological environments are associated with the local formations within this Paleoproterozoic-Mesoproterozoic hybrid domain. In detail, the most favourable factors are in decreasing order: MP_MKB_GK__ (Mesoproterozoic Kibaran granitic suite), PP2_RU___

(Paleoproterozoic Ruzizi Supergroup), MP_KV___ (Mesoproterozoic Kivu Supergroup), hS_KA_Luk__ (Paleozoic Lukuga Group), MP_KB___ (Mesoproterozoic Kibara Supergroup) and NA_PP_CPXakb___ (Ante-Kibaran complex).

The main area of high Sn-Ta-Nb-W potential is located in the north of the Rwenzori-Kibara Belt, at the border triangle of the Nord-Kivu, Sud-Kivu and Maniema provinces. The second area is located to the south, where the Kibara Belt is oriented NE-SW. Between these two clusters, the predictive map indicates favourable areas where few occurrences are known and which can be potential targets for exploration. In the same way, further south, where the Kibara Belt connects to the Lufilian Arc, several prospective areas are highlighted.

However, as for lithium, this predictive mapping has limits and must be nuanced given the lack of constraints of the geological model used. To have better resolution, a regional geological synthesis is necessary to better constrain the geometry and the lithostatigraphic attribution of the different geological formations within this domain. A specific work on the typology (geochemical and geochronological) of the different magmatic suites would need to be carried out.

Predictivity mapping summary: The two main regions identified according to the predictors used in this study are the Rwenzori-Kibara belts for Sn-Ta-Nb-W and Li and the Lufilian Arc (Copperbelt) for Cu-Co. North of the Rwenzori-Kibara belts and the Kibara-Lufilian Arc connection are particularly interesting for tin, tantalum, niobium, and tungsten. Concerning Li, the most favourable factors include the Mesoproterozoic Kibaran granitic suite, the Paleozoic Lukuga Group, the Paleoproterozoic Ruzizi Supergroup, and the Mesoproterozoic Kivu Supergroup. For Cu-Co favourability, the study identifies specific geological formations such as the Nguba Group, Roan Group, and Kundelungu Group.

This study acknowledges limitations, such as the lack of geological constraints and detail on different granite environments. The need for regional geological synthesis to better constrain the geometry and lithostatigraphic association of the different geological formations could be supported by higher resolution geological mapping and geochemical prospecting campaigns, which would improve the favourability maps.

Improved coverage around the Lufilian arc to complement the 1:250K geological maps could help to better constrain predictivity in this region. Similarly, a geological map specified to the Kibara belt, either at a scale of 1:500K or in greater detail, would help to better constrain geological features such as pegmatites, which are the most interesting mineral-bearing features. Finally, with regard to occurrences, a sorting between data associated with deposits and other occurrences would enable the study to better target the most favourable objects and better constrain the prediction on key and economically viable zones.

DRC strategic national exploration plan:

The DRC Ministry of Mines has defined six priority areas in order to develop a strategic national exploration plan (Table 3). Exploration activities in the Kasai priority area target nickel, among others. This would be a commodity of high strategic relevance for the DRC, as it is important for lithium ion batteries. While the DRC has abundant cobalt resources, some lithium resources (including the largest undeveloped hard rock deposit in the world, Manono) and historical manganese exploitation, it is currently lacking nickel as an important element for battery cathodes. Likewise, the DRC is currently lacking another important battery metal, graphite, and this is not included in the national exploration plan. There are abundant graphite deposits in Tanzania and Mozambique, which raises the question whether parts of the DRC might have a similar geological environment with potential graphite endowment.

Priority area	Target commodities (including non-ECRM)
Kasai	Gold, diamonds, copper, cobalt, nickel, chrome, zinc, iron ore
Ituri	Gold, diamonds, tantalum-niobium
Tanganyika	Tin, lithium, gold, tantalum-niobium, copper, cobalt
Equateur	Gold, diamonds, REE, tin, tantalum-niobium, tungsten
Kivu	Gold, tin, tantalum-niobium, tungsten, REE
Kwango & Kongo-Central	Gold, diamonds, phosphate, aluminium, copper, vanadium, limestone cement

Table 3: Democratic Republic of Congo national exploration priority areas.

1.3. Ore processing and refining capacities

Article 108 of the Mining Law (2018) restricts the holder of a mining licence or a permanent mining permit from exporting unprocessed mineral substances. Exceptions to this rule are described in section 3.2.7 Intricacies of import and export mechanisms.

According to the Ministry of Mines (2023), ECRM sales (local and exports) during the financial year 2022 included copper (~2.5 Mt) and cobalt (~115 kt), manganese concentrates (~15 kt, only local sales) as well as tin (24.3 kt industrial, 8.5 kt artisanal), tantalum (~2.2 kt artisanal) and tungsten (~300 t artisanal) concentrates.

Whereas the 3Ts are exported as concentrates, in recent years, the DRC has increasingly enforced the processing restrictions in the copper-cobalt sector. Some notable large projects, such as the Kamoa copper mine, however, are currently allowed to export part of their production as copper concentrate, reflecting limited in-country smelting and refining capacities. Kamoa is currently constructing its own smelter such that it will at some point also export copper cathodes only (part of its concentrates are already processed in-country by a third-party smelter in Kolwezi).

A list of processing facilities in the DRC is presented in Table 4.

Name of processing entity	Status	ECRM	Operator (or owner)
Fonderie Electrique de Panda Cobalt Plant	Assumed Active	Co	Gécamines SA
Luapula Plant	Active	Co	Private Interest (China)
Plants in former Katanga Province	Assumed Active	Co	Congo Dong Fang International Mining sprl
Etoile	Active	Cu	Chemaf
Gecamines Smelter	Active	Cu	Gécamines SA
Huachin leach plant	Active	Cu	CN Nonferrous Mining Corp. Ltd [67.50%] ; China Huachin SPRL [32.5%]
Kakanda concentrator	Active	Cu	Boss Mining SPRL
Kamoa Smelter	Construction	Cu	Ivanhoe Mines Ltd.
Kamoto	Active	Cu, Co	Kamoto Copper Company (KCC)
Kipoi Central SX-EW Refinery	Active	Cu	Tiger Resources Ltd (Société d'Exploitation de Kipoi)
Kolwesi Smelter	Active	Cu	AuKing Mining Ltd.
Kolwezi Copper Mine	Active	Cu	La Compagnie Minière de Musonoie Global (COMMUS)
Lualaba Smelter	Active	Cu	China Nonferrous Mining Corp. Ltd
Luilu Smelter. Kolwezi	Active	Cu	Gecamines
Luita Plant	Active	Cu	Boss Mining SPRL
Nova Smelter	Care and maintenance	Cu	Unknown
Plant at Likasi	Care and maintenance	Cu	Kai Peng Mining Ltd.
Plant at Mabende	Assumed Active	Cu	CNMC Huachin Mining Mabende
Plant in former Katanga Province	Assumed Active	Cu	Shituru Mining Corp. SPRL
Plant in former Katanga Province	Assumed Active	Cu	La Compagnie Minière de Musonoie Global SAS
Plant in Likasi	Assumed Active	Cu	Rubamin SPRL
Plant near Kolwezi I	Assumed Active	Cu	La Minière de Kalumbwe Myunga (MKM)
Plant near Kolwezi II	Assumed Active	Cu	Compagnie Minière de Luisha (COMILU)
Roan Tailings Retreatment Plant (Metalkol RTR)	Active	Cu	Eurasian Resources Group (ERG)

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Name of processing entity	Status	ECRM	Operator (or owner)
Shituru	Active	Cu	Gécamines SA
Usoke Plant	Closed	Cu, Co	Chemaf (Shalina Resources Ltd)
Deziwa & Ecaille	Active	Cu, Co	Société Minière de Deziwa et Ecaille (SOMIDEZ)
Etoile - Lubumbashi Slag Treatment Smelter	Active	Cu, Co	Chemaf (Shalina Resources Ltd)
Kambowe	Active	Cu, Co	CNMC [55%]; Gécamines [45%]
Kinsevere Plant	Active	Cu	MMG Ltd.
Metalkol Roan Tailings Reclamation (RTR)	Active	Cu, Co	ERG
Musonoie (SX-EW)	In construction	Cu, Co	Jinchuan
Mutanda Processing Plant	Active	Cu, Co	Mutanda Mining SPRL
Ruashi Plant	Assumed Active	Cu, Co	Ruashi Mining SPRL
Sicomines - Dikuluwe	Active	Cu, Co	La Sino-Congolaise des Mines Sarl, (SICOMINES)
SOMIKA Plant	Assumed Active	Cu, Co	Société Minière du Katanga SPRL (Somika)
Tenke Fungurume Mine	Active	Cu, Co	Tenke Fungurume Mining SARL
STL (Big Hill)	Active	Cu, Co, Ge	La Société pour le Traitement du Terril de Lubumbashi (STL)
ASC Smelter	Active	Sn	Mining Mineral Rsrc S.P.R.L. (MMR)
TiTan Plant	In construction	Sn	Tantalex

Table 4: List of processing facilities in the Democratic Republic of Congo[4]. Note the list may not be complete/up to date due to the highly dynamic business development in Haut-Katanga and Lualaba.

2. Assessment of the ECRM value chain

2.1. Characterisation of the value chain for primary and secondary raw materials

2.1.1 List of the mining and recycling projects

According to the ECRM list, copper, cobalt, the 3Ts and manganese are currently mined in the DRC. The copper and cobalt sector (Copperbelt of Haut-Katanga and Lualaba) dominates the number of industrial mining projects, but also current exploration. Alongside copper and cobalt, some of these projects have also targeted germanium, such as Big Hill (Gecamines) or Kipushi (Ivanhoe Mines). In East Congo, the focus of exploration, in addition to the 3Ts, is increasingly on lithium (Manono - AVZ Minerals or Blue Sky - Tantalex).

[4] Data provided by AfricaMaVal (WP1), with minor adjustments by BGR

ERCM recycling in the proper sense does not take place in the DRC. However, there are some projects that treat or plan to treat tailings, e.g. for lithium (Manono tailings) or copper and cobalt (Kipushi tailings, Luilu tailings and Shituru tailings). A detailed list of exploration, mining and "recycling" (tailings) projects in the DRC is provided in Table 5. For inactive projects, the name of the last known operator is inserted, if available. The listed projects exclusively concern industrial mining. Details and locations of artisanal small-scale mining (including semi-mechanised operations) can be found in IPIS (2023) and in Figure 2.

Operation	Status	ECRM	Operator/Majority owner
Boss & Frontier	Operating	Cu	ERG
CNMC Huachin Mabende	Operating	Cu	CNMC
Congo (DRC)	Operating	Cu	Chengtun Mining Group
Dikulushi	Operating	Cu	JCHX Mining Management
Hanrui Metal Congo	Operating	Cu	Hanrui
Kamoa	Operating	Cu	Ivanhoe
Kimin (Kisanfu Mining)	Operating	Cu	Kisanfu Mining
Lonshi	Construction Started	Cu	JCHX Mining Management Co.,Ltd.
Lubembe	Prefeas/Scoping	Cu	Jinchuan Group International Resources Co. Ltd
Luisha	Reserves Development	Cu	Shalina Resources Ltd
Miniere Musoshi Kinsenda	Operating	Cu	Jinchuan Group International Resources Co. Ltd (Venturer) 77%; SODIMICO (Venturer) 23%
Mufunta	Reserves Development	Cu	Shalina Resources Ltd
New Minerals Investment	Operating	Cu	Ke Fei
Western Foreland	Target Outline	Cu	Ivanhoe Mines Ltd.
Kimono	Target Outline	Cu, Co	Société d'Investissement Minier Akon et Sodimico S.A.
292	Target Outline	Cu, Co	African Energy Metals Inc.
Basse Kalemba	Exploration	Cu, Co	Red Rock Resources Plc
Commus	Operating	Cu, Co	Zijin Mining

Operation	Status	ECRM	Operator/Majority owner
Dezita	Reserves Development	Cu, Co	Eurasian Natural Resources Corporation Limited
Deziwa	Operating	Cu, Co	China Nonferrous Mining Corp. (CNMC) (JV with Gecamines)
Dikuluwe-Mashamba	Operating	Cu, Co	Sicomines
Gambov	Construction Started	Cu, Co	China Nonferrous Mining Corporation Limited
Haute Kalemba	Target Outline	Cu, Co	Red Rock Resources Plc
Kabolela	Target Outline	Cu, Co	Unnamed Owner
KaiPeng (Kambove)	Operating	Cu, Co	Shenzhen Yite Holdings
Kalongwe	Committed	Cu, Co	Xuchen International (Chengtun Mining)
Kalongwe	Feasibility Complete	Cu, Co	Chengtun Mining Group Co., Ltd.
Kalukundi	Feasibility	Cu, Co	Camrose Resources Limited
Kalumines	Feasibility	Cu, Co	Gécamines SA
Kambove Mining SAS	Operating	Cu, Co	China Nonferrous Mining Corp. (CNMC)
Kambove/Kolwezi	Operating	Cu, Co	Gécamines
Kamilombe	Target Outline	Cu, Co	Private Interest
Kamoto/KOV/T17 (Katanga)	Operating	Cu, Co	Glencore
Kamoya	Operating	Cu, Co	Comika (Wanbao Mining)
Kankutu	Target Outline	Cu, Co	Unnamed Owner
Kansuki	Satellite	Cu, Co	Glencore plc
Kasombo	Target Outline	Cu, Co	Paragon Mining Sarl
Katanga	Exploration	Cu, Co	Rubamin FCZ
Kinsevere	Committed	Cu, Co	MMG Limited
Kipushi tailings	Commissioning	Cu, Co	Paragon Mining Sarl
Kisanfu	Committed	Cu, Co	CMOC, CATL & Gecamines
Kisanfu Mining	Operating	Cu, Co	Société Minière du Katanga SPRL (Somika)
Kisinka	Exploration	Cu, Co	Power Metal Resources plc
Luanshimba	Target Outline	Cu, Co	Red Rock Resources Plc

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Operation	Status	ECRM	Operator/Majority owner
Luilu	Target Outline	Cu, Co	Cobalt Blue Ltd.
Luilu tailings	Operating	Cu, Co	Hong Kong Excellen Mining Investment
Luisha (Comilu)	Operating	Cu, Co	Congo International Mining Corporation (China Railways)
Luisha South	Reserves Development	Cu, Co	Excellen Minerals SARL
Luiswishi	Operating	Cu, Co	Congo Dongfang International Mining SPRL (Huayou) (CDM)
Lupoto (Iverland)	Operating	Cu, Co	Société Minière du Katanga SPRL (Somika)
Metalkol - Roan Tailings Reclamation (RTR)	Operating	Cu, Co	Eurasian Natural Resources Corporation Limited
MIKAS	Operating	Cu, Co	Congo Dongfang International Mining SPRL (Huayou) (CDM)
MKM Lubumbashi (Kolwezi?)	Operating	Cu, Co	La Minière de Kalumbwe Myunga (MKM)
Mukabe-Kasari	Target Outline	Cu, Co	CoCu Pty Ltd
Mukondo Mountain	Satellite	Cu, Co	Eurasian Natural Resources Corporation Limited
Musonoi	Construction Started	Cu, Co	Jinchuan Group International Resources Co. Ltd
Mutanda	Operating	Cu, Co	Glencore
Mutoshi	Construction Started	Cu, Co	Chemaf SPRL (Shalina Resources)
Pumpi	Operating	Cu, Co	Lamikal (JV Wanbao Mining & Managem)
Ruashi	Operating	Cu, Co	Jinchuan Group Ltd
Shandwe	Target Outline	Cu, Co	MMG Limited
Shituru	Feasibility	Cu, Co	Pengxin International Mining Co.,Ltd
Shituru Tailings	Operating	Cu, Co	Shituru Mining Corporation (SMCO) - Pengxin Resources
Tenke Fungurume	Operating	Cu, Co	CMOC and Gecamines
Kipoi East	Target Outline	Cu, Co	Unnamed Owner
Big Hill (STL)	Operating	Cu, Co, Ge	Gecamines

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Operation	Status	ECRM	Operator/Majority owner
Kipushi	Construction Started	Cu, Co, Ge	Ivanhoe Mines Ltd.
Blue Sky	Target Outline	Li	Tantalex Lithium Resources Corp.
Manono	Feasibility Complete	Li, Sn, Ta, Cs, Nb	AVZ Minerals Limited
Manono tailings	Prefeas/Scoping	Li, Sn, Ta	Tantalex Lithium Resources Corp.
Mpokoto	Construction Planned	Mn	Arrow Mining Pty Ltd
Kisangani	Preproduction	Sn	Congo Premier
Bisie	Operating	Sn, Cu	Alphamin
Buckell	Operating	Sn, Ta, Li, Cs	Tantalex Lithium Resources

Table 5: List of exploration, mining (operating) and "recycling" (tailings) projects in the DRC and their project status.

2.1.2 Existing ESG indicators

The ESG framework of the DRC is still in its early stages of development, but the government and various stakeholders are making efforts to improve the sustainability of the country's economic activities. Legal and regulatory frameworks are implemented to promote sustainable development and address ESG issues in the mining industry. Overall, the DRC ESG framework in the mining industry is focused on promoting sustainable development, protecting the environment, and ensuring that mining activities benefit local communities and the Congolese people. The following sections provide a brief overview about the ESG indicators. For further details on the DRC ESG framework, challenges and potential see sections 4.1 Country-level assessment and context and 4.1 Mining practices *vs.* Environmental, Social and Governance (ESG) goals.

Environment and sustainable development: The government has implemented several environmental regulations which aim to balance the country's economic development with the need to protect its rich natural resources and biodiversity. In the mining sector, companies shall prepare a Mitigation and Rehabilitation Plan as well as an Environmental and Social Impact Assessment (ESIA) with associated Environmental Management Plan in accordance with the guidelines contained in the Mining Regulations. For reasons of national security, public security or environmental preservation, areas may be classified as prohibited areas without time limit, and mining rights may not be granted in a protected area (Art. 6, Mining Code).

Social: The DRC government has established requirements for mining companies to engage with local communities and obtain their consent for mining activities. The government has also established a framework for community development agreements that require mining companies to invest in local development initiatives. The government has established labour standards that require mining companies to adhere to local labour laws. The government also promotes the development of local skills and capacity-building in the mining industry.

Governance: The mining sector in DRC is governed by the Mining Code (2018) as well as the ministerial decrees supporting and/or domesticating the national and/or regional mineral traceability initiatives, ratified texts and sub-regional and international commitments (e.g., OECD, EITI, ICGLR, Kimberley Process).

2.1.3 Status of economic links between the formal and informal sectors

In the DRC, there are complex and dynamic economic links between the formal and informal mining sectors. The formal mining sector typically consists of large-scale mining projects, often operated by local companies or joint ventures (JV) that are in turn controlled by foreign-owned companies, operating under government-issued licenses, with minor shareholding through a free-carried interest by the government, usually through parastatal Gecamines. While not all of these companies fully adhere to all regulations (corruption risks), they may nonetheless be classified as formal. The informal mining sector, on the other hand, comprises cooperatives and sometimes unorganised artisanal miners, who often operate without formal licenses, in less mechanised operations. Some of these operations are small, while others are major operations with up to about 15,000 artisanal miners working on one site. The following text is a brief summary of key facts from Vasters and Schütte (2023).

Formalisation of the ASM sector comprises a range of measures, including the creation of the governmental “Service d’Assistance et d’Encadrement des Mines Artisanales et de Petit Echelle (SAEMAPE, formerly SAESSCAM) responsible for ASM supervision, legal requirements to work in cooperatives, registration of miners and traders and the creation of artisanal mining zones (“ZEA”). However, the implementation of these measures is challenging as SAEMAPE agents may not be present at every mine site, cooperatives may not form structures owned by the workers but rather by “company management” and artisanal mining zones are often of marginal geological prospectivity or have difficult logistical access.

Tantalum production in the DRC is primarily attributed ASM sector. Some ASM mines are run by operators who registered industrial small-scale or even large-scale concessions. Tin mining in the DRC is primarily carried out through artisanal production, with a notable exception being Alphamines' Bisie mine, which began industrial production in May 2019 and has expanded since. Previously, Bisie was a hotspot for artisanal cassiterite production, but these informal activities were officially banned to facilitate the development of the industrial mine. In 2021, ASM

operators contributed one-third of Congolese tin concentrate exports, while the Bisie mine and a few other concessions made up the remaining fraction. The Kanuka mine, located on the border between Haut-Lomami and Tanganyika provinces, can be considered a semi-industrial producer of mixed tin and tantalum concentrates. Additionally, artisanal Rare Earth Element (REE) mining is taking place through the re-processing of tin mine tailings and alluvial material on the state-owned SAKIMA concession in North Kivu province, which is registered as an industrial mining concession. Mining in the Copperbelt is mostly by industrial means, with artisanal cobalt miners variably contributing up to about a quarter of national cobalt production in some years. From 2017-2021, Vasters and Schütte (2023) estimate an average national cobalt ASM production share of 17%.

In addition to manual mining and processing methods, semi-mechanised processes are used at certain 3T mine sites and processing centers in the DRC. These semi-mechanised operations involve equipment, which require cooperation between the (semi-)industrial mining license holders, who oversee the usage, and mining cooperatives.

Grade control practices vary, with some applying grade control when selling concentrate to local traders or exporters, while others do not. All of the DRC's 3T minerals are presently exported in concentrate form, with typical export grades consisting of 20-30% tantalum and 50-60% tin or tungsten content. Copper and cobalt ore mined by artisanal miners usually corresponds to the oxidized upper part of the ore deposits. This ore type is easier to process than the deeper-seated sulfide ore or mixed sulfide-oxide ore. At the mine site, the ore variably undergoes washing, manual crushing and screening before being sold as ore or pre-concentrate to local traders and processors. In 2018, the mean metal content of sold ASM pre-concentrate was estimated at 14% copper and 4.2% cobalt (BGR 2019). At that time, local traders rarely accepted ASM material with grades <1% cobalt or <3% copper; with the recent positive copper price development, lower copper cutoff grades may apply by now. The traders and processors (‘depots’) receiving these pre-concentrates directly from mining cooperatives or through intermediaries perform particle size classification and milling, with the aim of reducing grain size sufficiently to allow for subsequent leaching at local hydrometallurgical processors. Artisanal oxide ore is sometimes blended with mixed sulfide-oxide ore from other mines, as this may allow for cheaper processing (avoiding the use of expensive oxidation agents that must be added otherwise). While artisanal miners do locally sell copper concentrates as well, their relative share in the total Congolese copper exports is not very high, due to the large tonnages supplied from industrial copper production. In 2018, the BGR estimated a total artisanal copper production of about 16,000 tons (copper content; BGR 2019). This corresponded to about 1% of the DRC’s copper exports of that year. The recent strong growth in ASM copper mining output makes it likely that the current production share and total ASM copper output is higher though.

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2.2. Identification of the bottlenecks along the value chain

2.2.1 List of the main bottlenecks and the links between them

The DRC scores very low in international ratings concerning raw material governance and investor attractiveness. The DRC appears very badly quoted by international agencies in several indices. See Table 6 for comparison with the other Country Case Studies of this report and for references in the table caption. The DRC ranks 183 of 190 in doing business, 166 of 180 in the Corruption Perception Index, 49 of 54 in the Index of African Governance and 82 of 84 in the index referring to attractivity seen by mining companies. More specifically, the main identified bottlenecks that may affect the development of the extractive sector in the DRC are described below.

Country	Doing Business 2020 (score on 190) (World Bank 2023a)	Corruption Perception Index 2020 (score on 179) (Transparency International 2023)	Index of African Governance 2021 (score on 54) (IIAG 2023)	Attractivity seen by mining companies 2021 (score on 84) (Fraser Institute 2022)
AfricaMaVal case study countries				
Morocco	53	86	10	8
Senegal	123	67	9	46
Gabon	169	129	27	-
Namibia	104	57	8	59
DRC	183	170	49	82
Tanzania	141	94	21	67
Mozambique	138	149	26	-
Zimbabwe	140	157	29	84
South Africa	84	69	6	75
Madagascar	161	149	34	-
DRC neighbouring countries				
Angola	177	142	40	-
Burundi	166	165	43	-
Central African Republic	184	146	50	-
Congo Republic	180	165	46	-
Rwanda	38	49	12	-
South Sudan	185	179	54	-
Uganda	116	142	31	-
Zambia	85	117	24	-

Table 6: Comparison of the ratings concerning raw material governance and investor attractiveness by different international agencies.

- **Road infrastructure**: Infrastructure gaps are particularly large in road transport and no road connects Eastern and Western DRC. Much of the DRC is disconnected with only 5 % of roads being tarred and 14 % in good conditions (IMF 2023). The total “on paper” road network in DRC

is about 152,400 km long, but most of these roads are impassable due to poor conditions. There is no reliable land connection between the national road corridors that run east-west (between the Atlantic and the Kasais) and north-south (along the Great Lakes region), severely impacting the flow of people and goods (World Bank 2022a). Due to the high frequency of trucks transporting ore, some good roads are available in the main copper mining region (Haut-Katanga), e.g., between Kolwezi and Lubumbashi.

- **Rail infrastructure**: The DRC has one of the most extensive rail networks in Africa, with close to 3,500 km of rails in the South and formerly 1,000 km in the North (Chemin de fer des Uélé), where operations ceased in 2000. However, today the railways are not functioning, being in a state of disrepair, suffering from broken-down infrastructure, weak management and governance, and high operational costs. The "Société Nationale des Chemins de Fer du Congo" (SNCC) operates an extensive network centred in the southeast of the country, i.e., connecting Katanga on the Zambian border to Dilolo on the Angolan border and the northern part of the Katanga region to Ilebo in the Kasaï region (World Bank 2022a). The SNCC network is used extensively for copper exports leaving the DRC for the port of Durban and will also facilitate exports through Lobito in Angola. The latter requires the completion of the Lobito Corridor, connecting the southern DRC and north-western Zambia to regional and global trade markets via the Port of Lobito in Angola. An EU-U.S. partnership will immediately support the governments of the DRC, Zambia and Angola to launch pre-feasibility studies for the construction of the new railway line (White House 2023).

- **Port capacities**: With poor connections to the sea, the DRC is predominantly landlocked. No ports in the DRC can take direct calls from conventional cargo liners and the country has to rely on transhipments from Pointe Noire in the Republic of Congo using smaller vessels that may use the port of Matadi. Inland cargo-handling is limited and inefficient, thus trade from southeast DRC, notably copper, is channelled mainly through Durban in South Africa and, in particular since the Covid crisis, through other southern African ports in Mozambique and Namibia. The most important port for the eastern DRC is Dar Es Salam in Tanzania; since 2021, this port is also receiving an increasing number of copper export shipments. Mombasa in Kenya remains the key port for Kisangani and the northeast part of the country. The DRC government plans to develop the Port of Banana and convert it into a deep-water port. Currently, the government has a concession agreement over the port of Banana with the Emirati company DP World (Africa Intelligence 2022).

- **Energy**: DRC's installed grid power has a capacity of 2,844 MW and is sourced from hydroelectricity (99.6 %), biomass and waste, fossil fuels and solar (0.4 %) (Africa Energy 2023). The dominant contribution of hydroelectric power in the grid reflects relatively low CO_2 emissions of the mining sector. Currently, there are 16 dams in operation in the DRC, 12 of which are operated by the state-owned company Société Nationale d'Electricité (SNEL) and 4 by private

individuals (Int. J. Hydropower Dams 2016). The majority of the installed capacity (1,800 MW) originates from the Inga 1 and Inga 2 dams (completed in 1972 and 1982, respectively), however, the poor condition of the two power plants results in only a fraction of the capacity being produced. Thus, about 40 % of firms in the DRC own and operate their own backstop generator to shield themselves from frequent power interruptions. Others, such as Ivanhoe, have entered into a partnership with SNEL to ensure energy security by taking care of the refurbishment of hydropower turbines themselves (e.g. turbine no. 5 of the Inga II dam). Despite these challenges, the DRC has immense power generation potential. It boasts the largest and most cost-effective hydropower potential on the continent and could produce up to 100,000 MW of power. The first step in achieving this goal is the construction of the Grand Inga dam (Inga 3-8) with a proposed capacity of up to 40,000 MW. However, after the World Bank withdrew from the project in 2016 and the partnership with a Chinese-Spanish consortium failed, the Australian developer Fortescue stepped in 2021. South Africa has binding offtake agreements with the DRC over 5 MW supplied by the Grand Inga dam project. Delays, however, could now lead to South Africa being allowed to withdraw from their contract even before the commencement of construction (DW 2020).

- **Political Instability and security**: The DRC has a history of political instability and conflict, such as the two Congo wars in the late 1990s. Since then, supported by international organisations, such as the United Nations Organisation Stabilisation Mission in the Democratic Republic of the Congo (MONUSCO), the country's first free and fair elections in 46 years were held on 30 July 2006 and many regions in the country generally stabilised. The eastern part (i.e., Ituri, North Kivu and South Kivu), however, continued to be plagued by recurrent waves of conflict, chronic humanitarian crises and serious human rights violations, including sexual and gender-based violence. About 27 million are in need of humanitarian assistance and 5.5 million are displaced (as of January 2022). The Armed Forces of the Democratic Republic of the Congo (FARDC) fight against numerous armed rebel groups, such as the Allied Democratic Forces (ADF), the Cooperative for the Development of the Congo, the March 23 Movement, and local Mai Mai militias. Nonetheless the UN plans the complete withdrawal of MONUSCO for 2024 (UN 2022). See also section 4.2.2 Socio-economic issues).

3. Investment/financing prospects for ECRM projects in the DRC

3.1. Fiscal, legislative and regulatory context for in-country financings

The mining sector in DRC is governed by Law N° 007/2002 of July 11, 2002 on the mining code (Mining Code 2002), which is amended and supplemented by Law N° 18/001 of March 09, 2018 (Mining Code 2018) as well as the ministerial decrees supporting and/or domesticating the national and/or regional mineral traceability initiatives, ratified texts and sub-regional and international commitments (e.g., OECD, EITI, ICGLR, Kimberley Process). The numbers mentioned in the following sections originate from the Finance Law 2015, the Mining Code 2018 and a KPMG report (2020).

3.1.1 Fiscal framework for mining investment (due to the Finance Law 2015)

- **Royalty rates**: 3.5% for iron and ferrous metals, non-ferrous metals and precious metals (except for the Primera Gold JV, which pays a reduced rate), 6% for gemstones, 1% for industrial minerals, 0% for common construction materials as well as 10% for strategic minerals determined by the government (i.e., cobalt, coltan, germanium).

- **Corporate tax**: Resident companies and individuals are exempted from paying withholding tax on foreign dividends. Latent capital gains on business assets are exempted in so far as they are not realized by the taxpayer.

- **Tax on salaries**: Salaries and all benefits in cash or in kind paid to local and expatriate employees are taxable at a maximum rate of 30% after deduction of the employee's social security contribution. The tax is withheld by the employer who is liable for the payment of the tax. Family allowances, pensions, annuities, housing, transport allowance and medical expenses are exempted up to the proportion published by the Government.

- **Value-Added Tax** (VAT): Imports and transactions within the DRC are taxed at 16%, while exports are zero rated. Exporting mining companies, oil producing companies and companies having made significant investments which are in the implementation phase are authorised for their local acquisitions, to be delivered free of VAT, goods and services that they are geared to their operating and investment needs. The law exempts the import and purchase of equipment, materials, reagents and other chemical products intended for prospecting, exploration, research and development and construction of mining and petroleum projects, before the beginning of operations.

- **Investment incentives**: Small and medium enterprises (SME) and small and medium industries (SMI) carrying out on an investment program receive a total exemption from duty and import taxes for machinery and equipment, second-hand machinery and spare parts for first allocation not exceeding 10% of the CIF value of such equipment, as well as industrial inputs necessary to achieve the approved investment. SMEs and SMIs are also exempted from registration fees in the Trade Register and the acts of cooperatives or company.

- The legal framework for subcontracting (loi de sous-traitance) and repatriation of capital gains are explained below as well as for exports in section 3.2.

Authorisation	Duration	Tax	Requirements
Research (exploration) license	5 years (renewable once)	US$ 16.99/km^2 for year 1 US$ 25.49/km^2 for year 2 US$ 29.73/km^2 for year 3 US$ 33.98/km^2 for the following years	A person and his associates cannot hold more than 50 licenses (less than 20,000 km²).
Exploitation license (large-scale mining)	Max. 25 years; renewable over periods of 15 years	US$ 424.78/km^2 per year	A person and his associates cannot hold more than 50 licenses. Exploited materials are to be processed in the DRC. Participation of natural persons of Congolese nationality in the share capital of up to 10%.
Exploitation license for mine tailings	5 years (renewable)	US$ 679.64/km^2 per year	-
Small-scale mining licence	5 years (renewable)	US$ 195.40/km^2 per year	Only for those areas where large-scale mining is not economically viable.
Artisanal mining area (ZEA)	May be closed if the factors leading to its creation are no longer applicable.		Established by order of the minister. Artisanal mining areas and other mining permit areas are mutually exclusive. Requires registration of artisanal miners in cooperatives.
Research authorization of quarry products	5	US$ 4.25/km^2 per year	-
Permanent operating license for quarry	25	US$ 169.91/km^2 per year	-
Authorisation for processing or beneficiation	-	-	The processing or beneficiation of mineral substances is carried out either by the holder of the Exploitation Permit or by a beneficiating entity.

Table 7: Authorisation requirements and process[5]

[5] Mining Code 2018; KPMG 2020

Resident companies	
Corporation Tax	
- Normal rate	30%
- Mining companies	30%
Capital gains	30%
Dividends (local)	20% (withholding tax)
Dividends (foreign)	Exempt
Dividends distributed by mining companies and their subcontractors	10% (withholding tax)
Interest	20% (withholding tax) / 0% for mining companies under conditions.
Income for services provided by foreign companies	14% (withholding tax)
Resident individuals	
Individual salary tax	Schedule with 30% maximum
Dividends (local – WHT deducted at source)	20%
Dividends (foreign)	Exempt
Dividends distributed by mining companies and their subcontractors	10% (withholding tax)
Rental revenue	22% (monthly withholding tax of 20%; 2% tax on landlord at the end of the year)

Table 8: Income Tax, Withholding Tax[6]

Country	Dividends qualifying companies	Interest	Technical Management & consultancy fees (%)	Royalties
Belgium	15/10	10	N/A	10
South Africa	15/5	10	N/A	10
African Continental Free Trade Area	The African Continental Free Trade Area (AfCFTA) is a free trade area brokered by the African Union and encompassing 43 African parties and another 11 signatories committing its members to eliminating tariffs on most goods and services.			

Table 9: Double tax treaties and reduced rates Treaties[7]

Conversion of local currency into hard currency: The holder of mining rights is free to convert capital contributions, funds advanced by shareholders, drawings on loans and foreign currency receipts from the sale of products into Congolese Francs (CDF) at the best exchange rate offered by approved banks on the day of the conversion operation. However, the holder of mining rights may use approved non-banking intermediaries other than financial messengers to exchange cash (Art. 263, Mining Code 2018).

Transfer funds to abroad: The holder of the mining rights shall be authorised, after payment of the taxes and duties due, to make capital transfers directly related to the activities permitted by his mining right. In addition, foreign personnel residing in the National Territory and employed by the holder of a mining title are guaranteed the free conversion and transfer of all or part of

[6] Finance Law 2015; Mining Code 2018, Chapter 3; KPMG 2020
[7] PwC 2023

the sums due to them, provided that the persons concerned have paid their taxes and various contributions in accordance with the legislation in force in the DRC (Art. 264, Mining Code 2018).

Foreign/local currency accounts: The holder exporting the mining products may open and maintain an account or group of accounts in foreign currency with approved commercial banks located in the Democratic Republic of Congo to manage the revenues and expenses of the project he is operating under his mining rights in foreign currency. He is free to keep all revenues from export sales of the project products in foreign currency without being obliged to convert them into local currency (Art. 268, Mining Code 2018).

Foreign exchange monitoring fee: The holder is required to pay the Banque Centrale du Congo a foreign exchange monitoring fee of 0.2% on all payments abroad with the exception of repatriation of income from the main account as well as any debit or credit transaction carried out on its main account, with the exception of transfers to foreign debt service accounts (Art. 270, Mining Code 2018).

Requirement to repatriate funds: A licensee who exports marketable products from the mines during the amortisation phase of its investment is:

a) Authorised to keep and manage up to 40% of its export sales revenue in its main account and foreign debt service accounts. The terms and conditions for funding the foreign debt service accounts, as well as the terms and conditions for payment of the holder's foreign debt service, are set out in the borrower's loan agreements with its foreign lenders;

b) Obliged to repatriate 60% of export receipts to its account in the Democratic Republic of Congo within fifteen days of receipt in the main account provided for in Art. 267 (Mining Code 2018).

In the event of amortisation of its investment, it is obliged to repatriate 100% of the revenue from its export sales to its main national account in the DRC within the period stipulated in paragraph b above; Only the holder of mining rights who has provided bank details and who sends the Central Bank of the Congo a quarterly report of his activities recorded in the main account, as set out in Art. 271 (Mining Code 2018), may keep a share of export receipts or pre-financing abroad. The repatriated portion is intended to cover domestic expenses for residents and may not be used to finance the transactions referred to in Art. 264 (Mining Code 2018).

Transfer Pricing: Transfer pricing is of great importance in the extractive sector because companies often operate in different countries and trade commodities or products between their different entities. Transfer Pricing affects tax, risk management, compliance and business performance, and is regulated as followed. Companies established in the DRC are obliged to have transfer pricing documentation on operating transactions with their affiliated companies located

offshore (Finance Law 2015). In practice, the Ministry of Mines currently (2023) sees transfer pricing as a major problem affecting the mining sector.

3.1.2 Legislative framework for mining investments

Subcontracting law (loi de sous-traitance; from BGR 2023): The Subcontracting Act (Law N°17/001 of 8 February 2017 determining the rules applicable to subcontracting in the private sector), promulgated for the mining sector in March 2018. The law aims to involve small and medium-sized local companies in mining projects and to promote them with Congolese capital. National labour should be protected and the tax base broadened in favour of the treasury. However, local companies often have difficulties meeting the requirements of mining companies, which makes it difficult for them to participate in subcontracts. A detailed assessment of potential implications of the legal, regulatory and institutional context related local procurement and especially the Subcontracting Act is presented in BGR (2023). The Subcontracting Act, which application to mining companies is expressly reaffirmed in the revised Mining Code of 2018, notably provides that:

- Activities can only be subcontracted to "companies with Congolese capital promoted by Congolese nationals", defined as in the 2013 Ministerial "arrêté", as companies headquartered in DRC, with a majority of their share capital held by Congolese natural or legal persons, governance bodies with a majority of Congolese nationals, and staff essentially made up of Congolese nationals.
- An exception is made for the case of proven unavailability or inaccessibility of expertise, in which case it can be done by a foreign company for less than 6 months, beyond which the foreign company must register locally. This deadline was later revised by the ministerial decree in January 2021 which enshrines a derogation regime, including a permanent exception.
- Tender must be done for subcontracts exceeding 100 million CDF.
- Companies may not subcontract more than 40% of the value of a contract.
- Subcontractors are to be paid a 30% advance and the balance within 30 days of contract completion (with a possible extension for specificity of the contract).
- Companies established in DRC must disclose annually their turnover with subcontractors and the list of those, and put in place a policy of training to enable Congolese nationals to acquire the technical know-how and the qualifications necessary to accomplish certain activities.
- Sanctions include monetary penalties (up to 150 million CDF), nullity of the subcontracting contract, and an administrative measure of temporary closure.
- The Ministry of SME monitors subcontracting at the national level, through a structure to be put in place; provincial and local authorities also have a role in control of the Law.
- A 12-month transitional period was provided for companies to comply with the new Law.

International arbitration: According to Article 30 of the Uniform Act (1999), for the enforcement of an arbitral award in OHADA States, including the DRC, there must be a recognition order

(exequatur) from a competent court. The Code of Civil Procedure (1960), in turn, provides in Article 184 that an arbitral award can only be enforced in the territory of the DRC by an order of enforcement issued by the president of the competent court. Article 185 provides that such an order is appealable. The DRC is also a State Party to the New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards, which governs the enforcement of foreign arbitral awards in its territory.

In the recent past, international arbitration tribunals, particularly the one in Paris and Geneva, have been called upon to take up Congolese mining cases. These include the case of MMG Limited (Hong Kong) against the Congolese state-owned mining company Gecamines, following the alleged occupation by the armed forces of the DRC of two concessions near its Kinsevere copper mine (Mining 2022). Furthermore, there are multiple arbitration proceedings initiated by AVZ (Australia) regarding the rights on the Manono lithium concessions, including one with a unit of Zijin (China) and another with Cominiere (DRC) (Mining Weekly 2023).

3.2. Macroeconomic context for in-country financings

This section provides an overview of the economic landscape of the DRC, traversing the intersections of gross domestic production (GDP) dynamics, foreign direct investment (FDI) trajectories, foreign exchange (FX) and inflation undulations, sovereign debt burdens, regional economic integrations, and the intricacies of import and export mechanisms.

3.2.1 Overview

Table 10 gives an overview on the macro economy of the DRC.

Key Indicator	Value	Year	Source
Population	96 million	2021	UNCTAD 2023
Poverty	60% of population lives in extreme poverty (<US$ 2.50)	2022	World Bank 2023b
GDP	US$ 58 billion	2022	World Bank 2023b
GDP per capita	US$ 1,100	2021	CIA Factbook
Annual average CDF per USD	2,0010	2022	IMF 2023
Annual average inflation rate	9.0%	2022	IMF 2023
Government budget balance as % of GDP	-1.2%	2022	IMF 2023
Central Government Expenditures as % of GDP	17.1%	2022	IMF 2023
Share of extractives in GDP	46.7%	2021	BCC 2023

Key Indicator	Value	Year	Source
Share of Cu and Co in exports	88.0%	2021	BCC 2023
Public debt (absolute, as % of GDP)	US$ 11.2bn, 23.1%	2020	World Bank 2022b
World Bank Classification (2022)	Low income	2022	World Bank 2023b
Fitch Rating Agency Rating	CCC	2022	Fitch Rating Agency 2023
Real annual GDP growth (2014-2022)	5.5	2014-2022	World Bank 2023b
Ease of Doing Business Index	183rd out of 190	2020	World Bank 2023a
Corruption Perceptions Index	170th out of 180	2020	Transparency International 2023
Global Competitiveness Index	139th out of 141	2019	World Economic Forum 2023
Mining Investment Attractiveness Index	55th out of 62 countries	2022	Fraser Institute 2023
Sovereign credit rating	B- (negative)	2022	S&P 2023c
Sovereign credit rating	B3 (negative)	2022	Moody's 2023
Country risk classification (export credits)	7 (highest risk)	2023	OECD 2023

Table 10: DRC Economic Fact Sheet.

The DRC is generally considered as a developing economy. Its economy is characterised by a low level of industrialisation, a low income level, a high poverty rate, and a great reliance on agriculture and natural resource extraction. The latter include minerals like copper (African no. 1 copper producer, global no. 2 as of 2022), cobalt (global no. 1 cobalt producer), gold, tin and diamonds (USGS 2022). However, the DRC also faces challenges such as political instability, inadequate infrastructure, poverty, and limited access to education and healthcare.

At the time of its independence in 1960, the DRC was the second most industrialised African country after South Africa. Sometime after Mobutu became the sole ruler in 1965 its economic situation started to deteriorate. By 1979, purchasing power was only 4% of 1960 levels. A report of the International Monetary Fund (IMF) in 1982 exposed Mobutu's corrupt system and economic mismanagement. Foreign exchange shortages forced money printing for spending. The DRC's growth turned negative in 2000 due to donor conditions, low export prices, and post-coup instability (Shantz 2008).

Stability improved in most areas after foreign troop withdrawal in 2002, but to this day remains precarious in the eastern DRC. For the past 10-15 years, there has been a significant re-industrialisation of the DRC's copper-cobalt sector in the former Katanga province (now split in different new provinces). Due to the Congo wars and the widespread liquidity challenges in the final Mobutu years, the sector had shown significant decay. With the increasing international demand for copper and cobalt, combined with the relative stability in this part of the DRC, the sector has recently seen massive growth, well exceeding historical peak production. Since copper

and cobalt are raw materials required for the energy transition (copper for transmission lines, cobalt in the cathodes of lithium-ion batteries), this has put the DRC at the centre of the global transition to decarbonisation, along with other countries such as Indonesia. The DRC currently does not produce any other battery metals than cobalt, though.

3.2.2 Gross Domestic Production dynamics

The DRC has a complex economic history with periods of growth, decline, and instability. According to the World Bank (2023c), DRC's GDP (current US$) grew from US$ 3.4bn in 1960 to US$ 58.1bn in 2022, representing an average annual growth rate of 1.8%. The country's highest recent GDP (except 1962) growth rate was recorded in 2014, at 9.5%, while the lowest was in 1993, at -13.5% (World Bank 2023c). However, the global shocks, such as the global financial crisis in 2008 and the COVID-19 pandemic in 2020 had significant impacts on the DRC economy, resulting in contractions (Figure 7).

Figure 7: Gross Domestic Product Growth Rates, in percentage (World Bank 2023c).

Exploitation of the DRC's significant mineral wealth has historically been a major contributor to the GDP. Over the past decade, copper has played the by far most important role, while cobalt (as a by-product of copper) and gold made significant contributions as well. These and other minerals have fuelled export earnings and government revenue. The mining sector's performance heavily influences the country's economic prospects. The extractive sector dominates growth dynamics with growth benefitting from increasing copper-cobalt mining production (Figure 8; World Bank 2022b). It should be noted that the GDP in the DRC only reflects the formal part of the national economy. There is a significant informal sector, associated with many business activities and including ASM as well.

The non-extractive sector (agriculture, services and manufacturing) as percent of GDP is displayed in Figure 8. Agriculture has traditionally been a vital source of livelihood for many Congolese. However, due to limited modernisation, infrastructure and access to markets, the agricultural sector's contribution to GDP has been relatively modest compared to its potential

(World Bank 2022b). The services sector includes activities such as trade, transportation, and finance. While the services sector has grown in importance over time, it has often been constrained by inadequate infrastructure and a challenging business environment (World Bank 2022b). Manufacturing has historically faced challenges such as power shortages and limited investment. However, there have been efforts to promote industrialisation, particularly in sectors like textiles and food processing. Non-extractive growth has decelerated lately due to services and manufacturing as investment moderated (World Bank 2022b).

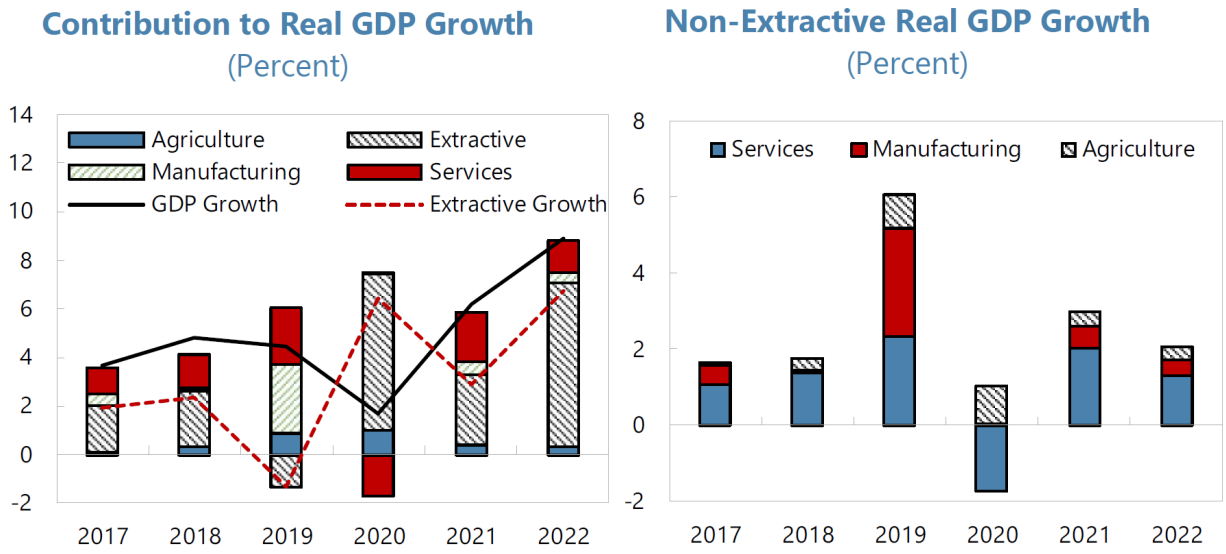

Figure 8: Contribution to the Real GDP Growth, inclusive extractive economy (left) and exclusive extractive economy (right) (IMF 2023).

The mining sector is expected to expand further in 2022 and pick up pace out to 2024, as Kamoa-Kakula, which aims to become the second-largest copper mine in the world, entered its second phase of expansion in late 2022 (World Bank 2022b). Mining sector growth may average 9.3 percent in 2021-24, fuelled by continued expansion in domestic mining production and overall favourable, though volatile commodity prices, especially copper and cobalt prices. Increased output from the mining sector, together with political stability, the removal of the remaining COVID-related restrictions, and improved regulation in the telecommunications sector will boost the services sectors, which will be among the main growth drivers (World Bank 2022b).

The DRC economy's vulnerability to commodity price fluctuations and the growth of its trading partners, combined with geopolitical conflicts, poses significant risks. The economy heavily depends on mining, while investment and infrastructure remain weak (World Bank 2022b). The country's high dependence on copper and cobalt exports, mainly to China, makes it susceptible to global market volatility. Political tensions surrounding elections may hinder reforms and investment. Climate change-related risks also impact the agriculture sector. Maintaining stability while pursuing sustainable growth is the immediate challenge (World Bank 2022b).

3.2.3 Foreign Direct Investment trajectories

To date the country has faced problems such as corruption, political instability, lack of infrastructure and legal uncertainties, which have often prevented broader and more diversified FDI inflows. The FDI potential of the DRC is based on abundant mineral resources as well as in sectors like energy (especially hydroelectric) and infrastructure. The government sees major potential for future FDI growth to be directed to mineral-associated value addition in a special economic zone on battery value chains which may initially focus on refining and chemical production, and later on progressively expand towards more steps of the battery value chain until, eventually the level of electric vehicles (including two- and three-wheelers). Another special economic zone is under construction near Kinshasa. Figure 9 displays the development of the FDI in absolute values (Figure 9) and as percent of GDP (Figure 9). To date, the mining sector is the one that attracts most FDI, followed by telecommunications. South Africa, Belgium and China are the country's main investors. According to UNCTAD (2022), FDI flows into the DRC increased from US$ 1.6bn in 2020 to US$ 1.8bn in 2021.

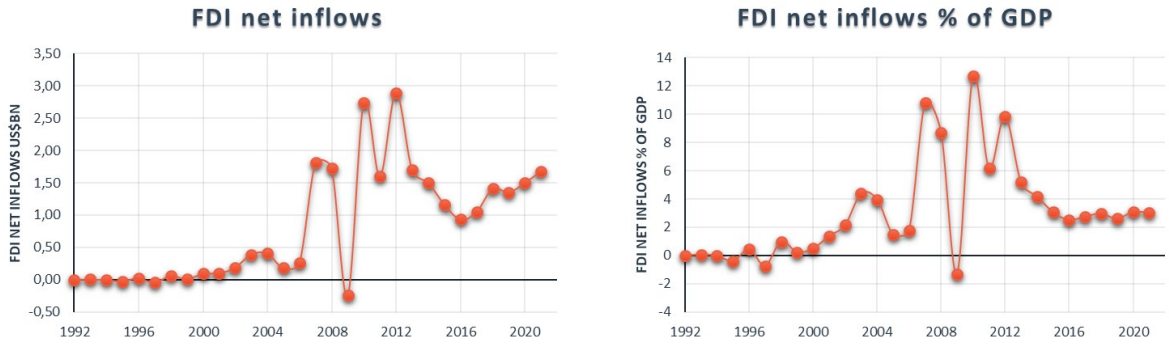

Figure 9: Foreign Direct Investment inflows into DRC, absolute values in billion US$ (left) and as % of GDP (right) (World Bank 2023c).

Around the mid-2000s, a global commodities boom led to increased interest in the DRC's mineral resources, particularly copper (including cobalt as by-product). Significant historical mining assets often held by the parastatal Gecamines were sold to new developers in a challenging governance framework, sometimes involving controversial middlemen such as Dan Gertler, an Israeli businessman under US sanctions who enjoyed privileged access to then-president Kabila. In 2008, former DRC president Kabila negotiated a "mining for infrastructure" deal with Chinese partners, initially valued at US$ 9 billion and subsequently reduced to US$ 6 billion. Chinese stakeholders were to invest in infrastructure and energy projects in return for obtaining mining rights, such as the 'Sicomines' operation near Kolwezi. Subsequently, Chinese influence in the copper-cobalt sector grew strongly. According to an evaluation by the IMF (who contested the initial agreement), as part of the deal Chinese partners invested close to US$ 3 billion while in turn realising gains of US$ 76 billion. New president Tshisekedi has questioned the deal and calls for its re-negotiation. Aside from Chinese partners, a range of other foreign investors are engaged

in the DRC's mining sector. Prominent investors in the industrial mining sector hail from Switzerland (Glencore), Kazakhstan (ERG), Canada (Barrick, Ivanhoe) and the UAE (Chemaf). Mineral trade in the mostly informal ASM sector for critical metals (producing copper, cobalt, tantalum, tin and subordinate tungsten) is controlled by Congolese, Chinese and other stakeholders who often provide pre-financing of minerals and goods along their trading networks, although actual investment in the ASM mine infrastructure is very low.

The DRC also has potential reserves of oil and gas, although this sector has seen less FDI compared to mining. Oil exploration and production activities have attracted some foreign investment, including from companies like Total. Oil and gas exploration is seen as particularly controversial where it occurs in the Virunga national park in the eastern DRC.

The DRC has vast agricultural potential, and there has been interest from foreign investors in agribusiness projects, including large-scale farming and agro-industrial ventures. The telecommunications sector has attracted FDI as well, as the DRC seeks to improve its digital connectivity and expand access to communication services.

3.2.4 Foreign exchange fluctuations and inflation undulations

The DRC utilizes the CDF as its official currency although in day to day business the US Dollar plays an important role as well. The DRC's foreign exchange market has experienced periods of volatility, influenced by factors such as commodity prices, global economic conditions, political instability, and trade dynamics. The nation's significant dependence on mineral exports, especially copper and cobalt, makes it susceptible to shifts in global commodity prices. Inflation has historically been a challenge within the DRC. Elevated inflation can erode purchasing power, influence consumer expenditures, and introduce economic uncertainties.

Throughout the forecast period, the foreign exchange market remain relatively stable, against a backdrop of well-coordinated good coordination of economic policies. The domestic currency is expected to depreciate by 0.4% and 1.3% in 2022 and 2023 respectively (Figure 10; BCC 2023).

The DRC's banking sector remains heavily dollarized, with a significant proportion of deposits and loans denominated in foreign currencies, mainly US Dollars. These measures collectively aimed to stabilize inflation, promote currency stability, and address the challenges posed by the pandemic while ensuring adequate liquidity in the financial system (World Bank, 2022b).

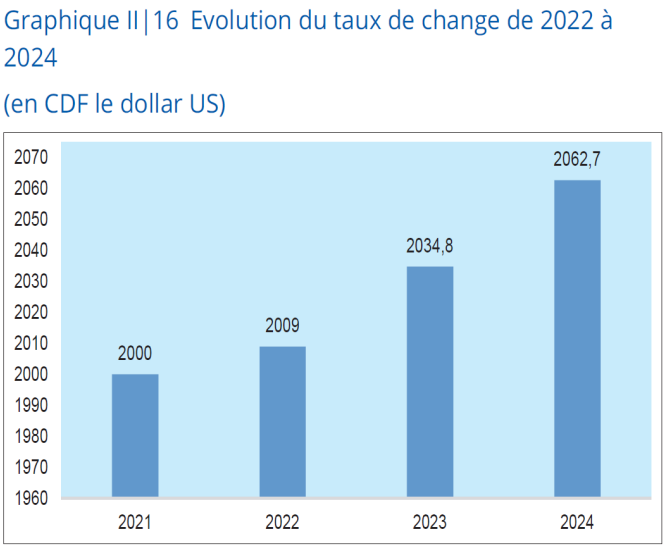

Figure 10: Exchange rate trends from 2021 to 2024 in CDF per US dollar (BCC 2023).

On the basis of the price index, an acceleration in the pace of domestic price formation was noted in 2020 compared with 2019. The inflation rate was 15.8%, compared with a target of 7.0% and targets of 4.6% in 2019 and 7.2% in 2018 (Figure 11). The average annual inflation rate was 11%, compared with 4.7% a year earlier (Figure 11). This acceleration has affected all consumption functions, particularly food and non-alcoholic beverages, due to the disarticulation of supply chains, which has reduced the supply of goods and services on the market, and the depreciation of the CDF against the main foreign currencies in a context marked by the Covid-19 pandemic (BCC 2023).

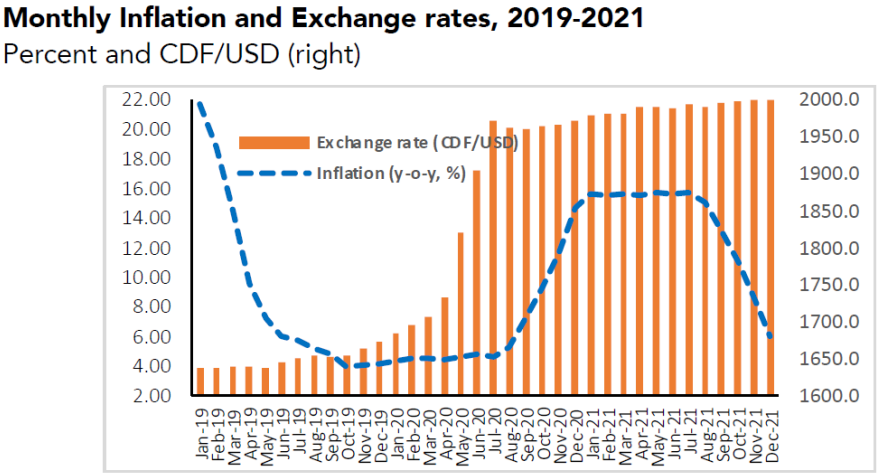

Figure 11: Monthly Inflation and Exchange rates, 2019-2021 in percent (left) and CDF/USD (right) (World Bank 2022b).

In 2020, the pandemic led to increased domestic price pressures, inflation, and economic instability due to lockdown measures and import restrictions. Inflation reached 11.2% in 2020,

up from 4.7% in 2019. However, in 2021, the situation improved, and inflation decreased to 5.3%, which was below the Banque Centrale du Congo (BCC) target of 7.0%. This improvement was attributed to currency stability and BCC policy tightening in late 2020 (World Bank 2022b).

The BCC adopted a flexible monetary policy approach to address the pandemic's impacts. Initially, it lowered its policy rate, eliminated reserve requirements, and provided liquidity to commercial banks. As inflation and currency depreciation became issues, the BCC gradually raised its policy rate from 18.5% in August 2020 to 7.5% in early 2022. The BCC also intervened in the foreign exchange market, injected foreign currencies, and used measures like mandatory reserve ratios and BCC debt securities auctions to control money supply growth, which slowed from 45.9% in 2020 to 35.2% in 2021 (World Bank 2022b).

The exchange rate continued to depreciate, fuelling inflation and tightening government's domestic borrowing conditions (IMF 2023). Inflation is expected to decelerate due to the coordinated tightening of monetary and fiscal policies. Inflation in 2023 is projected at 11.5% and is expected to moderate further to 7.1% by end-2024 (Figure 12). Inflation is projected to revert to the BCC's 7% target over the medium term. The current account deficit is projected to narrow to 2.9% of GDP by end-2028, driven by an improved trade balance (IMF 2023).

Figure 12: Annual targets and actual annual average values of inflation (IMF 2023).

3.2.5 Sovereign debt burdens

An analysis of Congolese public debt shows that its cost is relatively low, thanks to the high concessionality of the portfolio. As a result, the country is exposed to refinancing risk and only slightly to interest rate risk. However, the portfolio carries a major foreign exchange risk due to the preponderance of public debt denominated in foreign currencies (BCC 2023).

According to the December 2021 debt sustainability analysis, the DRC's debt is considered sustainable with moderate risks of external and public debt distress. The total debt in 2020 was US$ 11.2bn referring to 23.1 % of GDP, including external debt of US$ 7.4bn (~50 % is owed to China) (World Bank 2022b).

While higher debt issuance and temporary fiscal deficits have occurred due to investment needs financed by budget support, the medium-term trajectory of external and public debt does not raise significant concerns about debt sustainability. However, extreme shock scenarios, such as lower nominal exports, could breach debt thresholds, particularly due to the DRC's vulnerability to commodity price fluctuations. As a result, both external and overall public debt are at a moderate risk of debt distress (World Bank 2022b).

Efforts are ongoing to improve data coverage for state-owned enterprises' debt. While data on all state-owned enterprises' debt is not currently available, steps are being taken to include debt data for strategic state-owned enterprises in the coming years. State-owned enterprises' debt is factored into the debt sustainability analysis for contingent liability shocks, even if not captured under public and publicly guaranteed debt parameters (World Bank 2022b).

3.2.6 Intricacies of import and export mechanisms

The import and export situation in the DRC is characterised by its heavy reliance on mineral commodities, primarily on copper and, to a lesser extent, cobalt and gold (Figure 13). Gold exports are largely due to industrial production whereas artisanal gold production (approximately one third of total national gold production), until recently, used to be smuggled out of the country to the United Arab Emirates, through transit states in eastern Africa. This has only changed since 2022 with the arrival of the new Primera Gold JV which, due to a strongly reduced special export royalty, has been able to capture a lot of the formerly smuggled gold from the eastern DRC (except for ASM gold in the north-eastern part of the country, which is a major gold mining region). Smaller DRC mineral export commodities such as coltan (tantalum) are partly officially exported and partly, in unknown proportion, smuggled to eastern neighbouring countries, in particular Rwanda, from where they are then exported officially. From 2010 through 2020, mineral export values rose from about US$5 billion to US$13 billion. With the strong commodity price increase in 2022, the combined value of mineral exports surpassed the US$25 billion threshold. Copper and cobalt together make up about 90% of mineral export revenues. Copper is mostly exported as cathodes while cobalt is exported as crude hydroxide. Tin and tantalum are mostly exported as concentrates, while a small proportion of tin has also been exported as tin ingots since 2023.

Currently, exports remain highly concentrated in mining products while broad-based products constitute imports (Figure 13). The DRC faces fiscal policy challenges due to volatile resource revenues. It needs to avoid pro-cyclical fiscal practices and establish rules for medium-term fiscal

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sustainability. While the domestic fiscal balance aims to curb pro-cyclical spending, experts advise adopting a resource-based fiscal framework due to uncertain extractive revenue projections, fiscal volatility, and limited transparency in the extractive sector's financial flows.

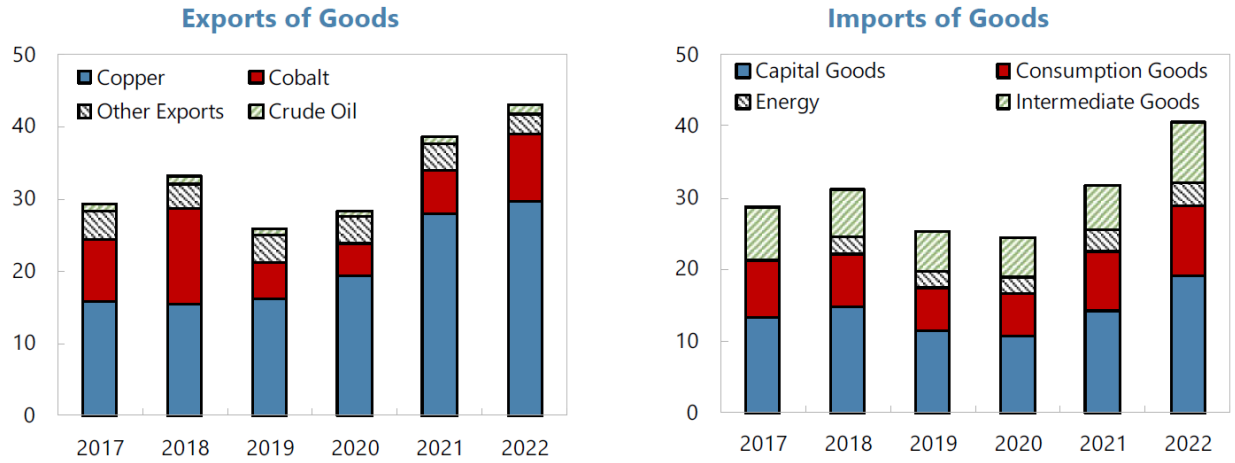

Figure 13: External Sector Developments, 2017-23 showing (left) the export of goods and (right) the import of goods as percent of GDP (IMF 2023).

Buoyant exports, driven by the extractive sector's growth, partially offset a significant rise in imports, attributed to increased public spending and mining sector capital goods imports. Although the current account deficit widened to 5.3 percent of GDP, strong private sector capital inflows contributed to rising gross international reserves, reaching US$ 4.5 billion by December 2022, equivalent to two months of imports.

The DRC's top export partners in 2022 were China, the UAE, the Republic of Korea, Spain, Portugal and Zambia (Figure 14) whereas the top import partners in 2022 were China, Zambia, South Africa, Rwanda, India and the UAE (Figure 14).

Looking ahead, the mining sector will continue to significantly influence the current account balance. Mineral exports, a substantial part of total exports, are expected to increase further due to new mining projects or expansions of existing projects, in response to global demand for climate-transition-related commodities. Imports are projected to gradually increase due to growing demand for capital goods and intermediates for infrastructure investments.

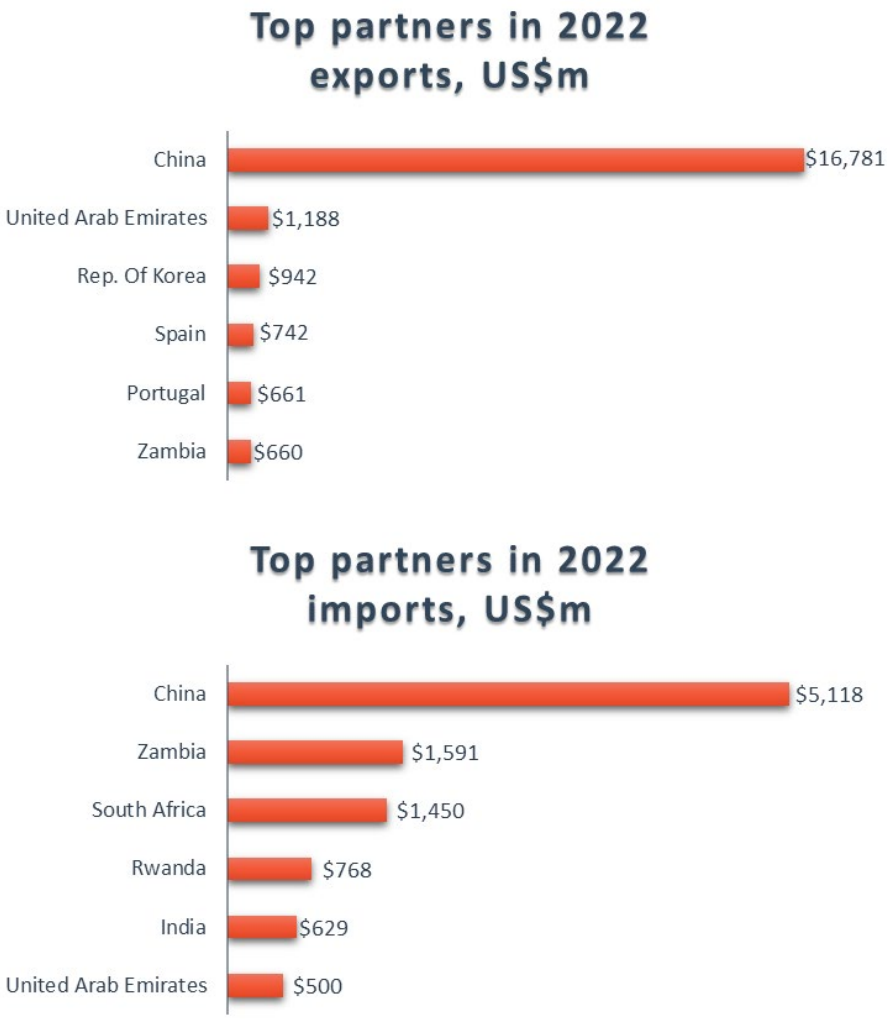

Figure 14: DRC's top (top) export and (bottom) import partners in 2022 (UN Comtrade 2023).

Export restrictions: Article 108 of the Mining Law restricts the holder of a mining licence or a permanent mining permit from exporting unprocessed mineral substances. There is an exception to this restriction, if the holder of the mining licence is authorised by an inter-ministerial decree of the Minister of Mines and the Minister responsible for foreign trade to have its mining products processed outside the national territory, subject to the payment of the related tax and an authorisation period of only one year. In the past, exemptions happened frequently but, in recent years, the DRC has increasingly enforced the processing restrictions in the copper-cobalt sector. Some notable large projects, such as the Kamoa copper mine, are currently allowed to export part of their production as copper concentrate, though, reflecting limited in-country smelting and refining capacities which requires sufficient energy infrastructure. Kamoa is currently constructing its own smelter such that it will at some point also export copper cathodes

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only (part of its concentrates are already processed in-country by a third-party smelter in Kolwezi).

3.3. Political context for in-country financings

The DRC hosts resources of a number of critical raw materials that are relevant for the global energy transition or other strategic applications. This includes copper, cobalt, manganese and lithium (power transmission lines and battery applications) as well as tantalum and tin (e.g., electronics sector) and strategic niche commodities including germanium and gallium. The Congolese government is keenly aware of the country's actual and potential relevance for global mineral supply, and is seeking to expand its strategic position by supporting exploration for nickel, among others. The DRC's relevance as a mining powerhouse is mirrored in the major production growth the country has achieved in recent years, rising to the second largest copper producer in the world. Annual mining conferences such as the DRC Mining Week attract thousands of delegates from around the globe. The government seeks to attract investment in value adding activities in the country in addition to exporting raw materials in the form of metals or intermediate products. Note that, with some notable exceptions, the DRC generally does not export significant tonnages of unprocessed raw materials, without any form of value addition; instead the country mostly exports refined metal (copper cathodes) or chemical products such as crude cobalt hydroxide.

The initiative for creating a special economic zone for battery supply chains, as a joint initiative of the DRC and Zambia, reflects the ambition to incentivise investment in further in-country value addition. It is however clear that a significant range of cathode active materials as well as anode materials required for lithium ion batteries are not yet produced in the DRC (lithium) or have not yet been identified in the DRC or Zambia at all in economically viable concentrations (nickel, graphite). ARISE Integrate Industrial Platform (ARISE IIP), a pan-African infrastructure developer, has been selected as the technical consultant to conduct a pre-feasibility study for the establishment of the Special Economic Zones in DRC and Zambia. This study is planned to be completed in Q4 2023 (UN 2023). ARISE IPP's project shall deploy well-established and proven EV technology that will enable both countries to exploit their mineral resources at scale. Closing this gap would be important, either by increased exploration and project development for the above commodities, or in terms of setting up local supply chains for imports from other countries, perhaps incentivised through the fiscal framework of a special economic zone and benefiting from the African continental free-trade area. Owing to the logistical position of the Copperbelt, being located in the centre of the continent with long transport routes to the next port, relying on significant imports would however present a challenge for the business case of local value addition in the battery supply chain. The latter might seem attractive in case of high cobalt prices but, considering that the trend in battery chemistry is towards producing high-nickel cathode chemistries or producing other battery chemistries such as lithium iron phosphate, both reducing

the role of cobalt in the cathode, and further considering cobalt price volatility and increasing cobalt supply from Indonesia, the prospects for creating an economically viable business case may appear somewhat cloudy. In fact, some industry sector stakeholders in the DRC claimed that the country already missed its window of opportunity in this regard. Other locations in Africa, most prominently Morocco, appear to have been more successful to achieve actual on the ground progress in terms of attracting investment in battery value chains. The latter reflects, among others, preferential tax arrangements with downstream markets, which allow market access and potential access to subsidies, in addition to raw material endowment. Nonetheless, investors proposing in-country value addition steps in the DRC and the associated infrastructure development will likely be preferred over investors seeking to focus exclusively on mining, except for the commodities noted above. Infrastructure projects such as the Lobito railway corridor, energy generation projects, and improvements of the conditions of road transport (currently characterised by extensive trucking times due to multiple administrative procedures along the route) may be of major significance not only for mining but also for value addition prospects in the DRC.

The somewhat uncertain governance framework in the DRC may appear challenging to potential investors. For example, in 2023, exploration licenses of a prominent foreign investor in the Copperbelt were called into question by the ministry of mines before the situation was resolved without any changes to the status quo. Targeted mineral export restrictions for some major copper-cobalt producers in recent years have left a mark on the country's reputation as attractive investment target as well. Finally, there is competition among different investors on attractive investment targets such as the giant Manono pegmatite deposit and its lithium resources. All this occurs on the background of a challenging location in terms of local infrastructure development, logistics, and contextual supply chain due diligence issues referring to the ASM sector and associated risks such as child labour. There are also other risks, such as legal risks and their economic implications of declaring certain commodities as strategic, which will lead to significantly increased export royalties.

As such, investment opportunities in the DRC are difficult to navigate. While the geological endowment of the country as a host of mineral resources is significant, the associated governance and logistical challenges may lead to a certain ambiguity of the business case. This argument becomes more pronounced when considering that the DRC currently does not represent a viable downstream market for products such as electric vehicles, due to the widespread poverty in the Congolese population.

The government is aware of these challenges for investment and seeks to increase the country's attractiveness for foreign investors. The new mining sector strategy (Ministère des Mines 2022) foresees a number of steps in this regard: (1) improving the DRC's score in global governance ratings through improved environmental and social performance; (2) promoting DRC investment

opportunities in national and international fora, emphasizing measures to increase transparency, improve control and reduce corruption; (3) putting in place legal incentives for investment protection, such as fiscal stability and avoiding expropriation; and (4) facilitating supply chain due diligence, mineral traceability, and a legal base for activities in the ASM sector, the latter having a reputational and sometimes physical impact on the industrial mining sector. To overcome environmental problems, DRC's government already created the Mining Fund for Future Generations (FOMIN) to take into account the contemporary imperatives related to environmental protection and sustainable development. The funds managed by FOMIN will help to overcome the environmental problems that people who are constantly exposed to certain risks due to mining may encounter. The organisation and operation of FOMIN are determined by the Prime Minister's Decree n° 17/19 of November 25, 2019.

4. Assessment of social, environmental, and governance challenges

4.1. Country-level assessment and context

4.1.1. Context

Despite being richly endowed with mineral resources, in global comparison, the GDP of the DRC is one of the lowest, making it one of the poorest and least developed countries ranking at 86 (AWIMA 2023). In 2021, the GDP was estimated to be US$ 55.4 billion with a US$ 577 GDP per capita. The mining sector currently represents more than 20% of the Country's GDP and constitutes almost one third of state revenue, and 90% of the country's exports. As such, the mining sector is of considerable importance for national development and poverty reduction. This includes both the industrial as well as the artisanal and small-scale mining sector, the latter having a particularly high relevance for informal employment. This special situation – the widespread poverty, instability in the eastern DRC, governance challenges and the highly dynamic mining sector – creates a range of ESG challenges in the DRC.

Since the two Congo wars in the late 1990s, the DRC has been in the spotlight of public attention due to the role of so-called conflict minerals (gold and the 3Ts) mined in the eastern DRC which contribute to conflict financing and other due diligence risks. This initially mainly affected the downstream electronics and led to the development of international due diligence guidelines for the associated supply chains (OECD 2018).

4.1.2. Mineral/mining policies, industry policies

The DRC has a relatively modern mining law ("code miner"), published in 2018 (law 18/001 of March 9, 2018). The law is operationalised through a general set of mining regulations (Reglement Minier 2003) as well as additional mining regulations on specific topics.

The legal and regulatory framework of the mining sector in the DRC is based on six pillars:

- The parties involved in the management of the Mining Code;
- Management of the Mining Domain;
- Management of Mining Titles;
- Socio-Environmental Responsibility (specifications, contribution to local development of 0.3% minimum of turnover, etc.);
- Taxation;
- Governance and Transparency.

Mineral resources are the exclusive property of the Congolese State. However, holders of mining rights acquire ownership of market rights by virtue of their right. Mineral resources are classified into mines and quarries (Art. 3, Mining Code). Any legal person is authorised after acquisition of mining rights to engage in research or exploitation of mineral substances, especially the extent of the territory. But only natural persons of Congolese nationality are authorised to practice artisanal mining (Art. 5, Mining Code). The State under its discretionary law and in view of the particular circumstances may declare a strategic substance with a particular legal regime or reserved subject to special rules.

The role of the State is to promote and regulate the development of the mining sector (Art. 6, Mining Code) and to ensure development by appealing in particular to private initiative. Decisions can be taken at the central level (Prime Minister, Minister, Administration of Mines competent in the granting of mining rights, Art. 8 to 14 of the Mining Regulations and/or at the Provincial level (Provincial Governor, Minister Provincial, Provincial Division).

The DRC has recently published a mining sector strategy for 2023-2027, focusing on five areas: (1) reinforcing the capacities of the ministry of mines; (2) intensify geology and mining research and manage the associated data infrastructure; (3) develop and support a competitive mining industry which creates employment and is environmentally sustainable; (4) improve the image of the DRC for mining sector investors; and (5) support the formalization and development of the ASM sector.

4.1.3. Mining regulations

The national mining laws and regulations, for both the industrial and artisanal mining sector, include reference to and define requirements for a number of transparency and ESG-related topics. This includes issues such as transparency (EITI), mine site certification, mineral traceability and due diligence. While this appears to be beneficial from an ESG perspective, the challenge frequently lies in the implementation and enforcement of the law at the mine sites. Formalisation of the ASM sector comprises a range of measures, including the creation of a government service (SAEMAPE, formerly SAESSCAM) responsible for ASM supervision, legal requirements to work in cooperatives, registration of miners and traders and the creation of artisanal mining zones (“ZEA”). Again, the challenge often lies in the practical implementation of these measures. For example, SAEMAPE agents may not be present at every mine site, cooperatives may not form structures owned by the workers but rather by “company management” and artisanal mining zones are of marginal geological prospectivity or have difficult logistical access. At the same time, industrial mining and exploration concessions cover the most prospective areas in the Copperbelt region, leaving little space for legal ASM activities.

As such, the mining regulations represent somewhat of a balancing act between the industrial and the ASM sector. Developing the former may be favoured by some due to its high relevance

for the national economy and state revenues. Controls of the implementation of regulations in the industrial mining sector are stricter in comparison to the ASM sector. Government authorities from both the ministry of mines and the ministry of environment oversee monitoring environmental performance in mining. This is not to say that the industrial mining sector is without problems. For example, dust emissions from copper-cobalt mines and historical dumps result in high exposure and health risks for the local population, often living next to active or former mines. A recent Amnesty International (2023) report called for attention on the problem of forced resettlement of the local population living in or around concession areas in order to develop the mine site infrastructure. These issues point to a general conflict between strict regulatory enforcement and the country's reliance on generating income from the growing mining sector.

4.1.4. Taxation and royalties

The fiscal, customs and tax regime applicable to the mining activities of the holder on the national territory is defined exclusively and exhaustively in the Mining Code (Title IX). It concerns taxes, duties, royalties and other parafiscal levies collected both for the benefit of the Government and for that of the provinces and decentralised territorial entities.

Mineral	Royalty rate (%)
Iron and Ferrous metals	3.5
Non-Ferrous metals (copper, tin)	3.5
Precious metals (gold)	3.5
Gemstones	6
Industrial minerals	1
Common construction materials	0
Strategic minerals determined by the government (currently defined as cobalt, coltan (tantalum), germanium)	10

Table 11: Royalty rates per mineral category.

The corporate income tax rate is set at 30% of turnover, as it is the case under the DRC's common regime. Specific taxes are subject to the standard or common tax regime, such as taxes on rental revenues, real estate contributions (for surfaces falling outside the scope of the mining surface taxes or rights) and taxes on vehicles and roads.

Mining companies employing expatriates are subject to payment of an exceptional tax on the basic salary of these employees. The tax rate on remunerations for mining companies employing expatriates' is set at 25%.

The Mining Code has further implemented a super profit tax at a rate of 50%. The super profit tax is due when the commodity prices rise by 25% in comparison to those referred to in the feasibility study. The revenues subject to the super profit tax are then exempted from the profit tax (i.e., the corporate income tax at 30%).

Mining companies seeking to invest in the DRC must note that, pursuant to the New Mining Code, subcontracting activities in the mining sector are subject to Act No. 17/001 of 8 February 2017 establishing the rules applicable to subcontracting in the private sector (the Subcontracting Act). The Subcontracting Act notably provides that:

- Activities can only be subcontracted to Congolese-owned companies or by Congolese nationals (with strictly limited exceptions);
- All companies established on Congolese national territory must put in place, internally, a policy of training that should allow Congolese nationals to acquire the technical know-how and the qualifications necessary to accomplish certain activities; and
- Companies may not subcontract more than 40% of the value of a contract.

In this respect, whereas local content requirements were already imposed on subcontracting activities in the mining sector by a Ministerial Decree, the Subcontracting Act's implementation measures impose rather unclear obligations on mining operators and subcontractors. Furthermore, the subcontracting authority has recently increased the frequency of its on-the-ground visits to control compliance of the mining actors with the Subcontracting Act and related regulations.

4.1.5. Land-use and mineral rights

Title XI of the Mining Code regulates the relations between holders of mining and/or prospecting rights and landowners. There is no provision in the Mining Code that provides for joint use of land by the mining company and the land owner, as these are two exclusive rights. There is initially the idea of an agreement between the mining operator and the land owner on the use of the land under certain terms and conditions. Without agreement or authorisation, any encroachment by the mining permit holder on private land ownership is an abuse of rights (ICLG 2023).

The holder of the mining right is fully entitled to repair any damage caused by the work carried out by him in the course of his mining activities, including authorised work.

Any occupation of land which deprives the beneficiaries of the use thereof, or any alteration which renders the land unsuitable for cultivation, shall result in the holder of a mining right being required to pay, at the request of and at the convenience of the beneficiaries, reasonable compensation equal either to the rent or to the value of the land at the time of the occupation, increased by half.

Possession of an indigenous title or other legal surface use right confers on its holder, even if he or she does not hold a mining right, the right to claim compensation in the event of damage suffered or payment by the holder of the mining right of an amount that could represent rent for

the occupied site. Land use without the consent of the landowner is considered abuse. This is of particular relevance in the DRC where a system of traditional authorities plays a significant role in the local population. This is also a cause of disputes in the ASM sector. The latter may not have formal mining titles in many cases but might get their activities authorized by a local chief – this then raises the question whether or not these activities may be considered legitimate.

4.1.6. Environment

In industrial mining, the mining regulations require any mining project to present an environmental plan and have it validated by the competent services before the actual start of its activities. For reasons of national security, public security or environmental preservation, areas may be classified as prohibited areas without time limit, and mining rights may not be granted in a protected area (Art. 6, Mining Code). Companies shall prepare a Mitigation and Rehabilitation Plan as well as an Environmental and Social Impact Assessment (ESIA) with associated Environmental Management Plan in accordance with the guidelines contained in the Mining Regulations.

As for the artisanal mining sector, it is governed by the code of good conduct (Annex IV of the Mining Regulations) to which the operator is subject under the supervision of SAEMAPE. Moreover, the social and environmental performance of ASM operations may be monitored according to other subject matter standards. For example, the DRC has formally adopted the CTC (Certified Trading Chains) standard for responsible ASM activities. The scheme was updated in 2019, following its initial inception in 2011, and includes most ASM commodities in the DRC. An additional standard that includes environmental as well as social issues was developed by the Entreprise Générale de Cobalt, a parastatal company which plans to trade in artisanal cobalt ores and concentrates. The company, in coordination with international offtakers, developed a dedicated ESG standard which would apply to all its suppliers.

Mineral exploration and exploitation operations must be the subject of a Mitigation and Rehabilitation Plan previously drawn up and approved in accordance with the provisions of Chapter IV of the Mining Regulations. According to the regulations, the Mitigation and Rehabilitation Plan must include carrying out backfilling, erection of reinforced slabs, construction of a fence and signalling of dangers signs on the area of the proposed activity (ICLG 2023).

For mining exploration operations, the Mitigation and Rehabilitation Plan is submitted after the granting of the Exploration Permit. Its approval by the Congolese Environment Agency in collaboration with the Department responsible for the Protection of the Mining Environment is a prerequisite for the start of exploration activities. For exploitation operations, the Mitigation and Rehabilitation Plan is filed at the same time, as the application for the proposed activity and its approval, by the competent authority, is a condition of the permit. Pursuant to Article 204,

paragraph 4 of the Mining Code, any person carrying out exploration or mining operations is required to constitute a financial security for the rehabilitation of the environment in order to ensure or cover the cost of the environmental rehabilitation measures.

In practice, mine closure is at the back of the priority list in the DRC's mining sector, as most companies and the government seek to expand existing and develop new mines, especially in the copper-cobalt sector. Moreover, the decades of historical mining activities have left large dumps and other mine infrastructure without adequate rehabilitation. It is not clear who will be in charge of rehabilitating these sites, if any. The lack of space, with the direct juxtaposition of neighbouring mining concessions and local villages and towns complicates things further. In addition, two licenses, focusing on mining and tailings re-processing, might cover the same area simultaneously. This factor creates further complications for possible rehabilitation. As such, despite a legal framework providing for rehabilitation in theory, this does not necessarily imply that all mining legacies are adequately taken care of.

The texts that regulate water management, protection and development in DRC is Law No. 15/026 of December 31, 2015 relating to water. The DRC has an abundance of water resources and low water stress. Over 50% of Africa's surface water reserves and approximately 25% of the continent's water resources are located in the DRC. The total volume of freshwater withdrawn by major economic sectors is 0.2% of the total resource endowment and total annual renewable water resources per person is 15,773 m^3, far exceeding the Falkenmark Water Stress Index threshold for water stress. The vast resources of the Congo Basin contribute to year-round surface water flows. Approximately 30 % of water resources originate in neighbouring countries (USAID 2021).

The Congolese legislation regulating the mining sector is fairly developed and obliges companies to make sure that they do not pollute water resources as part of their operations. DRC has no national water quality monitoring programmes. The lack of data limits regulatory capacity and enforcement and increases vulnerability to water-related environmental and public health safety risks.

Surface and groundwater pollution pose a risk to public health and biodiversity. Mining in the Katanga Copperbelt (southern DRC) has increased concentrations of trace metals and pollutants such as mercury, lead, cadmium, and copper in surface waters (and soils). High concentrations of faecal coliforms from poor sanitation systems and unprotected drinking water sources have contaminated drinking water, especially near large urban centres like Kinshasa. Deforestation has led to sedimentation of surface waters, especially along the eastern border and near Kinshasa (USAID 2021). Artisanal mining operations frequently use surface waters – ponds, and sometimes rivers – for washing the ore. In the hills of the eastern DRC, artisanal miners apply the practice of ground sluicing, leading to major erosion of hill flanks while possibly increasing flooding risks

where eroded sediments blocks rivers. The resulting floods may negatively affect local agriculture. Despite the legal framework in place, there are therefore major environmental risks associated with ASM operations.

4.1.7. Societal and community aspects, cultural heritage

The exploitation of mineral resources has been the engine or the accelerator of the economic growth of the DRC for several years now, especially during periods of high mineral prices on the world market. Periods of improvement, such as the last base metals super-cycle of 2009-2013, and the more recent positive copper price trend (cobalt prices are more volatile), constitute opportunities for a country rich in resources to transform not only its economy but also its local community (AWIMA 2023). On the other hand, the extremely dynamic mining sector development is also associated with a number of social risks.

The holder of the mining rights must comply with the labour legislation (Law No. 015/2002 of October 16, 2002 on the Labour Code; Labour Code 2002) in terms of employment, more particularly the regulation of the work of foreigners with regard to the authorised percentages that fix the list of jobs prohibited to foreigners as well as the regulations determining the conditions of engagement of foreigners.

With equal skills, the holder of the mining rights has to recruit nationals in priority. The holder also has to implement training programmes for Congolese personnel identified by the needs. They must cover all levels of qualification, to enable them to acquire skills required for the management of the company, in order to occupy management and supervisory positions within ten years, following the date of the start of commercial production.

The mining company establishes and transmits to the Cellule Technique de Coordination et de Planification Minière (CTCPM), for information and monitoring, their staff training and development plan. This plan includes a component of training courses for pupils and students of Universities, Technical Higher Education Establishments whose school and academic curriculum, as the case may be, covers mining sciences and techniques as well as jobs in the mining sector.

The protection of cultural heritage falls to the Congolese State. The holder of a mining right is required to inform the local administrative authority and the authority in charge of culture, Arts and Museums, of the discovery of archaeological evidence if this research or exploitation work reveals the existence of these indices (Art. 205, Mining Code). Additional provisions of the Mining Code are intended to ensure the conservation of any archaeological findings that occur during the course of the project.

The 2018 Mining Code recognises artisanal mining as a legal activity. The aspects in the Mining Code pertaining to artisanal mining are:

- Artisanal miners must register and restrict their activity to certain designated areas, namely artisanal exploitation zones (ZEA);
- Be affiliated with a cooperative to be able to work in ZEAs (Ministerial Order 2010) and
- Any actor involved in the chains of Mineral sourcing is required to adhere to the OECD (2018) Due Diligence Guidelines as well as the ICGLR Regional Certification Scheme (Ministerial Order 2012).
- ASM activities are reserved for Congolese nationals and limited in scope and equipment.
- They are governed by a code of conduct with safety, health and environmental requirements.
- ASM licences ("carte d'artisanal miner") must be renewed annually.
- Local mineral traders must be in possession of a trading licence ("carte de négociant") and sell their minerals to designated buying establishments (the so-called "comptoirs" or "processing entities"). The latter are the only entities officially authorised to export minerals from artisanal production.

The SAEMAPE was created under Decree No. 17/009 of April 04, 2017. SAEMAPE is a Technical Service in charge with administrative and financial autonomy in order to supervise and support the development of the ASM sector.

All aspects related to labour practices in the DRC are governed by Law No 015/2002 of October 16, 2002 on the Labour Code. The holder of the mining and/or quarry right is required to repair any damage caused by diseases attributable to the mining activity in accordance with the common law rules. The list of illnesses attributable to mining activity is determined in the Mining Regulations (Article 258 bis).

Mining has a significant impact on the daily life of the community in which it operates in terms of revenue to finance social services and infrastructure. Chapter IV of Title XI of the Mining Code (2018) governs all the social and community aspects related to mining activities. The highlights are discussed below and are visually illustrated in Figure 15:

- The holder of mining exploitation rights is required to contribute, during the period of his project, to the definition and implementation of socio-economic and industrial development projects for local communities affected by the project activities on the basis of specifications for the improvement of the living conditions of the said communities.
- The institution of specifications to serve as a framework of agreement allowing the realisation of development actions aimed at improving the economic, social and cultural well-

being of local populations affected by the mining activities of the holders of mining exploitation rights during and after exploitation.

- A mining fund is established for future generations (FOMIN). The resources of this fund consist of a portion of the mining royalty. A decree from the Prime Minister creates and organises the fund.

- The holder of a mining exploitation right is required to constitute, free of tax on profits and profits, an endowment for contribution to community development projects, the minimum amount of 0.3% of the turnover of the financial year during which it is constituted. The endowment must be fully made available to local communities before the expiry of the financial year following that in which it was incorporated (Art. 285). This provision replaced a different system under the previous mining law where mine operators made payments that were used for public benefit and infrastructure development in specific provincial committees.

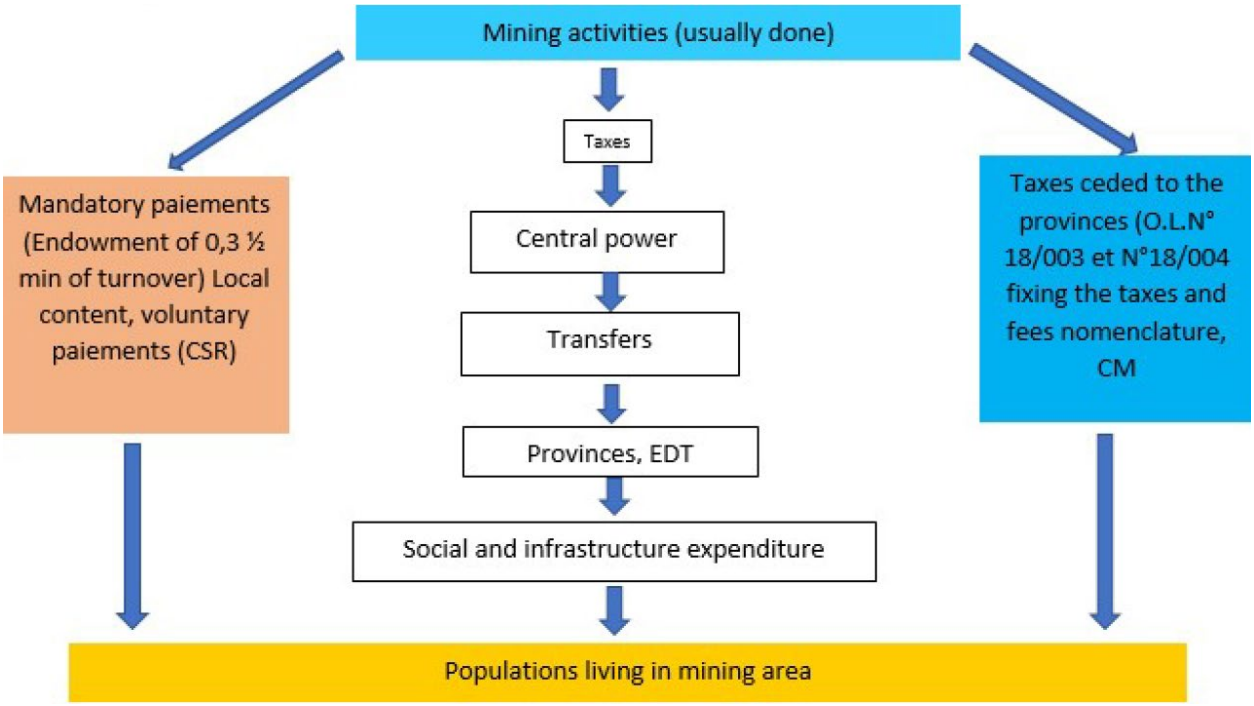

Figure 15: Revenue sharing through fiscal decentralisation[8].

4.1.8. Public health and safety

The 2018 Mining Code has no indication regarding public health issues. All questions relating to health are governed by Law No. 18/035 of December 13, 2018 laying down the fundamental principles relating to the organisation of public health.

[8] Mining Code 2018

Mining activities are subject to safety, health and protection measures enacted by special regulations ordered by the Mines and Health Administrations (Interministerial decree; Labour Code 2002). The holder of the mining rights must comply with the measures that are ordered by the Ministry of Mines in order to prevent or remove the causes of the dangers mining activities poses to public safety and health, to services, water and public roads.

Any serious or fatal accident occurring in a mine must be brought, immediately and by the fastest means of communication, to the attention of the Directorate of Mines and the administrative and judicial authorities of jurisdiction (Art. 209, Mining Code 2018). As this creates public attention and scrutiny, certain industrial mine operators may seek to avoid reporting on such incidents in practice. In the ASM sector, occupational health and safety is a major concern and fatal accidents are common, especially in underground operations.

4.2. Mining practices *vs.* Environmental, Social and Governance (ESG) goals

4.2.1 Environmental challenges

During the last decades of mining, the DRC has seen numerous acts of environmental damage:

- According to data available on the Global Forest Watch platform managed by the World Resources Institute, the DRC has lost 8.6% of its tree cover since 2000. One of the major causes of deforestation in the DRC is mining, though local charcoal production is a major contributor as well (Global Forest Watch 2023).

- The Kahuzi Biega National Park in North and South Kivu has been subject to illegal coltan mining operations, especially during the early years of the conflict in the eastern DRC (Mongabay 2022). The illegal miners encroaching on the park additionally engage in poaching to feed their families. This was a major problem for the local wildlife, including for eastern lowland gorillas whose population decreased from 8000 (1991) to 40 (2005).

- Emissions associated with historical and present mining activities (and associated mine dumps) in the Copperbelt area have led to substantial pollution of waterbodies, air and soil by certain heavy metals. It is often difficult to identify the source of pollution and there is a general deficit in terms of national standards and background parameters for such kind of pollution risks. The pollution observed in places has a negative impact on agriculture, on local ecosystems, and is impacting on public health.

- Artisanal miners often rely on waterbodies and streams to wash their mineral concentrates. An even stronger impact is generated if ASM activities are mechanized using river-borne dredges. These activities increase the sediment load in water bodies. ASM operations in the gold sector frequently use mercury for amalgamation which introduces a toxic chemical in

the water, which may bio-accumulate along the food chain. Hillside erosion caused by artisanal ground sluicing operations represent an additional problem for ecosystems and may negatively impact local agriculture. These examples illustrate the locally strong impact by ASM operations on local water quality and availability.

The Mining Code conditioned the granting of a mining license to the development and prior implementation of an ESIA, as well as an environmental management plan. The ESIAs are, in most cases carried out, however, based on the presentation given at the stakeholder engagement workshop (AWIMA 2023), the following points are highlighted:

- Lack of monitoring by the authorities during the implementation phase due to financial and human resources shortage;

- Consultation of local populations during the preparation of impact studies and as a prerequisite for the granting of mining license seems to pose many problems. In general, the local populations are not effectively involved in decision making that affects them. Furthermore, these people suffer numerous violations of their rights as a result of mining activities in their territories. These violations include alleged cases of uncompensated relocations and pollution of rivers, among others. In some cases, these violations have led to severe social conflicts.

4.2.2 Socio-economic issues

Despite the country's vast natural resources, two-thirds of the Congolese citizens were living below the poverty line in 2021. According to the World Bank (2021), the DRC ranks 164 out of 174 countries on the 2020 Human Capital Index, reflecting decades of conflict and fragility, and constraining development. Many people still face marked inequality because most of the wealth is held by a minority, despite the mining sectors contribution of more than 20% to the formal economy of the country:

- Working conditions in the ASM sector are appalling and unsafe. While artisanal mining may allow miners to earn enough money to sustain their families, the work is extremely dangerous, in particular underground. For example, at Mwenga in Shabunda (South Kivu), 50 artisanal miners died in September 2020 as a result of a coltan mine collapse (Aljazeera 2020). Similar accidents occur frequently elsewhere and for other commodities.

- Conflicts between members of an artisanal miners' cooperative and mine permit holders occur in places and may sometimes escalate. An example is the conflict between the Cooperamma cooperative and the coltan mining company SMB in North Kivu, which led to violence (Reuters 2020). In 2019, the government deployed the army to evict artisanal miners from industrial copper-cobalt concessions. Artisanal miners may start riots and destroy equipment if they are no longer granted access to certain concessions where they used to be allowed to work, in particular in Lualaba province.

- Local people claim to have been evicted from a number of copper concession areas in the Copperbelt and inadequately compensated, while the involved mining companies largely claim they followed the applicable legal procedures for compensation.

- Conflict financing, child labour and other due diligence risks continue affecting mineral supply chains. The DRC conflict is claiming more civilian lives now compared to the situation ten years ago; conflict intensity has intensified and the local population does not feel safe. It is important to note though that mining and mineral trade are not the root cause of the DRC conflict. As such, improving mining sector governance and supply chain controls may only be expected to have a limited impact towards ending the on-going conflict in the eastern DRC. Child labour risks in the DRC's mining sector have decreased in recent years, in response to increasing international scrutiny and improved local monitoring efforts.

- Corruption is a significant risk in the DRC and contributes to the disproportionate distribution of wealth in the country. Both the artisanal and the industrial mining sector are affected by corruption risks. In the ASM sector, corruption contributes to the undermining of supply chain due diligence and traceability efforts, leading to informal trade and mineral smuggling. In the industrial mining sector, the employed procedure for international companies to obtain attractive mining concessions in the DRC is sometimes highly questionable. In addition, at a smaller scale, corruption plays a role in avoiding the reporting of accidents and other ESG challenges, so that risks are not adequately mitigated.

4.2.3 What would be the best practices for a responsible mining?

Despite a sound legal and regulatory framework for the mining sector, DRC remains one of the poorest countries in the world. This is mostly attributed to the lack of implementation of certain legal and regulatory provisions in terms of transparency.

Some private sector stakeholders, driven by downstream demand, have started to consider adopting international standards and assurance procedures referring to local mining operations (both industrial and artisanal), local trade and smelting/refining. There are a number of international industrial mining standards (e.g., IRMA, Coppermark, ITA Code of Conduct), artisanal mining standards (e.g., CTC, the Fair Cobalt Alliance Framework, the EGC ESG standard), as well as due diligence initiatives (e.g., iTSCi, Better Mining, RMI/RMAP, the RCI) that would be applicable in the DRC and which illustrate best practice. These standards address a broad range of ESG aspects and a few of them (focusing on artisanal mining and due diligence) have been specifically designed based on the situation in the DRC.

In addition, minerals produced in the DRC are subject to a number of downstream regulations established in the EU and other jurisdictions. This includes the EU conflict mineral regulation (2017), which partly mirrors the US Dodd Frank act's conflict mineral provisions (2011) or the

upcoming EU battery regulation. While the former focus on supply chain due diligence procedures, the latter goes further by addressing certain ESG factors as well, eventually including carbon emission reporting. This growing landscape of international standards and regulations impacts on the DRC and may lead to improvements in certain supply chains. However, these standards and regulations were often developed without significant DRC ownership and they do not replace the government's responsibility to manage both the industrial and ASM sectors. In addition, certain parts of the DRC mining sector mainly supply downstream jurisdictions where there is little demand for improved mining and due diligence performance, again emphasising the key role of the DRC government to address the challenges affecting its mining sector.

The revision of the legal framework for the mining sector in 2018 and the new mining sector strategy of 2023 show that the state is committed to ensuring that the country's natural resources benefit its people. Revenue sharing through fiscal decentralisation is an attempt to improve this situation. If properly implemented and monitored, it could have a very positive impact on the livelihoods of DRC citizens. The government's strategy itself emphasises the need for strengthening the ministry's capacities to fulfil its mandate in the mining sector. The increasing demand for DRC minerals on the global market may represent an opportunity for the government to request more support by international partners in this regard. At the same time, the DRC has always benefited from the strong role of local civil society which engages in joint discussions with the government and the private sector. Leveraging international attention in combination with local multi-stakeholder fora and discussion platforms, which already exist in different provinces (e.g., IDAK) and at the national level (e.g., EITI), may be a key strength for the DRC government to mobilise in order to define sustainable solutions with full Congolese ownership.

Funded by
the European Union

5. Business network between the European Union and the DRC

5.1. Assessment of the upstream and downstream business ecosystem

5.1.1 Context, formal and informal players

The DRC's mining sector encompasses both formal and informal players across the upstream and downstream segments of the business ecosystem. The following presents an overview of these players. Formal upstream players first of all include Government Ministries such as the Ministry of Mines, and their associated technical services, such as the Geological Survey of the Congo (SGN-C), the national ASM oversight and support organisation (SAEMAPE), a government think tank (CTCPM), the mining environmental agency (DPEM), the national certification agency for exports (CEEC), and, with a semi-independent status, the Mining Cadastre Office (CAMI). The ministry and its associated technical agencies run offices at the provincial level in all relevant DRC provinces. A number of additional DRC ministries and their services, as well as the President's and the Prime Minister's offices, are playing a role in the mining sector and the associated value addition as well.

Furthermore, state-owned companies, such as Gécamines or SNEL (electricity company), and foreign-owned LSM companies are important formal upstream players. The latter comprise companies, such as Glencore (Kamoto, Mutanda), China Molybdenum Co. Ltd. (CMOC; Tenke Fungurume, Kisanfu Cu-Co mine), Eurasian Resources Group (ERG; Metalkol, Boss and Comide), the Vinmart Group and its local subsidiary Chemaf SPRL (Etoile and Mutoshi), Sicomines, Congo Dongfang, Jinchuan Group, Zijin Mining or China Nonferrous. These companies are usually members of the Congolese Federation of Companies (the FEC), which has an important chapter for mining, and are additionally organised in the national chamber of mines. In addition to small- or large-scale mining companies, ASM cooperatives occupy a semi-formal space. While they are organised and registered, as such formal, the ASM operations themselves are often informal, as outlined below. Mineral exporters buying from ASM (comptoirs) are usually registered as formal companies.

The DRC government joined the EITI in 2007 and has made meaningful progress in transparency of its mining sector, but this could not accurately represent standards due to the latest EITI validation of 2017 (EITI 2021). Germany, Belgium and other international development partners have worked or are working with the national DRC EITI secretariat which is in charge of increasing transparency in both the LSM and ASM sectors. A number of DRC ministries are directly involved in the national EITI process.

Informal upstream players first of all include ASM engaged in manual or semi-mechanised mining activities, typically in gold (230,000 miners), 3Ts (30,000-60,000 miners) and copper-cobalt

(50,000-200,000 miners) (Vasters and Schütte 2023). Furthermore, mineral traders and intermediaries are involved in buying minerals from ASM and sell them to larger traders or export companies. They play a role in facilitating the flow of minerals from informal to formal supply chains but can also contribute to opacity in the mineral trade. The illegal upstream sector is also influenced by illegal mining syndicates and smugglers. Importantly, every job in mining has a multiplier effect and creates indirect employment – this applies both to the formal and informal sector. The ASM sector creates indirect employment in agriculture and food supply, and local services such as transport and other small business. Many of these jobs, and indeed large parts of the DRC subsistence agricultural activities, are informal as well. A typical ratio employed for ASM is 4-5 indirect jobs are created for every full-time artisanal miner, but the ratio may differ and depends on the commodity and local economic context.

Formal downstream players include mineral refiners, which often also relate to large mining companies involved in the production of copper cathodes. Processing of raw ore into concentrates (tin, tantalum) or chemical intermediate products (cobalt hydroxide) are however, part of the upstream sector. Manufacturers and end users, such as companies in electronics, automotive and construction industries are important downstream players. Currently, almost all of these are situated outside of the DRC and thus irrelevant for this country case study at this stage. Regulatory bodies, such as the Ministry of Mines and the Ministry of Finance are involved in regulating mineral exports. Financial Institutions and other entities, e.g. logistics companies as well as environmental and quality control organisations are part of the downstream industry.

Informal downstream players include craftsmen which may create jewellery, ornaments and other handicrafts for local and regional markets. These are very few in number. The largest part of the informal economy is associated with the upstream supply chain.

5.1.2 Relationships at local or regional levels

Regional Integration: The DRC is a member of several regional economic integration initiatives in Africa. These initiatives aim to promote economic cooperation, trade and development among participating countries. Regional economic integration initiatives offer opportunities for the DRC to enhance trade relations, attract investment, and collaborate with neighbouring countries to address common challenges:

- Common Market for Eastern and Southern Africa (COMESA): The DRC is a member of COMESA, a regional organization consisting of 21 African countries. COMESA aims to create a common market and promote economic integration in Eastern and Southern Africa. It focuses on trade facilitation, infrastructure development, and investment promotion.

- Southern African Development Community (SADC): The DRC is also a member of SADC, a regional economic community comprising 16 countries in Southern Africa. SADC seeks to

promote sustainable economic development, regional cooperation, and integration. It emphasizes areas such as trade, infrastructure, and industrial development.

- Economic Community of Central African States (ECCAS): The DRC is part of ECCAS, a regional organization that aims to promote economic integration and development in Central Africa. ECCAS focuses on areas such as trade, infrastructure, and harmonization of economic policies.

- Great Lakes Region: The DRC is part of various initiatives aimed at promoting peace, security, and economic development in the Great Lakes region of Africa. These initiatives aim to address conflict, promote cross-border trade, and enhance cooperation among countries in the region. Noteworthy initiatives are the International Conference on the Great Lakes Region (ICGLR) and the Economic Community of the Great Lakes Countries (CEPGL).

- East African Community: The DRC joined the East African Community in 2022, an important trade block with seven member states. This trading block is important for the DRC because much of the trade in the central-eastern DRC is handled through the transit ports of Dar Es Salam (Tanzania) and Mombasa (Kenya), while trade in the south-eastern DRC (Copperbelt) often flows through transit ports in southern Africa (South Africa, Mozambique, Namibia, potentially Angola).

- African Union: The DRC is a member of the African Union, a continental organisation that aims to promote political and economic integration among African countries. The African Union's Agenda 2063 outlines the vision for a united, prosperous, and integrated Africa. The New Partnership for Africa's Development (NEPAD) was adopted by the African Union in 2001 and is a pledge to eliminate poverty and to achieve a sustainable path of growth and development on the continent.

Special Economic Zones: In partnership with Arise IIP, the DRC plans to establish SEZs focussing on the mining and processing of electric vehicle-relevant commodities and related products along the value chain. These comprise both the SEZs in the Copperbelt on the DRC and Zambian sides (see section 3.3 Political context for in-country financings; UN 2023) and the SEZ Kinshasa (or Kin-Malebo industrial zone). The construction of the latter has started in October 2022 with the aim to be operational in September 2023. The Kin-Malebo industrial zone will host wood processing, poultry processing, and beverage production for the local market, but also companies specialising in the pharmaceutical sector, plastic recycling, household appliances, electric vehicles, and other processing industries (Arise IIP 2022).

Local fora: Many discussions related to mineral supply chains in the DRC focus on sustainability and due diligence questions. These are coordinated in different provincial fora, such as the CPS (comité provincial du suivi), IDAK (former Katanga region) or IDAKI (Kivu region). Some

international partners (for instance, German organisations such as BGR and GIZ) are from time to time participating in these meetings, such that they provide an interface from the local to the global level.

5.2. Building new B2B relations

A couple of bilateral partner (donor) interactions over the past years have directly supported B2B relations, for instance linking local ASM cooperatives with international buyers. Both in the ASM and LSM sectors, there are abundant supply chain discussions between DRC stakeholders, international partners and the international downstream supply chain. Examples include pilot supply chains such as the past Solutions for Hope project (tantalum), Trafigura's support to the Mutoshi ASM cobalt development project, different companies funding the GIZ International Service intervention "Cobalt for Development" ("C4D"), the Fair Cobalt Alliance and its engagement at the Kamilombe copper-cobalt site, actions by the Responsible Minerals Initiative and the Responsible Cobalt Initiative, and private sector engagement with international certification and assurance schemes, such as iTSCi and Better Mining in the 3T sector. Collectively, these interventions show a broad and dynamic B2B networking process along DRC mineral supply chains that has been in place for years. Existing multi-stakeholder discussion platforms in the DRC, such as IDAK and IDAKI, represent good entry points for discussing shared supply chain concerns and establishing new relationships. Prolific opportunities for B2B networking in the context of the industrial mining sector may be sought at annual events such as the DRC Mining Week or via visiting delegations, such as those from time to time provided by the German-Southern African chamber of commerce (AHK). Also, the Mining Indaba in Cape Town frequently features attendance by the DRC government, by state-owned Gécamines, and by several mining companies and service providers active in the country, such that it presents an opportunity to engage in B2B networking.

5.3. Promoting local content and enabling mining cluster actors

To improve the framework conditions for European and African companies and organisations to co-create new value, businesses, products and services by transforming the ways they interact, hereafter Geoscience/mining related accredited education and training programmes are listed. A number of structures offer training courses of varying quality in the field of mining in the DRC, generally centred around mining engineering, geology, metallurgy, mineral resource management, mining safety, the environment and sustainable development:

- The **Department of Earth Sciences, University of Kinshasa** (UNIKIN), offers training courses in mine geology, hydrogeology and geotechnics, geochemical and geophysical prospecting, ore deposit evaluation and modelling, mining engineering, mining economics and project management as well as environmental impact assessment.

- The **Faculty of Sciences, University of Lubumbashi** (UNILU), offers training courses in geology focussing on exploration and mining geology as well as on environment and hydrogeology, and own mineral processing and geophysics laboratories. Furthermore, the African Centre of Excellence in Battery Manufacturing (CAEB) is to be established at UNILU with the aim of promoting training, research, innovation and technological capacity building. The actual inauguration took place on 22 April 2022 in the presence of political and academic authorities as well as members of the academic and scientific staff from the DRC and other countries (UNILU 2022).
- The **Faculty of Sciences, University of Kisangani** (UNIKIS), offers training courses in geology.
- **School of Mines, Official University of Bukavu** (UOB), offers training courses in exploration and mining geology as well as civil mine engineering.
- The **Faculty of Science and Technology, University of Goma** (UNIGOM), offers training courses in geology.
- The **Faculty of Mines and Geology, University of Uele**, offers training courses in mining-relating topics.
- The **Faculty of Science, Official University of Ruwenzori** (UOR-Butembo), offers training courses in mine geology, hydrogeology and geotechnics, geochemical and geophysical prospecting, ore deposit evaluation and modelling, mining engineering, mining economics, mining law and project management, environmental impact assessment as well as geothermal energy.
- The **Faculty of Science, University of Nature Conservation and Development** (UCNDK), offers training courses in geology.
- The **Academy of Mines ERG, University of Kolwezi** (UNIKOL), is a partnership of the UNIKOL and the company Eurasian Resources Group and offers training courses in geology focussing on exploration and mine geology as well as in metallurgy and mining.
- The **University of Mbandaka** (UNIMBA) offers training courses in Geology.
- The **Polytechnic Department** (Faculty of Applied Sciences), **University of Mbuyi-Mayi**, offers training courses in mining and exploration geology, mining engineering, mining economics, law and project management as well as hydrogeology.

In the DRC mining sector, it is common practice for international industrial companies to hire Congolese staff to maximise their share of the workforce, as required by regulations. A frequently employed procedure for more complex tasks is to send local staff abroad for training (depending on where the company has its global headquarters for such activities). Major international industrial companies are for example:

- ERG (Kazakhstan);
- Ivanhoe (Canada);
- Glencore (Switzerland);
- CMOC (China).

Mining training schools were originally established by parastatal Gecamines when it still had a monopoly over all mining activities in the DRC. Today, these schools are more or less independent of Gecamines. They offer courses in mining, electricity, mechanics, chemistry and electronics. From north to south the names and locations of the schools are (according to information provided by BGR's DRC project team in 2023):

- Mutoshi (Kolwezi);
- Viombo (Likasi);
- Kitendo (Lubumbashi);
- Tutumike (Kipushi).

A large number of international development partners and their implementation agencies as well as NGOs are supporting local partners in the DRC's mining sector, including the ASM sector, as far as sustainable economic development, transparency and good governance or responsible supply chains are concerned. Partners also work on related aspects, such as environmental protection of national parks or energy supply, including strengthening renewable energy. Table 12 provides a few examples of these organisations. Many mining companies implement CSR activities that address in particular the topic of local economic development as well.

Organisation	Origin (government or funding)	Field of engagement
BGR	Germany	Mining sector transparency (ASM), ESG, economic development
GIZ	Germany	Mining sector transparency, economic development
GIZ International Service (C4D project)	Private sector (downstream industry funding)	Mining sector transparency, economic development (ASM)
IPIS	NGO (Belgium; various international funding partners)	Mining sector transparency (ASM)
Responsible Minerals Initiative	Private sector (downstream)	Mining sector transparency (ASM)
USAID and others	United States	Mining transparency, economic development, ESG (ASM)
EU	EU	Mining governance, economic development
World Bank	World Bank	Mining transparency (Encore), economic development (RISE)
African Parks	South Africa	Environment
Greenpeace	Canada	Environment
Bboxx	UK	Renewable energy
Nuru (formerly Kivu Green Energy)	United States/DRC	Renewable energy

Table 12. Examples of organisations currently engaged in the DRC mining, environment or energy sector.

6. Energy and digital transition: develop a strategy for the EU and Africa Partnership

General strategy: This section first provides a general strategy for an EU-DRC partnership focussing on energy and digital transition followed by information on ongoing actions.

Backed by EU support, private sector entities, could:

- Invest in renewable energy infrastructure in DRC (e.g., solar, hydroelectric power plants);
- Facilitate the transfer of EU's renewable energy technology;
- Upgrade and expand the electricity grid to reach underserved areas;
- Introduce smart grid solutions for efficiency and reliability in energy distribution;
- Collaborate on capacity-building programs to train local workforce in renewable energy technologies and management;
- Invest in expanding and improving DRC's telecommunication networks, including broadband infrastructure;
- Promote initiatives for digital inclusion, ensuring access to technology and digital education across the country;
- Assist DRC in implementing e-government solutions;
- Support the digitisation of healthcare and education systems;
- Collaborate on establishing robust data security and privacy regulations, fostering a secure digital ecosystem;
- Offer training and expertise in cybersecurity to safeguard digital infrastructure.

The partnership framework should consider:

- Private-Public-Partnerships (PPPs) between EU private sector firms and the DRC government to ensure sustainable investment and operational excellence;
- Joint investment funds or facilities can be established to support projects aligned with the transition goals;
- Policy alignment between the EU and DRC to facilitate smooth implementation of projects and regulatory coherence;
- Sustainable Development Goals (SDG) to ensure that energy and digital transition projects contribute to sustainable development, social inclusion, and environmental protection.

The DRC mining sector strategy: According to the government's mining sector strategy plan, the following areas are to be improved, in order to achieve the goals of a pro-developmental mining sector:

1) Strengthening geological knowledge and research as well as centralisation of geological and mining data:

- Drawing up an inventory of documentation relating to geological data;
- Analysis and processing of geological data;
- Creation of the database;

- Improving knowledge of the soil and subsoil;
- Strengthening the geodetic network;
- Regional geological studies in selected areas;
- Certification of mining reserves.

2) Industrialisation of the mining sector:

- Acquisition of appropriate production and refining technology (Article 108 of the Mining Law restricts the holder of a mining licence or a permanent mining permit from exporting unprocessed mineral substances, however, processing/refining options are not always available due to infrastructure (i.e., power supply) bottlenecks; see also sections 2.2.1 List of the main bottlenecks and the links between them and 3.2.7 Intricacies of import and export mechanisms);
- Strategic minerals determined by the government are currently defined as cobalt, coltan (tantalum) and germanium (see also section 4.1.4. Taxation and royalties);
- Reinforcing commitments to social responsibility on the part of mining operators.

3) Strengthening environmental performance:

- Strengthening the capacities of the structures responsible for environmental protection;
- Drawing up a community development policy for mining areas;
- Capacity-building for environmental protection bodies;
- Protection;
- Drawing up a community development policy in mining areas, etc.

4) Promoting FDI into DRC and its mining industry:

- Strengthening measures to combat mining fraud and smuggling;
- Strengthening control and transparency of the sector's revenues and combating corruption (The DRC government joined the EITI in 2007 and has made meaningful progress in transparency of its mining sector, but this could not accurately represent standards due to the latest EITI validation of 2017; EITI 2021; see section 5.1.1 Context, formal and informal players);
- Annual organisation of the DRC Mining Conference.

5) Promoting formalised production from ASM:

- Deployment of modern laboratory equipment in the former Katanga Province, Maniema, North Kivu and South Kivu ;
- Monitoring of the application of the OECD Due Diligence Guidelines in the Cobalt, Copper and 3T production chain;
- Continuing to set up Artisanal Mining Zones;
- Training for SAEMAPE staff;
- Training for executives of mining cooperatives in company management companies;
- Creation of trading centres near mining sites.

EU-DRC strategy and partnership: The EU supports the sustainable and inclusive development of the DRC, in line with the National Strategic Development Plan (PNSD) and the Global Gateway

strategy. The EU's action builds on the strategic position of the DRC in Central Africa to foster regional peace and stability, preserve biodiversity and sustainably manage natural resources. In February 2023, the EU adopted a renewed EU Great Lakes Strategy to support the transformation of the root causes of regional instability into shared opportunities.

Team Europe in the DRC brings together the EU, Belgium, France, Germany, the Netherlands, Sweden, and European financial organisations such as the European Investment Bank (EIB), the Agence Française de Développement (AFD), Proparco, the Nederlandse Financierings-Maatschappij voor Ontwikkelingslanden (FMO) and the German Kreditanstalt für Wiederaufbau (KfW) (EC 2023).

The EU allocated € 424 million grants to the partnership with the DRC for the period 2021-24. The DRC also benefits from regional and global EU programmes. For EU's engagement in the DRC related to energy and digital transition see section 6 Energy and digital transition: develop a strategy for the EU and Africa Partnership, which focusses on critical raw materials value chains, related transport, energy as well as digital infrastructure.

Due to the sluggish nature of the Congolese private sector, the EU provides economic aid at both macro and micro-economic level as part of development financing. This aid includes:

- The PROINVEST programme for the promotion of foreign direct investment;
- The Centre for the Development of Enterprise for the support of small and medium enterprises and the supply of skills and capacities to businesses across a wide range of sectors. It also focuses its activities on businesses launching new projects (e.g., BizClim programme, Microfinance framework programme, EIB Investment Facility.

The EU supported the DRC government developing the national trade strategy paper, which is focused on participating in global trade. This strategy is part of a comprehensive development plan to be implemented by 2035 envisaging opportunities offered by globalisation (value chains, integration into regional economy).

In addition, the EU and its member states and industry are funding the European Partnership for Responsible Minerals (EPRM), which is implementing short-lived pilot projects in the context of responsible raw material extraction, often under the lead of local civil society organization. This represents another example of the integrated nature of local and international interactions in the DRC's mining sector.

The EU already has some initiatives in the DRC related to the energy and digital transition, which focus on critical raw materials value chains, related transport, energy as well as digital infrastructure (EC 2023).

In November 2023, the EU and the DRC agreed on a Strategic Partnership on sustainable critical raw materials value chain to diversify raw materials supply chains, as well as to develop local

value addition and transforming trafficking of mineral resources into legitimate trade. EU action focuses on the integration of sustainable raw materials value chains, the mobilisation of funding for infrastructure, sustainable and responsible production, research and innovation as well as on capacity building.

Under the label "Global Gateway", the EU participates in the expansion of the Lobito Corridor, which aims to increase multimodal transport capacity between the Congolese Copperbelt and the Angolan port of Lobito. The investment will extend the railway tracks to Zambia, ultimately creating a 420 km rail link between Angola, the DRC and Zambia. For the DRC, this will facilitate trade and transport and contribute to the economic growth and integration of the region (see also sections 2.2.1 List of the main bottlenecks and the links between them and 3.3 Political context for in-country financings).

The EU is engaged in supporting renewable energy production, which aims to meet the growing needs of the mining sector and the population and to improve the regional electricity distribution between the DRC, Uganda and Zambia.

The EU is supporting the development of digital infrastructure, including the laying of a fibre optic cable in eastern DRC and the construction of GSM antennas in remote areas, as well as systematic support for digitalisation in a number of sectors, including health, education, public finance and cybersecurity.

Non-EU-DRC partnerships: Besides Europe, the United States supports the government of the DRC's decision to review mining contracts and greater accountability in the sector. The USA encourages the DRC to continue its collaboration and work on fiscal transparency, labour rights, and adherence to environmental, social, and governance standards for the mining sector. The USA is providing more than $ 30 million in assistance to help the DRC promote responsible and sustainable mining practices (US GOV 2022).

In 2008, the "mining for infrastructure" deal between the DRC and Chinese partners was negotiated, initially valued at US$ 9 billion and subsequently reduced to US$ 6 billion. Chinese stakeholders were to invest in infrastructure and energy projects in return for obtaining mining rights, such as the 'Sicomines' operation near Kolwezi. Subsequently, Chinese influence in the copper-cobalt sector grew strongly. According to an evaluation by the IMF (who contested the initial agreement), as part of the deal Chinese partners invested close to US$ 3 billion while in turn realizing gains of US$ 76 billion. The Congolese president Tshisekedi has questioned the deal and calls for its re-negotiation.

7. Opportunities for responsible investments

7.1. Identification of individual exploration, mining and refining projects

The following projects (Table 13) related to exploration, mining and refining of ECRM were identified and are proposed for presentation as fact sheets in WP7. This is a non-exhaustive list subject to change while the BGR is implementing AfricaMaVal project Task 7.2. The political appropriateness of these projects (e.g. exclusion of highly controversial projects or controversial stakeholders and owners) have been verified as of November 2023.

Each project was supposed to fulfil the following minimum requirements:

- Credible ECRM resource estimate available (for mining projects);
- Sufficient availability of project-specific information;
- The project operator is seeking investment or financing related to project development, project expansion, or optimising certain aspects of a project (e.g. to improve ESG performance) or, alternatively, the project could be of interest for European industry offtakers;
- Part of the project's current or anticipated future ECRM production is potentially available to the EU industry, which excludes projects where owners or offtake partners exclusively direct the large majority of project ECRM production to third countries outside of the EU.

Since it was challenging to find suitable projects meeting all these criteria, the definition was subsequently broadened to also include examples for projects that could be of interest to European offtake partners, without necessarily requiring financing for project development.

Project	Operator	Com-modity	Address	Location	Status	Reserves/ Resources
Bisie	Alphamin	Sn, Cu	Perrieri Office Suites, Office Block C, C2-302, Level 3, Suite 1, La Croisette, Grand Baie, Rivière du Rempart 30517, Mauritius	1.03361 S, 27.74500 E	Mining, Expansion	9.78 Mt @ 3.54 % Sn, 0.16 % Cu
Manono (tailings)	Tantalex	Li, Sn, Ta	1410-120 Adelaide Street West,	7.31977 S, 27.40828 E	Scoping & Prefeasibility	11.93 Mt @ 0.61 % Li_2O,

			Toronto, Ontario M5H 1T1, Canada			0.031 % Sn, 0.003 % Ta
Western Foreland	Ivanhoe	Cu	999 Canada Place Suite 606 Vancouver, British Columbia V6C 3E1 Canada	10.85420 S, 24.97147 E	Scoping & Prefeasibility	Maiden resource estimate expected in Q4/2023.
Mutoshi	Chemaf (Shalina)	Cu, Co	LOB 5, Office 107, Jebel Ali Free Zone, Dubai, United Arab Emirates	10.67444 S, 25.53556 E	Construction	0.3 Mt of contained Co
Special Economic Zone for battery value chains					Scoping & Prefeasibility	

Table 13: Projects to be proposed for fact sheets in WP7.

7.2. Artisanal and small-scale mining

In the AfricaMaVal project, the consulting company Levin Sources is responsible to develop investment recommendations targeting the ASM sector but work on this task is not yet complete. In the meantime, Vasters & Schütte (2023) developed country profiles showing the geological, mining and processing status for ECRM production in the ASM sector of the DRC and other African countries. These country profiles include a short section on investment opportunities, which is reproduced in the following. The full country profile is shown in Vasters & Schütte (2023).

The DRC's artisanal tin and tantalum (+/- tungsten) subsector may represent a straightforward investment target to increase the country's artisanal ECRM production. Several mine sites appear to have sufficient production potential to warrant undergoing semi-mechanisation. Note, however, that there are a number of geological and economic uncertainties and risks to consider for such investments. In the absence of actual exploration data, the size of the ore body, the grade distribution and the remaining mineral resources are poorly known, and resource depletion at any given site will occur eventually. In implementing mechanization programs, mining companies and investors might further create conflict and tensions with local cooperatives or informal artisanal mining groups. These stakeholders often resist mine mechanization efforts as this may result in job losses for unqualified workers. This has happened at the Bibatama mine site (SMB) in North Kivu, for instance, the country's largest coltan producer for many years. Another economic risk for investment in the artisanal 3T sector refers to the impact of the Primera JV, set up between the DRC and a company based in the United Arab Emirates in December 2022, and to its influence on artisanal mineral exports. While Primera

Gold's role in controlling the artisanal gold exports in the eastern DRC has become well known since then, the JV additionally includes provisions for Primera Metals DRC to develop a technical business plan regarding exporting and setting up a smelter for 3T minerals. As part of the JV agreement, the DRC government commits to authorizing an exclusive export tax rate of 3.5% for 3T minerals. For tin (cassiterite) and tungsten (wolframite), this rate is the same as the general export royalty rate in place for base metals. For tantalum (coltan), however, this exclusive rate awarded to Primera Metals DRC would be substantially lower than the current export royalty rate in place for other companies, set at 10% due to coltan being classified as a 'strategic substance' by the DRC government.

The lithium content of artisanal pegmatite mine sites (producing tin and tantalum) and associated tailings is of potential market interest at certain lithium price levels if operators were to introduce lepidolite and/or spodumene processing circuits that would allow separation and recovery of lithium concentrates for export. Currently, most lithium minerals contained in 3T pegmatite ore report to the tailings fraction. The efficiency of recovering lithium concentrates also depends on the degree of weathering of the lithium minerals, among others, and would hence require conducting metallurgical processing studies. Also, artisanal mine site operators rarely engage in systematic ore stockpiling and tailings storage, which may complicate lithium recovery through re-processing. In any case, it is possible that basic handpicking of high-grade lithium pegmatite ore would be economically viable for individual artisanal miners at the current (03/2023) lithium price level if local traders offered to buy such material. Similar considerations apply to REE concentrates obtained from re-processing of tin mine tailings, though monazite is more resistant to weathering (and, in fact, enriched in placers) than lithium minerals. There is a small potential to increase the value potential in artisanal gold supply chains in the Lubero area if gold concentrates were analysed for their PGM content.

At the time of writing (04/2023), despite its major commercial significance, the artisanal copper and cobalt sector represents perhaps the most challenging subsector to engage in terms of structured national ECRM production growth, due to the associated legal uncertainties and pending decisions by the DRC government. Unless the DRC mining authorities enforce a clear framework on enabling factors such as artisanal copper and cobalt trade and the associated roles of parastatal companies such as the Entreprise Générale de Cobalt, it is likely that the subsector's output will mainly be driven by external commodity price developments. In any case, it is important to underline the economic importance of the country's artisanal copper production, in addition to artisanal cobalt production.

Conclusions

This report shows that the DRC will honour its reputation as a mining powerhouse in the years to come. In 2022, total DRC ECRM exports were dominated by copper, followed by cobalt, tin and tantalum; tungsten is of minor importance. Outside of the ECRM space, the DRC is also a major exporter of gold. The DRC government's strategy for the mining sector also increasingly focuses on lithium (especially Manono, the world's largest undeveloped hard rock lithium project), while there might be potential for a couple of other ECRM as well (e.g., aluminium, chromium, nickel, phosphate, rare earths and vanadium).

Currently, industrial ECRM projects are in various development stages, from grassroots exploration, active mining, brownfield expansions of operating projects, to re-evaluations of tailings from historical production. In addition to a number of Chinese partners, other foreign investors are also active in the DRC's industrial mining sector. Prominent investors in this sector come from Switzerland (Glencore), Kazakhstan (ERG), Canada (Barrick, Ivanhoe) and the United Arab Emirates (Chemaf).

The government seeks to attract investment in value adding activities in the country in addition to exporting raw materials in the form of metals or intermediate products. At least since the modernisation of the Mining Code (2018), with a few notable exceptions, the DRC does not generally export significant tonnages of unprocessed raw materials without any form of value addition. Instead, the country mainly exports refined metal (copper cathodes) or intermediate chemical products such as raw cobalt hydroxide.

Besides environmental and social risks, the somewhat uncertain governance framework in the DRC may appear challenging to potential investors. In recent years, this has included, for example, the questioning of exploration licences of a prominent foreign investor by the Ministry of Mines, targeted mineral export restrictions for some large copper and cobalt producers and strong competition from various investors for attractive investment targets.

The government is aware of these challenges for investment and seeks to increase the country's attractiveness for foreign investors. The new mining sector strategy foresees a number of steps in this regard:

- improving the DRC's score in global governance ratings through improved environmental and social performance;
- promoting DRC investment opportunities in national and international fora, emphasising measures to increase transparency, improve control and reduce corruption;
- putting in place legal incentives for investment protection, such as fiscal stability and avoiding expropriation; and
- facilitating supply chain due diligence, mineral traceability, and a legal base for activities in the ASM sector.

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There is undoubtedly a great need for investment in the DRC. With respect to mineral resources, the DRC does currently produces cobalt, but it does not represent a viable downstream market for the battery value chain. There is also no strong recycling sector apart from the revaluation of tailings. A planned Special Economic Zone, designed in partnership between the DRC and Zambia, aims directly at the battery supply chains and may therefore development of upstream mining projects, for instance for lithium, nickel and graphite, or trade agreements with third countries to import these commodities. Crucially, developing the zone will require the production of refined battery cathode chemicals in the DRC, which is not yet the case. While this offers a major investment opportunity, it is also associated with market risks, given the anticipated changes in battery chemistry, towards other cathode types and, eventually, towards solid-state batteries. Considering possible future market changes, speed is key to provide a product while there is still significant demand for market growth.

The ASM sector also offers investment opportunities, although formalisation through the government service SAEMAPE is progressing sluggishly. In recent years, the ASM sector has accounted for 100% of total tantalum, up to a third of total tin and up to a quarter of total cobalt production. Pilot projects such as Mutoshi and Kasulo not only show how productivity can be increased through semi-mechanisation, but also how ESG risks can be minimised.

In addition to mineral resources, the DRC also has enormous hydropower potential. However, the power supply is also one of the country's key bottlenecks for mining, refining and other sectors. An expansion of capacities, e.g. through the Grand Inga project, is planned, but has repeatedly stalled in the past due to failed partnerships between the DRC government and external consortia. In addition to the energy bottlenecks, the road and rail sector also requires massive investment. As part of the "Global Gateway", the EU is currently involved in the expansion of the Lobito corridor, which is intended to increase exports from the DRC and Zambia via the port of Lobito in Angola.

This is also part of the planned Strategic Partnership between the EU and the DRC on sustainable critical raw materials value chain to diversify raw materials supply chains, as well as to develop local value addition and transforming trafficking of mineral resources into legitimate trade. Such strategic partnerships and the memberships in several African economic integration initiatives will remain of great importance in the future to achieve economic stability and optimise access to global markets.

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References

Africa Energy (2023). https://www.africa-energy.com/database/datatool.

Africa Intelligence (2022). Spotlight DRC - DP World puts pressure on Tshisekedi over Port of Banana. https://www.africaintelligence.com/central-africa/2022/06/03/dp-world-puts-pressure-on-tshisekedi-over-port-of-banana,109789544-eve.

Aljazeera (2020). At least 50 feared dead in DR Congo mine collapse. https://www.aljazeera.com/news/2020/9/12/at-least-50-feared-dead-in-dr-congo-mine-collapse.

Amnesty International (2023). DRC: Powering Change or Business as Usual? https://www.amnesty.org/en/documents/AFR62/7009/2023/en/.

ARISE IIP (2022). ARISE IIP signs a framework agreement with the Democratic Republic of Congo for the development of the Kin-Malebo industrial zone, near Kinshasa. https://www.ariseiip.com/pr-arise-iip-signs-agreement-with-democratic-republic-of-congo/.

AWIMA (2023). AfricaMaVal Deliverable 4.1 Report on mining regimes with respect to ESG objectives

Banque Central du Congo (2023). Rapport Annuel 2021

Bundesanstalt für Geowissenschaften und Rohstoffe (2019). Mapping of the Artisanal Copper-Cobalt Mining Sector in the Provinces of Haut Katanga and Lualaba in the Democratic Republic of the Congo. ISBN 978-3-943566-68-0. https://www.bgr.bund.de/EN/Themen/Min_rohstoffe/Downloads/studie_BGR_kupfer_kobalt_kongo_2019_en.pdf?__blob=publicationFile&v=3

Bundesanstalt für Geowissenschaften und Rohstoffe (2022). Factsheet: Economic Development and Responsible Supply Chains in the Mining Sector - Democratic Republic of Congo. https://www.bgr.bund.de/EN/Themen/Zusammenarbeit/TechnZusammenarb/Downloads/FS/3027_Factsheet_RDC_en.pdf?__blob=publicationFile&v=6.

Bundesanstalt für Geowissenschaften und Rohstoffe (2023). Report on the regulatory, policy and economic environment in DRC for mining local procurement.

Bird, P.J. (2016). Evolution of the Kibali Granite-Greenstone Belt, North East Democratic Republic of the Congo, and Controls on Gold Mineralisation at the Kibali Gold Deposit. PhD Thesis, Kingston University London.

Cahen, L., Delhal, J., Vail, J.R. and Ledent, D. (1984). The Geochronology and Evolution of Equatorial Africa. Clarendon, Oxford, pp. 147–156.

Cailteux, J., (1994). Lithostratigraphy of the Neoproterozoic Shaba-type (Zaire) Roan Supergroup and metallogenesis of associated stratiform mineralization. In: Kampunzu, A.B., Lubala, R.T. (Eds.), Neoproterozoic Belts of Zambia, Zaire and Namibia. Journal of African Earth Sciences 19:279-301.

Cailteux, J. and Kampunzu, A.B. (1995). The Katangan tectonic breccias in the Shaba province (Zaire) and their genetic significance. In: Wendorff, M., Tack, L. (Eds.), Late Proterozoic Belts in Central Africa. Musée Royal de l Afrique Centrale, Tervuren, Belgique. Annales des Sciences Géologiques, 101:63-76.

Cailteux, J.L.H., Kampunzu, A.B., Lerouge, C., Kaputo, A.K. and Milesi, J.P. (2005). Genesis of sediment-hosted stratiform copper-cobalt deposits, Central African Copperbelt. In: Robb, L., Cailteux, J., Sutton, S. (Eds.), Recent Advances in the Geology and Mineralization of the Central African Copperbelt. Journal of African Earth Sciences, 42:134-158.

Congo Code of Civil Procedure (1960). http://droitcongolais.info/files/250.03.60-Decret-du-7-mars-1960_Code-de-procedure-civile.pdf.

Decrée, S., Deloule, É., Ruffet, G., Dewaele, S., Mees, F., Marignac, C., Yans, J. and De Putter, T. (2010). Geodynamic and climate controls in the formation of Mio–Pliocene world-class oxidized cobalt and manganese ores in the Katanga province, DR Congo. Mineralium Deposita, 45:621-629.

De Putter, T., Liégeois, J.-P., Dewaele, S., Cailteux, J., Boyce, A. and Mees, F. (2018). Paleoproterozoic manganese and base metals deposits at Kisenge-Kamata (Katanga, D.R. Congo). Ore Geology Reviews, 96:181-200.

Deutsche Welle (2020). Zwischen Strommangel und Mega-Staudamm. https://www.dw.com/de/kongo-zwischen-strommangel-und-mega-staudamm/a-52825810.

De Wit, M.J. and Jelsma, H.A. (2015). A Review of the Kimberlites of the Democratic Republic of Congo In de Wit, M.J. et al. (Eds.), Geology and Resource Potential of the Congo Basin. Regional Geology Reviews, Springer-Verlag Berlin Heidelberg.

Dewaele, S., Henjes-Kunst, F., Melcher, F., Sitnikova, M., Burgess, R., Gerdes, A., Fernandez-Alonso, M., De Clerq, F., Muchez, P. and Lehmann, B. (2011). Late Neoproterozoic overprinting of the cassiterite and columbite-tantalite bearing pegmatites of the Gatumba area, Rwanda (Central Africa). Journal of African Earth Sciences, 61:10-26.

Dewaele, S., Hulsbosch, N., Cryns, Y., Boyce, A., Burgess, R. and Muchez, Ph, (2016). Geological setting and timing of the world-class Sn, Nb–Ta and Li mineralization of Manono-Kitotolo (Katanga, Democratic Republic of Congo). Ore Geology Reviews, 72-1:373-390.

Delegation of the European Union to the Democratic Republic of the Congo (2021). The European Union and the Democratic Republic of the Congo. https://www.eeas.europa.eu/democratic-republic-congo/european-union-and-democratic-republic-congo_en?s=94#6840.

European Commission (2023). Democratic Republic of Congo. https://international-partnerships.ec.europa.eu/countries/democratic-republic-congo_en.

Extractive Industries Transparency Initiative (2021). Democratic Republic of the Congo - Overview and role of EITI. https://eiti.org/countries/democratic-republic-congo.

Le Cabinet du Président de la République (2015). Loi de Finances pour l'Exercice 2015. Journal Officiel de la République Démocratique du Congo. http://droit-afrique.com/upload/doc/rdc/RDC-LF-2015.pdf.

Fitch Ratings (2022). https://www.fitchratings.com/region/democratic-republic-congo.

François, A. (1973). L'extrémité occidentale de l'Arc cuprifère shabien. Etude Géologique, Gécamines, Likasi (Shaba-Zaïre), p. 120.

François, A. (1974). Stratigraphie, tectonique et minéralisations dans l'Arc cuprifère du Shaba (Rép. du Zaïre). In: Bartholomé, P. (Ed.), Gisements stratiformes et provinces cuprifères. Centenaire de la Société Géologique de Belgique, Liège, 79-101.

François, A. (1995). Problèmes relatifs au Katanguien du Shaba. In: Wendorff, M., Tack, L. (Eds.), Late Proterozoic Belts in Central Africa. Musée Royal de l'Afrique Centrale, Tervuren, Belgique. Annales des Sciences Géologiques, 101:1-20.

Fraser Institute (2022). Annual Survey of Mining Companies 2021. https://www.fraserinstitute.org/sites/default/files/annual-survey-of-mining-companies-2021.pdf.

Global Forest Watch (2023). https://www.globalforestwatch.org/.

Hulsbosch, N., Hertogen, J., Dewaele, S., André, L. and Muchez, P. (2014): Alkali metal and rare earth element evolution of rock-forming minerals from the Gatumba area pegmatites (Rwanda): Quantitative assessment of crystalmelt fractionation in the regional zonation of pegmatite groups. Geochimica and Cosmochima Acta, 132:349-374.

International Comparative Legal Guide (2023). Mining Laws and Regulations - Congo D.R. https://iclg.com/practice-areas/mining-laws-and-regulations/congo-d-r.

Mo Ibrahim Foundation (2023). Ibrahim Index of African Governance 2022. https://mo.ibrahim.foundation/iiag.

International Journal on Hydropower & Dams. World Atlas 2016. https://www.hydropower-dams.com/world-atlas/.

International Monetary Fund IMF (2023). Country Report No. 23/244 Democratic Republic of the Congo.

International Peace Information Service (2023). Open Data. https://ipisresearch.be/fr/home/cartes-donnees/open-data/.

KPMG (2020). Democratic Republic of Congo Fiscal Guide 2019. https://assets.kpmg.com/content/dam/kpmg/za/pdf/pdf2020/drc-fiscal-guide-2019.pdf

Le Cabinet du Président de la République (2002). Loi N° 015/2002 du 16 Octobre 2002 portant Code du Travail. Journal Officiel de la République Démocratique du Congo. http://droit-afrique.com/upload/doc/rdc/RDC-Code-2002-du-travail.pdf.

Melcher, F., Graupner, T., Gäbler, H-E., Sitnikova, M., Henjes-Kunst, F., Oberthür, T., Gerdes, A. and Dewaele, S. (2015). Tantalum-(niobium-tin) mineralization in African pegmatites and rare metal granites: constraints from Ta-Nb oxide mineralogy, geochemistry and U-Pb geochronology. Ore Geology Reviews, 64:667-719.

Melcher, F., Graupner, T., Oberthür, T. and Schütte, P. (2017). Tantalum-(niobium-tin) mineralisation in pegmatites and rare-metal granites of Africa. South African Journal of Geology, 120-1:77-100.

Mining.com (2022). MMG to start arbitration against Congo's Gecamines. https://www.mining.com/web/mmg-to-start-arbitration-against-congos-gecamines/.

Le Cabinet du Président de la République (2002). Loi N° 007/2002 du 11 Juillet 2002 portant Code Minier. Journal Officiel de la République Démocratique du Congo. https://resourcegovernance.org/sites/default/files/Mining%20Code.pdf

Le Cabinet du Président de la République (2018). Loi N° 007/2002 du 11 Juillet 2002 portant Code Minier telle que modifiee et completee par la Loi N° 18/001 du 09 Mars 2018. Journal Officiel de la République Démocratique du Congo. https://congomines.org/system/attachments/assets/000/001/467/original/J.O._n%C2%B0_spe%C3%ACcial_du_28_mars_2018_CODE_MINIER.PDF.pdf?1523182711

Mining Weekly (2023). Dispute over Congo lithium heats up with dueling claims. https://www.miningweekly.com/article/dispute-over-congo-lithium-heats-up-with-dueling-claims-2023-10-26.

Ministère des Mines (2022). Plan Stratégique de Développement du Secteur Minier (2022-2026)

Ministère des Mines (2023). Statistiques Minieres Provisoires et Partielles Exercice 2022. Janvier 2023.

Mongabay (2022). What went wrong with conservation at Kahuzi-Biega National Park and how to transform it (commentary). https://news.mongabay.com/2022/01/what-went-wrong-with-conservation-at-kahuzi-biega-national-park-and-how-to-transform-it-commentary/.

Moody's (2023). https://www.moodys.com/.

Organisation for Economic Co-operation and Development (2018). OECD Due Diligence Guidance for Responsible Business Conduct. https://www.oecd.org/investment/due-diligence-guidance-for-responsible-business-conduct.htm.

Organisation for Economic Co-operation and Development (2023). Country Risk Classifications of the Participants to the Arrangement on Officially Supported Export Credits. Valid as of 13 October 2023. https://www.oecd.org/trade/topics/export-credits/documents/cre-crc-current-english.pdf.

Oosterbosch, R. (1962). Les minéralisations dans le système de Roan au Katanga. In: Lombard, J., Nicolini, P. (Eds.), Gisements stratiformes de cuivre en Afrique, 1ère partie, Copenhagen, 1960. Association des Services Géologiques Africains, Paris, pp. 71-136.

Philippe, M.K., Matanda, P.M., Kipata, M.L., Chabu, M. and Batumike, J. (2018). Ni-Cr mineralization in the regolith of serpentinite at Lutshatsha and Nkonko deposit (Congo Craton, Democratic Republic of Congo): Exploration and grade distribution. Conference Paper, CAG 27 Portugal.

Pohl, W., Biryabarema, M. and Lehmann, B. (2013). Early Neoproterozoic rare metal (Sn, Ta, W) and gold metallogeny of the Central Africa region: a review. Applied Earth Science (Transactions of the Institution of Mining and Metallurgy, Section B) 122:66-82.

PwC (2013). Africa Infrastructure Investment - Democratic Republic of Congo. https://www.pwc.com/gx/en/transportation-logistics/publications/africa-infrastructure-investment/assets/drc.pdf.

PwC (2023). Worldwide Tax Summaries - Congo, Democratic Republic of the. https://taxsummaries.pwc.com/democratic-republic-of-the-congo/corporate/withholding-taxes.

Le Cabinet du Président de la République (2003). Decret N° 038/2003 du 26 Mars 2003 portant. Reglement Minier. Journal Officiel de la République Démocratique du Congo. https://congomines.org/system/attachments/assets/000/001/761/original/J.O._n%C2%B0_sp%C3%A9cial_du_12_juin_2018_REGLEMENT_MINIER__Textes_coordonn%C3%A9s-min.pdf?1581684992.

Reuters (2020). Three dead in violence at SMB's coltan mine in Congo. https://www.reuters.com/article/us-congo-mining-smb-idUSKBN23V1P5.

S&P Global (2023a). Reserves and Resources of DRC exploration and mining sites.

S&P Global (2023b). Manono (AVZ Minerals Ltd.) Property Profile.

S&P Global (2023c). Credit Ratings. https://www.spglobal.com/ratings/en/products-benefits/products/credit-ratings.

Schütte, P. and Näher, U. (2020). Tantalum supply from artisanal and small-scale mining: A mineral economic evaluation of coltan production and trade dynamics in Africa's Great Lakes region. Resources Policy, 69:101896.

Shantz, J. (2008). Imperialism and the west's proxy war in the Democratic Republic of Congo. Journal of International and Peace Studies, 5(6):123-142.

Tack, L., Wingate, M., De Waele, B., Meert, J., Belousova, E.A., Griffin, B., Tahon, A. and Fernandez-Alonso, M. (2010). The 1375 Ma "Kibaran event" in Central Africa: Prominent emplacement of bimodal magmatism under extensional regime. Precambrian Research, 180:63–84.

The East African (2020). DRC goes on with Grand Inga dam project. https://www.theeastafrican.co.ke/news/africa/DRC-goes-on-with-Grand-Inga-plan/4552902-5579782-42va4h/index.html.

Transparency International (2023). https://www.transparency.org/en/.

United Nations (2022). 9142nd Meeting (AM). SC/15045 30 September 2022. Ahead of Elections, Peacekeeping Mission Drawdown in Democratic Republic of Congo, Security Situation Still Dire, Special Representative Tells Security Council. https://press.un.org/en/2022/sc15045.doc.htm.

United Nations (2023). Afreximbank and UNECA sign agreement to establish special economic zones for the production of Battery Electric Vehicle. https://www.un.org/africarenewal/magazine/april-2023/afreximbank-and-uneca-sign-agreement-establish-special-economic-zones-production

UN Comtrade (2023). https://comtradeplus.un.org/

United Nations Conference on Trade and Development (2022). World Investment Report 2022.

United Nations Conference on Trade and Development (2023). https://unctadstat.unctad.org/EN/.

OHADA Uniform Act on Arbitration 1999. https://www.droit-afrique.com/uploads/OHADA-Uniform-Act-1999-arbitration.pdf.

Université de Lubumbashi (2022). https://www.unilu.ac.cd/?p=11012.

U.S. Department of State (2022). The United States-Democratic Republic of the Congo Relationship. https://www.state.gov/the-united-states-democratic-republic-of-the-congo-relationship/.

U.S. Agency for International Development (2021). Democratic Republic of the Congo Water Resources Profile Overview. https://pdf.usaid.gov/pdf_docs/PA00XV8H.pdf.

U.S. Geological Survey (2018). 2017–2018 Minerals Yearbook – Congo (Kinshasa).

U.S. Geological Survey (2023). Mineral Commodity Summaries 2023. https://pubs.usgs.gov/periodicals/mcs2023/mcs2023.pdf.

Vasters, J. and Schütte, P. (2023). D1.4 – Country profiles of artisanal and small-scale ECRM mine production and processing developments. DOI: 10.25928/mar3-v778. https://africamaval.eu/wp-content/uploads/2023/09/AfricaMaVal-D1.4-Country-profiles-of-artisanal-and-small-scale-ecrm-mine-production-and-processing.pdf

The World Bank (2021). The World Bank in DRC. https://www.worldbank.org/en/country/drc/overview.

The World Bank (2022a). Report No: PAD2573. International Development Association project appraisal document on a proposed credit in the amount of US$427.98 million and a proposed grant in the amount of SDR 53.6 million (US$72.02 million equivalent) to the Democratic Republic of Congo for a transport and connectivity support project may 26, 2022. https://documents1.worldbank.org/curated/en/141991655916124024/pdf/Congo-Democratic-Republic-of-Transport-and-Connectivity-Support-Project.pdf.

The World Bank (2022b). Democratic Republic of the Congo Economic Update (7th Edition). Digital Inclusion for Equitable Growth. The New Telecom Law: A Key Catalyst.

The World Bank (2023a). https://archive.doingbusiness.org/en/rankings.

The World Bank (2023b). https://www.worldbank.org/en/country/drc/overview.

The World Bank (2023c). https://www.worldbank.org/en/home.

The White House (2023). Joint Statement from the United States and the European Union on Support for Angola, Zambia and the Democratic Republic of the Congo's commitment to Further Develop the Lobito Corridor and the U.S.-EU Launch of a Greenfield Rail Line Feasibility Study (09.09.2023). https://www.whitehouse.gov/briefing-room/statements-releases/2023/09/09/joint-statement-from-the-united-states-and-the-european-union-on-support-for-angola-zambia-and-the-democratic-republic-of-the-congos-commitment-to-further-develop-the-lobito-corridor-and-the/.

World Economic Forum (2023). https://www.weforum.org/.

APPENDICES

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Appendix

A1.2. Prospectivity and mineral high potential mapping

A1.2.1 Geological framework used for prospectivity mapping

The DRC geological structure is composed of the ''Cuvette Centrale'' (CC) or "Central Depression". The CC covers an area of over 2,000,000 km² where it is bounded to the south by the Lufilian Pan-African chain, the Kasai craton to the west, the West-Congolian Pan-African chain to the north-west, the Ntem craton to the north, the NE Congolese craton to the northeast and the Ubandian chain to the east. It is composed of Cambrian to Triassic successions comprising the Biano-Banalia-Inkisi Groups and then the Karoo Supergroup, surmounted by the Jurassic terrains of the Stanleyville series (i.e. the Kisangani Group) and the Cretaceous deposits of the Sankuru and Lukula Supergroups. The sedimentary pile ends with the Kalahari Supergroup. The Precambrian basement outcropping towards the edge of the CC is composed of distinct cratonic blocks of Archean and Paleoproterozoic age (Chaillu-Ntem, Angola-Kasaï, Tanzania-Bangweulu, Bomu-Uélé-Bomokandi). Mobile chains and crystalline terrains of Meso- and/or Neoproterozoic age, forming the «Congo craton», join these blocks, of roughly similar size. These blocks outcrop respectively to the W, S, E and NE of the CC (Fernandez-Alonso et al., 2015). Around the CC, the most important mobile chains include the Ruzizian (Paleoproterozoic) chain, Kibaran and Irumide belts (Mesoproterozoic), West-Congolian and Lufilian belt/Copperbelt (Neoproterozoic), as well as the slightly deformed terrains of the Neoproterozoic Mbuji-Mayi and Lindian Supergroups, which act as foreland platforms and/or aborted rifts on the Congo craton. The entire Proterozoic rim of the CC is well known for its metallogenic provinces (Fernandez-Alonso et al., 2015), in particular for the Lufilian arc and the Kibara belt. This Kibara belt includes all the Mesoproterozoic metasedimentary and metavolcanic rocks of the SW-NE-trending Kibaran chain developed north of the Lufilian arc and in the vast Lubudi plain as far west as the Archean rocks of the Kasai. On a regional scale, the Mesoproterozoic rocks involved in the Kibaran orogen, equivalent to the Grenvillian orogeny, cover an interval of 1400-900 Ma and are linked to the aggregation of the Rodinia supercontinent. It extends over more than 2,000 km, from the Katangan, Kolwezi-Mutshatsha region (Kibara belt), to the Tanganyika-Kivu and Victoria Great Lakes (Karagwe-Ankole belt) and continues into Tanzania, Rwanda and Uganda as well as the Irumides in south-eastern DRC and Zambia. The entire stratigraphic pile, comprising siliciclastic and volcanic terrains, is almost 10. km thick and is frequently cut by acidic and basic plutonic intrusions between 1415 and 1000 Ma old. At least three phases of deformation affect the Kibaran series: the term 'Kibaran events' is strictly reserved for granitic intrusions intersecting the basic terms, the age of which is computed on the basis of the age of the Kibaran events. Formed after the Kibaran event, the Lufilian arc domain is represented by the Neoproterozoic terrains of the Katanga Supergroup of the DRC Copperbelt, which form the Congolese part of the Central African

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Copperbelt (CAC), itself a segment of the Lufilian (i.e. pan-African) Neoproterozoic belt between the Congo craton to the west, the Kalahari craton to the south and the Bangweulu block to the east. These terrains form an arc (i.e. a Lufilian arc) whose convexity is oriented towards the north, extending over approximately 700 km in length and 50 km in width on either side of the border between the DRC and Zambia.

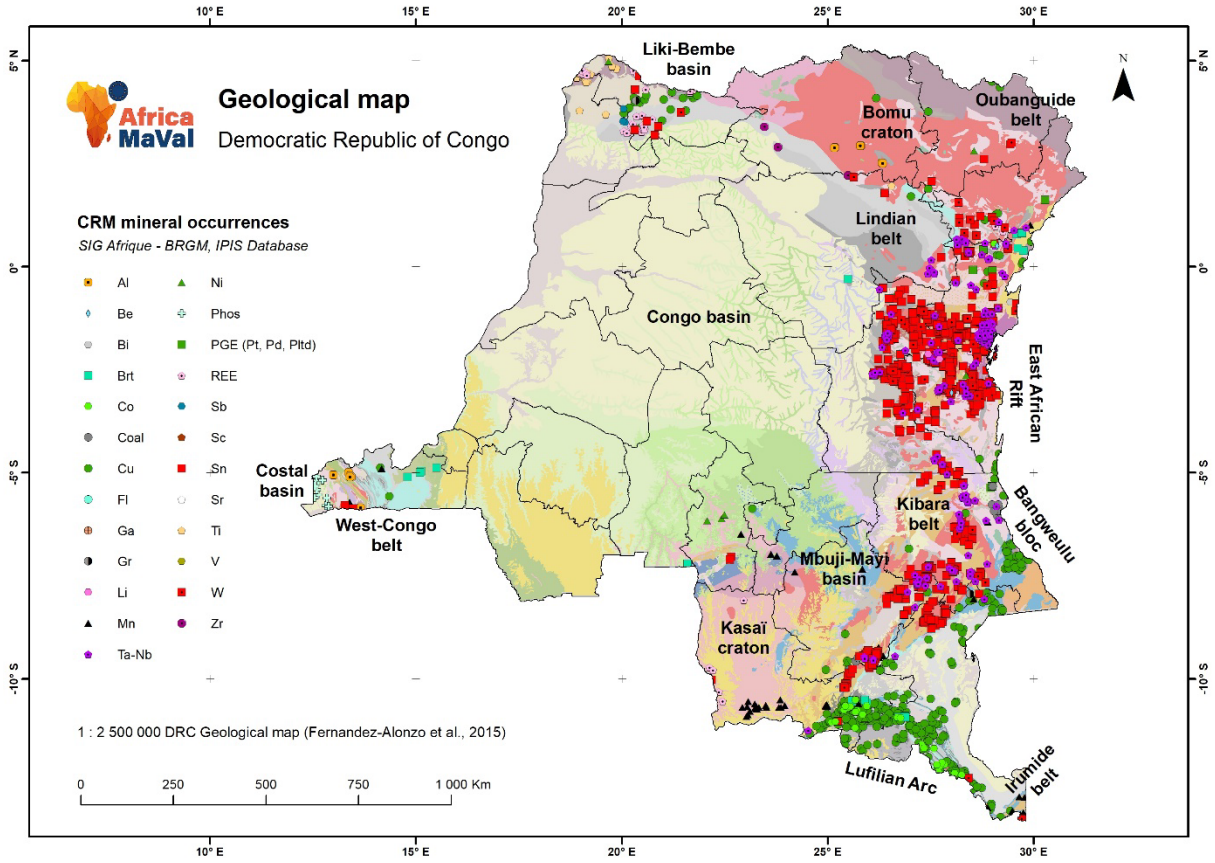

Figure 16. Geology map of the DRC showing important domains hosting the LSUs for the predictive maps as well as ECRM occurrences. Modified after Fernandez-Alonso et al. (2015).

Domain	Supergroup	Group	Sub_Group	Formation	code_caisson	code_Africamaval
Bangweulu Bloc	Complexe volcano-plutonique des Marungu	Gabbro			CPXma-gb--	PP3_CPXma_gb__
Bangweulu Bloc	Complexe volcano-plutonique des Marungu	Diorite de kwale			CPXma-kw--	PP3_CPXma_kw__
Bangweulu Bloc	Complexe volcano-plutonique des Marungu	roche verte d'âge indifférencié			CPXma-rv--	PP3_CPXma_rv__
Bangweulu Bloc	Complexe volcano-plutonique des Marungu	Rhyolites			CPXma-ry--	PP3_CPXma_ry__
Bangweulu Bloc	Complexe volcano-plutonique des Marungu				CPXma---	PP3_CPXma___
Bangweulu Bloc	Supergroupe des Muhila				MH---	NA_MH___
Bangweulu Bloc	Supersuite magmatique du bloc de Bangweulu	Complexe magmatique de la phase Ubendienne	Suite des granitoïdes des Dômes	Granite de Mokambo	BG-UB-DO-MO	PP3_BG_UB_DO_MO
Bangweulu Bloc	Supersuite magmatique du bloc de Bangweulu	Complexe magmatique de la phase Ubendienne	Suite des granitoïdes des Dômes	Granite de Luina	BG-UB-DO-LU	PP3_BG_UB_DO_LU
Bangweulu Bloc	Supersuite magmatique du bloc de Bangweulu	Complexe magmatique de la phase Ubendienne	Suite des granitoïdes des Dômes		BG-UB-DO-	PP3_BG_UB_DO__
Bangweulu Bloc	Supersuite magmatique du bloc de Bangweulu	Complexe magmatique de la phase Ubendienne			BG-UB--	PP3_BG_UB___
Bangweulu Bloc	Supersuite magmatique du bloc de Bangweulu				BG---	PP3_BG____
Bomu Craton	Complexe gneissique de la Garamba				CPXga---	NA_CPXga___
Bomu Craton	Complexe migmatitique de Dibaya	Amphibolite		Craton Bomu	CPXdi-amp--	NA_CPXdi_amp__
Bomu Craton	Complexe migmatitique de Dibaya				CPXdi---	NA_CPXdi___
Bomu Craton	Supergroupe de Niangara	Inférieur			NI-Inf--	NA_NI_Inf__
Bomu Craton	Supergroupe de Niangara	Supérieur			NI-Sup--	NA_NI_Sup__
Bomu Craton	Supergroupe de Niangara				NI---	NA_NI___
Bomu Craton	Supergroupe des ceintures de roches vertes archéennes	Groupe des ceintures vertes de Kilo			AGB-CVK--	A_AGB_CVK__
Bomu Craton	Supergroupe des ceintures de roches vertes archéennes	Groupe de la Gangu			AGB-GN--	MA_AGB_GN__
Bomu Craton	Supergroupe des ceintures de roches vertes archéennes	Groupe de Kibali			AGB-Ki--	NA_AGB_Ki__
Bomu Craton	Supergroupe des ceintures de roches vertes archéennes	Complexe gneisso-amphibolitiques de la Bomu			AGB-CPXbo--	PA_AGB_CPXbo__
Bomu Craton	Supergroupe des ceintures de roches vertes archéennes				AGB---	A_AGB____
Bomu Craton	Supersuite magmatique de l'Uélé				MUE---	PP2_MUE___
Costal basin	Supergroupe des séries du Bassin Côtier	Groupe de Quelo			CO-Que--	m_p_CO_Que__
Costal basin	Supergroupe des séries du Bassin Côtier				CO---	m_p_CO____
Cuvette du Congo	Supergroupe de Kisangani				KS---	Js_KS___
Cuvette du Congo	Supergroupe de la Sankuru	Loia / Bokungu			SN-LB--	C_SN_LB__
Cuvette du Congo	Supergroupe de la Sankuru	Groupe de Bokungu			SN-Bok--	Ci_SN_Bok__
Cuvette du Congo	Supergroupe de la Sankuru	Groupe de la Loia			SN-Loi--	Ci_SN_Loi__
Cuvette du Congo	Supergroupe de la Sankuru	Groupe du Kwango			SN-Kwa--	Cs_SN_Kwa__
Cuvette du Congo	Supergroupe de la Sankuru				SN---	C_SN____
Cuvette du Congo	Supergroupe des alluvions, eluvions et colluvions (sub)modernes	Groupe de la cuvette centrale du Congo			AC-CC--	Qp_AC_CC__
East African Rift	Supergroupe du Rift	Groupe des séries volcaniques du Rift	Sous-groupe de Virunga et Bukavu	trachytes	RF-SV-VB-t	m_RF-SV-VB-t
East African Rift	Supergroupe du Rift	Groupe des séries volcaniques du Rift	Sous-groupe de Virunga et Bukavu	lave basique	RF-SV-VB-b	m_RF_SV_VB_b
East African Rift	Supergroupe du Rift	Groupe des séries volcaniques du Rift	Sous-groupe de Virunga et Bukavu		RF-SV-VB-	m_RF-SV-VB
East African Rift	Supergroupe du Rift	Série du fossé tectonique africain			RF-FA--	m_Qh_RF_FA__
East African Rift	Supergroupe du Rift	Groupe des séries volcaniques du Rift			RF-SV--	m_RF-SV
East African Rift	Supergroupe du Rift				NRF---	m_NRF
Irumide belt	Supergroupe de la Muva				MV---	MP3_MV___
Kasaï Craton	Complexe gabbronoritique de la Lueta				CPXlu---	PP1_CPXlu___
Kasaï Craton	Complexe granito-gneissique de Sandoa				CPXsa---	MA_CPXsa___
Kasaï Craton	Complexe granulitique de Musefu				CPXmu---	MA_CPXmu___
Kasaï Craton	Complexe tonalitique de la Haute Luanyi				CPXhl---	PA_CPXhl___
Kasaï Craton	Supergroupe de la Lusanza	Groupe volcano-sédimentaire de Lulua	Syéno-diorites		LS-Lul-sd-	PP2_LS_Lul_sd_
Kasaï Craton	Supergroupe de la Lusanza	Groupe métasédimentaire de Luiza / Lukoshien			LS-Lui--	PP2_LS_Lui__
Kasaï Craton	Supergroupe de la Lusanza	Groupe volcano-sédimentaire de Lulua			LS-Lul--	PP2_LS_Lul__
Kasaï Craton	Supergroupe de la Lusanza				LS---	PP2_LS___
Kasaï Craton	Supersuite magmatique du Kasaï				MKA---	PP_MKA___
Kibara belt	Complexe anté kibarien du Shaba central				CPXakb---	NA_PP_CPXakb___
Kibara belt	Complexe indifférencié Ruizi Kivu				CPXruki---	PP_MP_CPXruki___
Kibara belt	Supergroupe de l' Rombwe				IT---	NP1_IT___
Kibara belt	Supergroupe des Kibara				KB---	MP_KB___
kibarian belt	Supersuite magmatique du Kibarien	Suite des granites du Kibarien			MKB-GK--	MP_MKB_GK__
kibarian belt	Supersuite magmatique du Kibarien				MKB---	MP_MKB____
Likibemban basin	Supergroupe de Liki-Bembe				LB---	MP_LB___
Lindian Belt	Supergroupe de la Lindi	Groupe de la Lokoma	Akwokwo	Panga	LI-Lok-Ak-Pa	NP2_LI_Lok_Ak_Pa
Lindian Belt	Supergroupe de la Lindi	Groupe de la Lokoma	Akwokwo		LI-Lok-Ak-	NP2_LI_Lok_Ak__
Lindian Belt	Supergroupe de la Lindi	Groupe de l'Ituri			LI-Itu--	NP1_LI_Itu__
Lindian Belt	Supergroupe de la Lindi	Groupe de la Lokoma			LI-Lok--	NP2_LI_Lok__
Lindian Belt	Supergroupe de la Lindi	Groupe de l'Aruwimi			LI-Arw--	NP3_LI_Arw__
Lindian Belt	Supergroupe de la Lindi				LI---	NP_LI___
Lufilian Arc	Supergroupe du Katanga	Groupe du Nguba	Muombe	Mwale	KT-Ngu-Ng1-Mw	NP2_KT_Ngu_Ng1_Mw
Lufilian Arc	Supergroupe du Katanga	Groupe du Kundelungu	Ngule		KT-Kun-Ku2-	NP3_KT_Kun_Ku2_
Lufilian Arc	Supergroupe du Katanga	Groupe du Kundelungu	Gombela		KT-Kun-Ku1-	NP3_KT_Kun_Ku1_
Lufilian Arc	Supergroupe du Katanga	Groupe du Nguba	Muombe		KT-Ngu-Ng1-	NP2_KT_Ngu_Ng1__
Lufilian Arc	Supergroupe du Katanga	Gabbros			KT-Gab--	NP_KT_Gab__
Lufilian Arc	Supergroupe du Katanga	syéno-diorites			KT-KTsd--	NP1_KT_KTsd__
Lufilian Arc	Supergroupe du Katanga	Groupe du Roan			KT-Roa--	NP1_KT_Roa__
Lufilian Arc	Supergroupe du Katanga	Groupe du Nguba			KT-Ngu--	NP2_KT_Ngu__
Lufilian Arc	Supergroupe du Katanga	Groupe du Kundelungu			KT-Kun--	NP3_KT_Kun__
Lufilian Arc	Supergroupe du Katanga				KT---	NP_KT____
Mbuji-Mayi Belt	Supergroupe de la Mbuji-Mayi	Mbuji-Mayi sous Sankuru			BM-MBSoSa--	NP1_BM-MBSoSa
Mbuji-Mayi Belt	Supergroupe de la Mbuji-Mayi				BM---	NP1_BM___
Mezosoic Deposit	Supergroupe des alluvions, eluvions et colluvions (sub)modernes	Groupe des formations superficiels du rift			AC-rf--	m_Qh_AC_rf__
Mezosoic Deposit	Supergroupe des alluvions, eluvions et colluvions (sub)modernes	alluvions et sédiments (sub)modernes			AC-hol--	QHo_AC_hol__
Mezosoic Deposit	Supergroupe des alluvions, eluvions et colluvions (sub)modernes	Alluvions et colluvions anciens			AC-AlCol--	Qp_AC_AlCol__
Mezosoic Deposit	Supergroupe des alluvions, eluvions et colluvions (sub)modernes				AC---	Qp_AC____
Mezosoic Deposit	Supergroupe du Kalahari				KL---	e_g_KL___
Oubanguide belt	Complexe migmatitique de l'Ubangi				CPXub---	PP2_CPXub___
Paleozoic bassin	Supergroupe de Lukula	groupe de la Luki			LU-Luk--	Ci_LU_Luk__
Paleozoic bassin	Supergroupe de Lukula	Groupe de Mavuma			LU-Mav--	Ci_LU_Mav__
Paleozoic bassin	Supergroupe de Lukula	Groupe de Bulu-Zambi			LU-Bul--	Cs_LU_Bul__
Paleozoic bassin	Supergroupe de Lukula				LU---	/
Paleozoic bassin	Supergroupe du Karoo	Groupe de la Lukuga			KA-Luk--	h5_KA_Luk__
Paleozoic bassin	Supergroupe du Karoo	Lukuga et Lueki indifférencié			KA-Luk/Lue--	h5_Tr_KA_Luk/Lue__
Paleozoic bassin	Supergroupe du Karoo	Groupe de la Lueki			KA-Lue--	Tr_KA_Lue__
Paleozoic bassin	Supergroupe du Karoo				KA---	h5_Tr_KA____
Rwenzori/Kibara belt	Complexe indifférencié anté Burudien	anté-Ruzizi /Ruzizi			CPXab-aRU--	NA_PP_CPXab_aRU__
Rwenzori/Kibara belt	Complexe indifférencié anté Burudien				CPXab---	NA_PP_CPXab_aRU__
Rwenzori/Kibara belt	Supergroupe de la Ruzizi				RU---	PP2_RU___
Rwenzori/Kibara belt	Supergroupe des roches vertes du Proterozoïque	Roches vertes du Kivu			PRV-Krv--	MP_PRV_Krv__
Rwenzori/Kibara belt	Supergroupe des roches vertes du Proterozoïque				PRV---	MP_PRV___
Rwenzori/Kibara belt	Supergroupe du Kivu	Groupe de la Luhule-Bilati			KV-LB--	MP_KV-LB___
Rwenzori/Kibara belt	Supergroupe du Kivu	syénites néphéliniques du kivu			KV-sn--	MP2_KV_sn__
Rwenzori/Kibara belt	Supergroupe du Kivu				MKV---	MP_KV___
West Congo Biet	Complexe migmatitique de Kimeza				CPXkm---	PP2_CPXkm___
West Congo Biet	Supergroupe de l'Ouest-Congo	Groupe des Cataractes	Haut Shiloango	Diamictite inférieur	OC-Cat-HS-Dinf	NP_OC_Cat_HS_Dinf
West Congo Biet	Supergroupe de l'Ouest-Congo	Groupe de Matadi	Sous-groupe de Gangila		OC-Mat-Ga-	NP1_OC_Mat_Ga_
West Congo Biet	Supergroupe de l'Ouest-Congo	Groupe des Cataractes	schisto-calcaire		OC-Cat-SC-	NP_OC_Cat_SC_
West Congo Biet	Supergroupe de l'Ouest-Congo	Groupe des Cataractes	Sansikwa		OC-Cat-San-	NP_OC_Cat_San_
West Congo Biet	Supergroupe de l'Ouest-Congo	Groupe des Cataractes	Mpioka		OC-Cat-Mpi-	NP_OC_Cat_Mpi_
West Congo Biet	Supergroupe de l'Ouest-Congo	Groupe des Cataractes	Haut Shiloango		OC-Cat-HS-	NP_OC_Cat_HS_
West Congo Biet	Supergroupe de l'Ouest-Congo	Groupe de l'Inkisi			OC-Ink--	Camb_OC_Ink__
West Congo Biet	Supergroupe de l'Ouest-Congo	Groupe des Cataractes			OC-Cat--	OC-Cat
West Congo Biet	Supergroupe de l'Ouest-Congo	Groupe de Matadi			OC-Mat--	NP1_OC_Mat__
West Congo Biet	Supergroupe de l'Ouest-Congo	Groupe de Seke-Banza/Tshela			OC-SBT--	NP1_OC_SBT__
West Congo Biet	Supergroupe de l'Ouest-Congo	Groupe de Tshéa / Seke-Banza			OC-Tsh--	NP1_OC_Tsh__
West Congo Biet	Supergroupe de l'Ouest-Congo				OC---	NP1_OC_Ts___
West Congo Biet	Supersuite magmatique de l'Ouest Congo	Granite Ouest Congo			MOC-GOC--	NP1_MOC_GOC__
West Congo Biet	Supersuite magmatique de l'Ouest Congo	syéno-diorites			MOC-SDOC--	NP1_MOC_SDOC__
West Congo Biet	Supersuite magmatique de l'Ouest Congo				MOC---	NP1_MOC____
	dolérites associés aux terrains précambriens				d---	PrCb_d___

Table 14. Summary table showing the location of the various lithostratigraphic units in the major geological domains of the DRC. The LSU codes used to produce the predictive maps are indicated in the code field.

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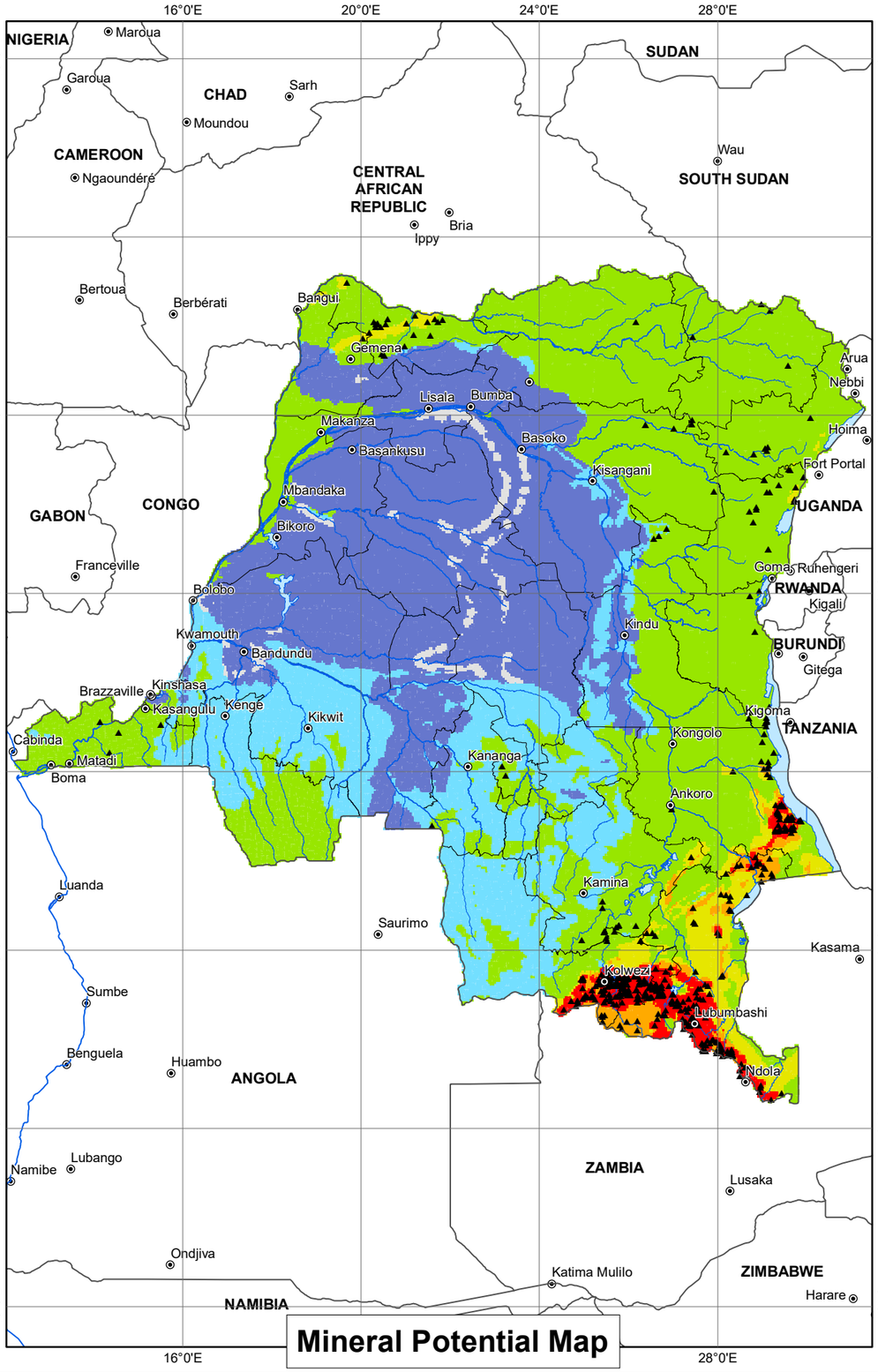
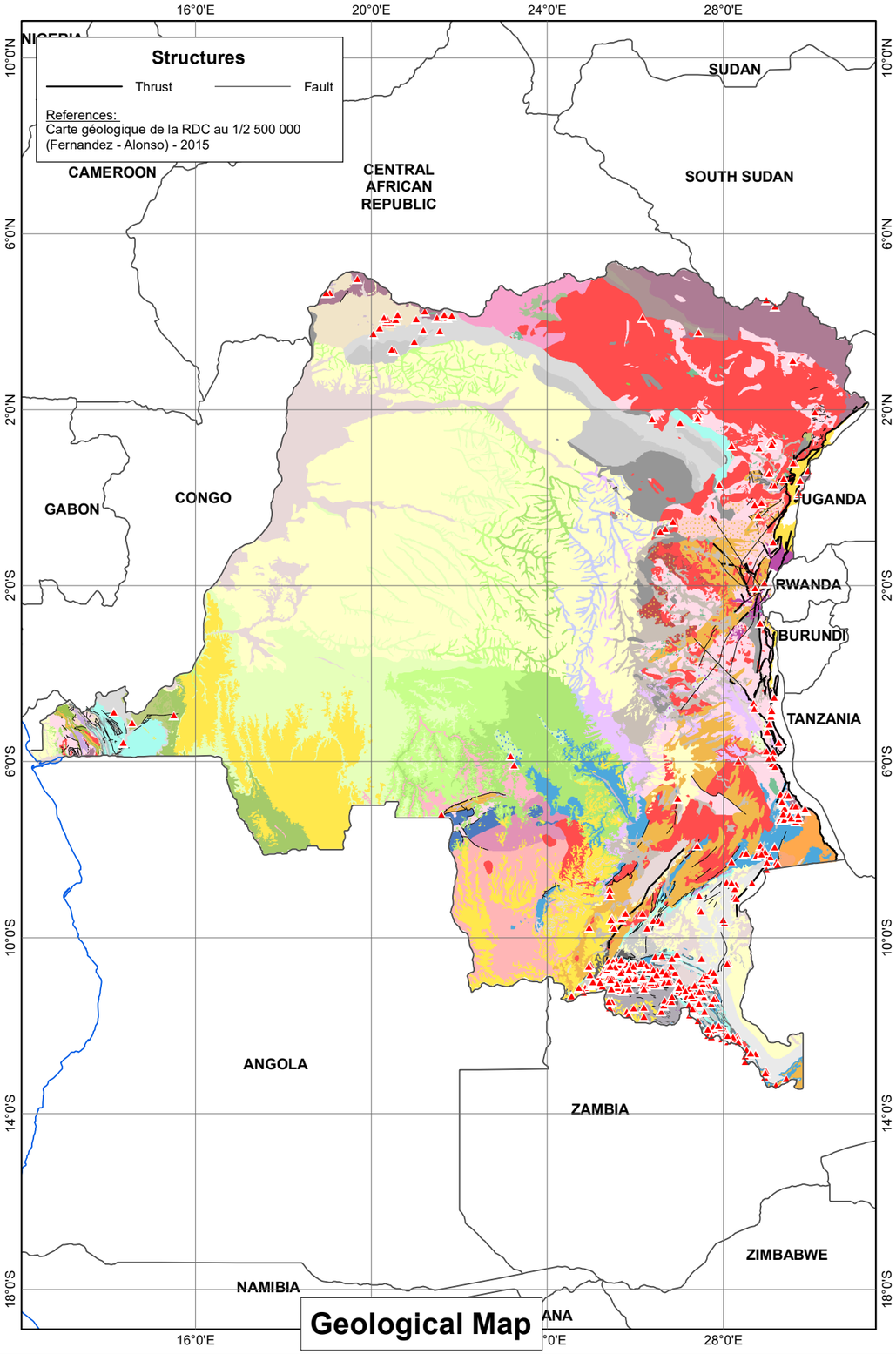
Country: DEMOCRATIC REPUBLIC of CONGO

MINERAL POTENTIAL MAP - *COPPER-COBALT (Cu-Co)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

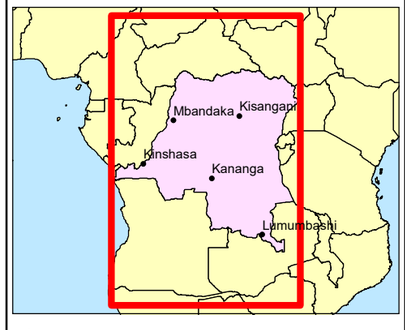
Known occurrences

Copper-Cobalt (Cu-Co)
SIG Afrique - © BRGM 2023
IPIS and S&P Global database

Confusion matrix

True negative Cells: 88538 94.31% Non-occurrence in database Non-occurrence predicted	False positive Cells: 4308 4.59% Non-occurrence in database Occurrence predicted
False negative Cells: 270 0.29% Occurrence in database Non-occurrence predicted	True positive Cells: 760 0.81% Occurrence in database Occurrence predicted

Threshold: 0.50
Cell size: 5000 m



N

0 125 250 500 Km

Datum : WGS84 (World Geodetic System 1984)

January 2024

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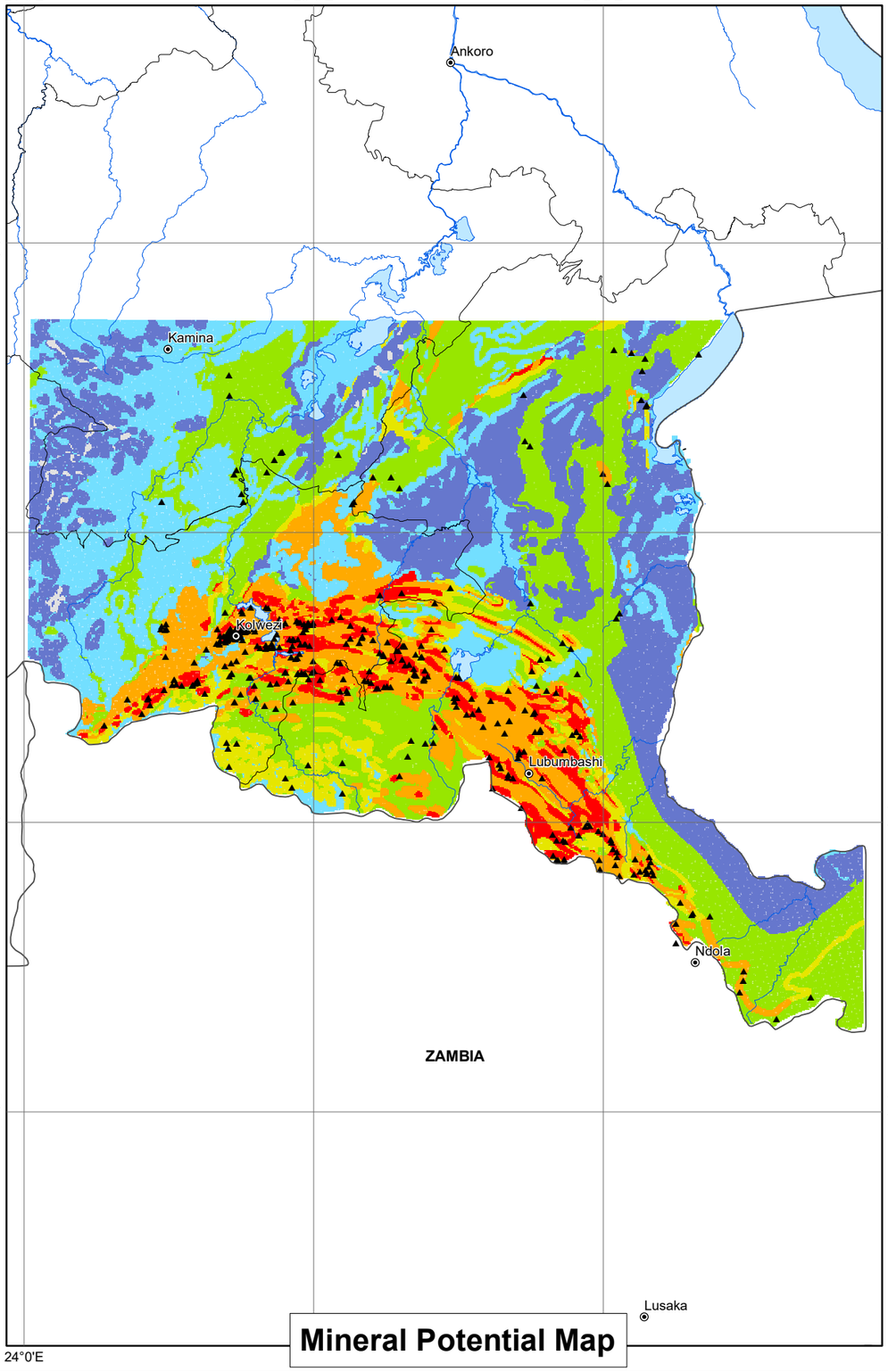
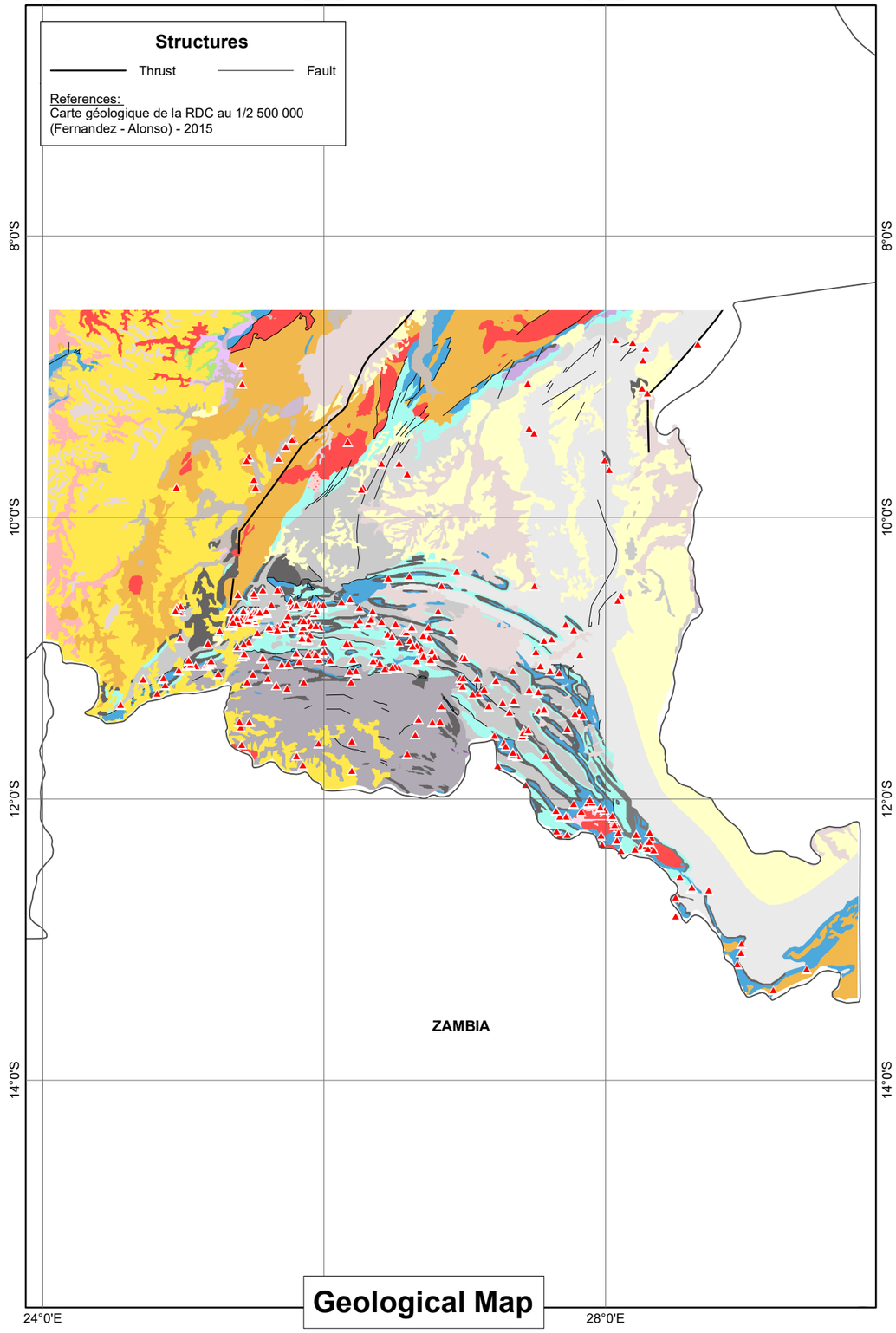
Country: DEMOCRATIC REPUBLIC of CONGO (Katanga)

MINERAL POTENTIAL MAP - *COPPER-COBALT (Cu-Co)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

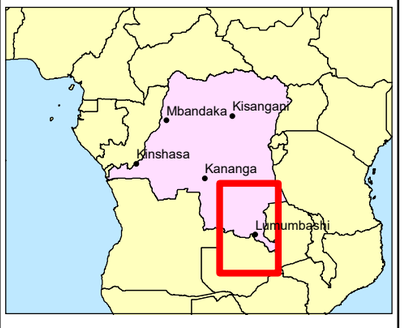
Known occurrences

Copper-Cobalt (Cu-Co)
SIG Afrique - © BRGM 2023
IPIS and S&P Global database

Confusion matrix

True negative Cells: 152479 79.37% Non-occurrence in database Non-occurrence predicted	False positive Cells: 36077 18.78% Non-occurrence in database Occurrence predicted
False negative Cells: 757 0.39% Occurrence in database Non-occurrence predicted	True positive Cells: 2814 1.46% Occurrence in database Occurrence predicted

Threshold: 0.50
Cell size: 1000 m



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Datum : WGS84 (World Geodetic System 1984)

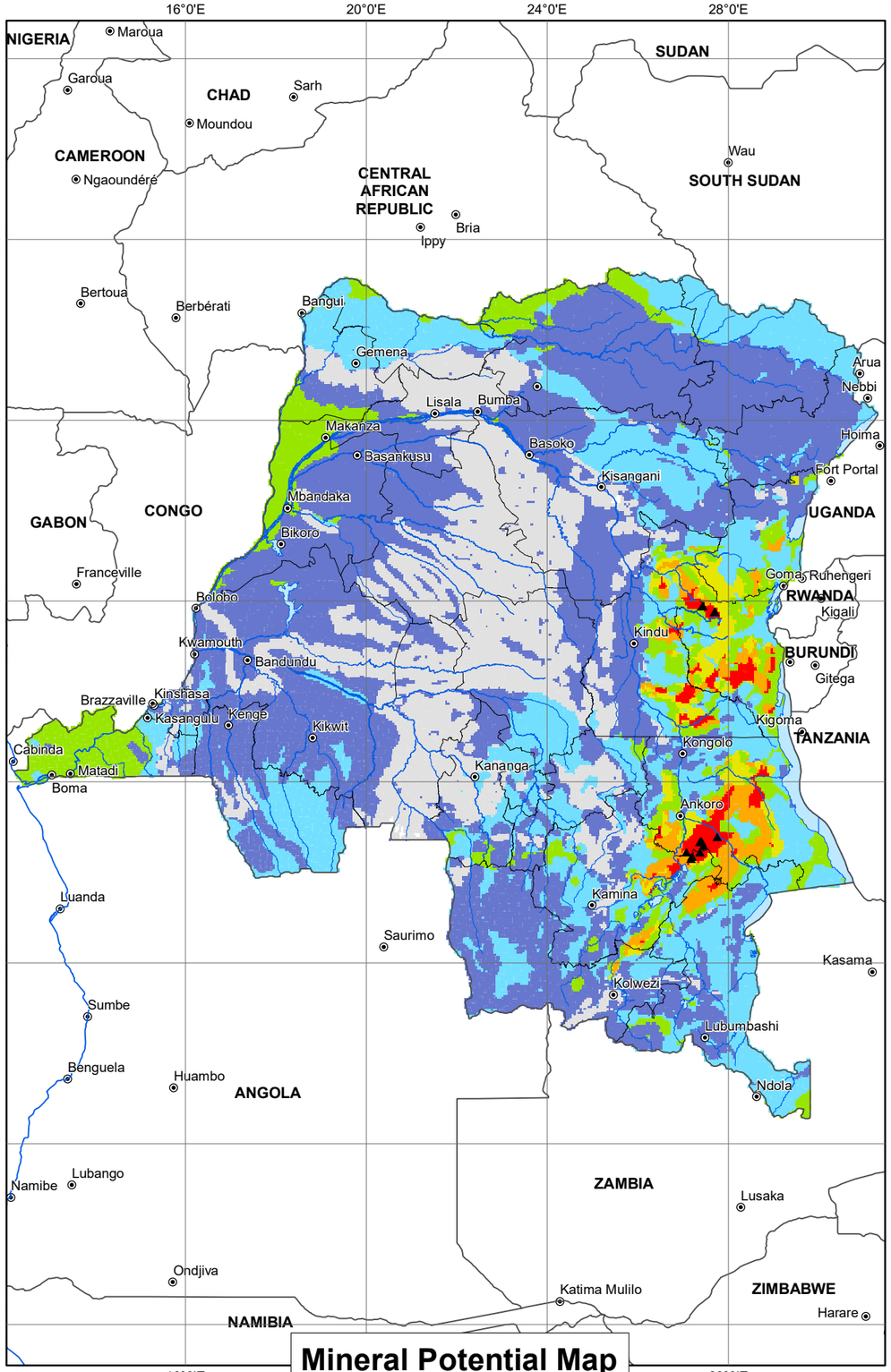
January 2024

brgm Géosciences pour une Terre durable

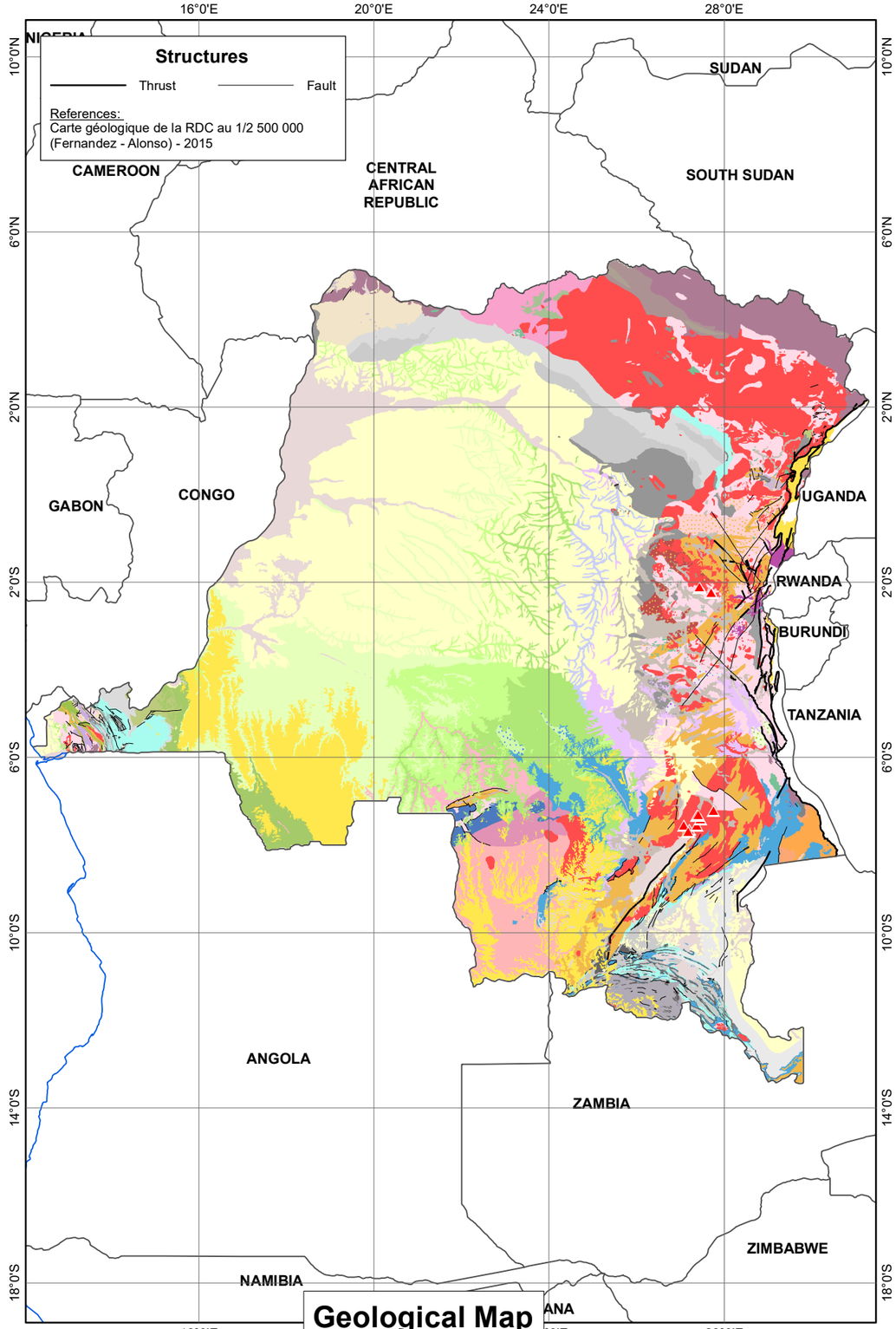
Country: DEMOCRATIC REPUBLIC of CONGO

MINERAL POTENTIAL MAP - *LITHIUM (Li)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

	< 0.05
	0.05 - 0.125
	0.125 - 0.25
	0.25 - 0.45
	0.45 - 0.60
	0.60 - 0.80
	0.80 - 1

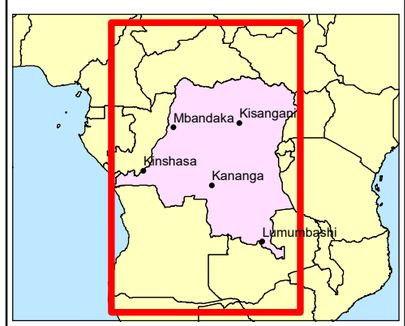
Known occurrences

Lithium (Li)
SIG Afrique - © BRGM 2023
IPIS and S&P Global database

Confusion matrix

True negative Cells: 91900 97.89% Non-occurrence in database Non-occurrence predicted	False positive Cells: 1951 2.08% Non-occurrence in database Occurrence predicted
False negative Cells: 0 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 25 0.03% Occurrence in database Occurrence predicted

Threshold: 0.70
Cell size: 5000 m



0 125 250 500 Km

Datum : WGS84 (World Geodetic System 1984)

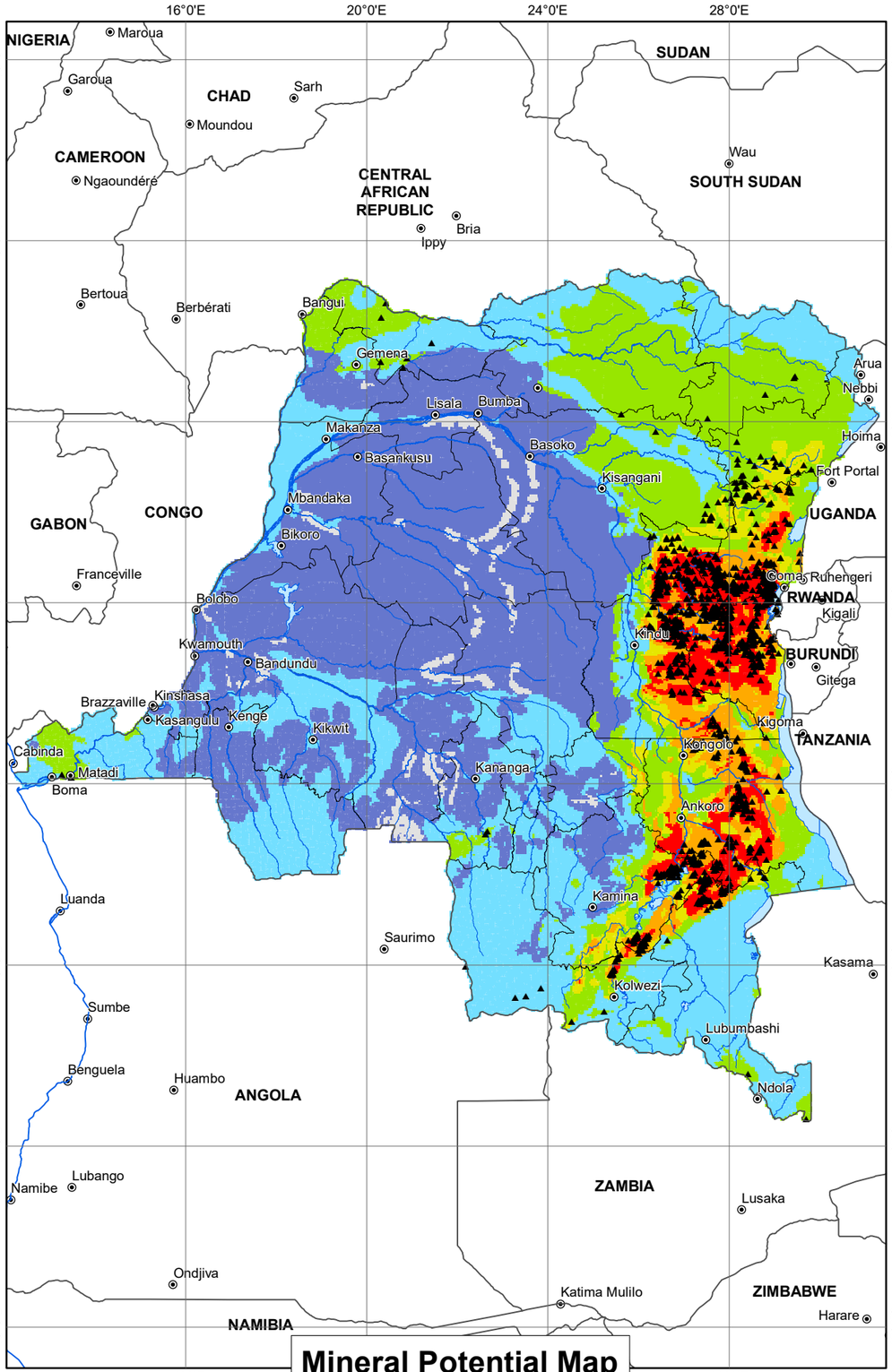
January 2024

brgm Géosciences pour une Terre durable

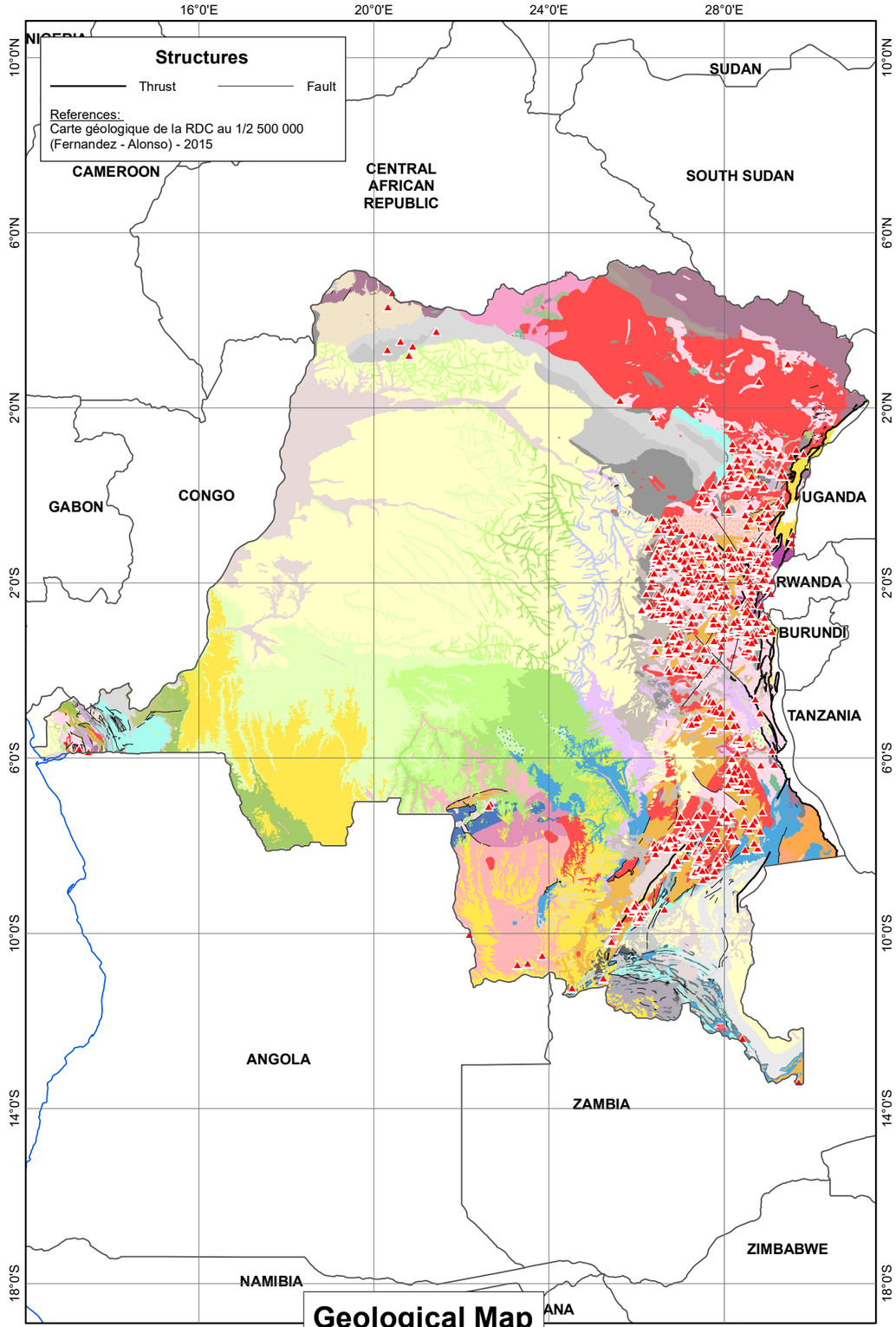
Country: DEMOCRATIC REPUBLIC of CONGO

MINERAL POTENTIAL MAP - *TANTALUM-NIOBIUM-TIN-TUNGSTEN (Ta-Nb-Sn-W)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

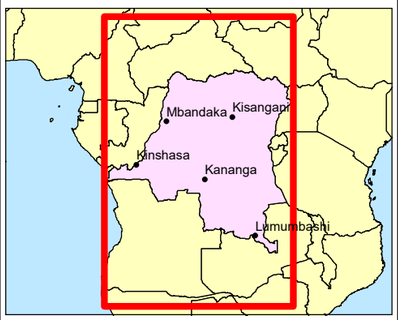
Known occurrences

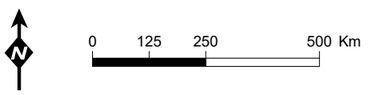
Tantalum-Niobium-Tin-Tungsten (Ta-Nb-Sn-W)
SIG Afrique - © BRGM 2023
IPIS and S&P Global database

Confusion matrix

True negative Cells: 81744 87.08% Non-occurrence in database Non-occurrence predicted	False positive Cells: 9839 10.48% Non-occurrence in database Occurrence predicted
False negative Cells: 196 0.21% Occurrence in database Non-occurrence predicted	True positive Cells: 2097 2.23% Occurrence in database Occurrence predicted

Threshold: 0.47
Cell size: 5000 m





Datum : WGS84 (World Geodetic System 1984)

January 2024

brgm Géosciences pour une Terre durable

Horizon Europe Framework Programme (HORIZON)

D9.3 – GABON case study

WP9 - Task 9.4

Date [30/11/2023]

L. BAILLY, M. HARLAUX, D. THIEBLEMONT, C. ZAMMIT[1]

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Table of Contents

1. Extended Critical Raw Materials (ECRM) supply potential of Gabon 9
1.1. Inventory of the ECRM 9
1.1.1 Geological setting 9
1.1.2 Known Ore deposits and occurrences 9
1.2. Prospectivity and mineral high potential mapping 15
1.2.1 Selection of the ECRM for mineral prospectivity 15
1.2.2 Mineral high potential areas 15
1.3. Ore processing and refining capacities 17
2. Assessment of the ECRM value chain 20
2.1. Characterisation of the value chain for primary and secondary raw materials 20
2.1.1 List of the mining and recycling projects (sorted by degree of maturity) 20
2.1.2 Existing ESG indicators 22
2.1.3 Status of economic links between the formal and informal sectors 23
2.2. Identification of the bottlenecks along the value chain 23
3. Investment/financing prospects for ECRM projects in Gabon 25
3.1. Fiscal, legislative and regulatory context for in-country financings 25
3.2. Macroeconomic context for in-country financings 40
3.3. Political context for in-country financings 49
4. Assessment of social, environmental, and governance challenges 56
4.1. Country-level assessment and context 56
4.1.1. Mineral/mining policies, industry policies 56
4.1.2. Mining regulations 59
4.1.3. Taxation and royalties 61
4.1.4. Land-use and mineral rights 63
4.1.5. Environment 64
4.1.6. Societal and community aspects, cultural heritage 65

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4.1.7. Public health and safety 65
4.2. Mining practices *vs.* Environmental, Social and Governance (ESG) goals 66
Environment 66
Social 66
Governance 66
Best practices for a responsible mining in Gabon 67
5. Business network between the European Union and Gabon 69
5.1. Assessment of the upstream and downstream business ecosystem 69
5.1.1 Context, formal and informal players 69
5.1.2 Relationships at local or regional levels 71
5.2. Building new B2B relations 71
5.3. Promoting local content and enabling mining cluster actors 73
6. Energy and digital transition: develop a strategy for the EU and Africa Partnership 75
7. Opportunities for responsible investments 77
7.1. Identification of individual exploration, mining and refining projects 77
7.2. Regulatory and ASM sector country profiles 83
7.2.1 Country profiles on regulations and good governance 83
7.2.2 Country profiles on ASM sector developments and investment 83

List of Figures

Figure 1: Simplified geological map of Gabon (from Chevallier et al., 2002) 10
Figure 2: Main occurrences of ECRM in Gabon 14
Figure 3: Map of mining operations in Gabon (situation in March 2023). 21
Figure 4: Gabon - Distribution of GDP across economic sectors from 2011 to 2021 [%] 40
Figure 5: Gabon - Historical GDP per capita from 2011 to 2021 & projected estimations from 2022 to 2030 41
Figure 6: Gabon – Historical and projected nominal GDP and real GDP growth 42
Figure 7: Gabon – Historical and projected real GDP growth [%] 42
Figure 8: Gabon - FDI net, net inflows, net outflows from 2013 to 2020 (Source: World Data Bank) 43

Figure 9: Gabon - Historical official exchange rate (CFA per US$, period average) 45
Figure 10: Gabon - Historical and projected data on inflation indicators 45
Figure 11: Gabon - Historical and projected data public debt and debt/GDP 47
Figure 12: Trade structure by destination/origin (% of total, 2021) (Allianz, 2022) 48
Figure 13: Trade structure by product (% of total, 2021) (Allianz, 2022) 48
Figure 14: Booklet Mining « Unveiling mining opportunities in Gabon » 76
Figure 15: Map of investment opportunities in the mining sector 79
Figure 16: Map of proposed overflight zones for the mapping project carried out by the SEM .. 80
Figure 17: Structuring rail and road infrastructure projects in Gabon as defined by the PAT 81

List of Tables

Table 1: Comparison of the quotation of Gabon by different international agencies. 23
Table 2: Reference texts concerning foreign exchange regulations, taxation and arbitration in Gabon. 26
Table 3: Institutional arbitration centres in Gabon 32
Table 4: Procedures to be followed for each of the above-mentioned arbitration centres in Gabon. 34
Table 5: Tax treaties for dividends and interests 37
Table 6: Taxes relative to the mining sector. 38
Table 7: fixed entrance fees for mining titles 38
Table 8: Surface royalties (attribution & renewal) 39
Table 9: Mining royalties according to commodities 39
Table 10: Mining authorizations & permits 61
Table 11: Ad Valorem tax per mineral category 61
Table 12: Mining royalties 62
Table 13: List of institutions for the creation of a network 71
Table 14: Investment priorities for the development of the mining sector 77

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Abbreviations and Acronyms

Acronym	Description
ADS	Alternative dispute settlement
BCEAO	Banque Centrale des États de l'Afrique de l'Ouest Central Bank of West African States
BEAC	Banque des États de l'Afrique centrale Bank of Central African States
BEPS	Base Erosion Profit Shift
CCJA	Cour Commune de Justice et d'Arbitrage Joint Court of Justice and Arbitration
CEMAC	Central African Economic and Monetary Community
CNAT	National Land Allocation Commission
COBAC	Commission Bancaire de l'Afrique Centrale Central African Banking Commission
COMILOG	Compagnie Minière de l'Ogooué Ogooué Mining Company
CPI	Consumer Price Index
CSR	Corporate Social Responsibility
DBA	Disc-based association
E3MG	Ecole des Mines et de la Métallurgie de Moanda School of Mines and Metallurgy of Moanda
ECCAS	Economic Community of Central African States
ECOWAS	Economic Community of West African States
ECRM	Extended Critical Raw Materials
EITI	Extractive Industries Transparency Initiative

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ESG	Environmental, Social and Governance
FDI	Foreign direct investment
GDP	Gross Domestic Product
IMF	International Monetary Fund
MPM	Mineral Prospectivity Mapping
NGM	Nouvelle Gabon Mining
OECD	Organisation for Economic Co-operation and Development
OHADA	Organisation pour l'Harmonisation en Afrique du Droit des Affaires Organisation for the Harmonisation of Business Law in Africa
PSGE	Plan Stratégique du Gabon Emergent
RF	Random Forest
SEM	Société Equatoriale des Mines
UMAC	Union Monétaire de l'Afrique Centrale Monetary Union of Central Africa

Wording

Mineral potential mapping: "Mineral potential mapping is concerned with quantifying and mapping the likelihood that mineral deposits are present in a study area. It is synonymous to mineral prospectivity mapping, which is concerned with quantifying and mapping the likelihood that mineral deposits may be found by exploration in a study area."

Keywords

ECRM, Mineral potential, Ore processing, Refining capacities, Recycling units, Value chain, Primary raw material, Secondary raw material, Bottlenecks, Finance, Investment, Sustainability, ESG, Land-use, Taxation, Mining regulation, Mining policies, Child labour, Responsible extraction, Gabon, Pan-African

Executive Summary

This report provides the reader with an overview of the key aspects regarding mineral resources, supporting regulations and institutions, as well as any related provisions in the prospecting of Critical Raw Materials (CRMs) in Gabon. The report is an integral part of the larger AfricaMaVal project and, in that context, provides this country overview specifically aimed at European Union (EU) investors and decision-makers.

AfricaMaVal is focusing on the minerals and metals present in the fourth list of CRMs for the EU as well as on Copper (Cu), Nickel (Ni), Tin (Sn) and Manganese (Mn) that are particularly pertinent considering Africa's geological potential and their critical status in the digital and energy twin transitions. Cu, Ni, and Mn were added in the 2023 UE Critical Raw Material list as Strategic Raw Materials (EC, 2023). Gabon is host of some of the ECRM as Mn, Ba, Cu, Ni and PGEs, thus the intended work will look at the availability of these elements. Gabon has a high-income economy, with nearly 80% of its export revenue and over half of its GDP coming from the exploitation of its oil reserves. Other significant sector of the Gabonese economy include manganese.

The assessment will also include value chain for these critical minerals therefore activities such as exploration, extraction, processing, and recycling will be evaluated. Fiscal regulation as well as the macroeconomic and political context will be scanned to give an overview of the country regime. ESG regulations and challenges will be depicted for the investors to better understand the background and questions to address when it comes to launch activities on the ground. A list of downstream to upstream actors related to the mining sector will assist deciders to build their Business to Business network. This country profile will try to address the needs of the EU green deal according to the country strategies and planifications.

Eventually, this report will underline some project opportunities or recommendations.

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- 2AD Consulting for their assistance regarding the actors of the ECRMs whole chain and institutions dedicated to the mining sector (2AD Consulting, 2023);
- Control Risk for providing the overview on the political context (Control Risk, 2023).

1. Extended Critical Raw Materials (ECRM) supply potential of Gabon

1.1. Inventory of the ECRM

1.1.1 Geological setting

The geology of Gabon (Figure 1) is characterized by four main lithostratigraphic domains (Thomas *et al.*, 2001; Martini and Makanga, 2001; Thiéblemont *et al.*, 2009a, b):

- The **Archean domain**: it covers a large part of Gabon, extending from the north (North Gabon Massif) to the south (Chaillu Massif). It is mainly composed of gneisses, granitoids and greenstone belts;
- The **Paleoproterozoic domain**: it occupies the centre and the west of Gabon. It consists of different lithological units belonging to the West central African Orogeny. In the western part of Gabon, west of the Ikoy-Ikobé thrust zone, the Paleoproterozoic orogeny affects the Lambaréné Block affiliated to the Archean. A belt of metamorphic rocks belonging to the Kolissen Complex is stacked between the Lambaréné Block and the Ikoy-Ikobé thrust. The Ogooué Domain, located to the east, consists of an Archean gneissic nucleus bordered by metasedimentary units. The most external part of the orogeny is represented by the Francevillian basin, lying unconformably on the Archean Domain. It also includes the N'Goutou alkaline complex;
- The **Neoproterozoic domain**: these formations represent the northern termination of the West Congo orogenic belt. In northwest Gabon, it is represented by the La Noya Serie composed of detrital and carbonate deposits, preserved from metamorphism and deformation. In the southwest, the Neoproterozoic rocks lie on the Archean Chaillu Massif. They form a large lenticular structure hosted by the western part of the basement (Lambaréné block), that mimics a sedimentary basin, the Nyanga basin. Along the western border of this basin, the rocks are strongly folded and evolved westwards to detrital formations in contact with the western extension of the Archean basement. They constitute the Mayombe belt, which constitutes the northern termination of the West Congo orogeny;
- The **Phanerozoic formations**: they occur to the west as Permian to Eocene marine sequence of the Costal Basin, and to the east as Quaternary sandstone formations of the Batéké Plateaus.

1.1.2 Known Ore deposits and occurrences

The mineral potential of Gabon covers a large set of mineral commodity occurrences and deposits discovered during several geological mapping and mineral assessment surveys (Martini and Makanga, 2002; Thiéblemont *et al.*, 2009b). Among them, barite, platinum group elements (PGE), vanadium, phosphate, fluorine, niobium-tantalum, rare earth elements (REE), and tungsten are listed in the EU fourth list of critical raw materials (EC, 2020), whereas manganese, nickel, copper, and tin where added to this list at the beginning of the project before their addition in the 2023 CRM list (except Sn) (EC, 2023).

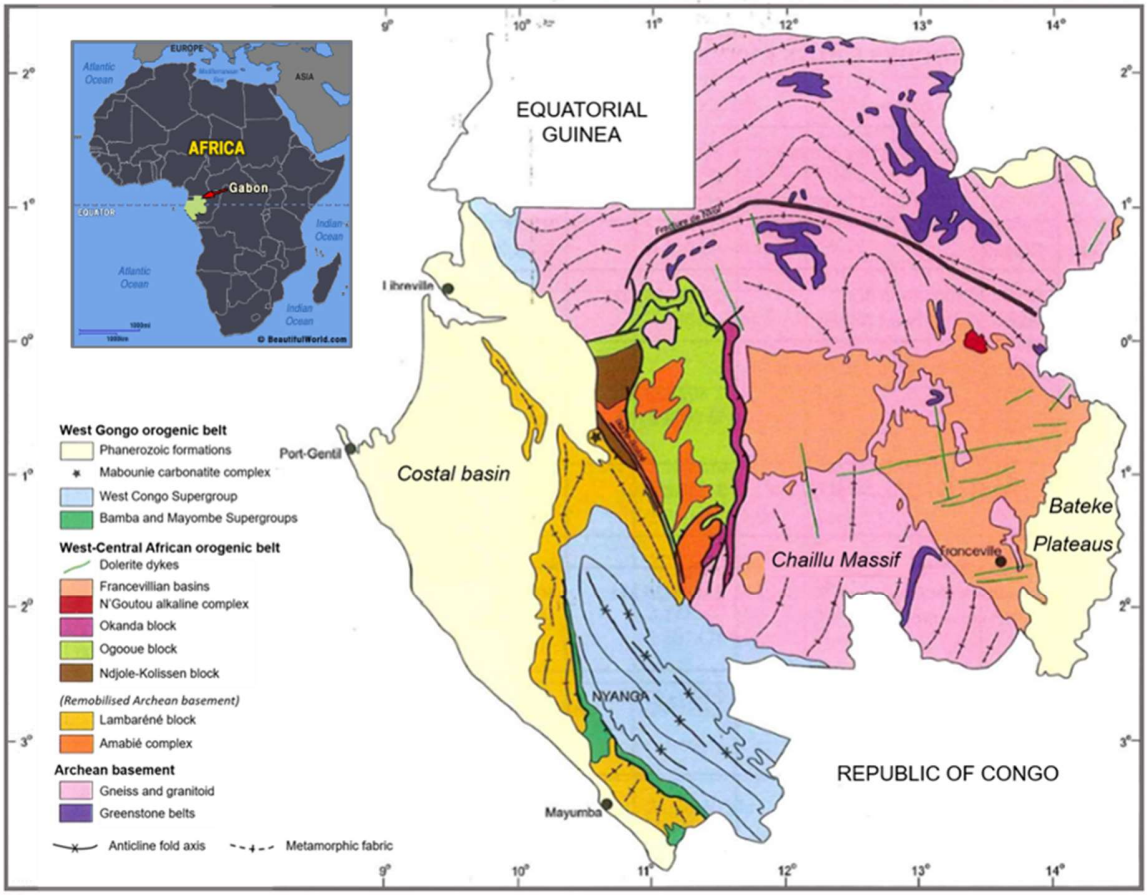

Figure 1: Simplified geological map of Gabon (from Chevallier et al., 2002).

Excluding gold and uranium, only manganese is mined among ECRM to date, mainly in the Francevillian basin, in the south-eastern part of Gabon. Most of the other mineral commodities correspond to occurrences, geochemical and/or alluvial anomalies discovered during several exploration surveys.

Mined ECRMs

Manganese – Mn: Manganese is currently extracted by three companies: COMILOG (Compagnie Minière de l'Ogooué, subsidiary of the French ERAMET company), and NGM (Nouvelle Gabon Mining, subsidiary of the Indian Coalsale Group) mainly active on deposits of the Franceville basin; and the Chinese CICMHZ company (subsidiary of the Citic Dameng company) active on manganese deposits hosted by the Ogooué Serie in northern Gabon. Around 10 Mt of manganese were produced in 2021 (COMILOG: 69 %; CICMHZ: 16.5 %; NGM: 14.5 %).

COMILOG is extracting Mn in the Moanda area, SE Gabon. The potential for manganese of the Franceville basin was discovered at the end of the 19th century, but was really investigated from 1951. The ore consists of secondary Mn-oxides (pyrolusite, cryptomelane, lithiophorite, nsutite, manganite) resulting from the supergene weathering of manganiferous dolomite and rhodochrosite deposits. The Moanda area is composed of five main prospective plateaus: Bangomé, Okouma, Massengo, Bafoula and Yéyé. The Bangoumé plateau is actively mined since 1961 whereas the exploitation of Okouma started in 2022.

Resources of 117 Mt of ore @ 43.8 % Mn and reserves of 65 Mt of ore @ 44.5 % Mn were reported in 2022 (ERAMET, 2021). The manganese ore production reached 7 Mt in 2021. Part of it (around 20 %) is beneficiated directly on site to produce ferromanganese, silico-manganese, manganese metal (up to 2020) and manganese oxide (MnO). In 2021, the Moanda production (752 000 t in total) was as follows: 67 kt of high carbon ferromanganese, 276 kt of silico-manganese, 404 kt of refined alloys and manganese metal, and 5 kt of manganese oxide.

In the same area, NGM owns the ''Manganèse de Franceville'' concession (835 km^2) in the Haut-Ogooué province. About 14 mineralised plateaus are identified totalling non-compliant resources of 153 Mt. JORC compliant resources of two of these plateaus (Bordeaux and Biniomi) reach 43 Mt and 33 Mt, respectively. The production started in 2020 in Biniomi, and reached 300,000 t in 2022.

The Chinese CICMHZ Huazhou company is active in the north of N'Djolé (geological map of Kango), where several Mn occurrences are hosted by schists and quartzites of the Ogooué Series, the most prospective being the Bembélé occurrence of about 9 km^2. Resources were estimated at 26 Mt and reserves at 18.3 Mt @ 31.6 % MnO.

ECRM occurrences

Barite – Ba: Numerous discontinuous quartz-chalcedony-barite (-galena-sphalerite-pyrite-chalcopyrite) occurrences are found along the eastern border of the Coastal Basin at the base of the N'Zémé Asso Formation of Lower Cretaceous age. They correspond to Mississippi Valley Type (MVT) deposits. The mineralisation mainly appears as residual blocks of massive, banded and geodic barite within the lateritic cover. Two main prospects are identified: Dourekiki, located in the southern border of the Nyanga synclinal, 100 km north of Mayumba, with resources evaluated in 1981 at 1.2 Mt of barite concentrate @ 46 % $BaSO_4$; and Biguieguieli, 27 km from Mayumba, with resources evaluated at 124 000 t. The Société Equatoriale des Mines (SEM) is looking for partners to develop the Dourekiki deposit.

Copper – Cu: Rare and poor Cu-Mo occurrences were identified in the Francevillian Supergroup and in the Nyanga synclinal. In the southern part of the Francevillian basin, surficial malachite-azurite (±smithsonite) disseminations hosted by black shales where investigated by systematic exploration surveys. The mineralisation is represented by discontinuous lenses of very limited lateral extension and low grade (< 0.2 % Cu). The copper occurrences of the Nyanga basin consist of malachite-chalcopyrite stainings in carbonate rocks of the Schisto-Calcaire Group. Boreholes were drilled on a geochemical anomaly located at the confluence of the Nounah and the Ivindo rivers. Chalcopyrite and molybdenite were found in quartz-chlorite veinlets within schists near the surface, and at depth in quartz-rich microdiorite, possibly indicating a porphyry-type copper mineralisation.

Nickel, copper, chromium, platinum group elements – Ni-Cu-Cr-(PGE): Several occurrences of chromite, Ni- and Cu-bearing sulphides associated with mafic and ultramafic rocks hosted by the Archean basement have been described, but to date, the exploration works failed to identify economic deposits.

Several of these occurrences have been mapped around Makokou (NE Gabon). The Ni content of mafic/ultramafic rocks is always low, ranging from 0.33 to 0.55 % Ni. The mafic/ultramafic rocks consist

of bodies of less than 1 km^2 in surface extension. Exploration pits failed to identify lateritic nickel concentrations.

Small ultramafic bodies (peridotite and pyroxenite) characterized by Ni content never exceeding 0.4 % Ni have been mapped north of Mayoumba in the Lambaréné block.

The most promising geological unit in terms of sulphide mineralization is the Kango complex of the Kinguélé Suite (northwestern part of the Archean basement). It consists of mafic (gabbro) to ultramafic (orthopyroxenite) dykes observed over 100 km in length and 1 to 1.5 km in width along a NE-SW direction (Grandin and Campiglio, 1990). The mineralization is disseminated and represented by pyrite, pyrrhotite, chalcopyrite and pentlandite (Campiglio *et al.*, 1983). Anomalous PGE contents (up to 1.4 ppm) were punctually identified in the feldspathic bronzitite and olivine-bearing norite facies.

Two exploration permits hold by Armada Exploration are presently active in the southwestern part of Gabon (Libonga-Matchiti trend south of Tchibanga) where geophysical data combined with soil geochemistry (Ni, Cu and Cr anomalies) revealed the presence of mafic/ultramafic rocks.

A geochemical Cr-(Ni) anomaly was identified during the SYSMIN project (Thiéblemont *et al.*, 2009b) in the Malinga area (Archean Gabon basement), suggesting the presence of mafic or ultramafic rocks. The associated Au-Bi-Sb anomalies suggest a potential for Cr-PGEs and/or Ni-Cu mineralisations.

Phosphate, niobium, tantalum, rare earth elements – P-Nb-Ta-REE: Two types of phosphate deposits are found in Gabon, i.e., sedimentary phosphates in the Costal Basin and the Mabounié Nb-REE-rich carbonatite in the Lambaréné block. Geochemical P-REE-Nb anomalies were also identified in the N'Goutou alkaline complex in the Haut-Ogooué province.

The Mabounié carbonatite, located 40 km east of Lambaréné, was discovered in 1987 following the airborne geophysical survey of Gabon in 1983-1984 (Guillemot, 1988). The carbonatite, dated at 660 ± 13 Ma; K-Ar on biotite), consists of heterogeneous sövite, crosscut by dykes of rauhaugite (dolomite-rich carbonatite) hosted by Paleoproterozoic fenitised gneisses and migmatites (Laval *et al.*, 1988). The carbonatite was subject to deep weathering resulting in secondary enrichment in P_2O_5 and Nb_2O_5. The lateritic profile ranges from 13 to 84 m in thickness (40 m on overage) and is composed of three main horizons. The phosphate-rich horizon is located at the interface with the least altered carbonatite, and is overlain by a Nb-rich horizon.

The Maboumine Nb and REE project was developed by the Maboumine company (COMILOG: 76 %; Gabonese State: 15 %; minor shareholders: 9 %). Resources of 2.3 Mt Nb_2O_5 at 1.2 % and 2 Mt REO at 1 % were reported in 2016. Niobium is mainly contained in pyrochlore and ferrocolumbite, while REE are carried by pyrochlore, apatite and crandallite. An innovative hydrometallurgical process was developed by ERAMET allowing the recovery of 90 % of Nb and REE contained in the ore concentrate. However, the economic feasibility is hampered by technical and operational risks linked to the process complexity, the high contents of radioactive elements (U, Th), the number of high value metals to be recovered and the remote location of the Maboumine industrial complex. In November 2022, COMILOG sold its shares to the Gabonese State.

REE geochemical anomalies, especially enriched in yttrium, were identified in the alkaline complex of N'Goutou (Agard, 1971). This complex was reinvestigated during the SYSMIN project (2005-2009) during

which high contents of REE, Nb and P were identified. At that time, these anomalies were considered as formational.

Sedimentary phosphate occurrences occur in the marine sequence of the Costal basin but none of them seems to be economically interesting. Those identified in the Francevillian basin are anecdotic and not described here. In the Costal basin, a phosphorite horizon, irregularly mineralised, is lying in the Coniacian (Upper Cretaceous) which consists of marls and sandy clays and hosts disseminated nodules/oolites of carbonate hydroxyapatite. Its extension is around 300 km, from Sette Kama to the Esterias Cap (Gonnard, 1971). The grade of P_2O_5 is generally low (< 5 % P_2O_5) but can locally reach up to 20 % P_2O_5 in association with abundant fish bone accumulations. Massive lenses rich in phosphate (20-39 % P_2O_5) are observed in the Turonian-Coniacian transition but they are too thin (< 1 m) and of too limited horizontal extension to be economic. One of these lenses was explored at Benghé.

Tin-(niobium) – Sn-(Nb): Cassiterite was commonly found in heavy mineral concentrates, either alone like in the Lébé river, 15 km southeast of Ndjolé, or more frequently associated with columbite-tantalite in the vicinity of the greenstone belts and iron formations hosted by foliated granites of the Archean basement.

Several Nb-Sn alluvial occurrences were reported in the Archean basement, in the NE part of the geological map of Mitzic (Prian *et al.*, 1998), in the NW part of Makokou (Moussu, 1971) and those associated with the iron formations of NE Gabon and East of the Chaillu massif (Donnot and Weber, 1968). The Nb and Sn grades are generally low (<100 g/m^3).

The most important Nb-Sn occurrences were found in the Early Eburnean domain. They are observed around the migmatitic domes of the Abamié and Diany-Miyolé areas. These migmatitic gneisses and Eburnean two mica granites are cut by numerous pegmatites in which columbite-tantalite minerals occur. The pegmatites are thought to be the source of the alluvial Nb-Sn concentrations in which cassiterite remains subordinate (Prian *et al.*, 1990). An area of 12 km in length and 2-3 km in width was delineated on the Abamié dome, where the alluvial columbite-tantalite content exceeds 250 g/m^3. Concentrates of 4 kg/m^3 of columbite-tantalite were identified in placers of limited extensions. The average columbite-tantalite composition is 54 % Nb_2O_5 and 23% Ta_2O_5. Similar placers were described on the Diany-Miyolé dome, where the concentration of columbite-tantalite is about 1 kg/ m^3 and are characterized by Ta–rich compositions (70 % Ta_2O_5 and 5 % Nb_2O_5).

Few alluvial Sn-Nb occurrences were also identified in the Lambaréné block in possible relation with the Fougamou granite (Artignan *et al.*, 1979).

Tungsten – W: scheelite and wolframite were only observed as traces in heavy mineral concentrates. Scheelite is an accessory mineral found in the Dondo Mobi gold deposit (Etéké district), in association with a pyrite-molybdenite-sphalerite-chalcopyrite-gold assemblage (Prian *et al.*, 1991). Several other tungsten occurrences were also reported north of this deposit, all located with the Ogooué complex.

Vanadium – V: After manganese, the Franceville basin is also rich in uranium deposits. The lower part of the Franceville Supergroup is characterized by several uranium deposits (Mounana, Boyindzi, Oklo, Okelobondo, Bangombé, Mikouloungou, Kiené) which were exploited up to 1999. The uranium

mineralization is associated with several vanadium primary and secondary minerals among which karelianite (V_2O_3), roscoelite ($K(V,Al,Mg)_2AlSi_3O_{10}(OH)_2$), duttonite ($V_2O_4.2H_2O$) and corvusite ($(Na,Ca,K)V_8O_{20}$) are the most important. These minerals are variably distributed in the different U deposits and were never recovered as by-product. The vanadium resources are not evaluated.

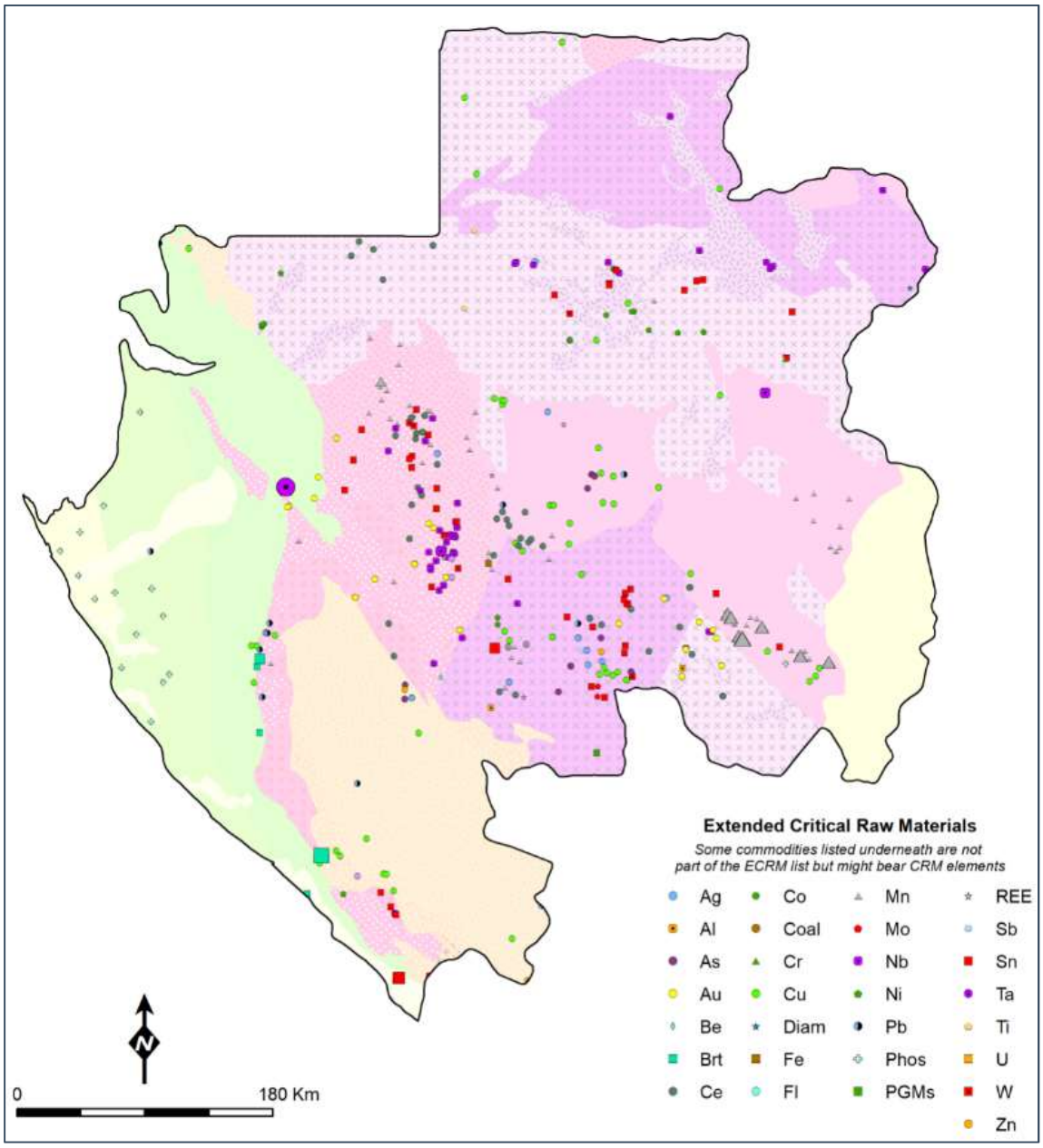

Figure 2: Main occurrences of ECRM in Gabon

1.2. Prospectivity and mineral high potential mapping

1.2.1 Selection of the ECRM for mineral prospectivity

Among the CRMs present as deposit and/or occurrences in Gabon, three were selected for mineral prospectivity mapping (MPM): **Mn, Cu, and Nb**. The choice of these commodities was constrained by the available dataset, as a minimum of 10 occurrences of a given CRM is needed to perform a reliable prediction. The MPM was performed using the Disc-based association (DBA) grid method coupled to a Random Forest (RF) method (Vella, 2022). This method focuses on the local spatial associations of geological variables and features of various nature to describe the relationships between the predictors and the mineralized occurrences. This allows the identification of geological environments in the study area around each node of the DBA grid, and the integration of both quantitative and non-quantitative spatial data, such as geophysical anomaly maps and location of geological map units, respectively. Then, RF classification is applied to perform a generalization of complex geological environments and features and evaluate their likelihood to host potential mineralization occurrences by giving a score comprised between 0 (low potential) and 1 (high potential).

In Gabon, the data used for MPM are:

- Geological map at 1/1 000 000 scale from SYSMIN mapping project (Thiéblemont, 2009);
- Mining databases (SIGAfrique database, SYSMIN database and SPGlobal database).
- Analytical signal from airborne magnetic survey (CGG, 1983-1984; SODETEG, 1984);
- Ternary K–Th–U radiometric map (red–green–blue additive chromatic combination applied point by point for the three radiometric measurements) from radiometric survey (CGG, 1983-1984; SODETEG, 1984);

The DBA grid for predictive modelling is mainly defined by **five parameters**:

- Size of cell – d;
- Search radius for lithologies – R;
- R/d ratio,
- Search radius for mineral occurrences – R_1. It can be null, in this case the search radius will be restricted to the cell size (d)
- Search radius for faults – R_2. It can be null, in this case the search radius will be restricted to the cell size (d) or it can take into account the cumulative length of faults present in the cell size (d).

In order to maximize the grid resolution while minimizing overlaps and cells with only one lithology, the parameters of the DBA grid for **Mn, Cu, and Nb** commodities used in this study are as follows:

- For maps at the country scale: d = 2000 m, R = 6000 m, R/d = 3, R_1 = 3000 m, R_2 = 3000.
- For maps at the district scale: d ≈ 1333 m, R = 4000 m, R/d = 3, R_1 = 2000 m, R_2 = 2000.

1.2.2 Mineral high potential areas

Mineral high potential areas were highlighted for the three studied CRMs in Gabon. The criteria allowing the assessment of DBA-RF modelling can be found in the table below. All the mineral prospectivity maps can be found in the **Appendix_1.2_MPM_GABON**.

	TN	FN	FP	TP	TPR	FPR	PPA (%)	Precision (%)	Accuracy (%)	J-score	Threshold
Country-scale predictive maps											
Mn	59251	45	7763	444	0.908	0.116	12.2	5.4	88.4	0.792	0.420
Cu	59806	129	7176	392	0.752	0.107	11.2	5.2	89.2	0.645	0.361
Nb	61550	26	5601	326	0.926	0.083	8.8	5.5	91.7	0.843	0.417
District-scale predictive maps											
Mn	24000	9	2274	207	0.958	0.087	9.4	8.3	91.4	0.872	0.480
Cu	25219	35	2049	157	0.818	0.075	8.0	7.1	92.4	0.743	0.352
Nb	42080	20	5051	244	0.924	0.107	11.2	4.6	89.3	0.817	0.560

Notes: *True Positive (TP) and True Negative (TN) correspond to the number of grid cells which are correctly predicted by the RF model (i.e. mineralized and non-mineralized cells, respectively). Inversely, False Positive (FP) and False Negative (FN) correspond to the number of grid cells which are incorrectly predicted by the RF model (i.e. mineralized instead of non-mineralized cells and non-mineralized instead of mineralized cells, respectively).* ***FP could correspond to mineral high potential areas****. True positive rate (TPR), also called "Recall", correspond to TP/(TP+FN), False positive rate (FPR) correspond to FP/(FP+TN), Percentage of prospective area (PPA) correspond to (TP+FP)/All, Precision correspond to TP/(TP+FP), Accuracy correspond to (TP+TN)/All and J-score correspond to TPR – FPR.*

Manganese – Mn: The favorability map of Mn at the country-scale produced by the DBA-RF model display two large mineral high potential areas, corresponding to the Franceville basin to the southeast and the N'Djolé basin to the center of Gabon. According to the RF model, the most favorable lithology in the studied area is unsurprisingly the Francevillian formation (i.e., limestones, marls and ampelites) of Paleoproterozoic age. The DBA-RF model has an accuracy of ~88 % and indicates that about 12 % of the prospective areas can be prospected for discovering new Mn deposits. The predictive map performed at the scale of the Francevillian basin identified four major areas centered around the known Mn deposits of Moanda-Bagombé, Franceville, Okondja, and Ogouangoubou. The DBA-RF model has an accuracy of ~91 % and indicates that about 9 % of the district can be prospected for discovering new Mn deposits.

Copper – Cu: The favorability map of Cu at the country-scale produced by the DBA-RF model highlights three mineral high potential areas, including the Nyanga basin to the southwest, the Franceville basin to the southeast and the Abeilles basin to the east. According to the RF model, the most favorable lithology in the studied area is the Schisto-Calcaire formation (i.e., limestones, dolostones and schists) of Neoproterozoic age. The DBA-RF model has an accuracy of ~89 % and indicates that about 11 % of the prospective areas can be prospected for discovering new Cu deposits. The predictive map performed at the scale of the Nyanga basin identified one major area centered around the known Cu deposits of Doussé Koussou and Doumani on the western edge of the Nyanga basin, as well as two additional smaller anomalies to the south and north of the Nyanga basin. The DBA-RF model has an accuracy of ~92 % and indicates that about 8 % of the district can be prospected for discovering new Cu deposits.

Niobium – Nb: The favorability map of Nb at the country-scale produced by the DBA-RF model highlights one major mineral high potential area, corresponding to the Oggoué domain in the central part of Gabon. According to the RF model, the most favorable lithology in the studied area is the Oggoué complex (i.e., paragneisses, orthogneisses and micaschists) of Paleoproterozoic age. The DBA-RF model has an accuracy of ~92 % and indicates that about 9 % of the prospective area can be prospected for discovering new Nb deposits. The predictive map performed at the district scale shows that the southern part of the Oggoué

domain is the most favorable for Nb mineralization. The DBA-RF model has an accuracy of ~89 % and indicates that about 11 % of the district can be prospected for discovering new Nb deposits.

1.3. Ore processing and refining capacities

According to the *Article 148* of the 2019 Mining Law, the owner of an exploitation licence should transform locally all or part of its production. The part of the production that should be transform locally is reported in the mining convention signed at the beginning of the project by the owner and the Gabonese State.

According to the last version of the Gabonese cadastre (09/03/2023), Au, Fe and Mn are the only commodities for which an exploitation licence was delivered by the local authorities. To date, among all the ECRMs, only manganese is mined and partly (20 % of the ore production) processed in Moanda where two units of local transformation (COMILOG, NGM) are active for high-grade manganese and manganese alloys production.

Since 2015, the COMILOG operates two processing plants of the manganese ore coming from the Bangombé plateau, near Moanda, and since 2022, the Okouma plateau, 13 km north of Moanda. The raw ore is crushed on site and washed to eliminate clays and sand. About 20 % of this material is then transfer to the ''Complexe Industriel de Moanda (CIM)'' or the ''Complexe Métallurgique de Moanda (C2M or CMM)'' for additional treatments. The remaining 80 % are exported to other beneficiation plants of the company or directly to clients.
The CIM processes the fine by-products of beneficiation, as well as manganiferous sediments extracted from the Moulili River. Finished products are enriched to increase their Mn content from 30 % to 50 % MnO. Part of the concentrates produced by this process is sold directly, while the rest is mixed with coke and sintered at 1300°C to achieve a product grading 56 % MnO. The sintered product is mainly intended for melting in furnaces for transformation into manganese alloys. The sinter plant has a production capacity of 650,000 t/year.
The C2M consists in i) a pyrometallurgical line for high-carbon ferromanganese and silico-manganese production (69 % MnO) directly used in the steel industry, and ii) a hydrometallurgical line used for the production, up to 2020, of metallic manganese (Electrolytic Manganese Metal, EMM), and now used for MnO production. In 2021, ERAMET began selling MnO on the agricultural, animal feed, electronic and battery markets.

Since 2017, the ore extracted by NGM from the Biniomi plateau is beneficiated on site, through several steps of crushing, washing and gravimetric concentration up to the production of a concentrate grading 42 % MnO. The concentrates are transferred by truck up to the Benguia terminal, and then by train up to the Owendo terminal.

Processing and refining capacities of CRMs in Gabon are quite limited (see table hereafter) and concern manganese only. Despite these facilities, most of the Mn production, 80 % for COMILOG, 100 % for NGM, is exported as Mn concentrate produced after limited processing (washing, gravimetric concentration, sorting). Only 20 % of the ore production are processed in Gabon by COMILOG to produce different types of transformed Mn products. Apparently no processing facilities have been implemented by the CICMHZ company and the ore is likely directly shipped to China.

	Processing Unit 1	Processing Unit 2	Processing Unit 3	Processing Unit 4	Processing Unit 5
Name processing unit	Sintering plant	Moanda Industrial Complex - CIM	Moanda Metallurgical Complex - C2M	Nouvelle Gabon Mining	CICMHZ (Compagnie industrielle des mines de Hangzhou)
Processing Facility	Plant	Sintering plant	Metallurgical plant	Concentration plant	No processing facilities
Status	Assumed Active	Active	Active	Active	Active
ECRM	Manganese (Mn)	Manganese (Mn)	Manganese (Mn)	Manganese (Mn)	Manganese (Mn)
Owner	Eramet Group [63.7%]	Eramet (63,7 %), Republics of Gabon (28,9 %), Carlo Tassara France (7,4 %)	Eramet (63,7 %), Republics of Gabon (28,9 %), Carlo Tassara France (7,4 %)	Coalsale Group (90 %), Société Equatoriale des Lines (10 %)	South Manganese Industry Group Co (chinese, 90 %), Republic of Gabon (10 %)
Operator	Compagnie Minierè de l'Ogooué S.A. (Comilog)	Comilog	Comilog	Nouvelle Gabon Mining	CICMHZ
Technology / Process		Crushing, grinding, enrichment through magnetic separation, and, optionally, sintering	4 rotary furnaces, electrolytic plant	Crushing, washing, gravimetric contentration	Not found
Feedstock		Manganese concentrate	Manganese concentrate	Manganese ore	Manganese ore
Products		Mn-sinters	High-carbon ferromanganese, silicomanganese, MnO	Manganese concentrates	Manganese concentrates
Waste products		sand (particle size between 1 and 20 mm) and fine ore fraction (<1 mm).	-	-	-
Capacity	600 000 mt/y	650 000 t/year		Probably 1,7 Mt/y	Possibly 1 Mt/y
Production statistic	USGS 2018 Minerals Yearbook, Vol. III, Gabon Country Chapter, Table 2; various other USGS, industry, geologic research, and company reports; various mining databases	Ore: 7071 262 t (2021); High-carbon ferromanganese: 67 000 t, Silicomanganese: 276 000 t; refined alloys and manganese metal: 404 000 t; Mno: 5 000 t (Production 2021).		Ore: 1 472 960 t (2021)	Ore: 1 684 868 t (2021)
Energy		Electric furnace			

Port / rail		ore is sent by train to the Port of Owendo in Libreville		ore is sent by train to the Port of Owendo in Libreville	
Comments		Concentrates and sinters are produced in Moanda Industrial Complex, alloys are produced in Moanda Metallurgical Complex (C2M)		Ore is also mined from Ndjolé (Non, ce sont les chinois qui exploitent le Mn de Ndjolé, pas NGM) and from Lebaye (Okondja) mines.	

2. Assessment of the ECRM value chain

2.1. Characterisation of the value chain for primary and secondary raw materials

2.1.1 List of the mining and recycling projects (sorted by degree of maturity)

Mining projects - According to the March 2023 cadastre (Figure 3), the exploitation of ECRMs concerns only Mn which is currently exploited by *COMILOG* and *NGM* in the Franceville basin and by *CICMHZ Huazhou* in the Bembélé area (North of N'Djolé).

Exploration projects - Several mining companies hold exploration licences targeting Mn: *Africa Mining Development* (Mn, 2 licences), *COMILOG Exploration* (Mn and Au-Mn, 2 licences), *Hong Da* (Au-Mn, 3 licences), *Jade Fountain Investment Company Ltd.* (Mn, 2 licences), *Mournemining Ltd.* (Mn, 1 licence), *Société des Mines et Carrières du Gabon* (Au-Mn, 2 licences) and *SOGMEC* (Mn, 1 licence). The present day state of exploration works performed on these exploration licences is not known.

Several exploration licences are also hold by companies looking for commodities belonging to the EU ECRMs list: *Azingo* (Fe, Cu, Au, 1 licence), *Craton del Congo Exploraciones* (Au, Ag, PGE, 1 licence), *Heling Minerals* (Heavy Mineral Sands, 3 licences), *Reminac Gabon* (Fe, Au, Ag, Cu, Cr, Ni, PGE, 3 licences), *Select Exploration Gabon* (Pb, Zn, Cu, TR, Li, PGE, 2 licences).

The registered *Reminac* and *Azingo* companies are fully owned by *GENMIN Ltd.* active for iron and associated commodities in Baniaka, Mafoungui and Bitam. *GENMIN* is also active, as *Select Exploration Gabon*, on the Pb-Zn prospects of the Kroussou area, in the eastern border of the Costal Basin.

The SEM (Société Equatoriale des Mines) company holds several exploration licences (not reported on the Cadastre map) for Nb and associated commodities (Maboumine project), including Ba (Dourekiki deposit), REE (Ngoutou project), Cu-Mo-Au (Lemanassa project), and Ni-Cu-Cr-PGEs (Kinguelé project).

Recycling projects - A ministerial decree was published in August 2013 concerning the collection, sale, exportation and the exploitation of ferrous (iron, steel and cast iron) and non-ferrous residues (aluminium, zinc, copper, lead, tin, chrome and nickel). However, no information concerning recycling activities in Gabon have been found.

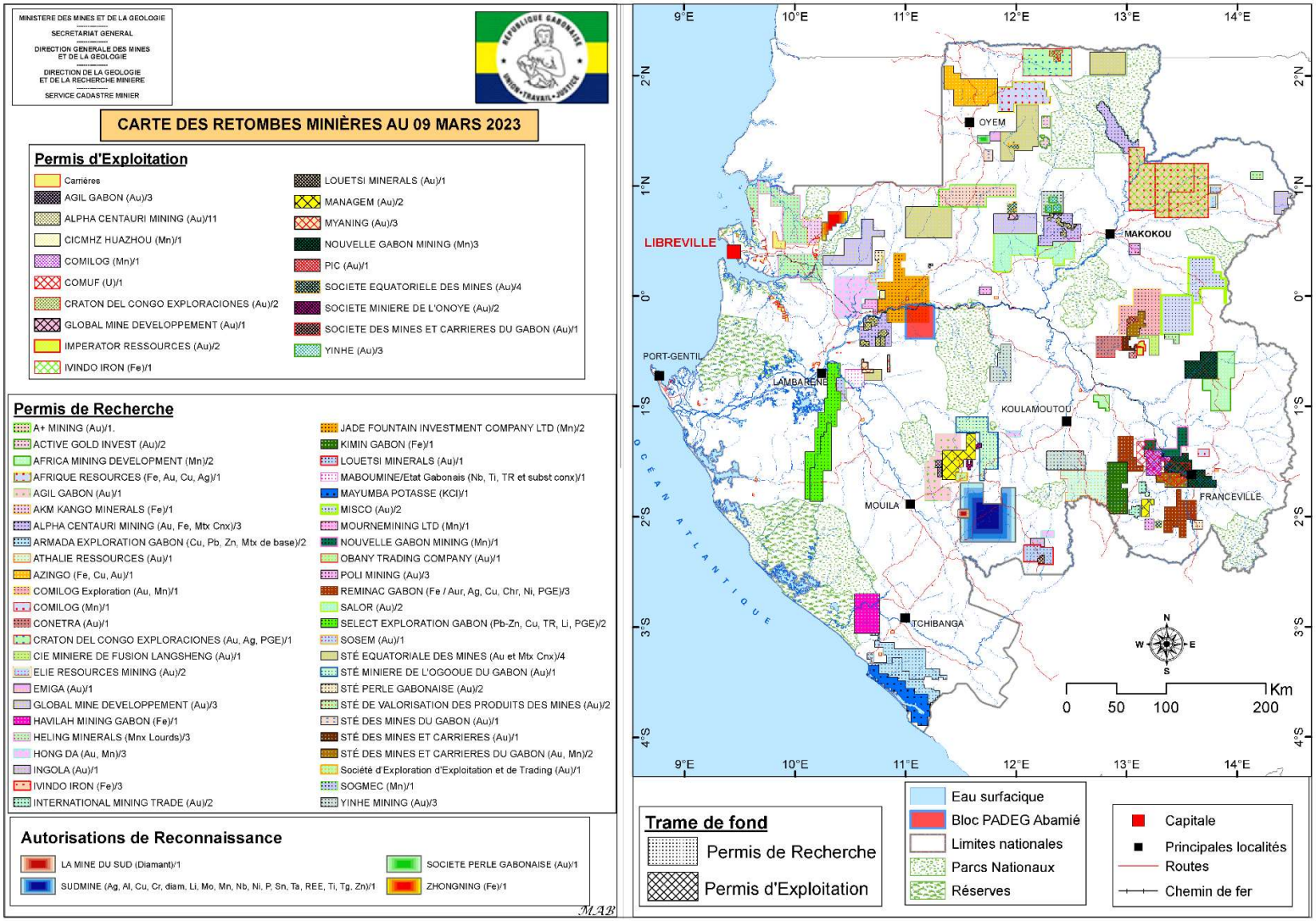

Figure 3: Map of mining operations in Gabon (situation in March 2023).

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the European Union

2.1.2 Existing ESG indicators

The ESG framework of Gabon is still in its early stages of development, but the government and various stakeholders are making efforts to improve the sustainability of the country's economic activities. Legal and regulatory frameworks are implemented to promote sustainable development and address ESG issues in the mining industry. Overall, the Gabonese ESG framework in the mining industry is focused on promoting sustainable development, protecting the environment, and ensuring that mining activities benefit local communities and the Gabonese people.

Environment and sustainable development - The government has implemented several environmental regulations which aim to balance the country's economic development with the need to protect its rich natural resources and biodiversity.

Provisions for the protection of the environment are specified in the law N° 007/2014 and in the Article 47 of the Constitution. The sustainable development is governed by the law No. 002/2014. The Ministry of Environment is in charge of the application of the law in this matter.

In the mining sector, an environmental impact study (decret No. 000539/PR/MEFEPEPN) is required before the beginning of a project (exploration and exploitation). The impacts evaluation and proposed remediation are examined and evaluated by the Ministry of Environment before the delivery of the authorization. The situation is slightly different in the oil & gas sector, where a special fund for the attenuation of the environmental impacts of the oil exploration and exploitation is planned by the Hydrocarbon Code.

Social - The Gabonese government has established requirements for mining companies to engage with local communities and obtain their consent for mining activities. The government has also established a framework for community development agreements that require mining companies to invest in local development initiatives.

The government has established labour standards that require mining companies to adhere to international labour conventions and local labour laws. The government also promotes the development of local skills and capacity-building in the mining industry.

Governance - The 2019 Mining Code encourages transparency and a thriving mineral ecosystem. Gabon is a member of the Extractive Industries Transparency Initiative (EITI), which aims to promote transparency and accountability in the extractive industries. The government also requires mining companies to disclose their payments to government entities. The Gabonese government is working to strengthen its institutional capacity to regulate the mining industry and address ESG issues. The government has established a regulatory agency, the Mining Regulator (REGOM), to oversee the implementation of mining regulations and promote sustainable development.

Gender equity – in September 2021, Gabon adopted new laws designed to reduce the risk of violence against women and prohibit discrimination in the economy, in particular by amending legislation to promote women's financial inclusion and access to more employment (https://blogs.worldbank.org/africacan/gabon-revises-legislation-protect-women-and-increase-their-economic-role).

2.1.3 Status of economic links between the formal and informal sectors

In Gabon, the informal sector is mainly focused on small scale alluvial gold exploitations. Most of this activity is conducted without mining rights. These activities locally affect the mining activities of legal companies. Area conflicts between illegal and legal companies are generally solved locally and directly by discussions between both parties. The Gabonese authorities are perfectly aware of the situation but struggle to address it.

2.2. Identification of the bottlenecks along the value chain

Gabon appears badly quoted by international agencies in terms of doing business (World Bank), transparency (Transparency International), general governance (Mo Ibrahim Foundation), mining investment attractivity (Fraser Institute) (Table 1). More specifically, the main identified bottlenecks that may affect the development of the extractive sector in Gabon are summarized below.

Country	Doing Business 2020	Transparency International 2022	IIAG 2022	Fraser Institute 2021
	World Bank report (score on 190)	Corruption perception Index (score on 180)	Index of African Governance (score on 54)	Attractivity seen by mining companies (score on 84)
Morocco	53	94	10	8
Senegal	123	72	9	46
Gabon	169	136	27	-
Namibia	104	59	8	59
DRC	183	166	49	82
Tanzania	141	94	21	67
Mozambique	138	142	26	-
Zimbabwe	140	157	29	84
South Africa	84	72	6	75
Madagascar	161	142	34	-

Table 1: Comparison of the quotation of Gabon by different international agencies.

Road and rail Infrastructures – Most of the extracting activities concern manganese, active deposits which are concentrated in the south-eastern part of Gabon in the Haut-Ogooué province. From there, the COMILOG and NGM production is sent by rail to the port facilities at Owendo and Port-Gentil. The management of the Transgabonese railway, linking Franceville to Owendo along 648 km, which is also used by the locals and the forest industry, is insured by the SETRAG (Société d'Exploitation du Transgabonais) since 2003. This unique railway, constructed between 1974 and 1986, is under-dimensioned considering the increase of the traffic, which is regularly stopped due to the lack of maintenance combined with the fact that parts of the line were constructed across wetland areas. The rest of the country is disserved by a poorly maintained road network, which constitutes a major drag on exploration investments.

Port capacities – Two deep water port capacities exist in Gabon, one at Owendo (south of Libreville) and one in Port-Gentil mainly used for the exportation of petrol and gas. The mineral port of Owendo (900 m in length) is managed by COMILOG, but can only accommodate shallow draught vessels (<12 m). The COMILOG production is transhipped at 70 km from low capacity (50,000 t) vessels to large ones (180,000 to 200,000 t). The New Owendo International Port (or Owendo Bulk port) is mainly a mineral port active

since 2017 with an annual capacity of 10 Mt of ore. It is managed by the Olam Group in joint venture with Meridian. NGM exports also its production off the port of Owendo.

Energy – The four main electricity networks in charge of electricity distribution are not interconnected and the kWh cost remains elevated for the country (0.20 €/kWh, equivalent to the electricity cost in France). The electricity distribution network in Franceville remains poorly developed and most of the mining companies prefer to use generating sets even if the cost is 2 to 3 times more elevated.

Qualified human resources - Private companies are hard pressed to recruit qualified staff. The academic offer in terms of technical training is low and the public sector remains more attractive than the private one. To balance this problem, COMILOG opened in 2016 the School of Mines and Metallurgy of Moanda (E3MG). Even with that, COMILOG is obliged to recruit external people under costly service provisions.

State governance – Corruption, lack of transparency, regulatory instabilities, and administrative barriers remain considerable obstacles to long-term investments in the mining sector.

Data accessibility – The mining cadastre is not accessible on the internet website of the Ministry of Mines. The same is true for the results of previous exploration/exploitation reports that are necessary to mining investors for taking decisions in terms of investments.

Social acceptability – More and more voices are being raised against exploration/exploitation projects, especially regarding the environmental impacts of past mining activities. Moreover, the financial benefits of mining activities for the population benefits and the development of the country are considered too low.

3. Investment/financing prospects for ECRM projects in Gabon

3.1. Fiscal, legislative and regulatory context for in-country financings

Legal and judiciary security of investments in Gabon

The exchanges between Gabon and foreign countries, concerning the mining sector, are governed by different legal documents listed in Table 2.

	List of legal documents
Foreign exchange regulations	• COBAC Regulation R-2005/01 of April 1st, 2005 on the due diligence of reporting credit institutions in the fight against money laundering and the financing of terrorism in Central Africa; • Regulation N°01/CEMAC/UMAC/CM of April 11th, 2016 on the prevention and repression of money laundering and the financing of terrorism and proliferation in Central Africa ; • Regulation N°02/18/CEMAC/UMAC/CM du December 21st, 2018 leading to the regulation of foreign exchange in the Central African Economic and Monetary Community (CEMAC) ; • Regulation N°01/21/CEMAC/UMAC/CM leading to the procedure for the implementation of certain provisions of foreign exchange regulations by resident extractive companies; • COBAC Instruction I-2006/01 of July 31st, 2006 relating to information on the prevention of money laundering and the financing of terrorism; • Instruction N°002/GR/2019 of June 10th, 2019 on the pricing of transfer operations; • Instruction N°005/GR/2019 of June 10th, 2019 relating to the terms and conditions for opening and operating foreign currency accounts for residents and non-residents; • Instruction N°011/GR/2019 of June 10th, 2019 relating to the terms and conditions for the exercise of manual foreign exchange activities in CEMAC; • Instruction N°002/GR/2020 relating to the transfer commission outside of CEMAC to be levied by the Central Bank ; • Instruction N°002/GR/2022 of February 4th, 2022 specifying the conditions and procedures for declaring the domiciliation, repatriation and clearance of exports of goods and services of resident extractive companies; • Instruction N°003/GR/2022 du April 4th, 2022 relating to the conditions and procedures for opening and operations of foreign currency for resident companies in the extractive sector;

	• Circular Note N°002/GR/2022 of March 11th, 2022 relating to the documentation to be provided by customers depending on the nature of operations;
Taxation	• General Tax Code (CGI) ; • Tax Treaty signed within the context of the CEMAC ; • Tax Treaty signed between Gabon and France; • Tax Treaty signed between Gabon and Morocco; • Tax Treaty signed between Gabon and Belgium; • Tax Treaty signed between Gabon and Canada ; • Tax Instruction N°0224/MER/DGI/DLC of April 21st, 2021 relating to the tax provisions of the Corrective Finance Law for 2020;
Arbitration	• United Nations Commission on International Trade Law (UNCITRAL) Model Law on International Commercial Arbitration of June 21st, 1985, as revised on July 7th, 2006; • Treaty on the Harmonization of Business Law in Africa of October 17th, 1993, revised on October 17th, 2008; • OHADA Uniform Act concerning Company Law and Economic Interest Groups (GIE) of January 30th, 2014; • OHADA Uniform Act relating to the law on arbitration of November 23rd, 2017; • OHADA Uniform Act on Mediation of November 23rd, 2017; • Arbitration Rules of the Common Court of Justice and Arbitration (CCJA) of November 23rd, 2017 ; • Arbitration Rules of the Centre of Arbitration, Mediation and Conciliation of Gabon (CAMC-GA) of June 26th, 2015; • Internal Rules of the CAMC-GA of June 26th, 2015; • Rules of procedure of the International Institute of Mediation, Arbitration and Conciliation of December 11th, 2021; • Charter of Ethics and Deontology of the International Institute of Mediation, Arbitration and Conciliation.

Table 2: Reference texts concerning foreign exchange regulations, taxation and arbitration in Gabon.

Foreign exchange regulations

In this section, we will present the regulations applicable to the banking and financial sector, as well as those applicable to foreign exchange controls, in Q&A format.

Questions	Answers
Can a company easily convert local currency into hard currency?	The conversion of local currency into foreign currency is authorized by Regulation N°02/18/CEMAC/UMAC/CM of December 21, 2018 on Foreign Exchange Regulations, only when carried out by regularly constituted and authorized legal entities, namely: - Credit and microfinance institutions; - Post offices and ; - Foreign exchange offices.

	The above-mentioned authorized establishments may only convert local currency into foreign currency: - Within the limits of available foreign currency and foreign currency allocation thresholds; - After checking the conformity of the supporting documents presented by the customer (identity, reason and amount of the transaction); - After verifying the origin of the funds being converted; - In compliance with regulations concerning the fight against money laundering, the financing of terrorism and proliferation. With regard to currency allocation thresholds, the aforementioned regulation N°02 only sets the threshold for allocating currency to travelers. The threshold set for this purpose is 5,000,000 CFA francs per person per trip. In the absence of a threshold set for manual foreign exchange operations other than for travel, the aforementioned threshold of 5,000,000 CFA francs per foreign exchange operation is applied in practice. However, as the use of local currency is preferred, the conversion of local currency into foreign currency for use in Gabon may be limited. Under certain conditions, it is therefore advisable to open a foreign currency bank account in Gabon. As a reminder, the exchange rate applicable to manual exchange operations is fixed for the Euro at the rate of 1 CFA Franc, equivalent to 0.001524 Euro (that is, 1 Euro = 655.957 FCFA). It may not be increased or reduced for any reason whatsoever. As regards other foreign currencies, in particular, the US Dollar, the buying and selling exchange rate may not be reduced or increased by more than 5% of the daily rate set and communicated by the Central Bank (See article 10 of Instruction N°011/GR/2019 of June 10th, 2019).
Can a company transfer funds abroad ?	As a reminder, Article 1 of Regulation N°2 on foreign exchange regulations defines "foreign" as countries other than those of the CEMAC, which includes Cameroon, Congo, Gabon, Equatorial Guinea, Central African Republic and Chad. Thus, a transfer of funds abroad occurs when the funds are transferred to a beneficiary residing in a country outside the CEMAC zone. In this respect, article 6 of the foreign exchange regulations states that a transfer of funds abroad is carried out freely, subject to justification of the origin of the funds and presentation of the documents required by foreign exchange regulations. However, for transfers of less than or equal to 1,000,000 CFA francs per month and per economic operator, the transfer is free on simple indication of the origin of the funds and a declaration to the Central Bank (article 6). Requests for transfers in excess of 1,000,000 CFA francs are subject to presentation of the supporting documents required by foreign exchange regulations, depending on the nature of the transaction (article 94).

	Finally, transfers in excess of 100,000,000 CFA francs must be declared to the Central Bank and the Gabonese Ministry of the Economy at least thirty (30) days before the transaction takes place (articles 86 and thereafter.). Please note: Depending on the nature of the transaction justifying the funds transfer request, additional conditions may be required by foreign exchange regulations. These include transactions involving the transfer of income such as : - Dividends, profits, interest, royalties; - Salaries, fees, per diems, miscellaneous allowances; - Rents; - Income from public and private contracts; - Income from the issue of foreign securities; - Loan repayments; - Loans granted to non-residents; - Inward and outward direct and portfolio investment; - Settlement of transactions with non-residents, etc. In this regard, Circular Note N°002/GR/2022 of March 11th, 2022, lists all the documentation to be provided by economic operators and investors, depending on the nature of the operations justifying the transfer of funds outside the CEMAC. Furthermore, we would like to inform you that, with a view to reducing processing times for transfer requests outside the CEMAC zone, the Central Bank has set up an application called "e-Transfer" since September 1st, 2020. This application enables banks and the Treasury to submit all their transfer requests, which will be processed by the Central Bank. More specifically for economic operators, a dedicated portal for consulting transfer request files has been integrated into this platform, called "e-Tracking". This dematerializes the process of analyzing transfer requests from outside the CEMAC zone. This application ensures the traceability and availability of tracking information in real time for economic operators, who are required to create a user account by providing information such as: Tax Identification Number (NIF), number of a valid identity document or residence permit, e-mail address, etc. To guarantee access to this application, the transfer request file must meet certain conditions: - The application must be submitted by the economic operator to a credit institution; - The credit institution must not use its current needs to process the application; - Processing of the application must be initiated in e-transfer by the credit institution.[1]
Are there any fees involved in the fund transfer process?	Authorized financial institutions are required to charge a transfer commission on the amount of the transaction. This rate is determined by the free play of competition and the texts in force. In this respect, Instruction N°002/GR/2019 of June 10th, 2019 relating to the pricing of transfer operations sets the maximum rate of the transfer commission outside CEMAC, as follows:

[1] Communication platform between CEMAC credit institutions and the Central Bank (BEAC).

<table>
<tr><td></td><td>
<table>
<tr><td>Type of Withdrawals</td><td>Outgoing Transfers</td><td>Incoming Transfers</td></tr>
<tr><td rowspan="2">Maximum transfer fee</td><td>1% before tax of the transaction amount, excluding the commission charged by the Central Bank</td><td>0,25% before tax of the transfer amount</td></tr>
<tr><td>This rate is reduced to 0.5% for transfers of earned income.</td><td>N/A</td></tr>
<tr><td>Minimum transfer fee</td><td>5,000 CFA francs per transfer, including fees and commissions to be deducted from the economic operator and the commission charged by the Central Bank.</td><td>N/A</td></tr>
</table>
In addition to the above rates, a commission of 0.5% exclusive of tax is charged by the Central Bank for outgoing transfers outside CEMAC on behalf of authorized intermediaries.

No Central Bank commission is expressly provided for incoming transfers.</td></tr>
<tr><td>Is repatriation of funds back to the country mandatory?</td><td>The obligation to repatriate funds back to CEMAC is set out in articles 56 and 70 of Regulation N°02 on foreign exchange regulations in CEMAC, for export transactions involving goods and services.

These provisions are supplemented by Instruction N°006/GR/2019 of June 10th, 2019 specifying the procedures for declaring and domiciling exports of goods and services, and for repatriating the related receipts to CEMAC.
Accordingly, exporters of goods and services must collect and repatriate the proceeds of their exports to CEMAC within a maximum of 150 days from the effective date of export, through the intermediary of domiciliary credit institutions.

Foreign currency to be repatriated includes, in particular:
- Receipts from exports of goods and services;
- Loans ;
- Current account advances;
- Income ;
- Donations;
- Direct and portfolio investments; and
- Unrequited transfers.</td></tr>
<tr><td>Can the company hold foreign accounts? Can it hold local accounts in hard currency ?</td><td>➢ Opening a foreign currency account abroad by CEMAC resident companies

Under the provisions of article 41 of Regulation N°02 on foreign exchange regulations in the CEMAC, resident companies, with the exception of credit institutions, are prohibited from opening a foreign currency account outside the CEMAC.

However, the Central Bank may authorize a resident company to hold an account abroad upon a reasoned request from the company, which must provide, in support of its request, the documents and information specified in instruction N° 005/GR/2019 of June 10th, 2019, relating to the terms and conditions for opening and operating foreign currency accounts for residents and non-residents.

The Central Bank authorization specifies the operations that may be credited to and debited from the account, as well as the duration of the authorization, which may not exceed two (2) years.</td></tr>
</table>

	Renewal of the authorization may be requested at least forty-five (45) days prior to expiry of the initial authorization. If a new authorization is not obtained from the Central Bank, the company will close the account and repatriate any assets held abroad resulting from the balance of the said account, within thirty (30) days. ➢ *Opening of local foreign currency accounts by CEMAC resident companies* In accordance with the provisions of article 42 of Regulation N°02 on foreign exchange regulations in CEMAC, resident companies are prohibited from opening a foreign currency account in CEMAC. However, the Central Bank may authorize a resident company to hold a local hard currency account with a local credit institution. The authorization of the Central Bank is notified to the credit institution and specifies the operations that may be credited to and debited from the account, as well as the duration of the authorization, which may not exceed two (2) years. The hard currency account cannot be replenished by payments in CFA francs or by debiting an account in CFA francs. Subject to conversion into CFA francs, foreign currency held in residents' hard currency accounts may not be withdrawn to cover local needs. The rules for renewing Central Bank authorization and closing accounts applicable to foreign accounts also apply to local hard currency accounts. Closure of the account automatically entails the transfer of the foreign currency in the balance to the credit institution in exchange for CFA francs, which will be returned to the Central Bank.

Alternative dispute settlement (ADS)

Alternative dispute settlement (ADS) methods (so-called in French “Modes Alternatifs de Règlement des Conflits” or “MARC”) are an integral part of business security. In Gabon, as well as in other French-speaking African countries, business law is governed by the provisions of the Uniform Acts of the Organization for the Harmonization of Business Law in Africa (so-called in French “Organisation pour l’Harmonisation en Afrique du Droit des Affaires” or “OHADA”).

- The Uniform Acts constitute common legislation for matters within their scope of application and apply uniformly to all OHADA member states. OHADA has established two Uniform Acts for Alternative dispute settlement, namely: The Uniform Act on Arbitration (so-called in French “Acte uniforme relatif à l’arbitrage”), in force since March 11, 1999, and revised on November 23, 2017.
- The Uniform Act on Mediation (so-called in French “Acte uniforme relatif à la médiation’’), which came into effect on March 15, 2018.

Alongside these ADS governed by the aforementioned Uniform Acts, traditional methods such as conciliation and settlement/transaction are also recognized. It is also worth noting that OHADA has a common jurisdiction, the Common Court of Justice and Arbitration (so-called in French “Cour Commune

de Justice et d'Arbitrage" or "CCJA"), which serves both as a Supreme Court for matters covered by the Uniform Acts and as an Arbitration Centre.

International arbitration – International arbitration in Gabon is governed by the provisions of the Uniform Act on Arbitration Law. This Uniform Act serves as the law applicable to arbitration in the 17 member countries of the Organization for the Harmonization of Business Law in Africa (OHADA), including Gabon, and is intended to apply to all arbitrations where the seat of the arbitral tribunal is located in one of the OHADA member states.

As such, the parties are free to determine the rules of law applicable to the merits of the dispute. The arbitral tribunal must therefore decide on the merits of the dispute in accordance with the rules of law chosen by the parties. Likewise, the parties are free to opt for either local or international arbitration:

- Directly in the binding agreement, by inserting an arbitration clause; or
- A posteriori, by concluding an agreement known as an arbitration agreement.

In both cases, the parties must specify the arbitration body (local or international) designated to settle disputes arising during the performance of the contract, and the place where the arbitration body is to sit. The following are examples of the international arbitration centres most frequently referred to in commercial contracts in Gabon:

- The Washington-based International Centre for Settlement of Investment Disputes (ICSID);
- The Paris-based International Chamber of Commerce (ICC);
- The London Court of International Arbitration (LCIA); or
- At regional level, the Abidjan-based Common Court of Justice and Arbitration (CCJA).

It should be noted that when an international arbitration centre is expressly designated by the parties in a contract (arbitration clause) or arbitration agreement, the rules of procedure to be applied are those set out in the rules of procedure drawn up by the said centre, taking into account the formal and substantive conditions for recourse to arbitration, as agreed by the parties.

In addition, where the parties do not so specify, the arbitrators are obligated to apply the rules of law they consider more appropriate, taking into account, where applicable, the usages of international trade.

Finally, arbitral awards rendered by international arbitration bodies are enforceable or may be enforced in an OHADA member country, by virtue of an *exequatur* decision issued by the judge of the court of the place where the award is to be applied.

Local arbitration - Gabon currently has an institutional arbitration system comprising three arbitration centres (Table 3). Institutional arbitration is arbitration carried out by a permanent institution known as an arbitration centre. Arbitration is organized in the same way as state justice, as embodied by the Tribunals and Courts, the only difference being that the arbitration centre selected is not empowered to make awards, this power being vested in the arbitrators appointed for this purpose.

The arbitration centre is required to confine itself to administering and supervising the arbitration proceedings, and to act as an interlocutor between the parties and the arbitrators.

The procedures to be followed for each of the above-mentioned arbitration centres are summarized hereafter:

Arbitration centres concerned	Legal form	Legal basis for territorial jurisdiction and arbitration proceedings
Common Court of Justice and Arbitration (CCJA)	Public Community Establishment **(Operational)**	OHADA Constitutive Treaty of October 17th, 1993 ; OHADA Uniform Act on Arbitration Law of November 23rd, 2017; Arbitration Rules of the Common Court of Justice and Arbitration of November 23rd, 2017
Centre of Arbitration, Mediation and Conciliation of Gabon (CAMC-GA)	Public Industrial and Commercial Establishment (**Non-operational)**	Implementing decree currently being adopted by the Gabonese government; Rules of procedure CAMC-GA of June 26th, 2015 ; CAMC-GA Arbitration Rules of June 26th, 2015
International Institute of Mediation, Arbitration and Conciliation (IIMAC)	Private Establishment **(Operational)**	Order N°27/MJGS/SG/DGAC/DAC of March 18th, 2020 of the Ministry of Justice, Guardian of the Seals; Rules of Procedure of December 11th, 2021 ; Rules of Arbitration and Mediation of December 21st, 2021; Charter of Ethics and Deontology of December 11th, 2021.

Table 3: Institutional arbitration centres in Gabon

Alongside arbitration, parties may also have recourse to the mediation procedure to settle their disputes. Mediation is governed by the provisions of the OHADA Uniform Act on Mediation of November 23rd, 2017. It is a process, in which the parties ask a third party to help them reach an amicable settlement of the dispute, arising from a contractual legal relationship. Mediation can be initiated by the parties (conventional mediation), at the request or invitation of a state court (judicial mediation), an arbitral tribunal or a competent public body.

Mediation may be institutional (recourse to a mediation institution) or ad hoc (outside a mediation institution). In both cases, the parties choose the mediator(s) by mutual agreement.

The mediated agreement is binding on the parties. It may be enforced. It may be filed with a notary, with acknowledgement of the parties' signatures.
The mediated agreement may also be subject to homologation or *exequatur* by the competent court.

Locally, the International Institute of Mediation, Arbitration and Conciliation (IIMAC) and the Centre of Arbitration, Mediation and Conciliation of Gabon (CAMC-GA) are also involved in mediation procedures. Procedures to be followed for each of the above-mentioned arbitration centres are listed in Table 4:

Arbitration center	Procedures for referral to the arbitral tribunal	Constitution of the arbitral tribunal and conduct of the arbitral proceedings	Nature and scope of arbitral awards
Common Court of Justice and Arbitration (CCJA)	Requests for arbitration are addressed to the Secretary General.	The CCJA's mission is to administer the arbitration process.	The Court examines draft arbitral awards within a

	The latter is required to appoint the arbitrator(s) (maximum 03) on the basis of the parties' choice (one arbitrator per party), or failing that, on the basis of the list of arbitrators registered with the Court. The defendant has thirty (30) days in which to submit its agreement to the choice of arbitrators.	It does not settle disputes, but appoints or confirms the arbitrators responsible for settling them. The arbitral tribunal is required to render its award within ninety (90) days of the order closing the proceedings, unless an extension is granted by the Court, ex officio or at the request of the arbitrators.	maximum period of one (1) month. Arbitral awards are binding on the parties and have the final authority of *res judicata* in each OHADA member State. It should also be noted that arbitral awards are subject to *exequatur*, by which they are rendered enforceable in the OHADA member States. *Exequatur* is granted by an order of the President of the Court or a judge delegated for this purpose
Centre of Arbitration, Mediation and Conciliation of Gabon (CAMC-GA)	The CAMC-GA is seized upon request for arbitration addressed to its Secretary General, who is required to notify the opposing party. The defendant has fifteen (15) days from receipt of the request for arbitration to submit its agreement and observations.	The Arbitral Tribunal is constituted by the appointment and confirmation of one or three (3) arbitrators. This appointment is made either by the parties or by the Arbitration and Mediation Committee, from a list drawn up by the Centre or any other list accepted by the General Secretariat. The procedure applicable before the arbitral tribunal is that set out in the Centre's arbitration rules, and the language of communication is French. Arbitral awards are made within six (6) months of the signature of the Terms of Reference.	The Arbitration and Mediation-Conciliation Committee examines draft arbitral awards before they are signed. Awards rendered by the arbitral tribunal are *res judicata* in the same way as decisions rendered by national courts. They may be enforced after obtaining *exequatur* from the local court.
The International Institute of Mediation, Arbitration and Conciliation (IIMAC)	Requests for arbitration shall be addressed in writing to the Permanent Administrator, by postal service, e-mail or shall be deposited at IMAC's registered office.	The arbitral tribunal is composed of a sole arbitrator or three (3) arbitrators. To constitute the arbitral tribunal, IMAC proposes to the parties, the	The original of any award rendered in accordance with the Rules shall be deposited with the Permanent Administration of the Institute.

	The defendant has thirty (30) days from notification of the request by the Permanent Administrator to reply to the claimant.	arbitrators registered on the list of arbitrators approved by the Institute. The parties remain free to choose other arbitrators. Arbitral awards are rendered within six (6) months from either the date on which the last signature of the arbitral tribunal or the parties has been affixed to the Terms of Reference, or from the date on which the arbitral tribunal is notified by the Permanent Administration of IMAC's approval of the Terms of Reference	The award is binding on the parties as soon as IMAC notifies them of a certified copy. In order to become enforceable, the arbitral award must, at the request of one of the parties, be *exequatur* by the competent Court.

Table 4: Procedures to be followed for each of the above-mentioned arbitration centres in Gabon.

Immigration Rules in Gabon

The conditions of residence in Gabon are regulated by the Law No. 5/86 (June 18, 1986) - admission and residence of strangers in Gabon, and related amending and implementing texts (Gabon - Loi no 5/86 du 18 juin 1986 fixant le régime d'admission et de séjour des étrangers en République gabonaise. (ilo.org)).

The law classifies foreigners into **two main groups**:

- **Temporary Visitors**: These are individuals staying in Gabon for less than 3 months, such as tourists, temporary workers, and business travellers. Temporary workers require entry permits and temporary work authorizations, while visitors from countries without immigration agreements with Gabon need visas.
- **Residents**: This category includes salaried contract workers in both public and private sectors, self-employed individuals, and family members of residents. Private sector foreign employees must provide various documents, including passports, work permits, entry permits, repatriation commitments, and accommodation commitments. Public sector contract workers have simpler requirements. Self-employed workers need approval from the relevant ministry.

Entry conditions are also established for family members, diplomats, experts, and cross-border workers. Foreigners over 16 must obtain a foreign resident's residence card within one month of arrival, which extends to their spouse and children. Employment depends on compliance with immigration regulations and possession of a work permit tied to a specific profession. Termination of employment leads to document cancellation and repatriation. A security deposit may be required if repatriation isn't guaranteed. Foreigners must leave the country upon the expiration of their stay and obtain an exit permit.

The law outlines procedures for deportation and expulsion, with penalties in place for the illegal employment of foreign workers, including fines and imprisonment.

Transfer pricing documentation and reporting requirements

As part of its campaign against the erosion of tax bases, the Organization for Economic Co-operation and Development (OECD) has launched the "BEPS Project" (Base Erosion Profit Shift), aimed at enabling countries to effectively combat this issue.
The Action Plan is structured around 15 specific Actions, including Action 13 on transfer pricing. This action is designed to require multinational companies to justify the prices applied in transactions between related entities (i.e., belonging to the same group).

Gabon, which is also a member of the Inclusive Framework of the BEPS Project, has adopted some of these measures as listed below (but the implementation may have evolved since January 2022)

- Transfer Pricing Rules: Gabon may have implemented or updated its transfer pricing rules to ensure that transactions between related entities are conducted at arm's length, preventing profit shifting.
- Country-by-Country Reporting (CbCR): Gabon may have required multinational enterprises to file CbCR, which provides tax authorities with detailed information on the global allocation of income, taxes paid, and other indicators.
- Exchange of Information: Gabon may have enhanced its commitment to exchanging tax-related information with other countries to combat tax evasion more effectively.
- Introduction of Anti-Abuse Rules: Gabon may have introduced anti-avoidance measures and rules to prevent companies from exploiting gaps in tax legislation.
- Updating Tax Treaties: Gabon might have revised its tax treaties to include BEPS-related provisions, such as those pertaining to the limitation of benefits, to prevent treaty abuse.
- Implementing Double Taxation Avoidance Agreements: Gabon may have signed new double taxation avoidance agreements (DTAs) with other countries or updated existing ones to align them with BEPS recommendations.
- Strengthening Transfer Pricing Documentation: The country may have required companies to maintain comprehensive transfer pricing documentation, including master files and local files.
- Enhanced Enforcement: Gabon's tax authorities may have increased their efforts to enforce existing tax laws, especially in cases involving multinational corporations and cross-border transactions.

Deductibility of financial expenses

Loans from shareholders to their companies are authorized in Gabon, notably through advances on shareholders' current accounts.

Under the provisions of article 11 of the Gabonese Tax Code, for an expense to be deductible, it must meet the following general conditions for deductibility. It must:

- Be incurred in the direct interest of the company's operations, or relate to the normal management of the company;

- Correspond to an actual expense supported by sufficient evidence;
- Result in a reduction in the company's net assets;
- Be included in expenses for the year in which it was incurred;
- Not be excluded from deductible expenses by law;
- Not be considered as an abnormal act of management.

With regard to the deductibility of interest on shareholder loans, in addition to the general conditions for deductibility set out above, Article 11-II of the Gabonese Tax Code specifies that interest paid to partners or shareholders as remuneration for sums they make available to the company is deductible under the following conditions:

- The company's capital is fully paid up;
- Interest is deductible within the limit of the Central Bank (BEAC) advance rates plus two (2) points. For information, the rate of BEAC advances is currently set at 5%,; that is, a deduction limit of 7%;
- Interest paid to partners or shareholders who have *de facto* or *de jure* control of the company is deductible only to the extent that the amount of the loan does not exceed, for all said partners or shareholders, one and a half times the paid-up share capital.

However, if the company paying the interest is undercapitalized, only part of the interest will be deductible.

A company is deemed to be undercapitalized if the amount of interest it pays to all affiliated companies simultaneously exceeds the following three (3) limits for the same financial year:

- The product corresponding to the amount of said interest multiplied by the ratio existing between one and a half times the amount of shareholders' equity, assessed at the company's discretion at the beginning or end of the financial year, and the average amount of sums left or made available by all affiliated companies (amount of sums loaned);
- The amount of interest paid to the company by affiliated companies;
- 25% of pre-tax income before non-recurring items, plus interest, depreciation and amortization taken into account in determining pre-tax income before non-recurring items, plus the share of lease payments taken into account in determining the sale price of the asset at the end of the contract.

The fraction of interest exceeding the highest of these limits may not be deducted for the year in question, but for the following year, in an amount equal to the difference between the third limit mentioned above and the amount of interest deductible (see deductibility limits below).

The balance not deducted at the end of the year in question is deductible in subsequent years, under the same conditions, less a 10% discount applied at the start of each year.

Pursuant to the combined provisions of Articles 116 and 206 of the General Tax Code, interest and dividends are subject to a 20% withholding tax, unless there exists an international tax treaty.

In this respect, please note that international tax treaties signed with the following countries are in force in Gabon:

- CEMAC countries (Cameroon, Central African Republic, Congo, Equatorial Guinea, Chad);
- France;

- Belgium;
- Canada;
- Morocco.

Note, however, that no international tax treaty signed with Gabon reduces the withholding tax rate on dividends and interest to 0%.

In Table 5, the following reduced rates shall alone be applied:

Tax Treaties	Dividends	Interest
CEMAC countries	• 5% maximum if the beneficiary is a parent company holding at least 25% of the capital of the distributing company • 10% maximum otherwise.	Maximum Rate: 10%
France	15 %	10%
Canada	15%	10%
Belgium	18%	15%
Morocco	15%	10%

Table 5: Tax treaties for dividends and interests

Other levies applicable to the mining sector in Gabon

Companies holding mining titles in Gabon are required to pay a range of fees and royalties to the Gabonese authorities. These include fixed entrance fees, surface royalties, and mining royalties.

An overview of the financial and custom taxes relative to the mining sector is presented in Table 6.

Type	Characteristics	Rate	Legal reference
Surface royalties	• Annual • Function of the surface area of the exploration/exploitation licence		Art. 196 Mining Code
Corporate income tax on mining society	• Direct income on all benefits of a society	• 35 % • Exoneration for new project; • 5 years exoneration for 10 years exploitation project • 8 years exoneration for 20 years exploitation project	Art. 3 & 4 Income General Code
Proportional mining tax	• Annual • Due by the owner of an exploitation licence • Concern all exploited commodities, except those stored or transformed on site	• Base metals: 3-5 % • Precious metals: 5-8 % • Gemstones: 8-10 %	Art. 202 Mining Code

Customs duties	• **Temporary admission regime** for: materials, furniture's, equipment's included in the exploration/exploitation project and validated by the Ministry of Mines, vehicles excepted those used for people transportation, temporary imported in Gabon by exploration/exploitation owners	• Exemption for all imported equipment's for new project and those used for local transformation • 5 % for equipment's directly and definitively necessary for the exploitation.	Art. 227, 228 & 231 Mining Code
	• **Exemption of custom duty regime** for: equipment's, furniture's, and all items used for geological and mining exploration, including construction furniture's		

Table 6: Taxes relative to the mining sector.

Fixed entrance fees ("*droits fixes d'entrée''*)[2]

Mining titles	**Fixed fee amounts (in FCFA)**
Reconnaissance Permit	500.000
Exploration Licence	1.500.000
Small scale exploitation licence	7.500.000
Large scale exploitation licence	15.000.000 to 30.000.000
Tailings & residues exploitation licence	3.500.000

Table 7: fixed entrance fees for mining titles

Surface Royalties (''redevance superficiaire")[3]

Licence type	Attribution	Renewal
Exploration licence		
	1,000/km^2/year	First: 3,000/km^2/year Second: 5,000/km^2/year
Small scale exploitation licence		
£ 10 km^2	3.000.000/km^2/year	5.000.000/km^2/year
> 10 £ 20 km^2	4.000.000/km^2/year	6.000.000/km^2/year
> 20 £ 30 km^2	5.000.000/km^2/year	7.000.000/km^2/year
> 30 £ 40 km^2	6.000.000/km^2/year	8.000.000/km^2/year

[2] Article 74 of the Mining Code
[3] Article 75 of the Mining Code

> 40 £ 50 km²	7.000.000/km²/year	9.000.000/km²/year
10 years large scale exploitation licence		
£ 10 km²	5.000.000/km²/year	6.000.000/km²/year
> 10 £ 20 km²	6.000.000/km²/year	7.000.000/km²/year
> 20 £ 30 km²	7.000.000/km²/year	8.000.000/km²/year
> 30 £ 40 km²	8.000.000/km²/year	9.000.000/km²/year
> 40 £ 50 km²	9.000.000/km²/year	10.000.000/km²/year
> 50 £ 70 km²	10.000.000/km²/year	11.000.000/km²/year
> 70 £ 90 km²	11.000.000/km²/year	12.000.000/km²/year
> 90 £ 100 km²	12.000.000/km²/year	13.000.000/km²/year
³ 100 km²	100.000/km²/year	
20 years large scale exploitation licence		
£ 10 km²	6.000.000/km²/year	7.000.000/km²/year
> 10 £ 20 km²	7.000.000/km²/year	8.000.000/km²/year
> 20 £ 30 km²	8.000.000/km²/year	9.000.000/km²/year
> 30 £ 40 km²	9.000.000/km²/year	10.000.000/km²/year
> 40 £ 50 km²	10.000.000/km²/year	11.000.000/km²/year
> 50 £ 70 km²	11.000.000/km²/year	12.000.000/km²/year
> 70 £ 90 km²	12.000.000/km²/year	13.000.000/km²/year
> 90 £ 100 km²	13.000.000/km²/year	15.000.000/km²/year
³ 100 km²	120.000/km²/year	
Tailings and residues exploitation licence		
	40.000/km²/year	

Table 8: Surface royalties (attribution & renewal)

Mining royalties (“redevances minières”)

Type of mineral substance	**Rate**
Base metals and other commodities	5-10 %
Precious metals exportation and/or selling	5 % of the market value
Gemstones exportation and/or selling	5 % of the market value
Diamond importation	10 % of the market value
Other precious commodity importation	8 % of the market value
Diamond origine certificate	*1.000.000 FCFA*
Other precious commodity origine certificate	500,000 FCFA

Table 9: Mining royalties according to commodities

Funded by
the European Union

Exit conditions for mining holders

Exit procedures for Mining Title Holder: An exploration or mining licence holder can give up his property rights before the expiration date of his authorization by advertising the Ministry of Mines at least 3 months before the renunciation date for an exploration licence, the 12 months before the renunciation date for a mining licence.

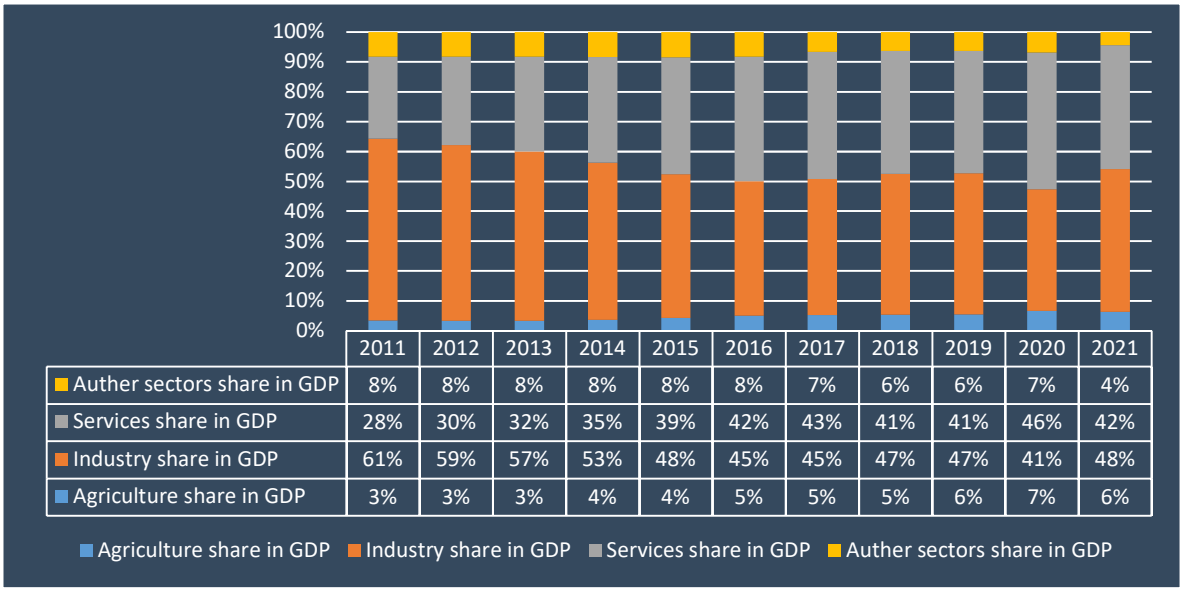
Rules governing the merger and demerger of companies in Gabon: The rules governing the merger or division of companies are essentially defined by the provisions of the OHADA Uniform Act on the Law of Commercial Companies and Management of Economic Interest.
However, when these operations involve companies holding mining titles, they are also subject to prior administrative authorization.
The various steps of a merger operation are detailed in the table below.

Tax implications of transfers of mining titles: from a tax point of view, the transfer (direct or indirect) of mining titles has implications in terms of
The application of these various taxes is detailed in the table below.

3.2. Macroeconomic context for in-country financings

Gross Domestic Product (GDP) analysis

High dependence on oil production



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Auther sectors share in GDP	8%	8%	8%	8%	8%	8%	7%	6%	6%	7%	4%
Services share in GDP	28%	30%	32%	35%	39%	42%	43%	41%	41%	46%	42%
Industry share in GDP	61%	59%	57%	53%	48%	45%	45%	47%	47%	41%	48%
Agriculture share in GDP	3%	3%	3%	4%	4%	5%	5%	5%	6%	7%	6%

Figure 4: Gabon - Distribution of GDP across economic sectors from 2011 to 2021 [%][4]

[4] Source: Statista

Gabon is a historically stable country located in a volatile region of the world and has significant economic advantages: a small population (roughly 2 million), an abundance of natural resources, and a strategic location along the Gulf of Guinea.

As the 4th largest oil producer in Sub-Saharan Africa, Africa's 2nd largest producer of wood and one of the leading producers of **manganese**, Gabon posted strong economic growth over the past decade, driven mainly by oil and manganese production. In 2020, the oil sector (included in "Industry") accounted for 38.5% of GDP and 70.5% of exports despite efforts to diversify the economy.

However, thanks to high oil production and despite the impact of the war in Ukraine, Gabon's economy is gradually recovering, supported by stronger external demand and higher oil prices.

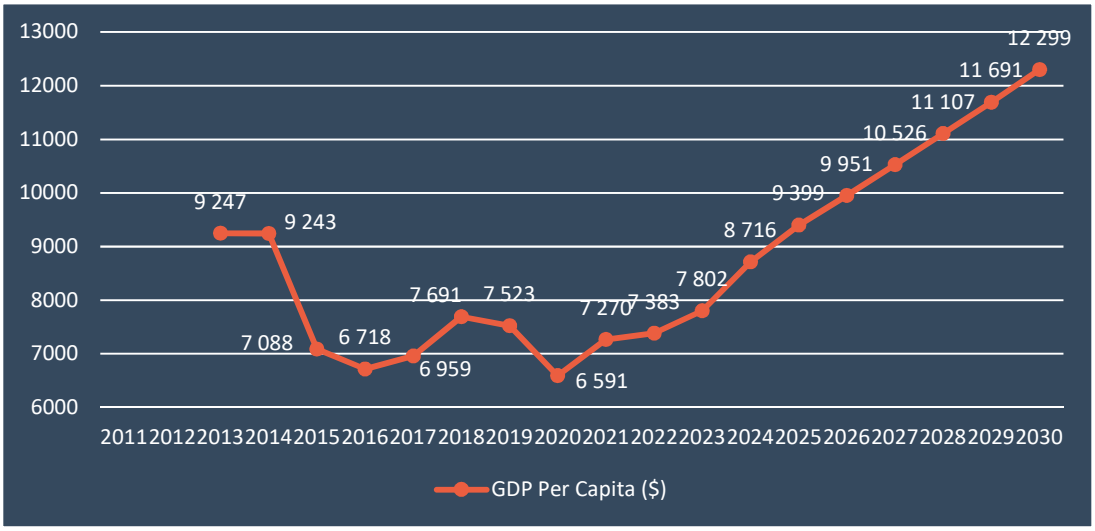


Figure 5: Gabon - Historical GDP per capita from 2011 to 2021 & projected estimations from 2022 to 2030 [5]

There was a decreasing trend of GDP per capita from 2013 to 2020 with trend reversal in 2021 with the raise of oil prices. GDP per capita in Gabon is expected to raise steadily to 12 299 $ in 2030, which is almost the double of 2020.

[5] (Sources: World Data Bank, S&P)

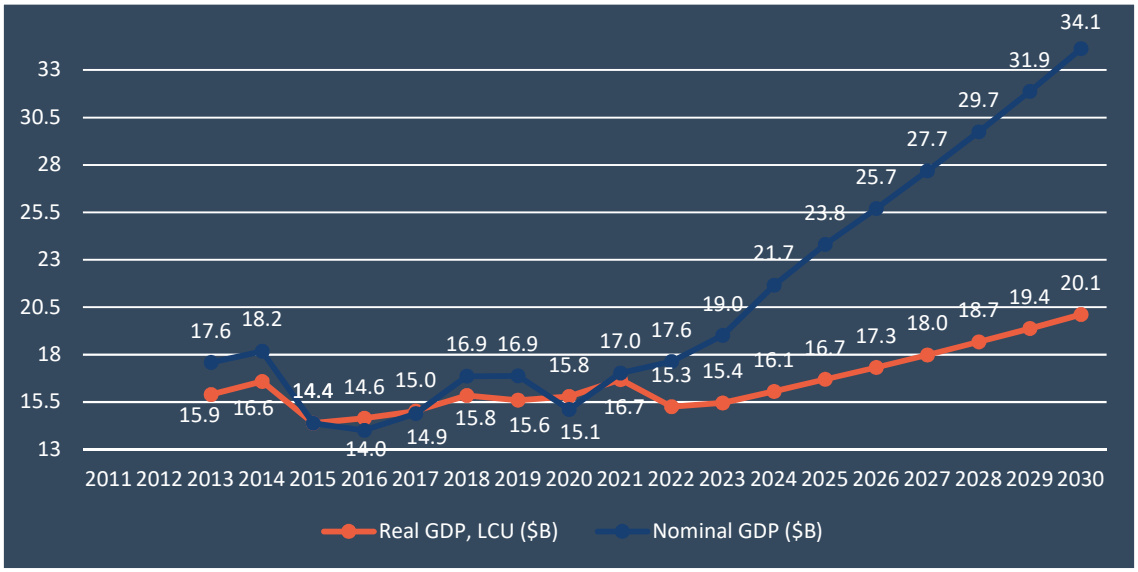


Figure 6: Gabon – Historical and projected nominal GDP and real GDP growth[6]

Real as nominal GDP stayed closed and almost constant until 2022. With the increase of inflation, we observe a stall between these two indicators. Real GDP is expected to increase in the coming years to reach 20.1 $B in 2030 (approximately 5 $B than today) with an increasing growth until 2024. After, the real GDP growth is expected to be meanly of 3.8 $B.

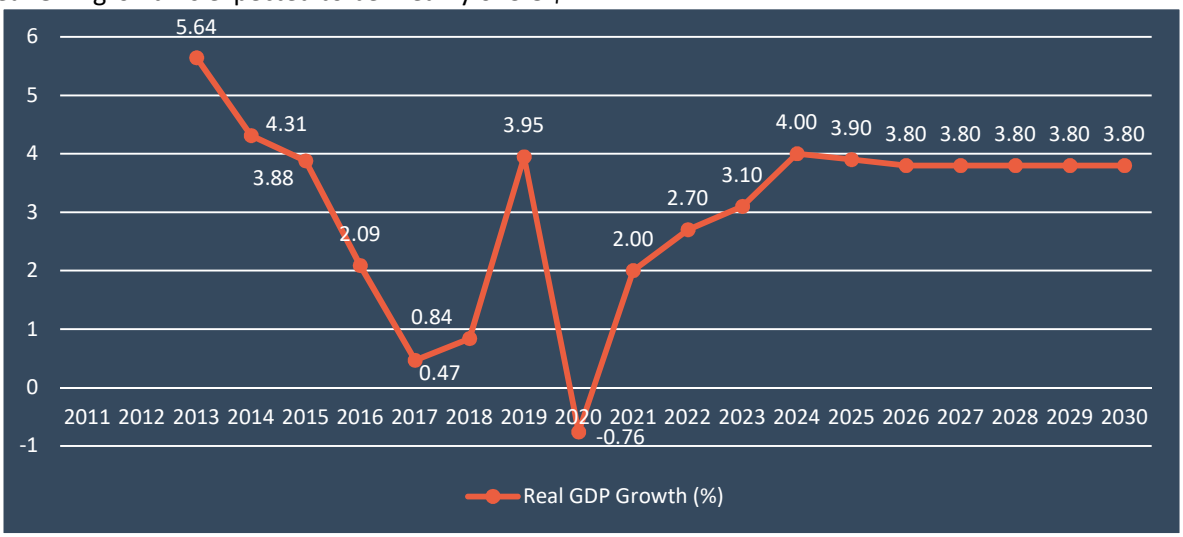


Figure 7: Gabon – Historical and projected real GDP growth [%]

Prospective overview, the importance of Gabon economic diversification

Gabon remains highly dependent on its revenue generated by hydrocarbon and mining productions. The price outlook for these commodities being high in the short and medium term, this bodes well for Gabon. However, in the long term, the economic health of Gabon rests on the diversification of its economy.

[6] Sources: S&P

Foreign Direct Investment (FDI) analysis[7]

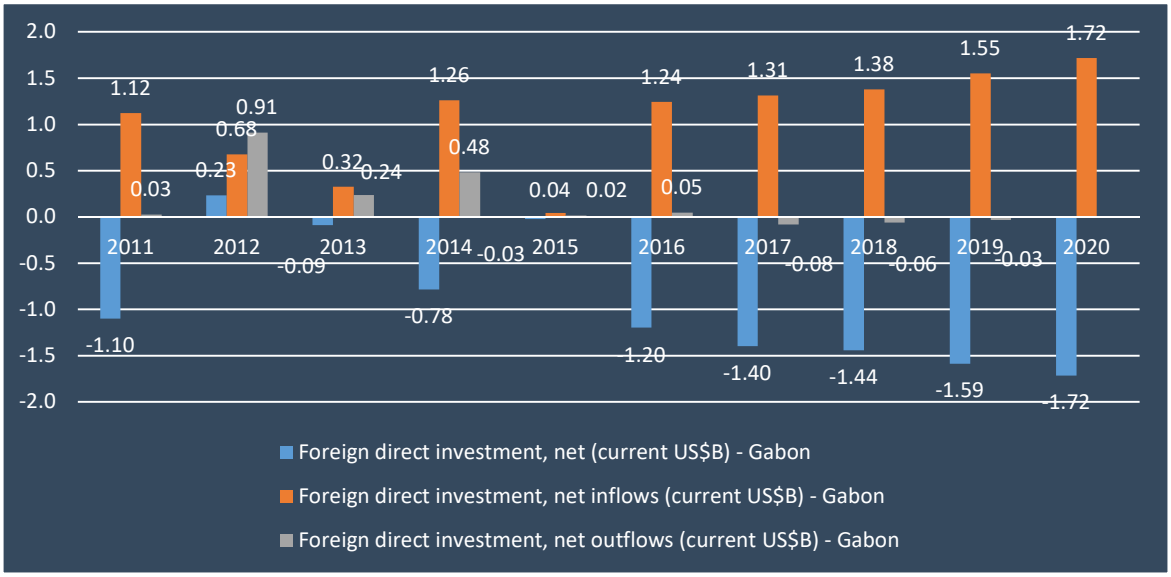


Figure 8: Gabon - FDI net, net inflows, net outflows from 2013 to 2020 (Source: World Data Bank)

Historical overview

From 2016 to 2020, foreign investments in Gabon have increased, widening the striking difference with Gabonese investments abroad, which are approximately 50 times lower. FDI inflows into Gabon increased from USD 1.5 billion to USD 1.7 billion between 2019 and 2020. The restrictive measures adopted to combat the pandemic and address the decline in oil prices in 2020 have resulted in rising unemployment and a sharp drop in domestic revenue mobilization, followed by a decline in exports and foreign direct investment, leading to a significant fiscal deficit. According to UNCTAD Investment Trends Monitor, global FDI flows rebounded strongly in 2021.

Main sectors for FDI inflows

The oil and mining sectors are the main destinations for FDI in the country, however, the agrifood and infrastructure sectors have recently received the largest FDI flows, notably from the Singaporean Olam group.

Main investors

China is increasingly present in the country, as illustrated by the recent EUR 180 million investment of Chinese energy firm TBEA in a hydropower project, and the USD 50-100 million progressive investment by Jiangsu Wanlin Modern Logistics Co. in the construction of a high-quality furniture factory in Libreville. Morocco is also a major investor in the country, with companies investing in the service sector, mining, infrastructure and construction. France has historically had a predominant place in the FDI stock of Gabon as hundreds of French companies have established branches in various sectors: oil exploitation, mining, timber, agribusiness, building and civil engineering works, financial services, water and electricity concessions, etc.

[7] Export Entreprises SA, 2022

Prospective overview

The government is actively trying to attract FDI. Its development strategy (Plan Stratégique Gabon Emergent – PSGE) aims at developing Gabon into an emerging economy by 2025 by diversifying the country and transforming Gabon into an internationally competitive investment destination. The plan calls for increased public and private investment, modernised infrastructure and improved human capital. Recently, the public-private partnership (PPP) agricultural programme (GRAINE) was launched, providing new oil palm plantations and the development of food crops.

Although Gabon is taking steps towards making the country a more attractive destination for foreign investment, it remains a difficult place to do business, especially without in-country or francophone experience. Foreign firms are active in the country, particularly in the extractive industries, but the difficulty involved in establishing a new business and the time it takes to finalize deals are impediments to increased private sector investment. Although the Gabonese government is taking a more active role to ensure transparency in extractive industries, investors are still waiting for key reforms to be established in law and in practice even though:

- Gabon enacted a new mining code in 2015;
- Gabon proposed revisions to its 2014 hydrocarbons code to draw more investors with greater flexibility and attractive financial terms;
- The Gabonese government implemented the new hydrocarbons code in 2019, leading to several new offshore production sharing agreements, some of which materialised in 2020.

Forex (FX) and inflation

Exchange rate

Currently the founding principles that act on the Franc Zone are those recalled in the conventions of 1972 and 1973.

- Fixed parities with the anchor currency
    - The rate of the CFA franc is pegged to that of the euro with a fixed parity rate. Nowadays 1 EUR = 655.957 CFA francs.
- Free transferability
    - Transfers are free within the Franc Zone, whether they are current transactions or capital movements.
- Guarantee of convertibility by the French Treasury and centralization of foreign exchange reserves
    - The Treasury undertakes to ensure the convertibility of the currencies issued by the issuing institutions of the zone (the BCEAO, the BEAC and the Central Bank of the Comoros). In return, the African central banks must deposit a portion of their foreign exchange reserves there (excluding current cash and transactions with the IMF-International Monetary Fund) up to 50% for the BCEAO and the BEAC. Since 1975 these assets have also had an exchange guarantee with the SDR (Special Drawing Right). The centralization of foreign exchange reserves is also done at the regional level with the central banks of the states in the zone.

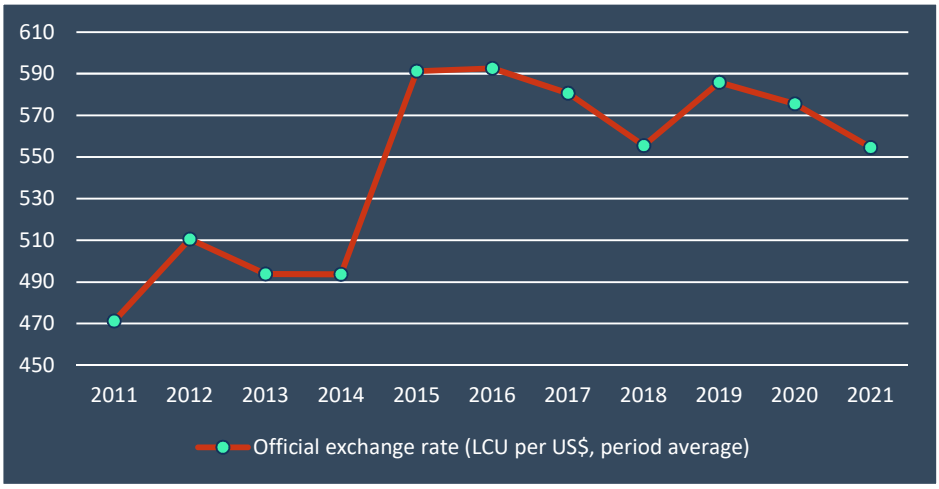


Figure 9: Gabon - Historical official exchange rate (CFA per US$, period average)

Therefore and according to 9, the average annual exchange rate generally decreased between 2019 and 2021 but it decreased sharply since May 2021 and this downward trend should not be reversed in 2023 according to the (Trading Economics, 2022) due to the high inflation in 2022 and likely in 2023.

The prime rates established in March 2022 by the BEAC should guarantee internal and external monetary stability. The balance on the current account is likely to improve, owing to the rising price of exported raw materials (oil, palm oil, gold, and manganese), reaching a surplus of 2.9% of GDP in 2022 and 0.7% in 2023. These outcomes are, however, subject to the execution of ongoing structural reforms as well as the pandemic's trends and the Russia–Ukraine conflict.

Inflation (IMF- International Monetary Fund, 2022)

Historical and prospective overview

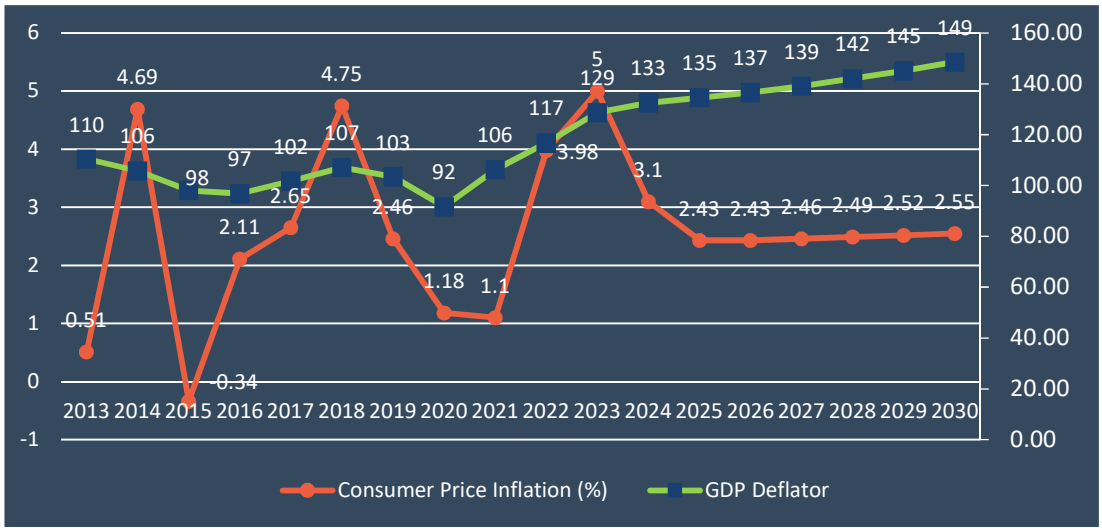


Figure 10: Gabon - Historical and projected data on inflation indicators[8]

[8] S&P Global, 2022

First, CPI (Consumer Price Index) is based on the prices of goods and services consumers buy from a fixed basket of goods. On the other hand, the GDP deflator covers all domestic products and services produced in an economy. CPI includes foreign or imported goods, while the GDP deflator is exclusively for domestically produced goods. This is why the evolutions of these two indicators are different.

We observe a change in trend in 2020 with an increase in the GDP deflator which breaks its continuous decline since at least 2013 mainly due to low oil prices. In 2021, consumer price inflation declined to 1.1% from 1.18% in 2020, owing to control of the price of transport and food products.

As regards consumer price inflation, it is supposed to reach 4% in 2022 and decrease by 2% between 2023 (peak at 5% versus 4% in 2022) and 2024 to stabilize around 2.43% in 2025 with slight growth until 2028 to reach 2.55%. For 2022 and 2023, the AFDB projects inflationary pressures, owing to the Russia–Ukraine conflict, which will affect the price of food and transportation.

Gabon is facing liquidity pressures as well as arrears problems. Domestic and external arrears have accumulated in 2021. In 2022, tensions on liquidity continues, with debt service accounting for 48.9% of revenue. The service ratio of the public debt to revenue and the ratio of interest burden to revenue are expected to reach average around 53% (compared to 80% in 2021) and 18% (compared to 19% in 2021), respectively, at middle term. Despite this downward trend, the planned redemption of a Eurobond in 2025 and the normalization of monetary policy in advanced and emerging countries is still a significant risk.

Focus on 2022

The war in Ukraine has fueled global inflationary pressures, driving up commodity prices. IMF staff estimates based on historical data suggest that it takes up to a year for global commodity prices to feed through to prices in Gabon due to weak domestic demand, control prices and other distortions that limit the pass-through of imported inflation.

In this context, average inflation over 12 months in Gabon stood at 2.9% in March 2022. Before the war in Ukraine, inflation measured by the CPI (Consumer Price Index) started an uptrend. It has passed from 0.6% in September 2021 to 1.7% in December 2021 (year-on-year). If the increase in food prices was at the origin of this evolution, an increase in inflation excluding food and energy has also been visible, suggesting a generalized increase for the entire CPI basket. The war in Ukraine has heightened tensions inflationary in 2022, mainly via the rise food prices, which represent more than 40% of the CPI basket. This is reflected in food inflation, which reached 3.5% in March 2022. According to IMF staff calculations, the direct impact of the increase in food prices over inflation is 0.8%. The contribution of price increases in fuels, directly for consumers and via costs for companies, has been limited by state fuel subsidies. Core inflation, excluding food and energy, also stood at 2.9% in March 2022, compared to 1.4% in December 2021, under the effect of the rising prices for household furnishings and capital goods, health services, leisure (hotel and restaurant) and other goods and services.

On March 28, the BEAC's Monetary Policy Committee raised the key rate from 3.50% to 4% and the rate of its marginal lending facility from 5.25% to 5.75%.

The tightening of monetary policy in advanced countries to deal with the rising global inflation is also a risk for Gabon. Major central banks, such as the Federal Reserve and the Bank of England, have already

started to raise their policy rates to deal with high national inflation rates. The central banks of several emerging countries reacted by intervening in the same way. While easing global inflationary pressures, these decisions could also result in a slowdown in economic activity on a global scale and by a reduction in the flow of capital to the region.

Sovereign debt (World Bank, 2022)

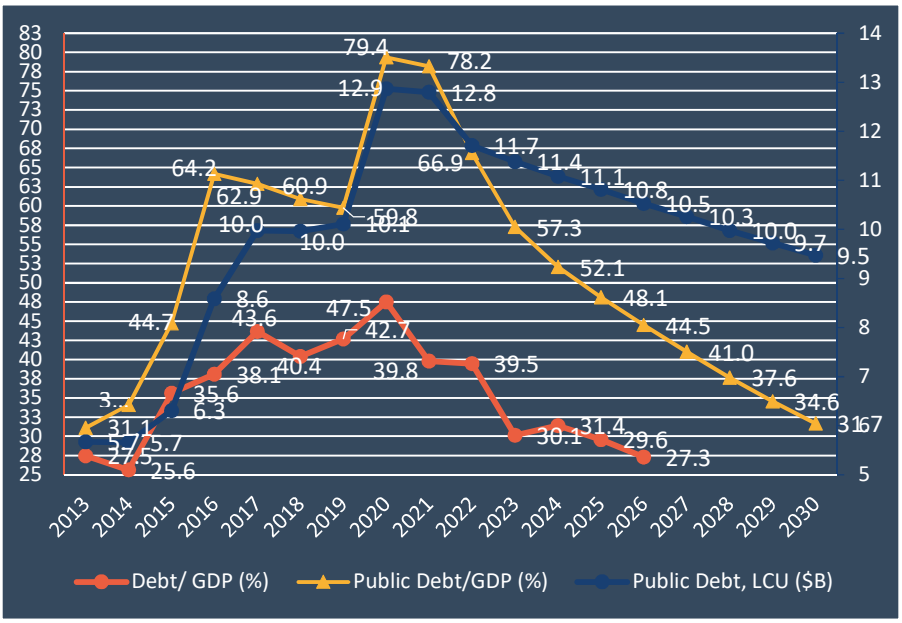


Figure 11: Gabon - Historical and projected data public debt and debt/GDP[9]

The budget deficit widened from 2.1% in 2020 to 3.4% because of a rise in health crisis–related capital and current spending. (African Development Bank Group, 2022) Public debt is estimated at 66.9% of GDP in 2022, down from 78.2% in 2021.

With the rise in oil prices and reforms initiated within the framework of the IMF program, the budget balance is forecast to post a surplus of 2.3% of GDP in 2022 and 3.4% in 2023. However, the rising cost of living could increase household vulnerability. Public debt is forecast to decline further to 57.3% of GDP by 2023 and continue to decrease over time under the effect of the envisaged consolidation of public finances, the increase in the price oil, projected growth and better debt management.

The debt sustainability analysis (DSA) shows that Gabon's public debt remains viable, but not with a high probability. In the absence of shocks, adverse events or slippages, the envisaged fiscal consolidation will be sufficient to place the debt on a decidedly downward trajectory. However, funding needs and service debt ratios will remain high over the medium term, limiting fiscal space and highlighting refinancing risks. IMF encouraged the authorities to improve debt management in line with technical assistance provided in FY2019.

[9] S&P Global, 2022

Regional economic alliances/uniform regulatory, accounting, legal frameworks as these may facilitate trade and foster a business-friendly environment

Gabon's commercial ties with France and China remain very strong, but the government continues to seek to diversify its sources by courting investors from the rest of the world.

Exports		Rank	Imports	
China 31.6%		1		24.8% France
South Korea 13.6%		2		14.3% Belgium
Netherlands 6.8%		3		13.9% China
Ireland 6.5%		4		5.4% United Sates
Italy 4.7%		5		3.2% Australia

Figure 12: Trade structure by destination/origin (% of total, 2021) (Allianz, 2022)

Exports	Rank	Imports
Petroleum, petroleum products and related materials 58.5%	1	9.2% Other industrial machinery and parts
Cork and wood 17.1%	2	9.0% Road vehicles
Metalliferous ores and metal scrap 13.5%	3	7.4% Meat and meat preparations
Cork and wood manufactures (excluding furniture) 2.7%	4	7.2% Iron and steel
Road vehicles 1.1%	5	7.2% Specialised machinery

Figure 13: Trade structure by product (% of total, 2021) (Allianz, 2022)

Restrictions on imports/exports and overview of time and costs relating to customs clearance (International Trade Administration, 2022)

Overview

All categories of products may be imported into Gabon with two exceptions – sugar and eggs. The Ministry of the Interior regulates the private import of all firearms and munitions. Automobiles more than five years old may not be imported, although there is a diplomatic exemption.

Trade barriers

Some products such as soap, cooking oils, and flour are heavily taxed to protect domestic production.

There are few barriers in the petroleum sector. Labor laws mandate that 80 percent of a firm's workforce must be local hires. While this law has not always been enforced, there is heavy pressure by the labor unions to enforce it in the oil sector and labor disputes are frequent. Gabon's labor code is heavily skewed in favor of workers and termination can be an arduous and costly endeavor. Labor disputes can effectively stall operations for even large firms for indefinite periods.

Import tariffs

In April 2018, Gabon signed a free trade agreement to create a single African market of economic cooperation called the AfCFTA (African Continental Free Trade Area) with 44 out of 55 other Africa Union member states. The free trade area will only take effect when all protocols are finalized and ratified by at least 22 countries.

Gabon organized in June 2018 a series of a three-day workshop training sessions for economic stakeholders and National Committees for the Admission of Industrial Products to the ECCAS-CEMAC Preferential Tariff regime. The training was to enable Gabonese companies to take advantage of the opportunities offered by the approximately 170 million-strong community market of the sub-region, which will extend to the rest of Africa with the advent of the AfCFTA.

Gabon and its neighbours follow the import tariff structure of Central Africa. Import tariffs include:

General Systems of Preference: no import tariffs for goods produced within a CEMAC-member country.

Common External Tariff: 5 percent for Category One products (e.g., basic products), 10 percent for Category Two (e.g., raw materials), 20 percent for Category Three (e.g., intermediate products such as most food), and 30 percent for Category Four (all other products).

Processing Fee (Redevance d'utilisation du système informatique, RUSID): can vary from 2%-80% of the cost of insurance and freight (CIF).

The Value Added Tax (VAT) is generally 18 percent. A reduced VAT of 10 percent is applicable to mineral water, cement, sugar, and chicken produced in Gabon. Milk products, butter, margarine, cereals, medicine and medical supplies, and fertilizer are exempt from VAT. Companies operating in the Special Economic Zone are exempt from customs taxes and some income taxes.

3.3. Political context for in-country financings

Introduction

Gabon has enjoyed political stability since gaining independence in 1960, attributed to its small population, abundant natural resources, lack of ethnic tensions, and effective political elite co-option. However, concerns arose over former President (2009 – 2023) Ali Bongo's health and electoral fraud allegations in 2016, leading to violent opposition protests. Most recently, less than an hour after the Centre for Gabonese Elections (CGE) declared President Ali Bongo as the winner of the 26 August presidential elections, military officers, led by Gen. Brice Clotaire Oligui Nguema – the commander-in-chief of the elite Republican Guard – staged a coup. They announced the cancellation of "rigged" elections, the dissolution of national institutions, and the establishment of a Committee for the Transition and the Restoration of Institutions (CTRI). Oligui was sworn-in as interim president on 4 September. The security situation has remained calm since the coup and pro-junta demonstrations were recorded in Libreville and Port-Gentil, reflecting popular support for the junta. Oligui has consolidated his power since the coup and commands broad support within the army, making a second coup unlikely in the coming weeks. Oligui

appointed on 6 September opposition figure Raymond Ndong Sima as the new prime minister. Sima unveiled a 26-member transition government on 9 September.

The country's recent economic diversification efforts, focusing on mining and agri-business, have made Gabon the fourth-largest global producer of high-quality manganese, primarily centered in the Moanda area, with about 10 million tons extracted annually.

Gabon's mining sector, constituting 6% of its GDP, includes valuable resources like gold, iron ore, niobium, and uranium. While the country has a mining code aimed at providing stability to investors, the focus has mainly been on manganese, with limited progress in other mining projects, which have faced criticism from NGOs for environmental and revenue distribution issues.

Since its arrival in power, the junta has been keen to show continuity in the economic sector.

Political environment

Background

Gabon has maintained political stability since gaining independence in 1960. Under Omar Bongo's rule (1967-2009), an oil-driven economy thrived, preserving ethno-regional balance. However, recent years have seen political challenges, as Ali Bongo's centralized and reformist approach caused divisions within the ruling Gabonese Democratic Party. The 2016 presidential election, marred by fraud allegations, led to civil unrest and heavy repression. Internet access was suspended, and protests eventually subsided with Bongo's confirmed victory by the Constitutional Court. The 26 August presidential elections also took place in a tense climate, with irregularities in polling stations reported by the opposition throughout the country. The government also imposed an internet shutdown, and a nationwide curfew from 19.00 to 06.00.

The 30 August coup has reflected internal power struggle within the political establishment. Oligui has deep-rooted connections to the Bongo family, having once served as an aide-de-camp to former president Omar Bongo Ondimba (1967-2009). However, once Ali Bongo came to power, he sent Oligui on several embassy postings abroad in a reported forced exile, before appointing him head of the Republican Guard in 2020. The coup could be seen as an attempt to target a faction of the Bongo “clan” led by First Lady Sylvie Bongo and her son Noureddin, which had grown in influence in recent years. Moreover, it seems that section of the political and military establishment, seeing Bongo’s poor performance in the polls, have opted to take over and organise a smooth transition of power that protects the interests of the elites.

Current dynamics

Oligui on 7 September appointed opposition figure Sima as prime minister. Sima previously served as prime minister in 2012-14 before joining the opposition and competing against Bongo at the 2016 and 2023 presidential elections. Sima was part of the Alternance 2023 opposition platform, which rallied behind opposition leader Albert Ondo Ossa at the August presidential election. Sima announced on 9 September the 26-member transitional government, which includes only three ministers of the former administration, who retained non-strategic positions. All strategic ministries now have new heads. The Ministry of Mines is now headed by Hervé Patrick Opiangah, a politician and businessman.

The transitional government is likely to retain only a symbolic role, with the junta retaining decision-making power. The transition charter was published after Oligui was sworn in as interim president on 4 September. The drafting of the constitution before the appointment of the transitional government shows that it was unilaterally drafted by the junta.

Meanwhile, the transition charter gives significant power to Oligui. It stipulates that the interim president heads the Ministry of Defence and appoints ministers, members of the National Assembly (lower house), Senate (upper house) and Constitutional Court, ensuring they will remain aligned with the junta's agenda. Furthermore, while the transition charter stipulates that members of the transitional government may not stand in the next elections, it does not prohibit the candidacy of junta members, including Oligui.

Stability outlook

The political situation is likely to remain stable in the coming months. Oligui is likely to retain a strong grip on power and to remain the most important decision-maker. He continues to consolidate his power within the military and political sphere by dismissing officials who were close allies of Bongo, and to launch corruption trials implication the inner circle of Ali Bongo. Oligui's consolidated power implies that a second coup or clashes between rival army factions remain unlikely.

Oligui is also likely to remain popular, surfing on a desire for change with a populist, nationalist message that resonates well with ordinary Gabonese. The economy is also likely to remain stable.

Attitudes towards foreign investment in the mining sector

After taking office in 2009, President Ali Bongo pursued economic diversification away from oil and gas, focusing on the mining industry through initiatives like the Emerging Gabon strategy. The government's Transformation Acceleration Plan (PAT) aimed to accelerate reforms and establish Gabon as a responsible mineral resource transformation reference.

The country seeks to become the world's top manganese producer and expand exploration in rare earths, copper, zinc, and uranium, partnering with companies like COMILOG, and NGM to achieve these goals while maintaining environmental and governance standards.

Despite efforts to promote it, , the mining sector only contributes 6% to Gabon's GDP, primarily due to factors like outdated geological mapping, infrastructure needs, and an unattractive mining code for foreign investors. Oligui and the junta will remain keen to maintain business continuity and to seek to attract foreign investment in the mining sector. The coup and the ongoing transition are unlikely to disrupt businesses operations.

Civil society activism

Gabon has limited civil society activism, with a few active environmental and pro-transparency NGOs like Brainforest scrutinizing natural resource investments and environmental impacts. Despite some improvements in transparency under Ali Bongo, anti-corruption activists face harassment from authorities, hindering their ability to monitor the extractive sector and creating a hostile environment for whistle-blowers. In the past, NGOs like Publish What You Pay's (PWYP) Gabon chapter and 22 other NGOs

faced temporary suspension and legal challenges, while activists like Marc Ona were sentenced for defamation. Gabon lacks a whistle-blower protection law, further limiting transparency efforts. Oligui, in his first months in office, is likely to show more openness to civil society activism to boost national support and to attempt to mark a change with Bongo's governance. As Oligui encourages the start anti-corruption investigations to prosecute cases of embezzlement and mismanagement of public funds under Ali Bongo's administration, he also let anti-corruption activists to operate more freely. However, the junta and Oligui are likely to remain opposed to investigations conducted by anti-corruption activists on their wealth or on the junta's management of the transition. Criticisms from civil society groups against the military authorities could push the junta to adopt a more authoritarian and repressive attitude towards civil society groups.

Regulatory environment

In March 2022, Ali Bongo restructured the government, creating a separate Ministry of Mines and Geology, signalling the country's commitment to becoming a more significant player in the mining industry, previously managed under the Ministry of Oil, Gas, and Mines.

The main strategic orientations for the Gabonese Ministry of Mines in accordance with the Transformation Acceleration Plan (PAT) are:

- Increasing the contribution of mining operations to GDP
- Promoting Gabon's mineral resources endowment
- Supporting financial transparency in the mining sector

The sector has also suffered from leadership instability, with seven ministers in charge of mines in the last ten years. Hervé Patrick Opiangah, a politician and businessman, was appointed as the new Ministry of Mines on 9 September.

In Gabon, the Mining Code regulates the general framework for mining activities and mining investors in the country. It was last revised in 2019. The following regulations also apply to the mining industry:

- Decree n°1018/PR/MMPH on the creation, attributions, and organisation of the Equatorial Mining Company (SEM)

The SEM is a government agency based in Libreville with an aim to facilitate the management of Gabon's mineral resources. Created in 2011, the SEM is a state-owned but privately managed company and is responsible for:

- Managing the shareholdings of the state in the mining sector
- Developing, alone or in partnership, any mining-related project in Gabon
- Expanding and developing strategic mineral resources within and outside Gabon

The 2019 Mining Code entrusts the SEM with the role of "national operator". In practice the SEM is in charge of carrying the state's participation in the share capital of mining titles holders.

Recent regulatory developments in Gabon's mining sector include a draft bill from April 2023 focusing on enhancing techniques for the gold industry and introducing new categories like "gold panners" and "authorized collectors." Additionally, a "Mining brigade" was created in February to investigate mining-related matters, aiming to secure and monitor resource exploitation. Despite claims of government

control, these changes have not been enforced yet and are unlikely to bring significant alterations to the sector.

Reforms

The Gabonese Mining Code underwent a revision in June 2019, aimed at enhancing its attractiveness to investors by establishing a secure regulatory framework. Key provisions include a 10% free-carry stake in mining projects, progressive taxation based on project size and resource type, and tax incentives like 0% tax during the research phase and a five-year corporate income tax exemption. Additionally, the code introduced a list of strategic substances, allowing the government to impose specific requirements for their mining and production without affecting fiscal terms.

The 2019 revision also introduced the following mandatory provisions for mining operators that are aimed to strengthen environmental and social standards around mining operations:

Prior to carrying out exploration, licence holders must carry out an impact assessment approved by the Ministry for the Protection of the Environment and Natural Resources, Forests and the Sea and the Ministry of Mines before launching an exploration project.

Project operators must also transfer 1% to 5% of the revenues to two structures financing Social and Environmental Responsibility (RSE) projects, the Fund for Social Responsibility and the Fund for Industrial Responsibility.

Local content and ownership regulations

The 2019 revision of Gabon's Mining Code introduced more comprehensive local content requirements but did not specify fixed local ownership quotas.

Mining title holders must contribute to a training fund and to a mining support fund;

Under Gabon's mining regulations, companies must prioritize hiring Gabonese workers with similar qualifications and experience, establish annual training programs, create internship opportunities, and implement plans for knowledge transfer and increasing the number of local employees.

Mining title holders and their subcontractors in Gabon are required to prioritize Gabonese companies when their prices, quantities, and delivery terms are equivalent. Compliance with this preference for Gabonese companies is crucial to maintaining tax and customs benefits granted under the Mining Code

A minimum portion of mining activity be reserved for small and medium-sized companies owned or controlled by Gabonese entities, with the specific percentage varying from 5% during certain stages to 15% in later years of exploitation

Mining conventions may set out the share of the production which is to be transformed in Gabon.

As Oligui adopts an increasingly nationalist and populist discourse, it is likely that he will strengthen local content requirements in the mining sector.

Expropriation and contract risks

Under Ali Bongo's leadership, Gabon focused on enforcing contractual terms and the rule of law, even amid periodic commercial disputes, particularly regarding tax matters. While one license was revoked in a 2011 tax dispute, such cases have been isolated, with the government preferring negotiation and fines over license revocation. Gabon's limited capacity and dependence on foreign capital in the mining sector make it cautious about damaging investor confidence through expropriation threats. Additionally, the country's membership in the International Centre for the Settlement of Investment Disputes (ICSID) and adherence to the New York Convention ensured recognition and enforcement of foreign arbitral awards under investment treaties.

Oligui on 13 September announced an investigation into public contract to detect any irregularities or potential fraud. The government will revive a taskforce, which existed in the previous government but had been inactive since 2021, to control payments owed by the state to public contractors. According to the new president, the taskforce will invite companies with ongoing public contracts to justify the amounts they claim are due. After taking power, Oligui had warned business leaders against over-billing during procurement. The Ministry of Hydrocarbons has reportedly asked oil companies operating in the country to provide a list of payments made to the state since 2020. It remains likely that similar efforts will be implemented in the mining sector in the coming months. However, they are unlikely to lead to sweeping reviews of contractual agreement with foreign investors. The junta has been keen to show continuity in the running government and will be reluctant to scare off investors with contract renegotiations or cancellations.

External environment

International relations

Gabon's historical ties with France have weakened since 2009 under Ali Bongo's diversification efforts, despite France's ongoing presence in the country with nationals, businesses, and military troops. Bongo has strengthened relations with Asian and Middle Eastern partners, particularly in the extractives and infrastructure sectors, and Gabon rejoined OPEC in 2016. Additionally, the country joined the Commonwealth in 2022, aiming to enhance connections with English-speaking nations. Gabon has received IMF funding to bolster its public finances following oil price declines and the COVID-19 pandemic, driving policy and governance reforms and its return to the Extractive Industries Transparency Initiative in 2021. To boost broad political support, a more populist and nationalist discourse in which Oligui stresses his desire to preserve national over foreign interests is likely to emerge. However, Oligui is likely to retain good relations with Westerns partners as he seeks to attract foreign investments.

International regulations (EITI and ILO)

Gabon had a troubled history with the Extractive Industries Transparency Initiative (EITI), facing late reports and a significant accounting gap, leading to its removal in 2013. However, as part of efforts to revive mining investment and under IMF pressure, Gabon rejoined EITI in 2021, publishing its first annual report in April 2023. To gain validation against the 2019 EITI Standard, Gabon is expected to disclose all oil, gas, and mining contracts, which may incentivize the government to comply. In addition, Gabon has

been a member of the International Labour Organisation since its independence, ratifying key international human rights conventions but facing challenges in implementation.

Major threats in the external environment for mines and mining companies in the country

The security environment is relatively stable, with no significant security risks. The country has no history of terrorism, and there are no local or international terrorist groups operating within its borders, making the threat of international extremist groups targeting Gabon insignificant.

4. Assessment of social, environmental, and governance challenges[10]

4.1. Country-level assessment and context

4.1.1. Mineral/mining policies, industry policies

Mineral/mining policies - The Mining Code is the main legal mechanism controlling the allocation of mineral rights in Gabon and was adopted in 2019. According to King & Spalding (2015)[11], the adoption of a new mining code, enacted through law no. 017/2014 dated 30 January 2015 and published in the Official Journal on 29 May 2015 (the "New Mining Code"), is intended to give a major boost to investments in this sector. The 2019 Mining Code regulates the institutional, technical, economic, and fiscal legal regime of mining activities and operations in Gabon. This New Mining Code is supported both by the government as well as the Gabonese citizens[12].

Within the framework of the examination of requests in a multidisciplinary regime, an ad hoc committee may be set up, at the request of the operator or in the interest of a quality public service, placed under the authority of the Minister in charge of Mines. The ad hoc committee only decides as an independent expert. Its opinions are reasoned. The composition, the functioning as well as the procedure for examining requests in the commission are fixed by regulation (Article 50, Mining Code).

Any legal entity wishing to carry out mining activities under the mining regime must constitute itself in the form of a public limited company. However, small-scale mining activities can be carried out in the form of a limited liability company. Research activities may be carried out in one of the forms of companies provided for by the texts in force.

In application of the precautionary principle, the State watches over the morality and reputation of the leaders of the corporate bodies of the companies holding mining titles in the mining regime. The State has the right to control international recruitment, in accordance with the provisions of the Labour Code (Article 52).

Any company holding a mining title under the mining regime is required to have a governance model in accordance with the provisions of the Organisation for the Harmonisation of corporate Law in Africa (OHADA) uniform act relating to the law of commercial companies and the Economic Interest Grouping. Any holder of a mining title referred to in paragraph 1 of the above must have in particular an identifiable head office allowing the administration in charge of mines to carry out checks and audits. Any decision taken in violation of the statutes constitutes a governance fault for the operator (Article 53 of the Mining Code).

[10] Most of this section is from AfricaMaVal deliverable 4.1 by AWIMA
[11] Ruxandra Lazar, 2015. New Mining Code in Gabon to give a major boost to investments, https://kslawemail.com/77/429/pages/article7.asp, Accessed on 23 May 2023
[12] African Mining Legislation Atlas, Gabon, https://a-mla.org/en/country/Gabon.

The mining title may be suspended if the effects of the governance fault are likely to compromise the mining activities, in particular production, as well as the related investments. The effects of governance faults cannot be invoked against the State.

The State has the right to information, in particular concerning stipulations of Article 54 of the Mining Code on:

- the level of investments made, the state of financing and the outlook for the mining activities concerned, the performance of production and the results achieved;
- policies for the development and competitiveness of mining activities;
- agreements with partners, in particular for the purposes of operational performance, restructuring, change of control or industrial necessity.

The State benefits from a mandatory right to information in the event of a proposed change of control of the majority shareholder(s) of a company holding a mining authorisation or title. The obligation to inform entitles the State to a communication relating in particular to the terms of the planned operation and the identity of the new prospective shareholder(s), made at least three months before the final completion of this planned operation. Within the above deadline, the new prospective shareholder(s) must communicate to the State the strategic direction they intend to give to the company holding the authorisation or the mining title, in particular to increase its performance (article 55 of the mining code).

The New Mining Code provides that the State shall have the right – which can be waived - to systematically hold a 10% mandatory interest in the share capital of holders of exploitation permits. Such interest shall be free from all charges / encumbrances and is non-dilutable. In addition, the State shall have the right to acquire at market value up to 25% of the share capital of the holder of an exploitation permit. In case of sale or assignment of a mining title (except where such transaction takes place between affiliates), the State has a pre-emption right.

The mining sector in Gabon is governed by international texts and commitments and by various Law:

- Law No. 037/2018 of June 11, 2019 regulating the mining sector in the Gabonese Republic;
- Finance Law No. 031/2021 of March 23, 2022 determining the resources and expenses of the State;
- Decree No. 0023/PR/MPGM/ of 22 January 2021 setting the rules relating to the contribution of mining activity to local development in the Gabonese Republic; -
- Decree No. 00022/PR/MPGHM on the creation, powers and organisation of the General Directorate of Mines and Geology; -
- Order No. 001118/MMEPRH/SG/DGMG/DMC of 04 January 2007, setting the price of quarry materials used as the basis for establishing the extraction tax.

Natural resources, including all mineral substances contained in the soil, subsoil, continental waters and in the marine domain of national territory, remain the property of the State (Article 7, Mining law). The national mining sector policy is based on the following principles (Article 5, Mining law):

- good governance and transparency in the management and exercise of mining activities;
- respect for human rights impacted by mine exploitation activities;
- mandatory compensation for damage caused by mining activities;
- the social responsibility of operators and local development;
- compliance with hygiene, health, safety and environmental protection standards;

- equal treatment of operators;
- the standardisation of authorisations and mining titles by regime and by activity;
- the application of production sharing in the operating phase
- sustainable exploitation and reasonable local transformation of mineral substances extracted from the national territory;
- the training of nationals in the programs the mining sector;
- progressive and total rehabilitation of mining sites;
- the development and supervision of artisanal mining.

The New Mining Code provides for a list of strategic minerals. Included in the strategic minerals are: uranium, thorium, niobium, tantalum, lithium and rare earths. The State may declare that other substances are of economical or geostrategic interest. Classification as a strategic substance has no impact on the validity of a mining title, nor on its fiscal terms. However, the Minister in charge of Mines may impose, for economic reasons, that the holders of mining titles respect, for strategic substances, specific requirements relating to the construction and operation of the various structures and facilities. The State may build up stocks of strategic substances and set out production thresholds for such substances.

In the frame of the ''Plan Stratégique du Gabon Emergent'' (PSGE) and the ''Plan d'Accélération pour la Transformation'' (PAT 2021-2023), the national priorities concerning the extractive sector are the following:

- Address the structural deficit of SOGARA (Gabonese Refining Company).
- Ensure increased transparency in the oil, gas, and mining sectors.
- Develop the gas sector in the country.
- Enhance the competitive advantage of the Gabonese mining sector, including a review of the regulatory framework.
- Attract investors to support the development of iron and gold industries.
- Safeguard the interests of major companies in manganese extraction

The engagements within the frame of the ''Programme Economique Elargi'' between the IMF and Gabon, concern:

- The promotion of the governance of the extractive industries to increase the oil and mine revenues;
- The promotion of the transparency through the publication of revenues and payments linked to the extractive sector;
- The centralisation of the oil and mine revenues in the unique account of the Tresor (CUT) and the identification of these revenues in order to insure a better follow up;
- The regular publication on a state internet site of all the documents and reports edited by the ETIE;
- The development of procedures to evaluate the natural resources;
- The management of public societies and their subsidiaries.

4.1.2. Mining regulations

Applications for authorisation and mining titles are addressed to the Minister in charge of Mines. They must be registered with the service in charge of the mining cadastre or the mining property. Monitoring and issuance of authorisations and mining titles are carried out by this same service.

After their delivery, the authorisations and mining titles subjected to the surface royalty are obligatorily transmitted to the Official Journal, within thirty days, for publication. The directory of authorisations and mining titles, with a cartographic representation allowing them to be located on the national territory, is made available to the public for consultation by any interested person.

The various licence and permit types available for the mining sector of Gabon are described below and summarised in **Erreur ! Source du renvoi introuvable.**..

Geological and Mining Reconnaissance Authorisation

This authorisation is issued by the Minister in charge of Mines, and on his delegation, by the competent general manager, in the forms and conditions set by Article 100 of the Mining law. The administration in charge of the mines must notify the holder of a reconnaissance licence of any request for an exploration permit made by a third party, when it totally or partially covers the area covered by this reconnaissance licence. The holder of the reconnaissance licence has a period of one month from the date of notification to file an application for transformation of his reconnaissance licence into an exploration permit. This application must comply with the conditions applicable to mining exploration permits. In the event of filing of a request for transformation, the two requests are subject to competition, in accordance with the provisions of this law (Article 103, Mining Code)

In the absence of a request for conversion or if this is not presented in the required forms and deadlines, the requested surface may be allocated to the third-party applicant, without compensation for the first occupant of the perimeter, provided that his application meets the required conditions.

If the deposit is economically exploitable, the holder of the exploration permit is guaranteed the allocation of an exploitation permit, in the forms and conditions provided for by this law and its implementing texts.

Research permit:

The research permit is issued by order of the Minister in charge of Mines, for a period of three years, renewable twice for the same period, in the forms and conditions set by regulation. It confers on its holder, within the limits of its perimeter and indefinitely in depth, the exclusive right to prospect and search for mineral substances.

At the expiry of an exploration permit whose holder does not request renewal, or at the expiry of the last period of validity of the exploration permit not followed by a request for the allocation of an exploitation title, the perimeter concerned becomes free of all rights. The data and information collected as well as the studies and work carried out are acquired by the State. (Article 107, mining code)

Small scale mining:

Small-scale mining is exclusively reserved for companies with the required technical capacities and whose capital is held at least to 35% by natural or legal persons of Gabonese nationality. (Article 116, mining code). The small-scale mining permit can only be granted to the holder of an exploration permit.

Under penalty of rejection, any application for the allocation of a small-scale mining permit must be accompanied by a feasibility study and an environmental impact study (Article 117). It is submitted for validation to the competent services of the Ministry in charge of Mines and the Ministry in charge of the Economy. The environmental impact study incorporates the elements determined by the provisions of the texts in force. It is validated by the competent services of the administration in charge of the environment.

The small-scale mining permit is issued by order of the Minister in charge of Mines for a period of five years, renewable for periods of three years, as many times as necessary. This duration is two years renewable for certain types of deposits of mineral substances whose duration is deemed limited due to their specificity (Article 118, Mining Code).

Large-Scale Mining (Article 120 and following)

The large-scale mining permit is issued by decree of the President of the Republic, on the proposal of the Minister in charge of Mines. On pain of rejection, any application for the allocation of a large-scale mining permit must be accompanied by a feasibility study and an environmental impact study

The large-scale mining permit is transferable and can be leased, subject to a prior authorisation of the Minister in charge of Mines, after consulting the competent departments of the administration in charge of mines, which rule in particular on the legal, technical and of the purchaser and in accordance with the provisions of article 15 of this law.

Exploitation of Mining Waste

The tailings exploitation permit is granted to a legal entity, whose share capital is held at least to 25% by nationals, unless waived by the Minister in charge of Mines. The right granted to the holder of an aforementioned permit does not extend beyond this.

An environmental inspection must take place before the attribution of a mining title of exploitation of the residues. The exploitation permit for mining waste may be subject to withdrawal by the Minister in charge of Mines, in the event of non-compliance by the holder with his obligations.

Authorization / Permit	Characteristics	Assignment, transfer, leaseback, pledging
Prospecting authorization	Non exclusive Max. area: 3,000 km^2 Validity: 1 year Non Renewable 500,000 FCFA	
Exploration licence	Exclusive Min. area: 1,500 km^2 Validity: 3 years, renewable twice for periods not exceeding 3 years Price: 1 500 000 FCFA Limited to 4 licences by operator	Cession taxes: 10% of the total amount of the sale
Small scale exploitation licence	Exclusive rights of exploration, exploitation Max. area: 50 km^2 Validity: 5 years, renewable for periods of 12 or 3 years	Cession taxes: 15% of the total amount of the sale

	Price: 7 500 000 FCFA 35% of the social capital holds by Gabonese's	
Mining licence (large scale exploitation licence)	Validity: 10 or 20 years Price: 15 000 000 – 30 000 000 FCFA Mining convention required	Cession taxes: 15% of the total amount of the sale Lease-back: authorized
Exploitation of tailings and residues	Non exclusive Area: > 3 000 km^2 Validity : 5 years, renewable Price: 3 500 000 FCFA At least 25% of the capital of the society are Gabonese	Cession taxes: 15% of the total amount of the sale Lease-back: not authorized
Collective artisanal small scale mining licence	Validity: 2 years, renewable Price: 250 000 FCFA Maximum 3 years, renewable for the same duration until the deposit is exhausted	Lease- back/cession: not authorized
Individual mining authorization	Max. area: 5 km^2 Validity: 2 years, renewable Price: 50 000 FCFA	Lease- back/cession: not authorized or authorized

Table 10: Mining authorizations & permits

4.1.3. Taxation and royalties

The research, exploitation, collection and marketing of mineral substances under the mining regime, on the national territory, give rise to the collection of duties, taxes, royalties and penalties according to the terms of assessment, liquidation and collection as fixed by this law. Unless otherwise provided, any administrative act which confers mining rights gives rise to the collection of the aforementioned taxes (Article 189, Mining Code).

According to Article 196 of the Mining Code, the surface tax is due at the beginning of each year and is determined on the basis of the surface area as well as the authorisations and mining titles held. The rates of rates of the Ad Valorem tax applicable to the mining titles of exploitation of the mining regime are fixed in the mining agreement as shown below.

Mineral	Royalty rate (%)
Base and other substances	5 - 10
Precious metals	5-8

Table 11: Ad Valorem tax per mineral category

The mineral substances of the mining operation, with the exception of those placed in stock on the extraction sites, are subject to a mining royalty proportional to their value at the extraction sites. The proportional mining royalty is due by any holder of an exploitation title under the mining regime Article 202.

- Products resulting from local processing are not subject to the proportional mining royalty.
- The export, import, collection and marketing of precious substances as well as the manufacture and transformation of works in precious metals give rise to the payment of a tax, the rate of which is set in the following table:

	Royalties Amount in XAF
Export or commercialization -Precious metals - Precious stones	5% of market value
Import - Diamond - Other substances	10% of market value 8% of market value
Certificate of origin - Diamond - Other valuable substances	1 000 000 5 000

Table 12: Mining royalties

The rate of exit duties applicable to the export of mineral substances cannot be greater than 1%.

Customs and Excise duties relating to permits

Exploration phase:

- Equipment, materials, supplies, machines, tools and capital goods included in the programme approved by the Ministry in charge of Mines as well as commercial vehicles, except those intended for the transport of persons, temporarily imported into Gabon by Holders of mining agreements are admitted to the normal temporary admission regime, in accordance with the provisions of Article 166 of the CEMAC Customs Code (Article 227, Mining law).
- Equipment, materials, supplies, machines, tools, and products directly necessary for geological and mining research, including those intended for constructions and installations, are admitted free of customs duties and taxes in accordance with the provisions of Article 276 of the CEMAC Customs Code. This exemption also extends to spare parts exclusively intended for machinery and equipment imported as part of mining reconnaissance or research activities (Article 228, Mining law).

Operation phase:

- Machines, devices and gears temporarily imported into Gabon by mining companies during the exploitation phase are admitted to the special temporary admission regime, in accordance with Article 171 of the CEMAC Customs Code (Article 231, Mining law)
- Materials, machines, equipment, tools and materials intended directly and definitively for mining benefit, on importation, from a reduced rate of 5%. Inputs used exclusively in the local transformation process benefit from an exemption from customs duties and taxes. The list of products and inputs referred to above eligible for the exemption from duties and taxes above, is indicated in the mining agreement. It is regularly updated at the initiative of the operator. The duration of the period of realisation of the investment extends from the date of signature of the mining convention of exploitation to the realisation of the first commercial product sale (Article 232, Mining law).

Exemptions

The **New Mining Code** stipulates that the following exemptions will apply for mining title holders and their sub-contractors:

- **Exploration phase:**
  - domestic VAT in respect of certain goods for carrying out geological and mining activities, as set out by a ministerial order;
  - the corporation tax;
  - the flat minimum corporation tax;
  - the business licence tax;
  - property tax on property other than houses; and
  - registration fees on deeds bearing capital increase and on professional leases.
- During the Operation phase, holders of mining titles relating to projects having an exploitation period of at least 10 years, and their sub-contractors, will be exempted from the payment of the corporation tax and the flat minimum corporation tax during the first 5 years after the commencement of the exploitation phase. This tax holiday can be up to 8 years for the most important mining projects, *i.e.* those having a lifespan of 20 years or more. However, the tax holiday would cease to apply to those mining title holders who get a return on investment during the exemption period.

4.1.4. Land-use and mineral rights

The mining exploitation title is equivalent to a declaration of public utility, from the date of its publication in the Official Journal. Before the expropriation procedure, an assessment of the property and rights is carried out, including the damages that may be suffered by the occupants of the area of influence of the mining title. Their indemnification or compensation must take place before the effectiveness of the expropriation. The expropriation procedure is conducted by the State within a maximum period of one year, after compensation, when the expropriation does not concern dwellings.

Compensation or indemnities paid to third parties affected by the expropriation measure are the responsibility of the holder of the mining exploitation title. The terms and conditions of compensation payments applicable in the mining sector, for the holder of the mining title, are fixed by decree. In the absence of specific regulatory provisions applicable to the mining sector, the terms and conditions of compensation are governed by the provisions of common law. No compensation is due to any third party who occupied illegally the areas covered by the declaration of public utility.

The National Land Allocation Commission (CNAT)[13] created by decree N°00212/MEPPDD of July 21, 2017. The main objective of CNAT is to develop the Land Allocation Plan, supervise and define the use of the territory in order to guarantee the compatibility of the socio-economic activities, environmental integrity and optimisation of natural resource management.

The objective of CNAT's National Land Allocation Plan is to resolve the problems of overlapping permits between mining and logging. The Land Allocation Plan also affects sectors such as agriculture. This plan considers three aspects, two of which relate to land issues:

[13] https://www.cnat-gabon.com/?lang=en

- **the social component**: the participatory mapping of all the villages to determine the delimitation of the permits and the use of the land by the villagers, and to draw up the national law on the allocation of the land. There are cities entirely covered by permits, which complicates the cohabitation between farmers and populations deprived of their agricultural lands and cultural sites. This leads to conflicts. Populations must be protected when granting permits.
- **the land component**: the country has also made commitments to preserve nature. Forest permits are therefore FSC certified and mining in specified forest areas is prohibited. This leads to conflicts between the two types of land-use.

Appropriate arrangements need to be put in place to allow all these activities to be undertaken without affecting each other and in a sustainable manner. Gabon is committed to securing rural land.

4.1.5. Environment

The "Gabon Vert"[14] or "Green Gabon" operational plan, a major pillar of the PSGE, advocates the sustainable use of natural resources to ensure the preservation of its natural capital for current and future generations. The Mining Law in its Article 162 prescribes, that holders of authorisations and titles mining companies are required:

- to draw up and have validated the plans for the prevention of industrial risks by the administration in charge of mines and any other competent administration;
- to establish and regularly update plans with a view to organising the means, equipment and methods of intervention in the event of a disaster in a facility.

The measures provided for in the emergency plans are subject to regular tests by the holder of the authorisation or the mining title. These plans are forwarded to the Minister responsible for Mines, to the competent administrations, as well as to the authorities of the local communities concerned.

Holders of authorisations and titles mining companies are required to conduct all operations governed by this law in a sustainable manner and responsible, in particular by using means efficient and rational in order to ensure optimal management of the resources exploited, in strict compliance with the environment in accordance with the regulations in vigor. Holders of authorisations and mining titles are required to rehabilitate mining sites as and as research and operating (Article 163, Mining law).

Holders of authorisations and mining titles, mining companies are required to establish and update regularly the environmental and social management plan, as defined in the texts in force in the matter. These plans are forwarded to the Minister responsible for Mines, the Minister in charge of the Environment and the other competent administrations as well as to the authorities concerned, to monitor its application effectiveness (Article 164, Mining law)

The Gabonese government has expressed an interest in developing ASM in alignment with its 'Green Gabon' vision, but there is no mention of any environmental obligation with respect to the practice of artisanal mining. In general, ASM's main impacts in critical ecosystems in Gabon appear to relate to impacts on biodiversity, forest and water.

Environmental regulations - Framework law n°007/2014 relating to the Protection of the Environment in the Gabonese Republic. This law defines the principles and means of environmental protection in Gabon,

[14] https://gabonvert.com/gabon-vert/

including the preservation and sustainable use of natural resources, pollution control, environmental education, and environmental information and monitoring. It refers to a series of pertaining plans and tools, such as a climate action plan, a national environmental plan and an environmental information system.

The regulation establishes the requirement of conducting an environmental impact assessment for developments that may harm the environment. This supports the necessary project appraisal with due public consultation. There are also provisions concerning auditing, information provision, sanctions, and transitory dispositions.

This law also refers to air quality standards, emissions monitoring, inventorying of air pollutants, air monitoring as well as requirements related to waste reduction and reuse.

4.1.6. Societal and community aspects, cultural heritage

Tangible and intangible cultural heritage are not mentioned in the laws and regulations governing the mining sector. Cultural heritage sites are governed by specific laws.

Mining activities can have significant impacts on the cultural heritage of a region. In Gabon, mining has been identified as a potential threat to the country's cultural heritage due to the potential destruction of sacred sites and the displacement of indigenous communities.

The Minkébé National Park in Gabon, which is home to several indigenous communities and contains important cultural heritage sites, has been identified as particularly vulnerable to mining activities. A study by Laurance et al. (2015)[15] found that mining could cause significant damage to the park's ecosystems and cultural heritage sites, and recommended that mining in the area be prohibited to preserve the park's cultural and environmental values.

In addition to the potential physical destruction of cultural heritage sites, mining can also have indirect impacts on cultural heritage through the displacement of indigenous communities. The Belinga iron ore deposit, for example, is located in an area that is home to several indigenous communities, including the Bagyeli and Bakoya peoples. The construction of mining infrastructure and the influx of outside workers can disrupt traditional livelihoods and social structures, potentially leading to the loss of cultural heritage (Bretzel et al., 2014)[16].

4.1.7. Public health and safety

The Ministry of Health is responsible for overseeing public health in Gabon. It has developed policies and programs to address various public health concerns, including malaria and communicable diseases such as and HIV/AIDS, as well as non-communicable diseases such as diabetes and hypertension. The government has also established health centres throughout the country, providing access to medical care and treatment to communities.

In addition, the Gabonese government has implemented regulations to ensure public health and safety in the mining sector. Holders of mining authorisations and titles are required to take the necessary measures

[15] Laurance, W. F., et al. (2015), "Averting Biodiversity Collapse in Tropical Forest Protected Areas", *Nature*, Vol. 489, No. 7415, pp. 290-294.
[16] Bretzel, F., et al. (2014), "The Belinga Iron Ore Deposit in The Bélinga Massif, Northeast Gabon: Potential Impact on the Socioeconomic Fabric and The Environment", *Resources Policy*, Vol. 39, pp. 31-42.

to ensure the safety and protect the health of workers. These measures include medical follow up, risk prevention actions professionals, information and training actions for workers, the establishment of organisations and means guaranteeing a better level of protection of the health and safety of workers. These measures must be scalable to adapt to changing circumstances, respecting all environmental provisions and actions relevant in this regard (Art. 160, Mining Law).

4.2. Mining practices *vs.* Environmental, Social and Governance (ESG) goals

The ESG framework of Gabon is still in its early stages of development, but the government and various stakeholders are making efforts to improve the sustainability of the country's economic activities. Legal and regulatory frameworks are implemented to promote sustainable development and address ESG issues in the mining industry. Overall, the Gabonese ESG framework in the mining industry is focused on promoting sustainable development, protecting the environment, and ensuring that mining activities benefit local communities and the Gabonese people.

Environment

The government has implemented environmental regulations that require mining companies to conduct environmental impact assessments and adopt mitigation measures. Generally, Gabon's environmental policies aim to balance the country's economic development with the need to protect its rich natural resources and biodiversity. These policies have helped to mitigate the impact of mining activities on the environment and ensure that the mining industry operates in a sustainable and responsible manner.

Social

The Gabonese government has established requirements for mining companies to engage with local communities and obtain their consent for mining activities. The government has also established a framework for community development agreements that require mining companies to invest in local development initiatives.

The government has established labour standards that require mining companies to adhere to international labour conventions and local labour laws. The government also promotes the development of local skills and capacity-building in the mining industry.

Governance

The 2019 Mining Code encourages transparency and a thriving mineral ecosystem. Gabon is a member of the Extractive Industries Transparency Initiative (EITI), which aims to promote transparency and accountability in the extractive industries. The government also requires mining companies to disclose their payments to government entities. The Gabonese government is working to strengthen its institutional capacity to regulate the mining industry and address ESG issues. The government has established a regulatory agency, the Mining Regulator (REGOM), to oversee the implementation of mining regulations and promote sustainable development.

Best practices for a responsible mining in Gabon

ESG (Environmental, Social and Governance) practices are increasingly expected by stakeholders, including investors, customers, civil society, etc. In Gabon, there are initiatives and projects that illustrate good ESG practices in the mining sector. Examples include COMILOG, SEMAFO and NGM.

COMILOG is specialising in the extraction and processing of manganese ore. As the second largest producer of this metal, the company is at the forefront of the international scene. It is committed to being a responsible and sustainable player, respecting mining and metallurgical best practice and engaging in dialogue and collaboration with its host communities and local authorities. Here are just a few examples of the ESG best practices implemented at the Moanda mine site:

- - As far as the environment is concerned, COMILOG has set itself limits on mining, which helps to preserve local biodiversity through the Lékédi park, which is managed by its subsidiary Sodepal. The site is ISO14001 certified, and once the ore extraction phase has been completed in a given area, the environmental team intervenes to reshape the landscape with topsoil that has previously been set aside and the planting of plant species to restore the site to a state close to its original appearance. Water is also closely monitored: 11 retention basins have been installed to settle run-off water, and samples are taken regularly to prevent water pollution. Rehabilitation of the Moulili river also began in 2010, with the recovery and reclamation of manganese fines previously discharged into the river. It should also be noted that the electricity mix at COMILOG's plants is more than 80% decarbonised, thanks to renewable energy sources such as hydroelectricity.

- On the social front, COMILOG facilitates access to healthcare: thanks to COMILOG funding, the Marcel Abéké hospital in Moanda provides free healthcare to company employees and their dependants, as well as to the local population at moderate prices, and other initiatives have been set up to facilitate access to healthcare for local people. COMILOG invests in the social development of local populations by creating two dedicated funds, in partnership with the Gabonese government, which finance socio-economic and training projects. It also contributes to local development through its spin-offs in the form of salaries, local purchases (subcontracting), taxes, royalties and dividends.

- In terms of governance, COMILOG organises information and consultation meetings with local communities, which have been held regularly for a decade. They have intensified since 2018 as part of the Moanda mine expansion project on the Okouma plateau (7 million tonnes project). They have also made it possible to identify the priorities and expectations of these populations in terms of health, education and economic diversification, particularly for young people. A local complaints management mechanism has also been set up so that anyone can alert the company to any concerns or incidents and put forward their suggestions.

The Canadian mining company SEMAFO, which recently merged with Endeavour Mining and operates the Boungou gold mine in Gabon, has implemented a number of ESG initiatives as part of its project. On the social front, for example, it has built social infrastructure (schools, health centres, roads, etc.) for local communities, created local jobs and promoted vocational training for young people, supported family farming and female entrepreneurship. On the environmental front, it has reduced its water and energy

consumption and offset its greenhouse gas emissions by planting trees. It has also introduced an ISO 14001-certified environmental management system.

Nouvelle Gabon Mining has signed an Exploitation and Product Sharing Contract (Contrat d'Exploitation et de Partage des Produits - CEPP) with the Gabonese government for the Okondja manganese deposit. This contract includes commitments in terms of Corporate Social Responsibility (CSR), such as creating local jobs, training young people, complying with environmental standards, and financing social projects in the fields of education, health, drinking water and electrification.

Heading to better practices?

The 9th EITI Global Conference in mid-2023 will provide an opportunity to improve the current EITI Standards especially around transparency of ownerships and contracts. According to the African Mining Vision, inadequate governance can limit the benefits of the mining sector, especially for the communities hosting the companies. The general perception around corruption in the mining sector regarding permitting and licensing and its possible risks should be managed with more information sharing and open forums in the communities on the various regulations.
Accountability and the push for transparency in all operations is continuously demanded by the stakeholders, in particular civil society organisations, non-governmental organisations, communities, trade unions as well as media houses.

In its last report the ITIE has made several recommendations supposed to improve practices for a responsible mining, most of them corresponding to ITIE requirements (Rapport ITIE 2021 (eiti.org)):

- Monitoring the Gabonese government's stakes in the Gabonese extractive sector.
- Publishing the financial statements of public enterprises GOC (Gabon Oil Company) and SEM (Equatorial Mining Company).
- Establishing a registry of permits in the Gabonese extractive sector.
- Transparency in contracts signed between the Gabonese government and extractive companies.
- Implementing a public register of the beneficial owners of extractive companies.
- Applying profit-sharing rules as stipulated by the mining code.
- Compiling statistics on the artisanal and informal mining sectors in Gabon.
- Tracking revenues from the extractive sector that are not included in the Gabonese state budget.
- Comprehensive disclosure of gold production.
- Disaggregating data from the extractive sector by project.
- Disclosure of amounts transferred or allocated to local communities.
- Enhancing the quality of data on exports.

5. Business network between the European Union and Gabon

5.1. Assessment of the upstream and downstream business ecosystem

5.1.1 Context, formal and informal players

The relevant institutions for the development of a network around the ECRMs in Gabon cannot be established without the existing institutional framework, composed as follows:

- The **General Directorate of Mines and Geology** (DGMG: Direction Générale des Mines et de la Géologie), responsible for sector regulations, the collection of fees and taxes, policy formulation, investor promotion, and license issuance.
- The **Equatorial Mining Company** (SEM: Société Equatoriale des Mines), a state-owned enterprise operating in the mining sector in Gabon, responsible for collecting dividends from the state's stakes in mining companies, storing raw gold, and functioning as a mining company.
- The **Ministry of Mines**, responsible for promoting and overseeing prospecting and mining activities in Gabon. The Ministry is also responsible for implementing and monitoring government policies and developing legislative and regulatory provisions applicable to the mining sector.

The **Head of the Mines Department** within the President's Cabinet, can also be included to the list above, given the crucial oversight of the highest authorities in the country on the mining sector.

It is essential to integrate the primary research organization in Gabon: **Cenarest** (National Centre for Scientific Research and Technological Development), including its Institute of Technological Research (IRT), established in 1976. Its mission includes studying the available raw materials in Gabon to assess their industrial transformation potential and establish technological methods for substance extraction. The IRT also promotes close collaboration between technology research and industries in Gabon, fosters researcher training, and undertakes studies to resolve industrial projects adapted to the country's conditions.

We recommend the involvement of the **NGO Brainforest** in this network due to the relevance of its environmental protection-focused studies. Brainforest in Gabon already collaborates with mining operators on pre-environmental impact assessments and social impacts, among other things. Its President, Marc Ona Essangui, has received several international awards, including the Goldman Environmental Prize in 2009, for his work and actions. He possesses a deep understanding of mining and environmental legislation, among other expertise.

At the university level, the **USTM** (University of Science and Technology of Masuku) is indispensable, despite recurring functional challenges. Located in the mining basin of Haut-Ogooué, it offers training in mining geology. The E3MG (School of Mines and Metallurgy of Moanda) is a vital player in professional training related to the mining sector, specifically for manganese.

All industrial players in the sector, whether currently engaged in exploration or large-scale extraction, or involved in small-scale projects, are included in the following table, which lists the potential network participants:

Network	Entities	Activities	Contact	Comments
RESEARCH	**CENAREST / IRT**	Scientific and technological research	Website : http://www.cenarest-gabon.org/?p=accueil	Organic and mineral chemistry laboratory
	BRAINFOREST	NGO	Website : Brainforest Gabon (brainforest-gabon.org)	Very active NGO in Gabon, numerous research works focused on the preservation of the environment, linked to the forestry and extractive sector
UNIVERSITIES	**USTM**	Scientific and technical university	Website : USTM (univ-masuku.org)	Structural and functional difficulties of the entity
	E3MG (School of Mines and Metallurgy - Moanda-Gabon)	Comilog application school	Mail : contact@e3mg.ga	A reference in Gabon for training in the mining sector
	CHAMBER OF TRADES		MWebsite : Chambre National des métiers de l'Artisanat du Gabon (artisangabon.com)	Looking for funding/skills building to develop the creation of artisanal mining cooperatives and the implementation of dedicated training
INDUSTRIES	**UMIGA**	Mining Union		Launched in 2010 12 members (only companies with mining titles)
	COMILOG	Manganese exploration and exploitation, local processing industry	Website : comilog.com	Leading manganese producer in Gabon (nearly 70% of the whole production)
	ERAMET			Development of mining projects in Africa (mainly manganese)
	GEOSCAN	Mining expert		Small scale mining project
	ARMADA METALS	Exploration		
	NGM	Manganese exploration & exploitation		
	CICMHZ	Exploration et exploitation manganèse		
	HELING MINERALS	Exploration		Fond of Maboumine project
GOVERNMENT ACTORS	**SEM**	Gabonese state mining company (research, exploration, implementation of state mining policy, management of Gabonese state holdings in the mining sector, mining operator)		

	GENERAL DIRECTORATE OF MINES AND GEOLOGY	Administration		
	PRESIDENCE	Administration		
	ANPN (National Agency for National Parks)	State agency for the management of Gabon's national parks, environmental studies, research on the impact of mining on ecosystems		Some protected areas in Gabon include sites rich in minerals.
	General Directorate of Environment and Nature Protection (DGEPN)	Administration	Website : DGEPN (environnement-gabon.com)	

Table 13: List of institutions for the creation of a network

5.1.2 Relationships at local or regional levels

Gabon, like many African countries, is part of regional economic communities that facilitate trade agreements and cooperation. The two main regional economic communities in Africa are the **Economic Community of Central African States** (ECCAS) and the **Economic Community of West African States** (ECOWAS). However, Gabon is located in Central Africa, so its primary regional economic community is ECCAS. ECCAS member states, including Gabon, work together to promote economic integration and cooperation. The trade agreements within ECCAS aim to facilitate the movement of goods, services, and people among member countries. These agreements may include measures to reduce trade barriers, harmonize policies, and promote regional development.

Gabon is part of **several trade agreements** with various countries and regions. These agreements can change over time due to renegotiations or the signing of new agreements. Here are some key aspects of Gabon's trade relationships:

- **Economic Partnership Agreement** (EPA) with the European Union (EU): Gabon is part of the Central Africa-European Union Economic Partnership Agreement. These agreements aim to promote trade and development between the EU and African, Caribbean, and Pacific (ACP) countries. The agreements typically involve trade liberalization and cooperation in various areas.
- **African Growth and Opportunity Act** (AGOA): Gabon is eligible for the benefits of AGOA, which is a U.S. trade preference program that allows eligible African countries to export certain goods to the United States with reduced or zero tariffs.
- **World Trade Organization** (WTO): Gabon is a member of the WTO, which means it follows the general principles of non-discrimination and Most-Favored-Nation treatment in its trade relations with other WTO member countries.

5.2. Building new B2B relations

The BRGM, in charge of the Gabon case study might organize a One-Day-Mining-Forum in March or April 2024. This event will be built around a half day technical meetings with officials (ministries, European

Delegation, Embassies, chamber of mines, and the CRM whole chain actors) and a half day exhibition with stakeholders and local CRM actors / players

Strengthening African mining clusters

Alternative Financing

There is no alternative financing solution specific to the mining sector in Gabon. The practice of "tontine" (association of people contributing to a common fund, the amount of which is paid to each of them in turn) is widespread in Africa and can be used in the informal sector.

In the gold mining sector in particular, cooperatives are supposed to organize commissaries and pre-finance activities. In fact, with the State not issuing operating authorizations to cooperatives since 2018, financing for small mines is extremely difficult to obtain. They are mainly done with own funds, very rarely via financing from a local bank with the guarantee of a political figure or senior administration.

Special Basket funds

The Mining Code (article 36) requires holders of a mining title or authorization to "adopt measures ensuring the promotion of social responsibility". The legislation directs this obligation towards local development.

The Ministry of Mines gives priority to **six areas for the CSR actions** of mining companies:

- Infrastructure
- Electricity and water
- Actions for young people
- The promotion of education and culture
- Health
- Women's empowerment.

Part of the **mining revenue is distributed** as follows:

- Proportional mining royalty, surface royalty, fixed rights:
    - o Towards the Local Community Development Fund: 20%
    - o Towards the Mining Sector Support Fund: 5%
- Extraction tax:
    - o Towards the Local Community Development Fund: 15%
    - o Towards the Mining Sector Support Fund: 5%

The **Local Community Development Fund** is intended to finance socio-economic projects for the benefit of local communities in the region where the mining sites are located, and is also used to finance economic reconversion programs for the locality concerned.

The **Mining Sector Support Fund** is intended for the revaluation and promotion of mining potential, as well as the carrying out of sectoral studies, the strengthening of the technical and operational capacities of the administration in charge of mines, technical assistance to artisanal miners, controls and audits of operators by the administration in charge of mines, economic model analyses of mining operations or projects and negotiations and annual reviews of mining conventions.

Apart from this, there is no special fund dedicated to training in Gabon.

5.3. Promoting local content and enabling mining cluster actors

To improve the framework conditions for European and African companies and organisations to co-create new value, businesses, products and services by transforming the ways they interact, hereafter the list of.

- **Geoscience/mining related accredited education and training programmes:**

A number of structures offer training courses of varying quality in the field of mining in Gabon, generally centered around mining engineering, geology, metallurgy, mineral resource management, mining safety, the environment and sustainable development.

The public **Université Omar Bongo** (**UOB**) offers mining engineering and geology programs in its geography department. It has laboratories and infrastructure suited to teaching and research in the sector, but structural difficulties at this public university hamper the smooth running of university courses.

Masuku University of Science and Technology (**USTM**) based in Franceville, near the Haut-Ogooué mining basin, this public university offers courses in mining engineering, geology and metallurgy.

The **Ecole des Mines et de la Métallurgie de Moanda** (**E3MG**) began its training in **2015**. As a result of a partnership between the Gabonese state and COMILOG, it offers training in mining and metallurgy trades, as well as in related fields. The University of Lorraine (France) has been entrusted with the engineering of the training program, as well as the selection and training of teachers and students. This application school is positioned between academic studies and the job market, with the vocation of training specialty engineers in 20 months and professional licenses in 12 months to meet the needs of the mining industry. 104 students in 4 classes of engineers and technicians were trained here from 2016 to 2021. E3M's 3rd graduating class (2022) has a professional integration rate of 80% (11 engineers and 14 professional licenses). E3M also hosts regular seminars, such as the March 2023 seminar on geohazards, whose training program was derived from PanAfGéo (geological hazards and environmental management for the post-mining era).

SEM and E3M signed a partnership agreement in October 2021 for the specialisation and professionalization of students in the mining sector. However, this new teaching program has yet to be implemented.

A number of **private universities** also offer training courses in the mining sector, of varying quality, but we were unable at this stage to ascertain whether these training programs were accredited by the Gabonese State. These include:

- **Université continentale de Libreville** (**UCL**), which offers an applied geology degree in mining and petroleum.
- **Université Libreville Nord**, with a bio-geosciences degree (professional option: "Geology, Mines, Petroleum")
- **Institut Supérieur d'Ingénierie** (**ISI**) offers a mining and petroleum engineering course.

- **List of relevant organisations across the African continent** and in Europe to host interns and apprentices with upstream and downstream players in the extractive industry.

The Mining Code requires holders of mining titles or authorizations, and their subcontractors, to create trainee positions for nationals (art. 43 of the Mining Code).

The following companies can take be involved in training activities:

- COMILOG SA
- COMILOG Exploration
- NGM
- CICMHZ
- Armada
- Azingo Gabon
- Select Exploration
- Jungle Storm
- Genmin
- Ivindo Iron
- SEM

6. Energy and digital transition: develop a strategy for the EU and Africa Partnership

The EU, France, Germany, Italy and Spain are present in-country and only France has bilateral cooperation. The EU Delegation and France implement a joint follow-up on the theme of "Green Economy and sustainable job creation". The development of a short and medium term action plan could be used to explore a number of (financial and non-financial) options for joint implementation in order to illustrate in a practical and pragmatic way the application of the "Working Better Together" approach.

In the spirit of "Team Europe", close collaboration with the EIB and Member States' cooperation agencies will be sought throughout the identification and implementation of potential actions in the priority areas of EU cooperation in Gabon, notably in the fields of green transition, sustainable job creation and economic diversification, in order to maximise the impact, coherence and visibility of European support[17].

Most of the mining partnerships between Gabon and France are related to the manganese industry:

- COMILOG: a manganese mining company in Gabon, a subsidiary of the French company Eramet. Eramet has a significant presence in Gabon and operates manganese mining and processing facilities.
- ERAMET: a French mining and metallurgy company, has been involved in various mining activities in Gabon, primarily focusing on manganese mining and production.

It seems that there is no specific mining partnerships between Gabon and the EU or it had not been widely reported or documented. On the other hand, Gabon and China have various mining partnerships and collaborations in place, particularly in the exploration and extraction of minerals, such as the Belinga iron ore project and the Maboumine niobium-REE project. CITIC Dameng Mining Industries Limited and Chinese companies have shown interest in exploring and potentially mining uranium in Gabon. Aside, China has been involved in infrastructure development projects in Gabon that support the mining sector, such as the construction of roads and ports to facilitate the transportation of mineral resources.

The mining sector currently accounts for 6% of Gabon's GDP, 6.4% of the country's exports, and employs approximately 6,000 people.

Despite numerous mining concessions granted by the Gabonese government, very few active or large-scale projects are in operation, except for manganese, which currently dominates the mining sector in Gabon. Efforts to diversify the mining industry are underway, in line with an active sectoral policy. However, apart from iron, where projects are most advanced, and gold, which is artisanal and unorganized in its exploitation, the exploration of critical minerals remains limited. None of these projects have entered the production phase to date.

[17] https://capacity4dev.europa.eu/resources/team-europe-tracker/partner-countries/gabon/jp_en

The development of the sector faces challenges related to delicate infrastructure, which is not always aligned with the ambition of making the mining sector in Gabon a true driver of growth.
The sector's legal framework, established in 2019, provides more flexibility for investors. Nevertheless, a deeper and more involved role of the state in monitoring and enforcing the established rules appears necessary.

Promising prospects, coupled with strong political will, could still enable the establishment of multiple collaborations to enhance extraction and transformation capabilities while developing activities that are currently non-existent in Gabon, such as recycling.

Gabonese authorities have outlined their sector objectives, prioritizing, among other things**, increased manganese production to become the world's second-largest producer** and the development of rare metal production, abundant in its subsoil, to rank among the world's leading producers.

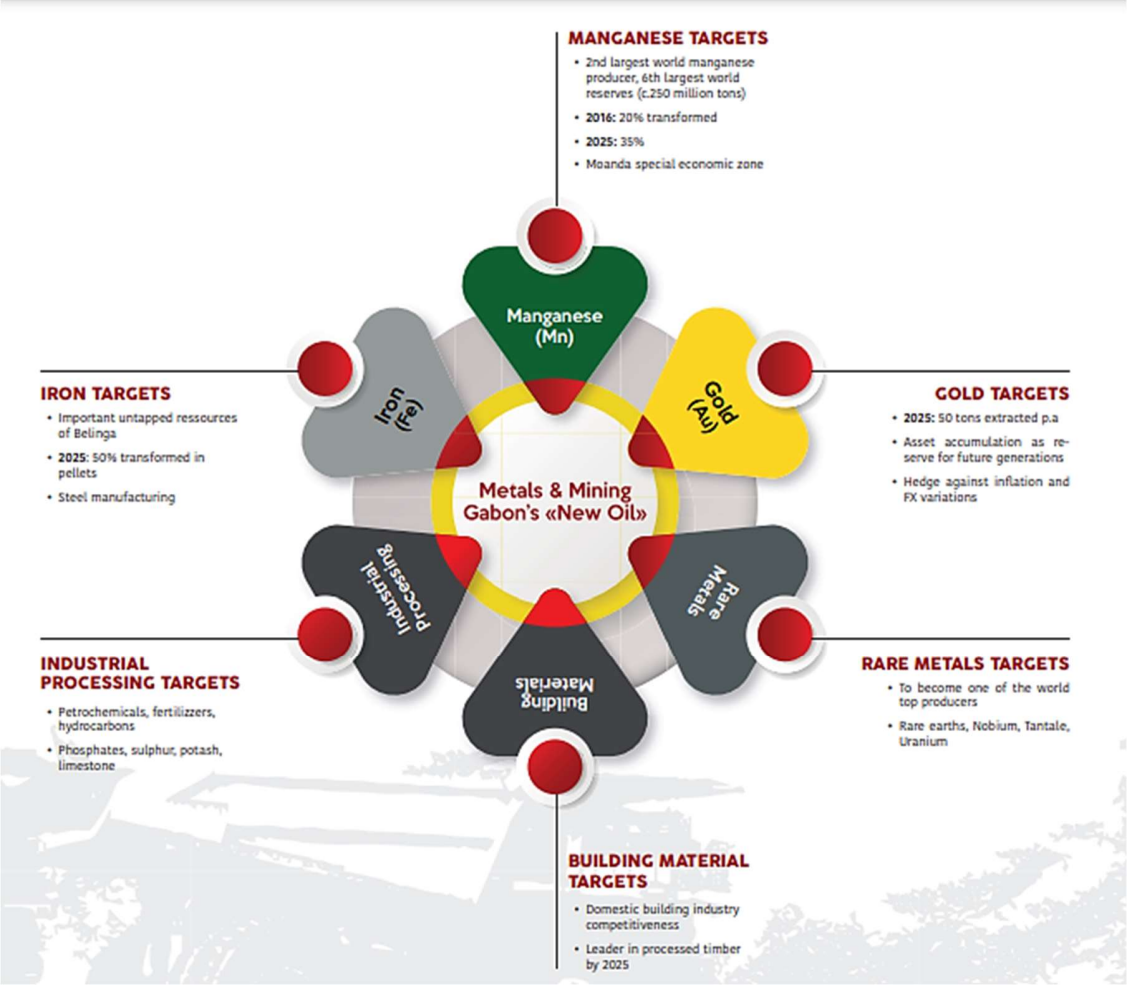


Figure 14: Booklet Mining « Unveiling mining opportunities in Gabon »[18]

[18] Ministère des Mines et de la Géologie du Gabon 2022

7. Opportunities for responsible investments

7.1. Identification of individual exploration, mining and refining projects

Investment possibilities for the development of a CRM value chain are mainly around mining production itself, through the development of local processing tools encouraged by the Gabonese government, but also through diversification of exploited minerals.

The Transformation Acceleration Plan (PAT) implemented since 2021, indicates three investment priorities for the development of the mining sector in Gabon:

Priority 1: Manganese Processing	Priority 2: Improvement of geological knowledge	Priority 3: Transport and energy infrastructure
Ensure the local treatment and transformation of all manganese production in Gabon	Promote the exploration and research of various minerals (gold, iron, rare earths, lithium, etc.) and set up a proper database	Continue efforts to build transport and energy infrastructure to serve the mining industry

Table 14: Investment priorities for the development of the mining sector

Investments are also needed to enhance the transport and energy infrastructure sector.

The training sector also requires investment or at least support, as an essential sector for skills development.

More broadly, as part of the institutional sector, support from the Gabonese State can be offered to improve the business environment.

The Société Equatoriale des Mines (SEM) is looking for partners to develop several mining projects (with various stage of progress depending on their history):

- Maboumine (Nb, P, REE, Ta, U) ;
- Kinguelé (Pt, Ni, Cu, Cr, Au) ;
- Lemanassa (Au, Cu, Mo) ;
- Ngoutou (REE) ;
- Dourekiki (Ba).

MABOUMINE PROJECT	*Niobium, phosphates, Rare Earth, tantalium & Uranium*
Geographical Settings	Mabounié, 300 kms from Libreville
Mineral Potential	**Project type** : Brownfield **Mineralisation and reserves**: 2,8 Mt of Nb203, 4Mt of REE, 83Kt of Uranium, 74 Kt of tantalium & 20Mt of phosphates
Available data	Reports and studies available on hydrometallurgical processes, resources and geology, assessments on logistics, infrastructure and environmental aspects
Available Infrastructures	**Roads** : Close to Nationale Road #1 heading to Libreville **Railway** : Possible connection to the Transgabonais railway leading to the deep water port of Owendo

	Port : Deep water ports of Owendo or Port-Gentil (river connection) **Energy** : To be defined **Airport** : small airport in Lambaréné
Project status	The project is ready for pre-feasibility or feasibility studies, pending receipt of an exploration permit

KINGUELE PROJECT	*Platinum, nickel, copper, chromate, gold*
Geographical Settings	« Mont de Cristal » , 100 kms from Libreville
Mineral Potential	**Project type** : Greenfield **Mineralisation and reserves**: 10-100 ppb Pt + Pd ; Pt/Pd >= 0.8, granular harzburgites and norites in a 1 700 preserved succession ; the exposed stratigraphic level of the Kinguele intrusion appears to straddle the boundary between ultramafic and mafic lithologies
Available data	**Preliminary studies** (2005-2009) : airborne geophysics (aeromagnetic and radiometrics@250m spacing), soil geochemistry (400mx25m. 46E ICP) and diamond drilling (15 holes)
Available Infrastructures	**Roads** : Close to Nationale Road #1 heading to Libreville **Railway** : Possible connection to the Transgabonais railway leading to the deep water port of Owendo **Port** : Deep water ports of Owendo **Energy** : Kinguélé hydroelectric dam **Airport** : Libreville international airport
Project status	The project is ready for pre-feasibility or feasibility studies, pending receipt of an exploration permit

LEMANASSA PROSPECTION PROJECT	*Gold, copper & et molybdene*
Geographical Settings	Boumango in the province of Haut-Ogooué (SE Gabon), 800 km from Libreville
Mineral Potential	**Project type** : Greenfield **Mineralisation and reserves**: 275-379 ppb Gold, 250 ppm Molybdene & copper, associated with tungsten, Bismuth. Porphyr deposit
Available data	**Preliminary studies**: airborne geophysics (magnetics and radiometric at 250m spacing line), soil geochemistry (400mx200m. and 200m x 100m
Available Infrastructures	**Roads** : a tar road between Boumango and Franceville **Railway** : Possible connection to the Transgabonais railway leading to the deep water port of Owendo **Port** : Deep water ports of Owendo **Energy** : Grand Poubara hydroelectric dam **Airport** : Franceville international airport
Project status	The project requires further exploration, in particular: trenching and diamond drilling and full soil / stream geochemical study

NGOUTOU COMPLEX PROJECT	*Rare Earth*
Geographical Settings	Ngoutou in the Haut-Ogooué province (SE Gabon, next to Okondja), 800 km from Libreville
Mineral Potential	**Project type** : Greenfield

	Mineralisation and reserves: REE, niobium, tungstn & F associated with syenites, microsyenites & trachyte deposit. Tin and Cerium ore deposits.
Available data	**Preliminary studies**: airborne geophysics (magnetics and radiometric at 250m spacing line), soil geochemistry (400mx200m)
Available Infrastructures	**Roads** : existence of a dirt road to Okondja and Makokou **Railway** : Possible connection to the Transgabonais railway leading to the deep water port of Owendo **Port** : Deep water ports of Owendo **Energy** : To be defined **Airport** : aerodromes in Okondja and Makokou + Franceville international airport
Project status	The project requires further exploration, in particular: trenching and diamond drilling and full soil / stream geochemical study

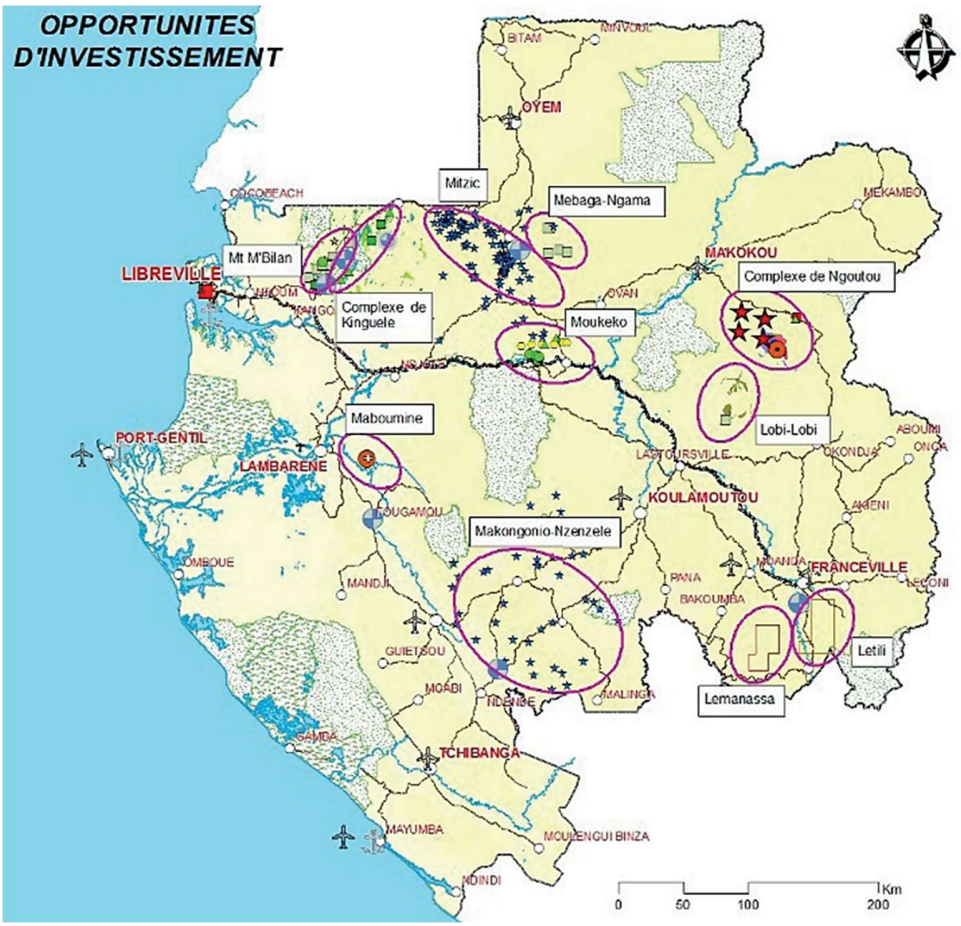


Figure 15: Map of investment opportunities in the mining sector[19]

The Gabonese State, via the Société Equatoriale des Mines (SEM), is also looking for partners to carry out high-resolution aerial geomapping for the entire country. This will involve mapping and demarcating potential mining exploration zones in order to monitor the work carried out by mining exploration companies. The objective is the creation of a modern geological map based on a complete interpretation

[19] Source : Booklet Mining « Unveiling mining opportunities in Gabon », Ministère des Mines et de la Géologie du Gabon 2022

of the data, in order to identify and develop the entire mining potential of the country and to provide mining companies, among others, with digital data complete.

More broadly, this project could be resized to take broader account of the needs of investors and operators in the sector. It is indeed appropriate to encourage the Ministry of Mines to communicate more the results of research already carried out by their predecessors. The transmission of this data to new permit holders would make it possible to add value to existing ones and offer significant time savings for operators. To do this, the creation of a catalog of existing resources could be proposed to the Ministry concerned, in order to streamline the communication of information.

In the same spirit, the design of a metallogenic map which would represent the different states of progress of the prospections carried out and in progress, their results, the ease of access and the hydrogeological aspects could represent an adequate promotional tool for investors, providing them with a global vision of the state of arts.

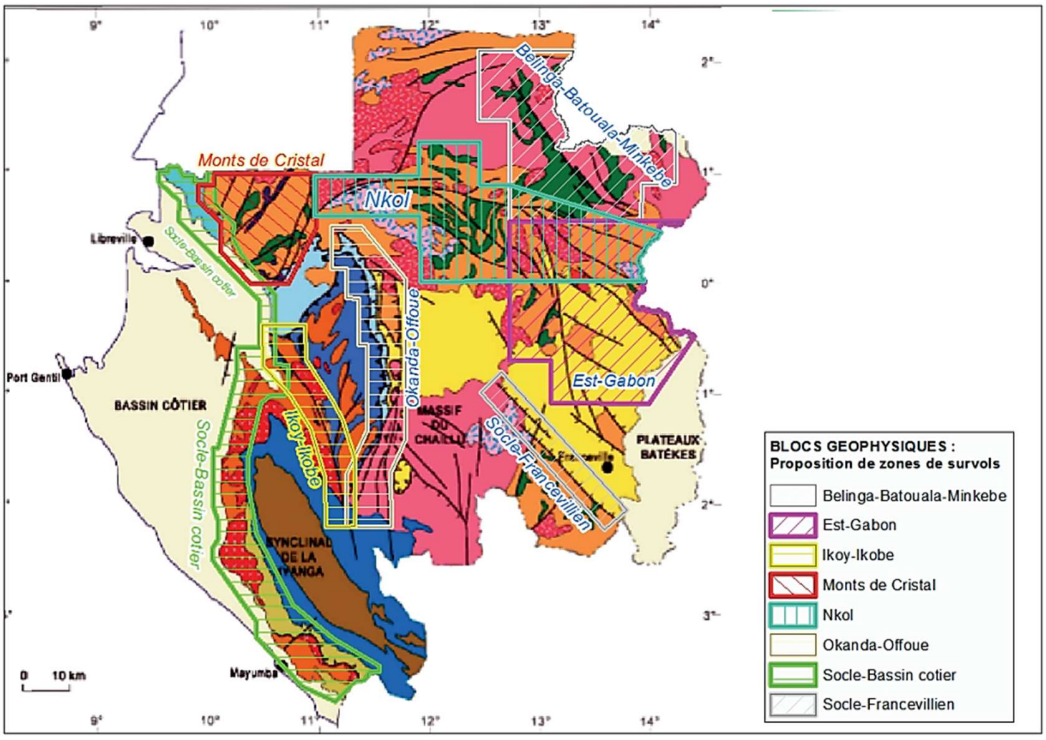


Figure 16: Map of proposed overflight zones for the mapping project carried out by the SEM[20]

Investment possibilities outside the mine

Investments or support for the promotion of the mining sector, more specifically to enhance activities linked to the CRM value chain are identified as critical. We will mainly focus on the development of transport and energy infrastructures, the development of downstream activities in the sector (transformation, refining, recycling), the development of research activities and the development of the

[20] Source : Booklet Mining « Unveiling mining opportunities in Gabon », Ministère des Mines et de la Géologie du Gabon 2022

sector, the improvement of the corpus of training and skills development, and the renewal of a sectoral incentive framework (more broadly improvement of the "business doing").

- **Development of transport and energy infrastructures**: the development and modernisation of the infrastructures, mainly road and railway, are essential to facilitate activities linked to the CRM value chain. A real need for construction and improvement of roads, railways, ports, but also for electrical energy is conditioning the evolution of the sector. This would considerably reduce the logistical costs of mining activities.

The "Transformation Acceleration Plan (PAT)" proposes a range of projects, all currently being implemented.

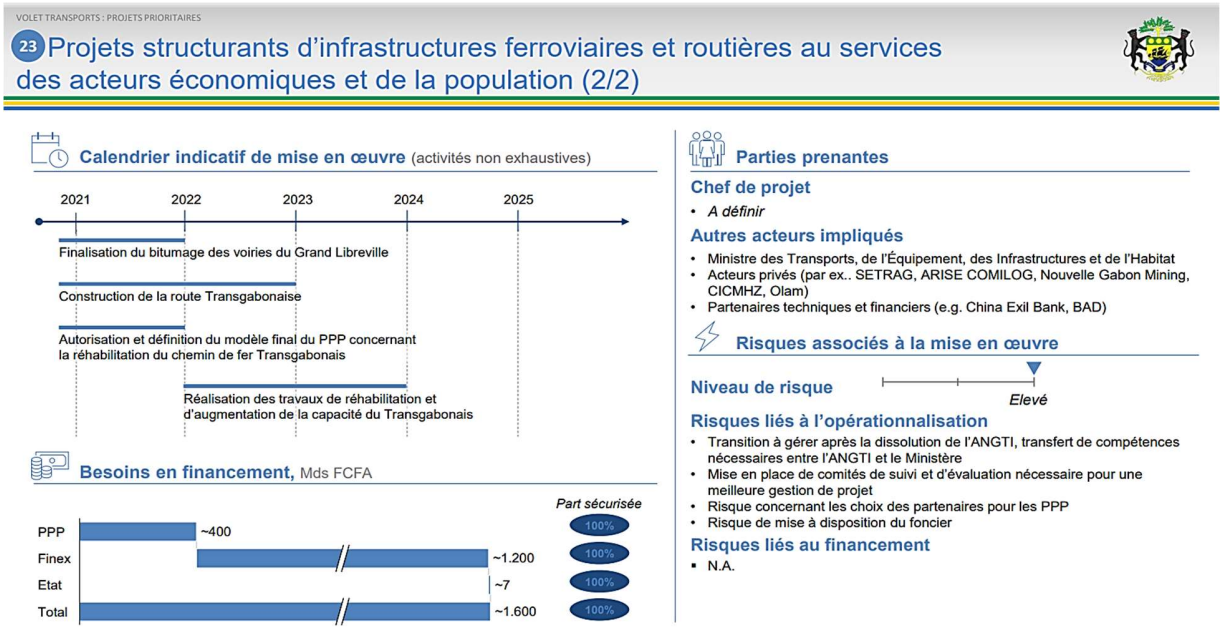


Figure 17: Structuring rail and road infrastructure projects in Gabon as defined by the PAT

However, supporting the Gabonese State in its infrastructure development policy may be necessary in order to take into consideration the specificities of the mining sector.

On top of these recommendations, mapping the forest dirt roads should be updated in order to give the investors a better understanding of the current situation, to improve the attractiveness of the country. Some of these roads, even if they are not drivable during the rainy season, facilitates the access to very remote areas.

- **Development of downstream activities of the mining sector**: the Gabonese State promotes the development of local processing of mining raw materials, including CRM, in order to diversify its economy, create employment and add value to its mining potential. Investment in processing, refining and recycling facilities is strongly encouraged as it promotes ores from the Gabonese subsoil. Refining and recycling activities for the materials concerned are non-existent in Gabon to date; this segment of activities needs to be developed entirely. Support from the State on legislative and technical aspects may be necessary. Possible partnerships could usefully be

established with operators in the sector, in order to support them in their development of activities linked to processing, made obligatory for any new mining agreement signed.

- **Development of research and development activities**: Investment in research and development activities would promote innovation and improvement of mining industry technologies. The Gabonese State has a real need for support in setting up specialized research centres, but also for financing research projects. Establishing partnerships with international universities and research institutions would make it possible to develop technological solutions adapted to the extraction and processing of critical raw materials in the local context. Cenarest (National Center for Technical and Scientific Research, (Cf. Point 2.1) would then be the appropriate contact.

- **Improvement of the training offer and skills development**: this is a critical point. This should aim to create a set of sectoral workforce (benefiting from qualifications meeting the real needs of operators), including specialized training programs, professional training centres, permanent collaboration with universities and encouraging capacity building initiatives for local workers and entrepreneurs. The Chamber of Trades could serve as a relay for this cooperation, as well as existing technical training structures (Cf. point 2.1). The Chamber of Trades, specifically, brings together a network of cooperatives under the banner of the confederation of artisanal miners of Gabon (CAMG), whose activities are currently focused around the exploitation of gold. She supports cooperatives in their formalization and obtaining small mining permits. The Chamber of Trades needs, in the form of cooperation, geologists in order to technically assist the cooperatives and develop knowledge of other minerals potentially exploitable in an artisanal manner, specific QHSE training, work equipment. More broadly, training in mining professions should be promoted among young people.

- **Improvement of the business environment and transparency**: the Gabonese State is already taking part in several initiatives to fight corruption and promote good business practices. Their implementation is difficult and the IMF is supporting Gabon on these issues with the implementation of administrative reforms. Gabon has returned to the EITI since 2021. The report published in May 2023 provides some recommendations for the mining sector in particular:
    - Improved transparency on the monitoring of State participations in the extractive sector, as well as the methods of financing these participations and the income they generate for the State.
    - Establishment of a public register of permits and beneficial owners of extractive companies operating in Gabon
    - Improved contract transparency disclosure of extraction contracts mentioning actions, responsible parties, timelines, resources and technical assistance needs.
    - Application of the rules provided for in the mining code, including that of sharing (articles 57 and 58) of the proportional mining royalty
    - Carrying out a study covering the artisanal mining sector and the informal sector of the country in the economy and employment

7.2. Regulatory and ASM sector country profiles

7.2.1 Country profiles on regulations and good governance

Article 4 of the Gabonese Mining Code stipulates that ASM is any operation which is involved in extracting useful mineral substances by rudimentary, manual, traditional or semi-mechanised methods and processes. Furthermore, Article 4 of the Mining Code also state that artisanal mining activities are conducted in accordance with the following general principles:

- the prohibition of the possession and use of chemicals and explosives on the sites;
- the exclusive allocation to nationals of authorisations mining;
- the prohibition of any semi-mechanised artisanal mining on the perimeter of a permit of research;
- the prohibition of artisanal mining of any kind on the perimeter covered by an operating title;
- the ban on the use of labour that is below age (child labour).

The holder of an operating ASM authorisation is required to:

- to start operations within three months, following the date of allocation of the exploitation right;
- to declare its production quarterly to the administration in charge of mines and keep a register of production and sales;
- to comply with the obligations relating to the protection of the environment;
- to explore and exploit the resource in the rules of art;
- to sell its production only to approved physical and moral persons (Gold Buying Centres "Comptoir")

The holder of an operating ASM licence is subject to the quarterly payment of 5% of the market value of its production except derogation granted by the Minister in charge of Mines under the conditions set by regulation. To practice ASM in Gabon, there are two types of authorisations required:

- individual ASM Authorisation is issued by the administration in charge of mines for a period of two years renewable. It confers on its holder, within the limits of its perimeter, the right to exploit the mineral substance precisely for which it is attributed.
- collective ASM Authorisation is only open to mining cooperatives, cooperative societies and assimilated. Artisanal miners can join together in a mining cooperative. The authorisation is granted by order of the Minister in charge of Mines for a period of two years, renewable, in the forms and conditions set by regulatory route. It confers on its holder, within the limits of its perimeter, the right to exploit the mineral substance precisely for which it is attributed. The area of an operating permit collective ASM cannot exceed 5 Km^2. The holder of a collective artisanal mining licence is subject to mining taxation.

7.2.2 Country profiles on ASM sector developments and investment

One of the core objectives of the AfricaMaVal is to identify investment opportunities in a number of commodities considered critical by the European Union, and there is a clear interest to include the ASM sector in the identification of such opportunities. The emphasis should be on identifying responsible investment opportunities that strengthen the artisanal sector's supply potential and address ESG impacts while also contributing to higher value addition and economic development.

To ease identification of opportunities, the following categories should be considered.

- Governance: focusing on the needs of the sector to strengthen its governance to ensure it contributes to socio-economic development. This could include support to government, knowledge sharing programmes, extension services to the ASM sector, etc.

- Support to existing initiatives: existing initiatives which focus on supporting the ASM sector to improve its social and economic impacts, and that could benefit from stronger / continued financing.

- Value chain projects (processing, trading, etc.): opportunities to support value addition projects which directly support and benefit the ASM sector.

- Small-scale mining projects: specific small-scale mining projects which might benefit from financing opportunities and investment (e.g., to improve mining techniques, production, environmental and social impact management.).

Conclusion

The mining sector in Gabon, although largely underexploited, holds significant potential that deserves special attention.

Aware of the country's strong mining potential and the significant economic growth lever it represents, Gabonese authorities have been implementing an active policy for sector development for several years. This policy is supported, among other things, by a regulatory framework provided by a mining code that governs the sector.

However, its growth faces significant obstacles, notably related to the weakness of its infrastructure, a lack of value chain control, and governance issues.

The Société Equatoriale des Mines (SEM), a state-owned entity, is a key player in implementing the sector's development policy. The projects it aims to develop require the support of industry experts. A comprehensive capacity strengthening program, including training and sector-specific updates, as well as addressing issues of corporate social responsibility (CSR) and governance, could enable SEM to fulfill its role more effectively.

On the other hand, the critical minerals' exploitation, processing, transformation, and recycling sector, apart from manganese, remains entirely undeveloped. State support appears to be necessary to guide the sector's governance, in connection with the Extractive Industries Transparency Initiative (EITI), to which Gabon was readmitted at the end of 2021.

The establishment of a network around ECRM would undoubtedly promote the development of this sub-sector. The demand for training is substantial, and the recognition of mining professions is crucial for promoting a local workforce that is not only well-trained but also motivated.

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References

2AD Consulting, Août 2023. Etude de cas Gabon. 63p + annexes 61p.

Agard, J., 1971. Terres rares. Dans : Direction des Mines de la République Gabonaise : Plan Minéral, 227-230.

Artignan, D., Pasquet, J.F., Ralay, F., 1979. Convention FAC/Etat gabonais. Mission Nyanga 1978 (Gabon). Cartographie géologique et prospection générale. Rapport BRGM 79 LIB 003.

AWIMA (2023). AfricaMaVal Deliverable 4.1 Report on mining regimes with respect to ESG objectives

Campiglio, C., Marion, C., Vannier, M., 1983. Le complexe mafique-ultramafique de Mbilan : étude des premiers échantillons de roches et de concentrés alluvionnaires. C.G.G.M, Ecoles des Mines, août 1983, 31 p.

CGG, 1983-1984. Interprétation de la prospection aéroportée de magnétisme et spectrométrie gamma du Gabon. Rapport c.r. gén. Géophysique (CGG), Ministère des Mines et du Pétrole du Gabon, 54 p.

Chevallier, L., Makanga, J.-F., Thomas, R.J., 2002. Notice explicative de la Carte géologique de la République Gabonaise à 1/ 1 000 000. Editions DGMG Gabon, 195 p.

Control Risk, June 2023. Assessment: Gabon. Confidential. 7p.

Donnot, M., Wéber, F., 1968. Notice explicative sur la feuille Franceville-Est et carte géologique de reconnaissance à l'échelle du 1/500 000. Première édition. Ministère des Mines, Ressourc. Hydraul., Energ., Gabon, Ed. BRGM, France, 43 p + 1 carte couleur, et rapport BRGM 68 RME 049.

EC, 2020. Study on the EU's list of Critical Raw Materials (2020). Final report (Blengini, G.A., Latunussa, C.E.L., Eynard, U., Torres de Matos, C., Wittmer, D., Georgitzikis, K., Pavel, C., Carrara, S., Mancini, L., Unguru, M., Blagoeva, D., Mathieux, F., Pennington, D.). European Commission, ISBN 978-92-76-21049-8, doi: 10.2873/11619, 158 p.

EC, 2023. Study on the critical raw materials for the EU, 158p. (study on the critical raw materials for the eu 2023-ET0723116ENN (1).pdf).

ERAMET, 2021. Universal registration document, 478p.

FFA Juridique & Fiscal (Member of Ernst & Young), July 2023. Summary of a study on the economic, legal and fiscal environment of the mining sector in Gabon. Confidential. 19p.

Gonnard, R., 1971. Indices minéraux et ressources minérales du Gabon : Phosphates. In : Plan Minéral de la République gabonaise, Collectif, 1971, deuxième partie, chapitre XVII, pp. 193-199, Ministère des Mines, Direction des Mines du Gabon.

Grandin , G. and Campiglio, C., 1990. Le complexe mafique-ultramafique archéen de Kango (Gabon) : rapport final sur la mission de reconnaissance à KG IV et sur les travaux concernant les échantillons de cette zone. Rapport inédit : Ecole des Mines de Paris, 15p.

Guillemot, D. 1988. Le lever aérogéophysique du socle gabonais. Chron. Rech. Min. pp. 491, 13-24.

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Laval, M., Johan, V., Tourlière, B., 1988. La carbonatite de Mabounié : exemple de formation d'un gîte résiduel à pyrochlore. Chronique de la Recherche Minière, BRGM Orléans, 491, pp. 126-136.

Martini, J.E.J., Makanga, J.-F., 2001. Carte Métallogénique de la République gabonaise à 1/1 000 000. Editions DGMG Gabon.

Martini, J.E.J., Makanga, J.-F., 2002. Notice explicative de la carte Métallogénique de la République gabonaise à 1/1 000 000. Editions DGMG Gabon, 169 p.

Moussu, 1971. Indices minéraux et ressources minérales du Gabon : Etain (niobium-tantale). In : Plan Minéral de la République gabonaise, Collectif ; 1971, deuxième partie, Chap. XIV, 173-178, Ministère des Mines, Direction des Mines.

Prian, J.P., Ebang, M., Siméon, Y., Johan, V., Tourlière, B., Angel, J.M., 1998. Synthèse géologique et géochimique, potentialités minières du degré carré Mitzic (Gabon Central) avec carte géologique à 1/200 000. République Gabonaise, Ministère des Mines et des Hydrocarbures, Libreville ; BRGM Orléans, 185 p., 45 fig. h.t. et pl.

Prian, J.P., Eko N'Dong, J., Coste, B., 1991. Synthèse géologique et géochimique, potentialités minières du degré carré Mouila (Archéen et Protérozoïque du Gabon central), avec carte géologique à 1/200 000. Synthèse du district aurifère d'Etéké. Edition BRGM pour DGMG Gabon en 1000 exemplaires. Vol. 1: 212 p., 54 fig., 17 tabl.; vol. 2: 36 fig., 7 pl. photos; 3 pl. h.t.

Prian, J.P., Siméon, Y., Johan, V., Ledru, P., Piantone, P., Coste, B., Eko N'Dong, J., 1990. Synthèse géologique et géochimique, potentialités minières du degré carré Booué (Gabon central), avec carte géologique à 1/200 000. Edition BRGM pour DGMG Gabon, en 1200 exemplaires. Vol. 1: 103 p., 26 fig., 8 tabl.; vol. 2: 43 p., 34 fig.

SODETEG, 1984. Synthèse des données de la géologie, du radar, du magnétisme et de la spectrométrie sur le Précambrien du Gabon. 2 volumes. Ministère des Mines et des Hydrocarbures de la République Gabonaise.

Thiéblemont, D., 2009. Carte géologique et des Ressources minérales de la République gabonaise à 1/1,000,000, 3ième édition. DGMG Editions, Ministère des Mines, du Pétrole, des Hydrocarbures. Libreville.

Thiéblemont, D., Castaing, C., Billa, M., Bouton, P., Préat, A., 2009b. Notice explicative de la Carte géologique et des Ressources minérales de la République gabonaise à 1/1,000,000. DGMG Editions, Ministère des Mines, du Pétrole, des Hydrocarbures, Libreville, 384 p.

Thiéblemont, D., Husson, Y., Truffer, C., Cruz-Mermy, D., Castaing, C., 2009a. Rapport de synthèse du projet « Constitution d'une base de données géologique et minière – Gabon » - Rapport final. BRGM/RC-58717-FR, 79 p., 18 fig., 4 ann.

Thomas, R.J., Makanga, J.-F., Chevallier, L., 2001. Carte géologique de la République Gabonaise à 1/ 1 000 000, 2e édition. Editions DGMG Gabon.

Vella, A., 2022. Highlighting mineralized geological environments through a new Data-driven predictive mapping approach. Ph.D. thesis, University of Orléans, France, p. 281.

Websites for Macroeconomic chapter:

African Development Bank Group. (2022). *Gabon Economic Outlook*. Retrieved from African Development Bank Group: https://www.afdb.org/en/countries/central-africa/gabon/gabon-economic-outlook

Allianz. (2022). *Gabon - Trade structure*. Retrieved from Allianz Trade: https://www.allianz-trade.com/en_global/economic-research/country-reports/Gabon.html#link_internal_1

Export Entreprises SA. (2022). *Gabon: Investing in Gabon*. Retrieved from Stanbic: https://www.tradeclub.stanbicbank.com/portal/en/market-potential/gabon/investment#

IMF- International Monetary Fund. (2022). P*remière et deuxième revues de l'accord élargi au titre du mecanisme elargi de credit, demandes de derogations pour le non-respect de criteres de realisation, et examen des assurances de financement.*

International Trade Administration. (2022). *Gabon - Country Commercial Guide*. Retrieved from International Trade Administration: https://www.trade.gov/country-commercial-guides/gabon-market-overview?section-nav=10574

Trading Economics. (2022). *Senegal currency*. Retrieved from Trading Economics: https://tradingeconomics.com/senegal/currency

World Bank. (2022). *The World Bank in Gabon*. Retrieved from World Bank: https://www.worldbank.org/en/country/gabon

Websites for ESG best practices section:

https://www.eramet.com/fr/groupe/etat-gabonais-comilog-creation-de-fonds-dedies-aux-populations-locales/

https://comilog.eramet.com/

https://journals.openedition.org/echogeo/11103

https://medias241.com/societe-la-rse-de-la-nouvelle-gabon-mining-un-exemple-a-suivre/

https://mo.ibrahim.foundation/sites/default/files/2023-01/2022-index-report.pdf

https://www.transparency.org/en/cpi/2022

https://www.fraserinstitute.org/sites/default/files/annual-survey-of-mining-companies-2022.pdf

https://documents1.worldbank.org/curated/en/688761571934946384/pdf/Doing-Business-2020-Comparing-Business-Regulation-in-190-Economies.pdf

APPENDICES

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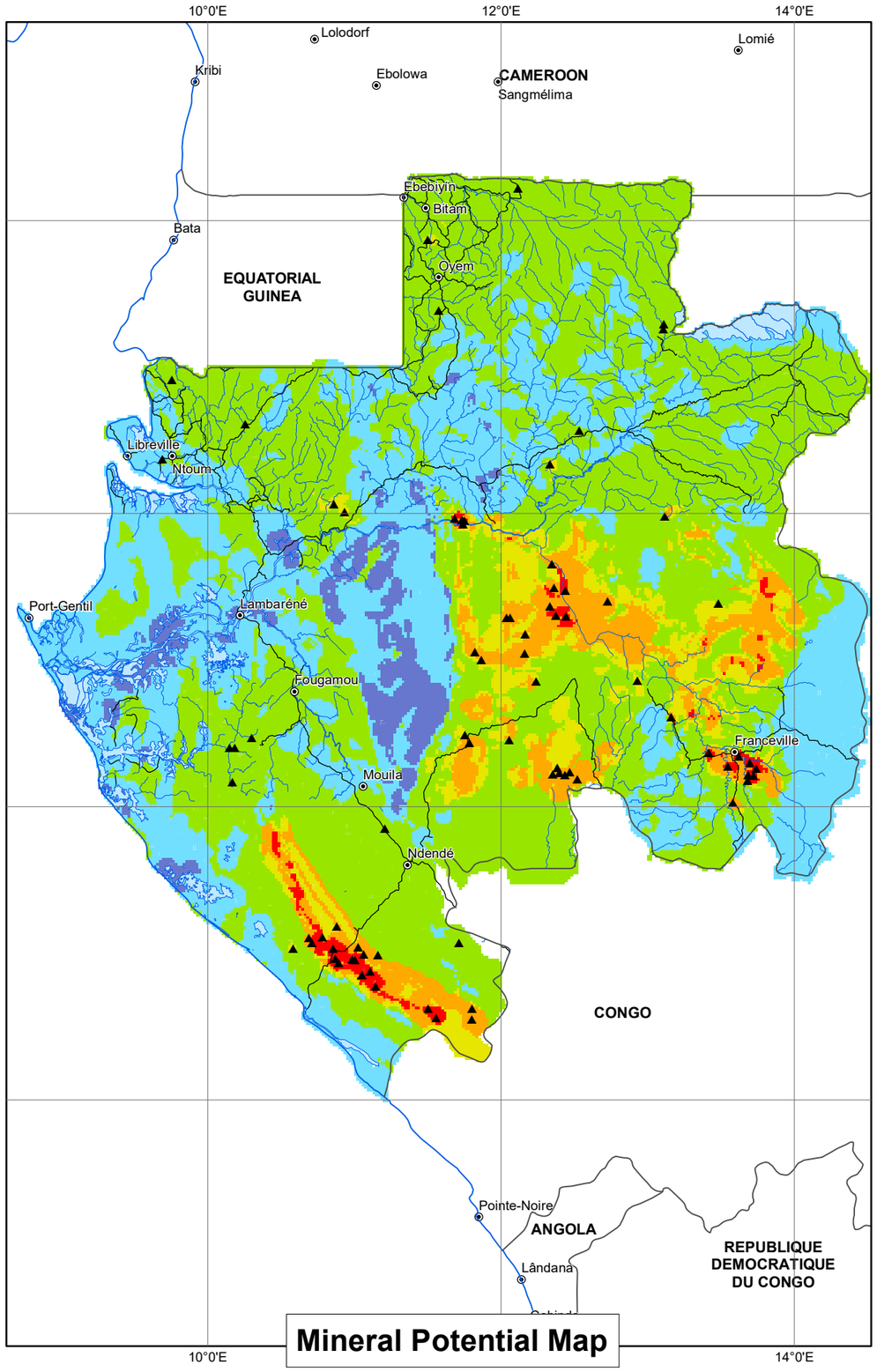
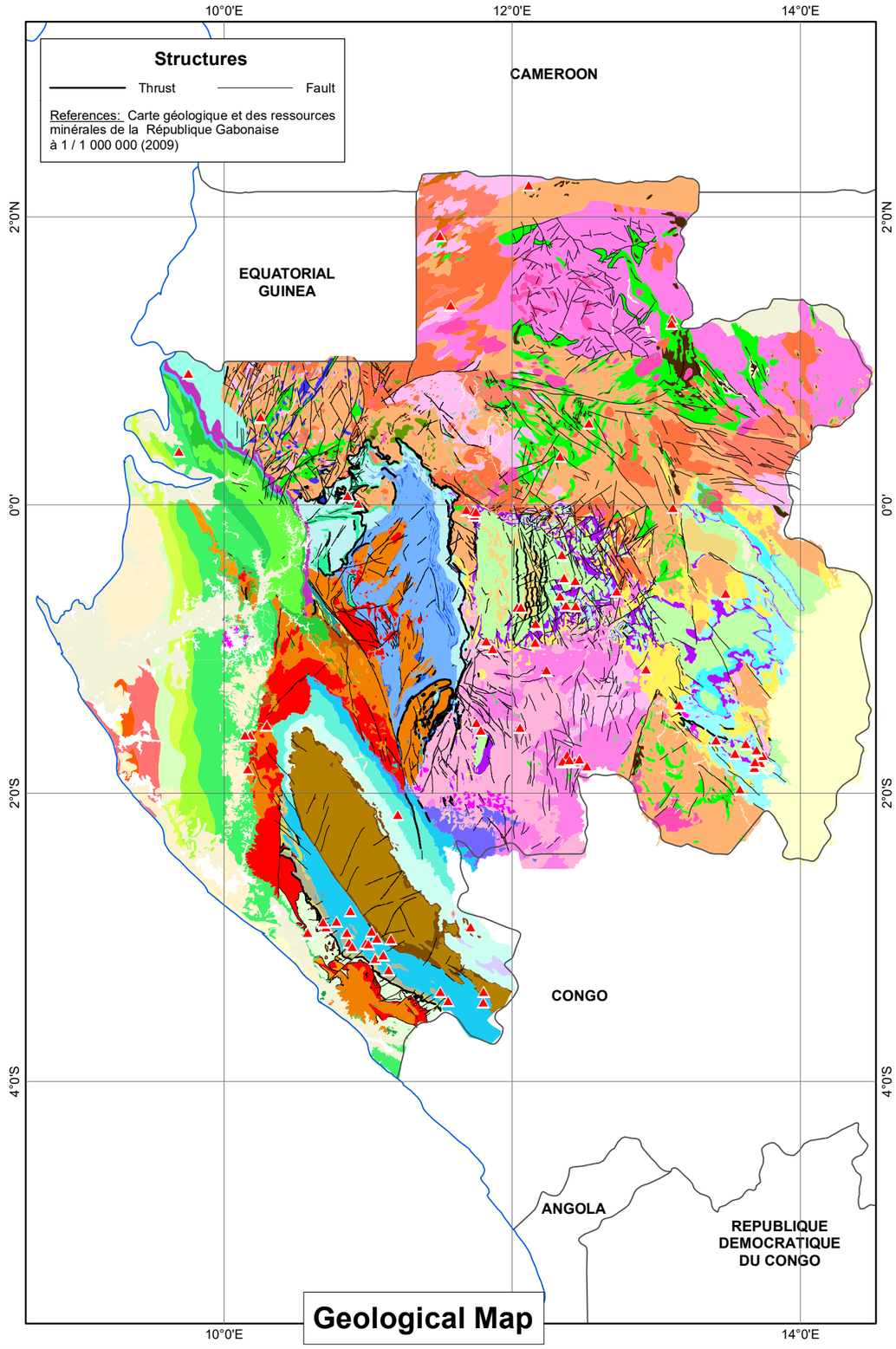
Country: GABON

MINERAL POTENTIAL MAP - *COPPER (Cu)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

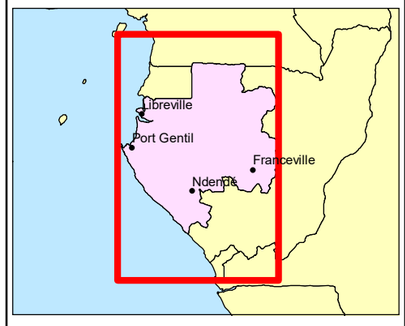
Known occurrences

Copper (Cu)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 59806 88.60% Non-occurrence in database Non-occurrence predicted	False positive Cells: 7176 10.63% Non-occurrence in database Occurrence predicted
False negative Cells: 129 0.19% Occurrence in database Non-occurrence predicted	True positive Cells: 392 0.58% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.36
Cell size: 2000 m



0 50 100 200 Km

Datum : WGS84 (World Geodetic System 1984)

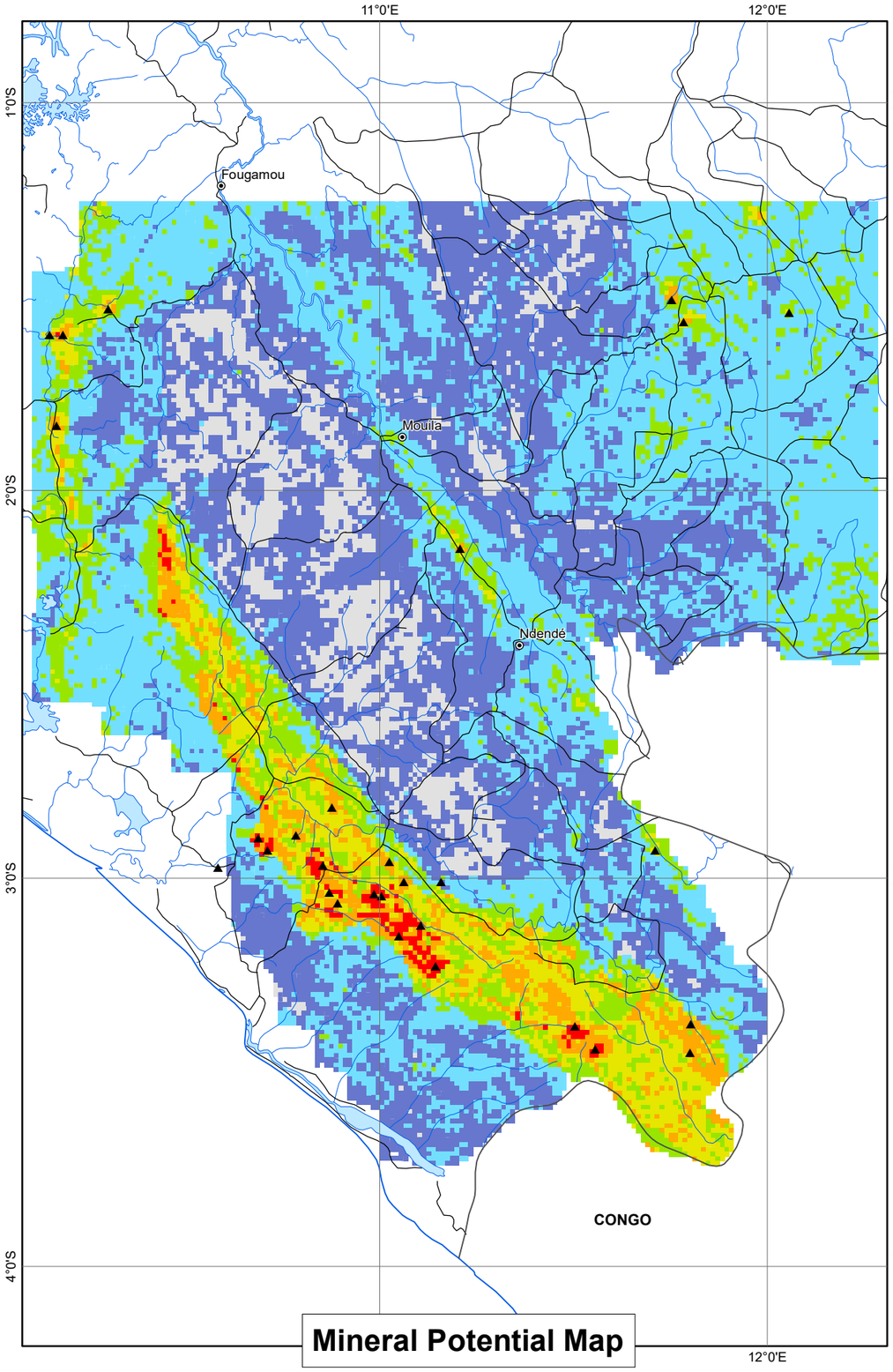
January 2024

Géosciences pour une Terre durable
brgm

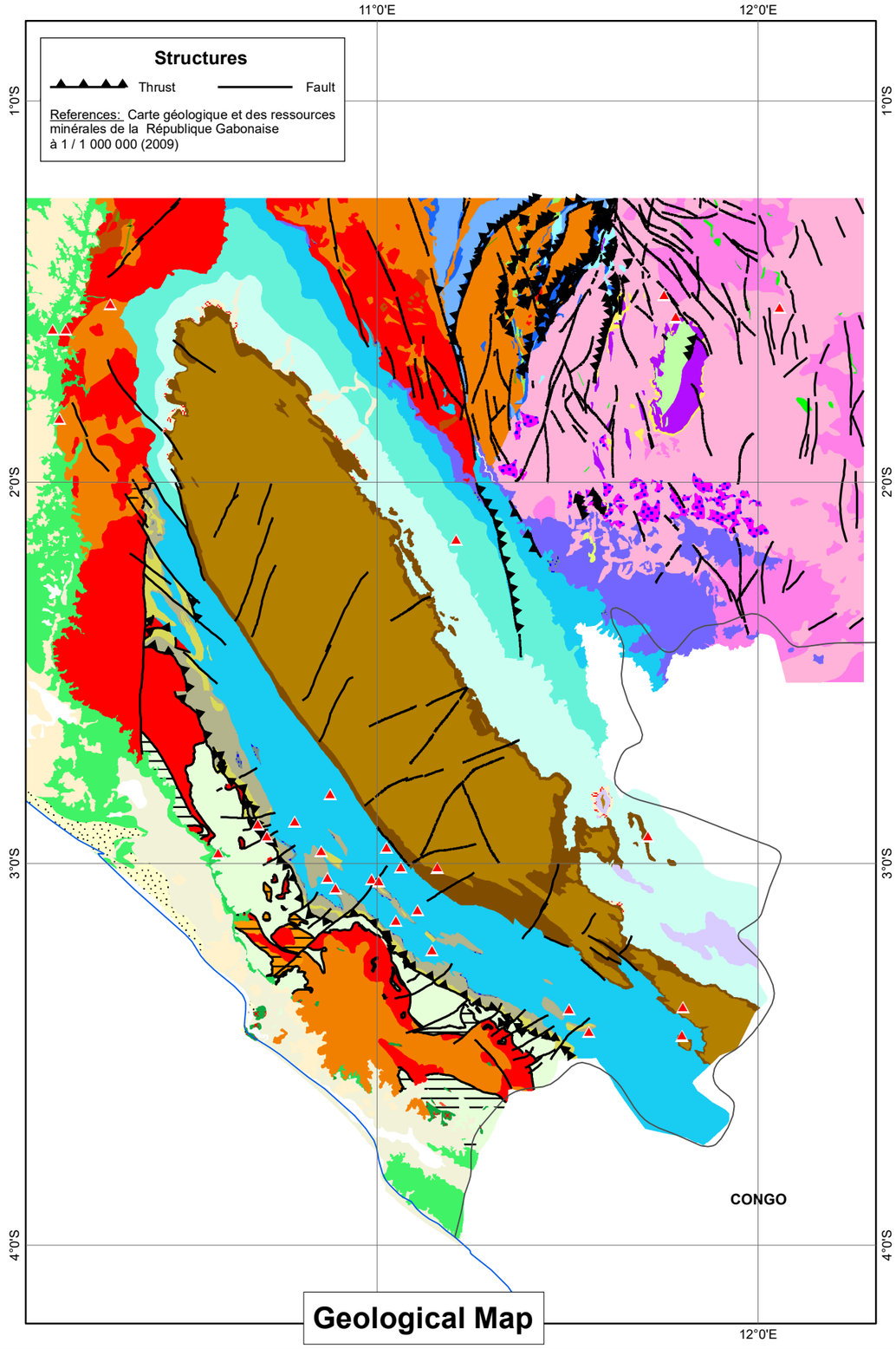
Country: GABON (Nyanga basin)

MINERAL POTENTIAL MAP - *COPPER (Cu)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

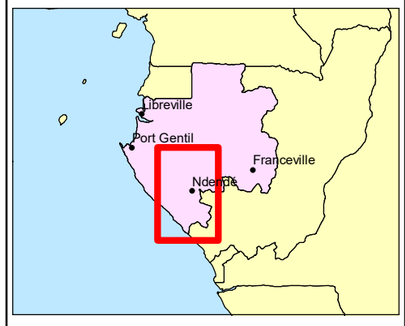
Known occurrences

Copper (Cu)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 25219 91.84% Non-occurrence in database Non-occurrence predicted	False positive Cells: 2049 7.46% Non-occurrence in database Occurrence predicted
False negative Cells: 35 0.13% Occurrence in database Non-occurrence predicted	True positive Cells: 157 0.57% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.35
Cell size: 1333 m



N

0 15 30 60 Km

Datum : WGS84 (World Geodetic System 1984)

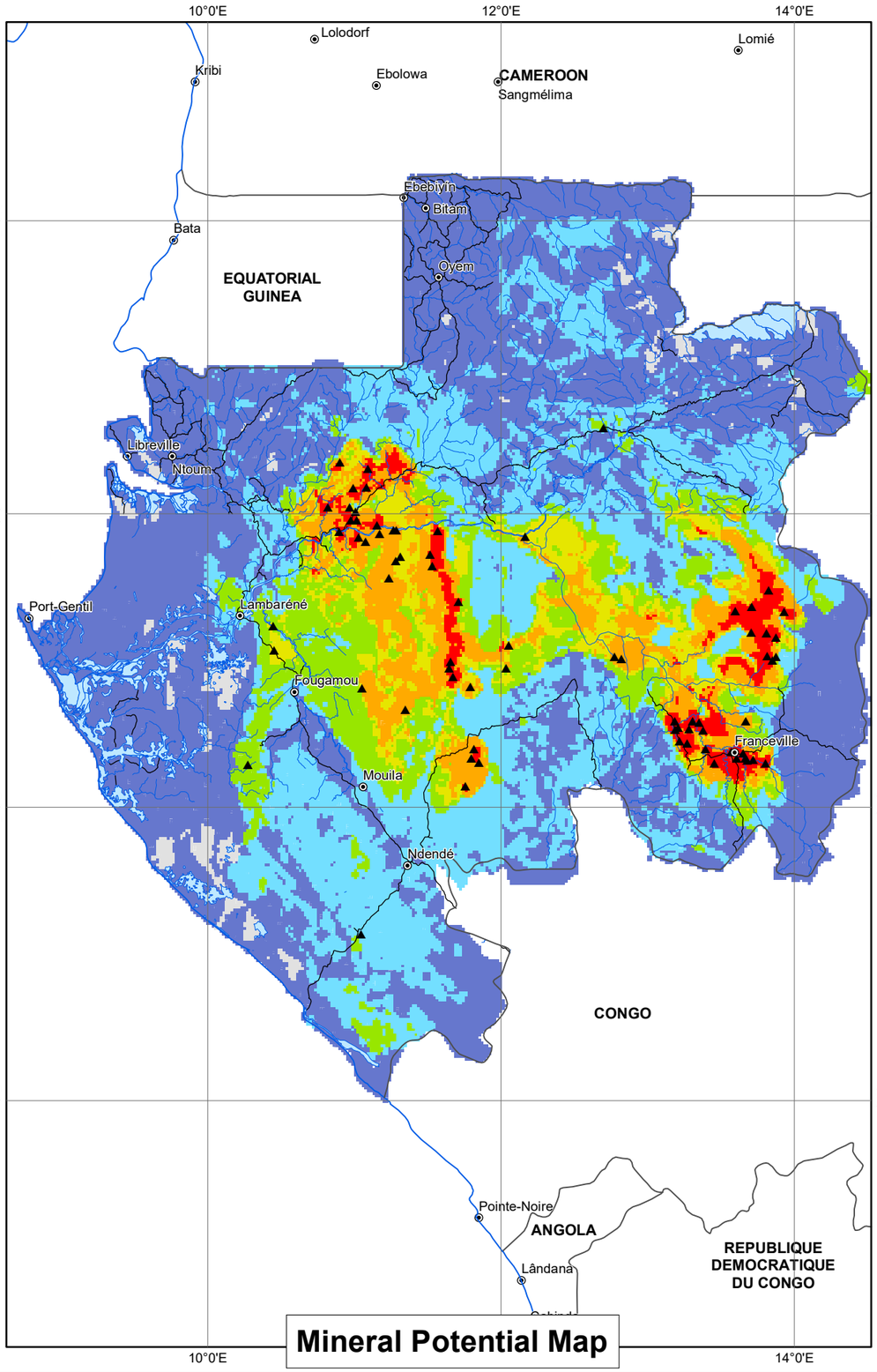
January 2024

Géosciences pour une Terre durable
brgm

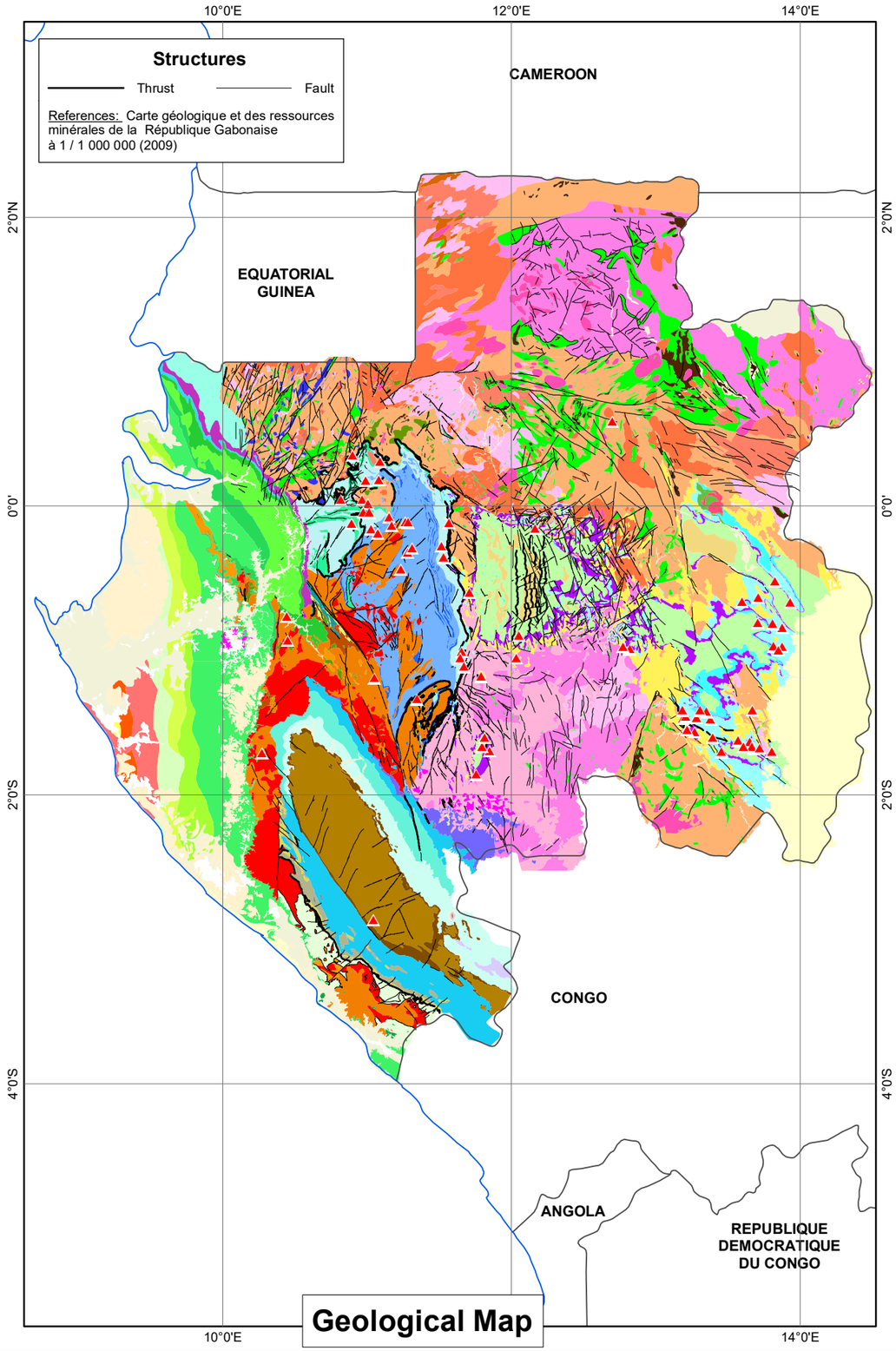
Country: GABON

MINERAL POTENTIAL MAP - *MANGANESE (Mn)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

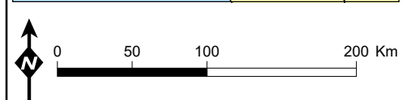
Known occurrences

Manganese (Mn)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 59251 87.78% Non-occurrence in database Non-occurrence predicted	False positive Cells: 7763 11.50% Non-occurrence in database Occurrence predicted
False negative Cells: 45 0.07% Occurrence in database Non-occurrence predicted	True positive Cells: 444 0.65% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.42
Cell size: 2000 m



Datum : WGS84 (World Geodetic System 1984)

January 2024

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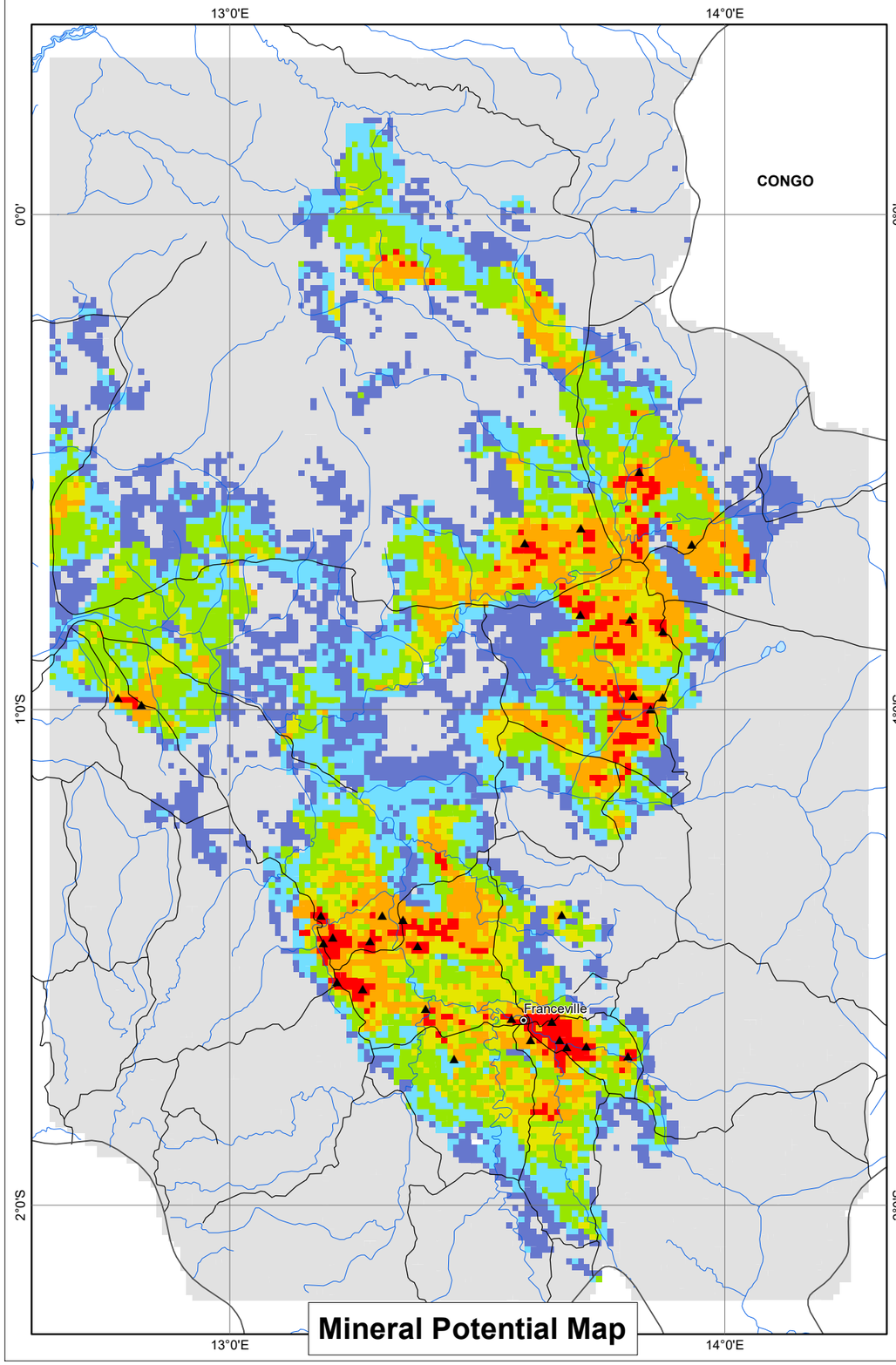
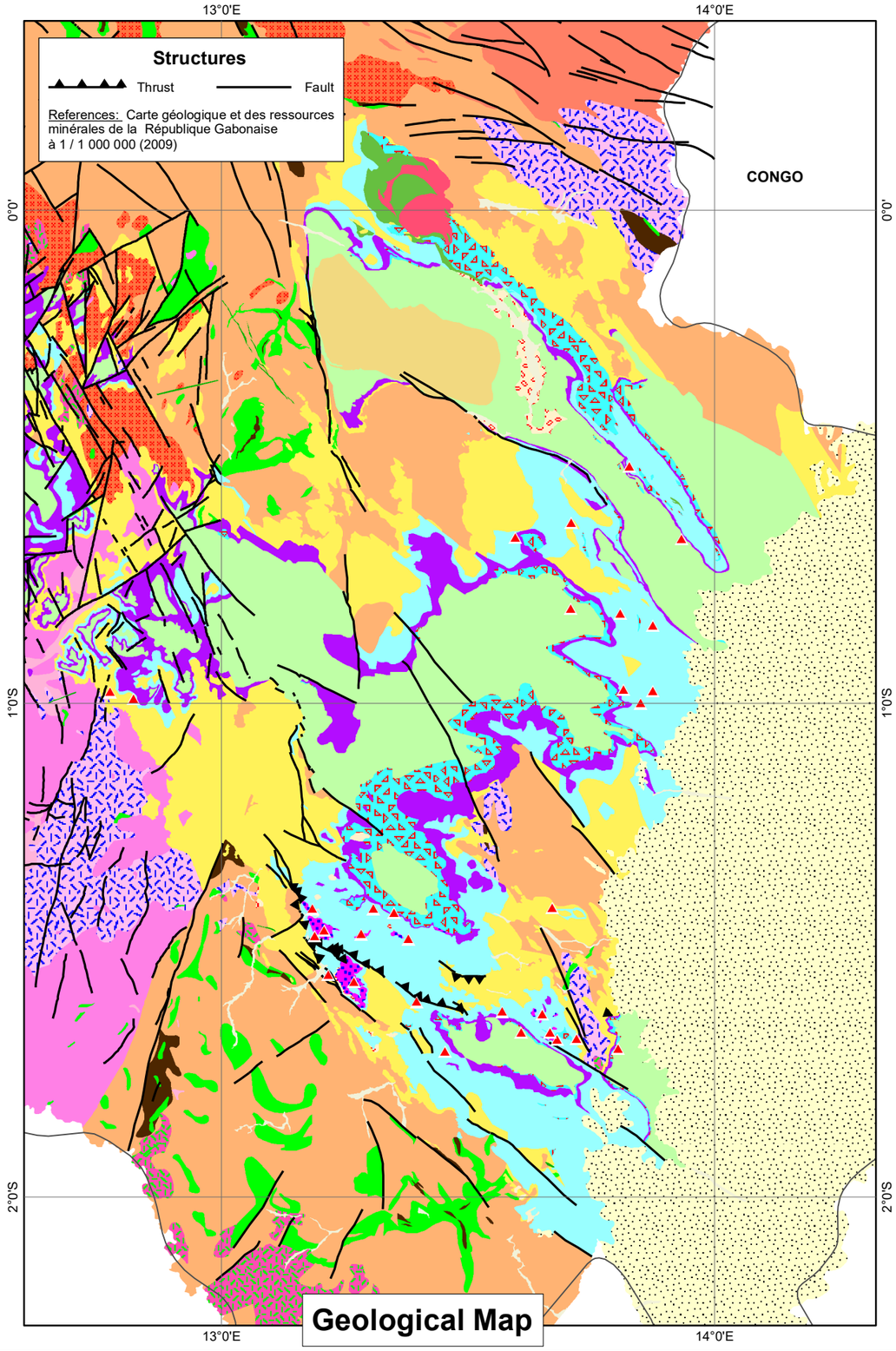
Country: GABON (Franceville basin)

MINERAL POTENTIAL MAP - *MANGANESE (Mn)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

Known occurrences

Manganese (Mn)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 24000 90.61% Non-occurrence in database Non-occurrence predicted	False positive Cells: 2264 8.58% Non-occurrence in database Occurrence predicted
False negative Cells: 9 0.03% Occurrence in database Non-occurrence predicted	True positive Cells: 207 0.78% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.48
Cell size: 1333 m

0 15 30 60 Km

Datum : WGS84 (World Geodetic System 1984)

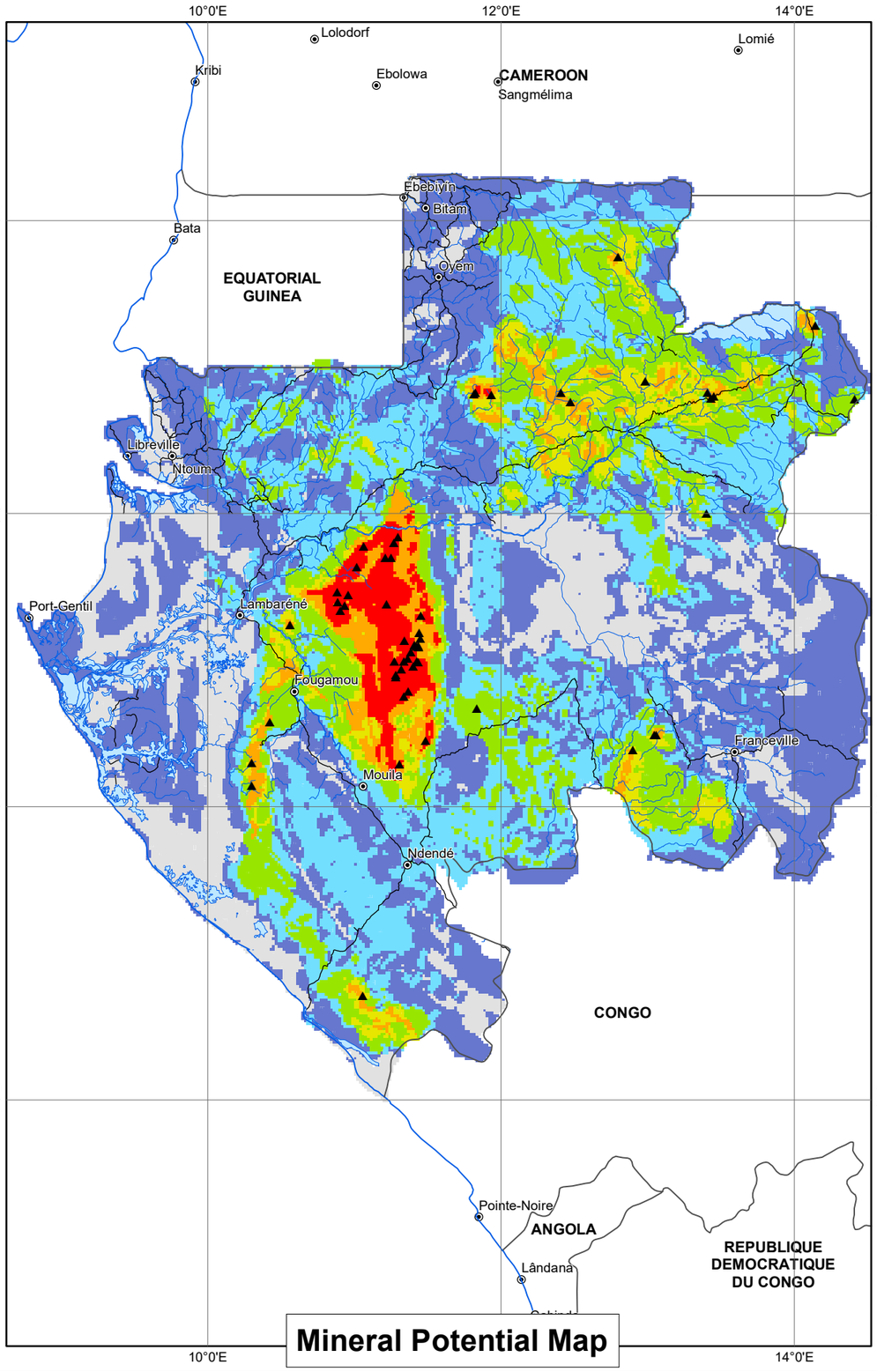
January 2024

Géosciences pour une Terre durable
brgm

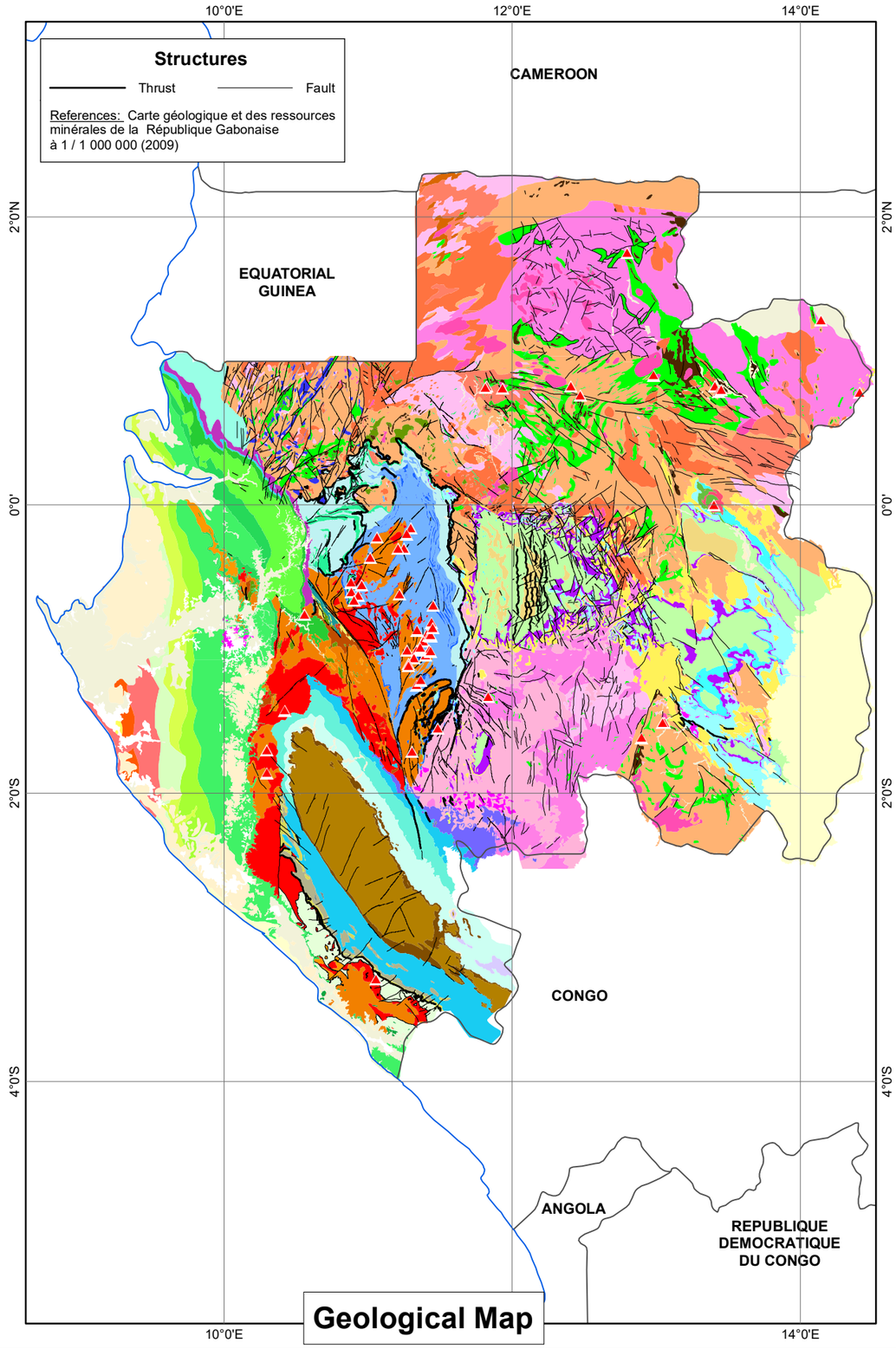
Country: GABON

MINERAL POTENTIAL MAP - *NIOBIUM (Nb)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

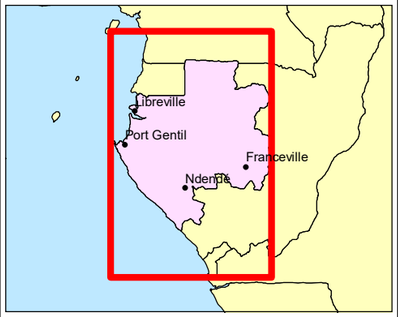
Known occurrences

Niobium (Nb)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 61550 91.18% Non-occurrence in database Non-occurrence predicted	False positive Cells: 5601 8.30% Non-occurrence in database Occurrence predicted
False negative Cells: 26 0.04% Occurrence in database Non-occurrence predicted	True positive Cells: 326 0.48% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.42
Cell size: 2000 m



0 50 100 200 Km

Datum : WGS84 (World Geodetic System 1984)

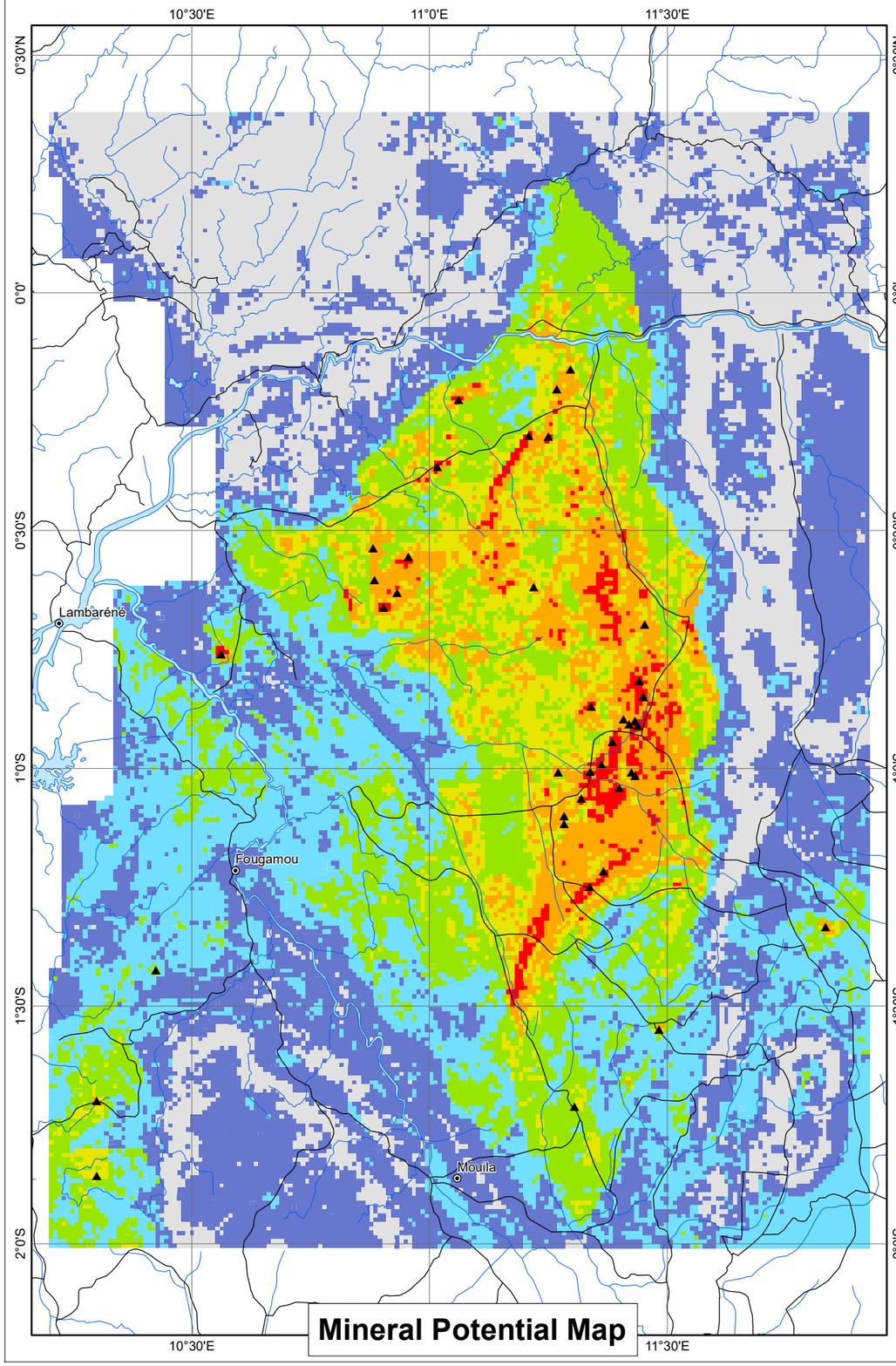
January 2024

Géosciences pour une Terre durable
brgm

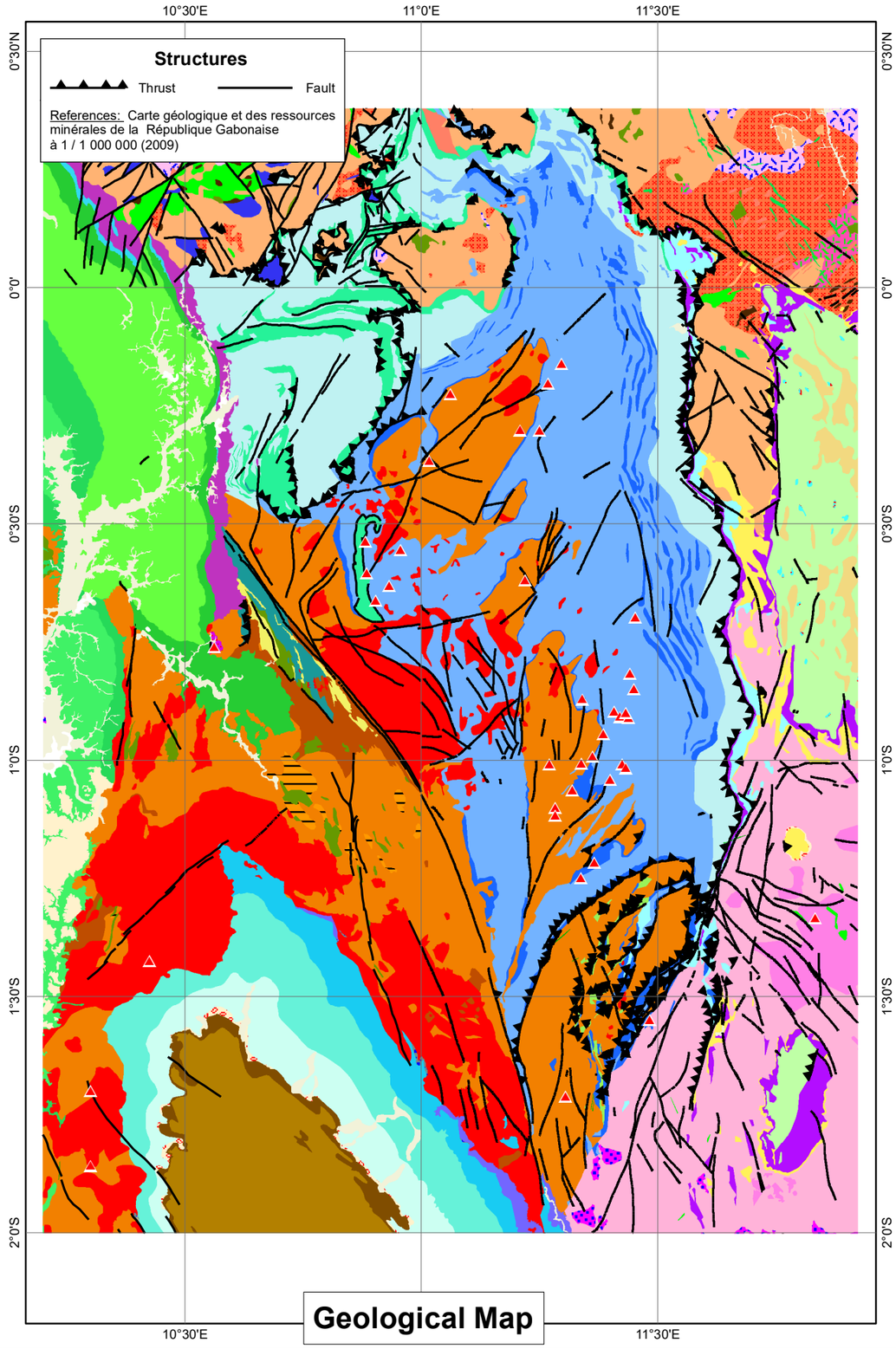
Country: GABON (Ogooué domain)

MINERAL POTENTIAL MAP - *NIOBIUM (Nb)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

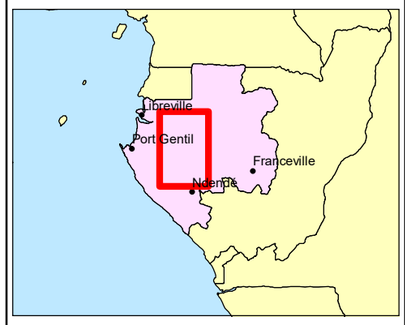
Known occurrences

Niobium (Nb)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 42080 88.79% Non-occurrence in database Non-occurrence predicted	False positive Cells: 5051 10.66% Non-occurrence in database Occurrence predicted
False negative Cells: 20 0.04% Occurrence in database Non-occurrence predicted	True positive Cells: 244 0.51% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.56
Cell size: 1333 m



0 15 30 60 Km

Datum : WGS84 (World Geodetic System 1984)

January 2024

brgm Géosciences pour une Terre durable

Horizon Europe Framework Programme (HORIZON)

D9.3 – MADAGASCAR case study

WP9 - Task 9.4

Date [13/12/2023]

M. Picault, N. Charles, C. Zammit[1]

[1]*BRGM*

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Project starting date (duration)	1st June 2022 (42 months)
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Related Task(s)	Task 9.4
Lead Organisation	BRGM
Contributing Partner(s)	BRGM
Due Date	January 2024
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Dissemination level	

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01/12/2023	V2	BRGM – M. Picault	BRGM – C. Zammit	Project opportunities Final Introduction – Conclusion
13/12/2023	FINAL	BRGM – M. Picault & C. Zammit	BRGM – N. Charles	Typos
21/12/2023	FINAL	BRGM – C. Zammit	BRGM - J. Melleton	

Table of Contents

1. Extended Critical Raw Materials (ECRM) supply potential of Madagascar 9
1.1. Inventory of the ECRM 9
1.1.1 Geological setting 9
1.1.2 Known Ore deposits and occurrences 12
1.2. Prospectivity and mineral high potential mapping 14
1.2.1 Selection of the ECRM for mineral prospectivity 14
1.2.2 Mineral high potential areas 14
1.3. Ore processing, refining and recycling capacities 16
2. Assessment of the ECRM value chain 18
2.1. Characterisation of the value chain for primary and secondary raw materials 18
2.1.1 List of the mining, processing and recycling projects 18
2.1.2 Existing ESG indicators 21
2.1.3 Status of economic links between the formal and informal sectors 22
2.2. Identification of the bottlenecks along the value chain 23
2.2.1 List of the main bottlenecks and the links between them 23
3. Investment/financing prospects for ECRM projects in Madagascar 30
3.1. Fiscal, legislative and regulatory context for in-country financings 30
3.2. Macroeconomic context for in-country financings 47
3.3. Political context for in-country financings 57
4. Assessment of social, environmental, and governance challenges 63
4.1. Country-level assessment and context 63
4.1.1. Context 63
4.1.2. Mineral/mining policies, industry policies 65
4.1.3. Mining regulations 66
4.1.4. Taxation and royalties 69
4.1.5. Land-use and mineral rights 71
4.1.6. Environment 71
4.1.7. Societal and community aspects, cultural heritage 74

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4.1.8. Public health and safety....75
Operational Health and Safety (OHS) and Labour Regulations....76
4.2. Mining practices *vs.* Environmental, Social and Governance (ESG) goals....76
4.2.1 Environmental challenges....77
4.2.2 Socio-economic issues....77
4.2.3 Governance....77
4.2.4 What would be the best practices for a responsible mining?....78
5. Business network between the European Union and "*country*"....80
5.1. Assessment of the upstream and downstream business ecosystem....80
5.1.1 Context, formal and informal players....80
5.1.2 Relationships at local or regional levels....82
5.2. Building new B2B relations....82
5.3. Promoting local content and enabling mining cluster actors....83
Geoscience/mining related accredited education and training programmes in the country 87
6. Energy and digital transition: develop a strategy for the EU and Africa Partnership 93
7. Opportunities for responsible investments....95
7.1. Identification of individual exploration, mining and refining projects....95
7.2. ASM sector country profiles....98
Country profiles on ASM sector developments and investment....98

List of Figures

Figure 1: Madagascar geological Domains and sub-domains and magmatic suites.... 10
Figure 2: The "Greater Dharwar Craton".... 11
Figure 3: Main CRM occurrences in Madagascar 13
Figure 4: The floating plant and MSU separation circuits. 20
Figure 5: Logistics Performance Index (LPI) of Madagascar from 2014 to 2023 23
Figure 6: Worldwide Governance Indicators (WGI) of Madagascar from 2012 to 2022 24
Figure 7: Ibrahim Index of African Governance (IIAG) for Madagascar in 2022 25
Figure 8: Ibrahim Index of African Governance (IIAG) for Madagascar in 2021 26
Figure 9: Madagascar - Distribution of gross domestic product (GDP) across economic sectors from 2011 to 2020 [%] (Source: Statista).... 48

Figure 10: Madagascar - Historical gross domestic product (GDP) per capita from 2011 to 2021 & projected estimations from 2022 to 2030 (Sources: World Data Bank, S&P) 48
Figure 11: Madagascar – Historical and projected nominal GDP and real GDP growth (Sources: S&P) 49
Figure 12: Madagascar – Historical and projected real GDP growth [%] 49
Figure 13: Madagascar - Foreign direct investment net, net inflows, net outflows from 2011 to 2020 (Source: World Data Bank) 50
Figure 14: Madagascar - Historical official exchange rate (Ariary per USD, period average) 52
Figure 15: Madagascar - Historical and projected data on inflation indicators (S&P Global, 2022) 53
Figure 16: Madagascar - Historical and projected data public debt and debt/GDP (S&P Global, 2022) 54

List of Tables

Table 1: Main processing units. 16
Table 2: List of the main mining activities. 19
Table 3: Overview of most common legal forms 33
Table 4: Obligations relating to cross-border financial transactions 34
Table 5: List of documents to be submitted to FINEX for prior authorization 34
Table 6: Obligations relating to transfers of funds abroad 35
Table 7: Currency repatriation and transfer obligations 36
Table 8: Opening a foreign currency account 37
Table 9: Taxation of interests and dividends 38
Table 10: Taxation rules for interest and dividends under double taxation agreements 38
Table 11: Thin capitalization rules 39
Table 12: Main taxes applicable 40
Table 13: List of tax arrangements specific to the mining sector 40
Table 14: Taxes by sector 41
Table 15: Tax residence of employees 41
Table 16: Employment-related taxes and contributions 42
Table 17: Export formalities for mining products 43
Table 18: Customs treatment of imports and exports 44
Table 19: Taxes applicable to investment transfers 45
Table 20: Investment guarantees specific to the mining sector 46
Table 21: Jurisdictional rules of the law - Source: Ordinance n° 62-041 of September 19, 1962 47
Table 22: Licence, permit, authorisations for the mining sector in Madagascar 68
Table 23: *Types of mining authorization and permits* - Source: Mining code 69
Table 24 : Tax regime 69
Table 25: Mining royalties 70
Table 26: Types of environmental permit - Source: Mining code and Decree MECIE 72
Table 27: List of the main authorities involved in the mining sector. Source: Mining code and websites of each organization 80
Table 28: List of mining projects proposed for investment opportunities 97

Abbreviations and Acronyms

Acronym	Description
AERP	Autorisation Exclusive de Réservation de Périmètre Exclusive Perimeter Reservation Authorization
AGOA	African Growth and Opportunity Act
ANOr	Agence Nationale de la filière Or/ National Agency for the Gold Sector
BCMM	Bureau du Cadastre Minier de Madagascar/ Madagascar Mining Cadastre Office
BD	Board of Directors (Conseil d'Administration)
CAC	Commissaire aux comptes/ External auditors
CB	Chairman of the Board (Président du Conseil d'Administration)
CDI	Code des Impôts/ Malagasy Tax Code
CENI	Commission Electorale Nationale Indépendante Independent National Electoral Commission
CGIM	Commission sur les Grands Investissements Miniers Commission on Large Mining Investments
CIRDI	Centre International pour le Règlement des Différends relatifs aux Investissements / International Centre for Settlement of Investment Disputes
CNAPS	Caisse Nationale de Prévoyance Sociale / National Social Insurance Fund
COI	Commission de l'Océan Indien/ Indian Ocean Commission
COMESA	Common Market for Eastern and Southern Africa
CPF	Code des Procédures Fiscales/ Tax Procedures Code
CPI	Consumer Price Index
CSR	Corporate Social Responsibility
DBA	Disc Based Association
ECRM	Extended Critical Raw Materials
EIE	Etude d'Impact Environnemental/ Environmental Impact Study
EITI	Extractive Industries Transparency Initiative
ESG	Environmental, social and governance
ESPA	Ecole Supérieure Polytechnique d'Antananarivo
FINEX	Service de la Finance Extérieure/External Finance Department
FMFP	Fonds Malgache pour la Formation Professionnelle / Madagascar Fund for Professional Training
FSE	social and environmental fund
GDP	Gross Domestic Product
GPS	Politique Générale de l'Etat/ General Policy of the State
HCC	Haute Cour Constitutionnelle / High Constitutional Court
IEM	Initiative for the Emergence of Madagascar
IMF	International Monetary Funds
ILO	International Labour Organization
IOC	Indian Ocean Commission
IWRM	Integrated Water Resources Management

JIRAMA	Jiro sy Rano Malagasy (National Water and Electricity Company)
IPPA	Investment Protection and Promotion Accord
IRNR	Impôt sur les Revenus des non-résidents/ Witholding tax on Non Resident Income
LGIM	Loi sur les Grands Investissements Miniers dans le secteur minier Malgache/ Law establishing regime for major investments in the Malagasy mining sector
LLC	Limited Liability Company (Société à responsabilité limitée)
LPI	Logistics Performance Index
MAF	Mining administration fees (Frais d'administration manière)
MECIE	Mise en compatibilité des investissements avec l'environnement/ Making investments compatible with the environment
MEDD	Ministère de l'Environnement et du Développement Durable/ Ministry of the Environment and Sustainable Development
MD	Managing Director / Directeur général
MMRS	Ministère des Mines et des Ressources Stratégiques Ministry of Mines and Strategic Resources
NGOs	Non-Governmental Organizations
OMNIS	Office of National Mines and Strategic Industries
ONE	National Office for the Environment
PEM	Plan Emergence Madagascar
PPG	Public and Publicly Guaranteed
QMM	QIT Madagascar Minerals
RF	Random Forest
SADC	Southern African Development Community
UNCTAD	United Nations Convention on Trade and Development
WTO	World Trade Organization

Wording

Mineral prospectivity: "Mineral potential mapping is concerned with quantifying and mapping the likelihood that mineral deposits are present in a study area. It is synonymous to mineral prospectivity mapping, which is concerned with quantifying and mapping the likelihood that mineral deposits may be found by exploration in a study area."

Keywords

ECRM, Mineral potential, Ore processing, Refining capacities, Recycling units, Value chain, Primary raw material, Secondary raw material, Bottlenecks, Finance, Investment, Sustainability, ESG, Land-use, Taxation, Mining regulation, Mining policies, Child labour, Responsible extraction, Madagascar, Pan-African.

Executive Summary

This report provides the reader with an overview of the key aspects regarding mineral resources, supporting regulations and institutions, as well as any related provisions in the prospecting of Critical Raw Materials (CRMs) in Madagascar. The report is an integral part of the larger AfricaMaVal project and, in that context, provides this country overview specifically aimed at European Union (EU) investors and decision-makers.

AfricaMaVal is focusing on the minerals and metals present in the fourth list of CRMs for the EU as well as on Copper (Cu), Nickel (Ni), Tin (Sn) and Manganese (Mn) that are particularly pertinent considering Africa's geological potential and their critical status in the digital and energy twin transitions. Madagascar is host most of the ECRM as well as Li, Mn, Graphite, Cu, Sn, Nb, Al and Ti thus the intended work will look at the availability of these elements. Madagascar is also known to have significant mining potential, with a variety of minerals being commercially exploited. One of the most prominent minerals mined in Madagascar is graphite. The country has the world's third-largest known graphite reserves, with deposits mostly found in the south-eastern region.

The assessment will also include value chain for these critical minerals therefore activities such as exploration, extraction, processing, and recycling will be evaluated. Fiscal regulation as well as the macroeconomic and political context will be scanned to give an overview of the country regime. ESG regulations and challenges will be depicted for the investors to better understand the background and questions to address when it comes to launch activities on the ground. A list of downstream to upstream actors related to the mining sector will assist deciders to build their Business to Business network. This country profile will try to address the needs of the EU green deal according to the country strategies and planning.

Eventually, this report will underline some project opportunities or recommendations.

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- Ernst and Young Madagascar for providing the overview on the fiscal, legislative and regulatory context;

- WR Consulting for their assistance regarding the actors of the ECRMs whole chain and institutions dedicated to the mining sector;

- Control Risk for providing the overview on the political context;

1. Extended Critical Raw Materials (ECRM) supply potential of Madagascar

1.1. Inventory of the ECRM

1.1.1 Geological setting

Two thirds of eastern Madagascar are underlain by Precambrian rocks, sometimes intruded by Cretaceous to Neogene volcanics (basalts and rhyolites), whereas the western third is composed of two large basins of mid-Palaeozoic to Recent sedimentary rocks.

The Precambrian basement can be subdivided into six major geological domains (Antongil/Masora - Antananarivo - Ikalamavony - Androyen-Anosyen - Bemarivo and Vohibory; Figure 2). Three distinctive magmatic suites intrude the domains including the Dabolava suite (ca. 1 Ga), the Imorona-Itsindro suite (820-760 Ma), and the Ambalavao-Kiangara-Maevarano suite (570-520 Ma).

The central part of the island is represented by the Archaean formations of the Antongil/Masora Domain (in the east) and the Antananarivo Domain. The Antongil/Masora Domain is interpreted as a fragment of the Dharwar Craton in India.

The adjacent Antananarivo Domain is characterized by the presence of four units of mafic-ultramafic gneisses known as the "Tsaratanana Complex," and interpreted as metamorphosed greenstone belts. The "Tsaratanana Complex" and the granitic-gneissic Antananarivo Domain are deduced as juxtaposed during the Late Archaean. It is clear that the Antananarivo Domain and the "Tsaratanana Complex" are very similar to the eastern domain of the Dharwar Craton, where similar structural, geochronological, and metallogenic characteristics have been identified.

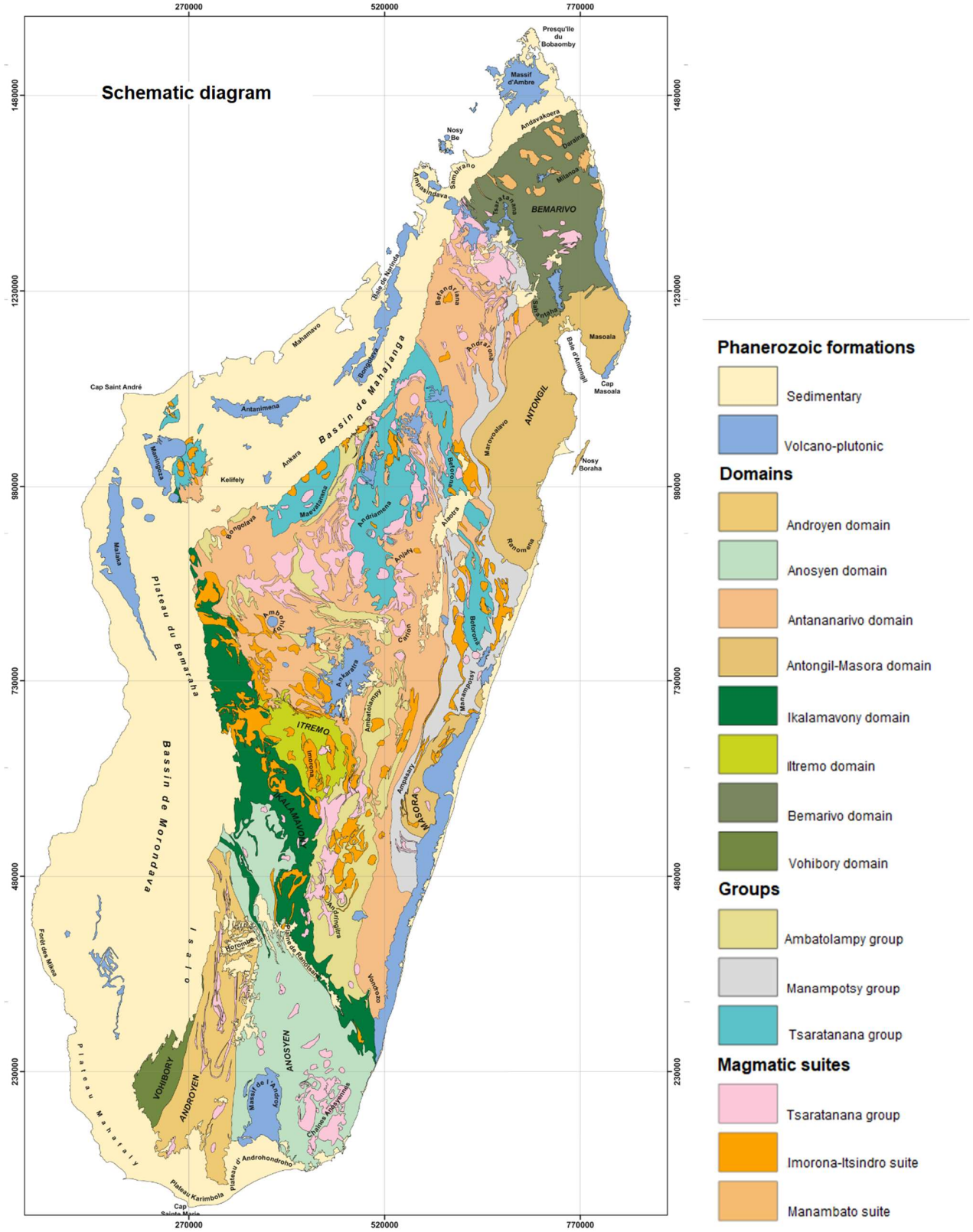


Figure 1: Madagascar geological Domains and sub-domains and magmatic suites

In the Antongil/Masora Domain, recent studies have allowed to: i) extending the period of juvenile accretion for the Archaean crust up to 3.32 Ga; ii) defining a new volcano-sedimentary assemblage deposited around 3.18 Ga and metamorphosed at 2.55 Ga; iii) specifying the deposition age of other supracrustal formations between 3.2 and 2.5 Ga, a period characterized, worldwide, by the emplacement of komatiites; iv) highlighting the same episode of anatexis and high-grade metamorphism at 2.5 Ga in the Antananarivo Domain and the "Tsaratanana Complex," west of the purported suture. Then, the Antongil/Masora and Antananarivo domains are interpreted as two blocks accreted from late Archaean to early Palaeoproterozoic.

The Antongil Domain is crosscut by Palaeoproterozoic magmatism represented by mafic dykes and tonalitic to dioritic orthogneisses.

On a Gondwana scale, the architecture and lithological nature of the Archaean blocks in Madagascar are very similar to those in India. Thus, the Antongil/Masora Domain and the western part of the Dharwar Craton are two fragments of a single Mesoarchaean-aged assemblage. The Neoarchaean Antananarivo Domain, including the "Tsaratanana Complex," is highly similar to the eastern part of the Eastern Dharwar Craton. Therefore, the Neoarchaean terrains of the Eastern Dharwar Craton and the Antananarivo Domain are symmetrically arranged around a Mesoarchaean-aged nucleus formed by the Western Dharwar Craton and the Antongil/Masora Domain resulting in "Greater Dharwar Craton" model.

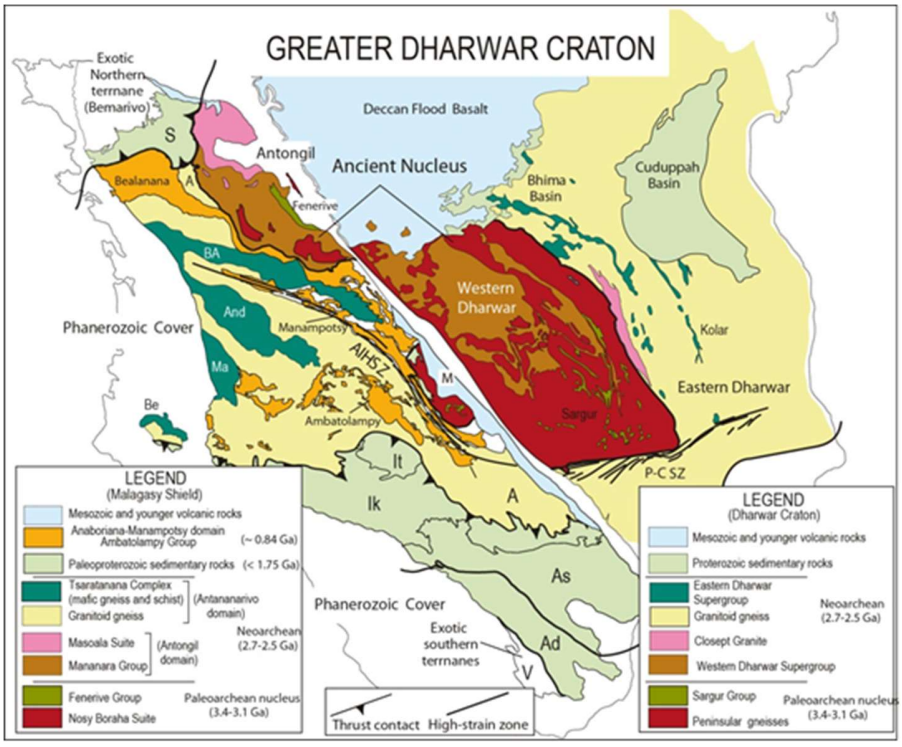


Figure 2: The "Greater Dharwar Craton"[1]

The southernmost domains (Androyen and Anosyen) consist of a Palaeoproterozoic substratum (2.0-1.8 Ga) and a cover sequence deposited before late Neoproterozoic intersected by the "intra-domain" shear zone.

[1] According to Tucker et al., (2011) showing the symetry of the juvenile Neoarchaean crust (c. 2.7-2.5 Ga) around the central Palaeo-Mesoarchaean nucleus (> 3.2 Ga) (Western Dharwar and Antongil-Masora Domain)

The Ikalamavony Domain is characterized by the presence of volcano-sedimentary formations deposited between 1.03 and 0.98 Ga and a magmatic suite dated at ca. 1 Ga (Dabolava Suite). The formations of the Ikalamavony Domain and the Anosyen sub-domain are involved in a complex folding deformation described as a "flower structure." This structure results from the extrusion of the Anosyen-Androyen Domain in response to oblique convergence between East Gondwana and West Gondwana. The Ikalamavony Domain is located at the boundary between the Antananarivo Domain and the Anosyen-Androyen Domain.

The Dabolava Suite, intrusive in the Ikalamavony Domain, has also been identified in the Anosyen sub-domain implying that they were already juxtaposed before 1000 Ma.

By discovering a Palaeoproterozoic crust in the Anosyen Domain and the accretion of this domain to the Archaean Antananarivo Block during the Mesoproterozoic (1000 Ma), it is proposed that the detrital signatures, especially the 2.0-1.8 Ga population in Palaeoproterozoic metasedimentary formations, originate from the terrains of southern Madagascar related to the "Wanni and Highland Complexes" in Sri Lanka, and the "Rayner Complex" in Antarctica.

The Antananarivo Domain forms the substratum of two sedimentary basins formed during a period of intracontinental extension. The sediments would have been deposited slightly before or synchronously with the magmatism of the Imorona-Itsindro Suite, during the Mesoproterozoic between 820 and 760 Ma.

To the north of the Antananarivo Domain, the Bemarivo Domain crops out. It consists of a Cryogenian magmatic arc (ca. 750-740 Ma), thrusted over the Palaeoproterozoic metasedimentary formations, with the entire assemblage subsequently thrusted over the Antananarivo and Antongil domains.

Finally, the extreme southwest of Madagascar is composed of the Vohibory Domain, interpreted as an intra-oceanic island arc accreted to the Androyen-Anosyen Domain during the Ediacaran (ca. 630 Ma). The juvenile rocks of the Vohibory Domain share lithologically and geochemically similarities with the upper nappes of the Mozambique Belt (i.e., Cabo Delgado Nappes in Mozambique). The resemblances in rocks compositions, ages inferred from protoliths, and metamorphic ages between these regions suggest that the Vohibory Domain represents an exotic block formed in the palaeo-Mozambique Ocean and subsequently sutured to Madagascar during early Ediacaran.

The last event of Madagascar geodynamic evolution corresponds to the magmatism of the Ambalavao-Kiangara-Maevarano Suite (late Neoproterozoic to early Cambrian). This magmatism is characterized by the emplacement of plutons and "stratoid" massifs of granites and syenogranites throughout the Malagasy shield, except in the Vohibory Domain and the Antongil sub-domain. This late-stage magmatism and the associated numerous pegmatitic veins are directly related to some gemstone deposits and, uranium, niobium-tantalum, as well as REEs (Rare Earth Elements) occurrences.

1.1.2 Known Ore deposits and occurrences

Mineral potential of Madagascar covers a very large set of mineral commodity occurrences and deposits.

Mined ECRMs

- Ambatovy lateritic Ni-Co deposit (Sumitomo-Komir);
- QIT heavy mineral sands deposit containing Ti-Zr-REE (QMM-RioTinto);
- Advanced exploration projects and small-scale exploitation: Toliara heavy mineral sands deposit, graphite deposits (Molo, Maniry, Graphmada, Sahamamy, Vatomina), and vanadium deposit;

- Artisanal and small-scale mining: Nb-Ta, REE, and Li.

ECRM occurrences

Occurrences of nearly all ECRM have been described in Madagascar. The only exception is borate even if some boron-bearing minerals have been identified as danburite (chemically close to datolite mined in Russia). It is noteworthy that there is no "real" occurrences of germanium, gallium, indium and hafnium owing to these elements are always mined as by-products. The possible lack of chemical analyses of various base metals ores impede the identification of Ge, Ga, In and Hf. For example, germanium is associated with zinc, gallium with zinc or aluminium/bauxite, indium with zinc or tin and hafnium with zirconium.

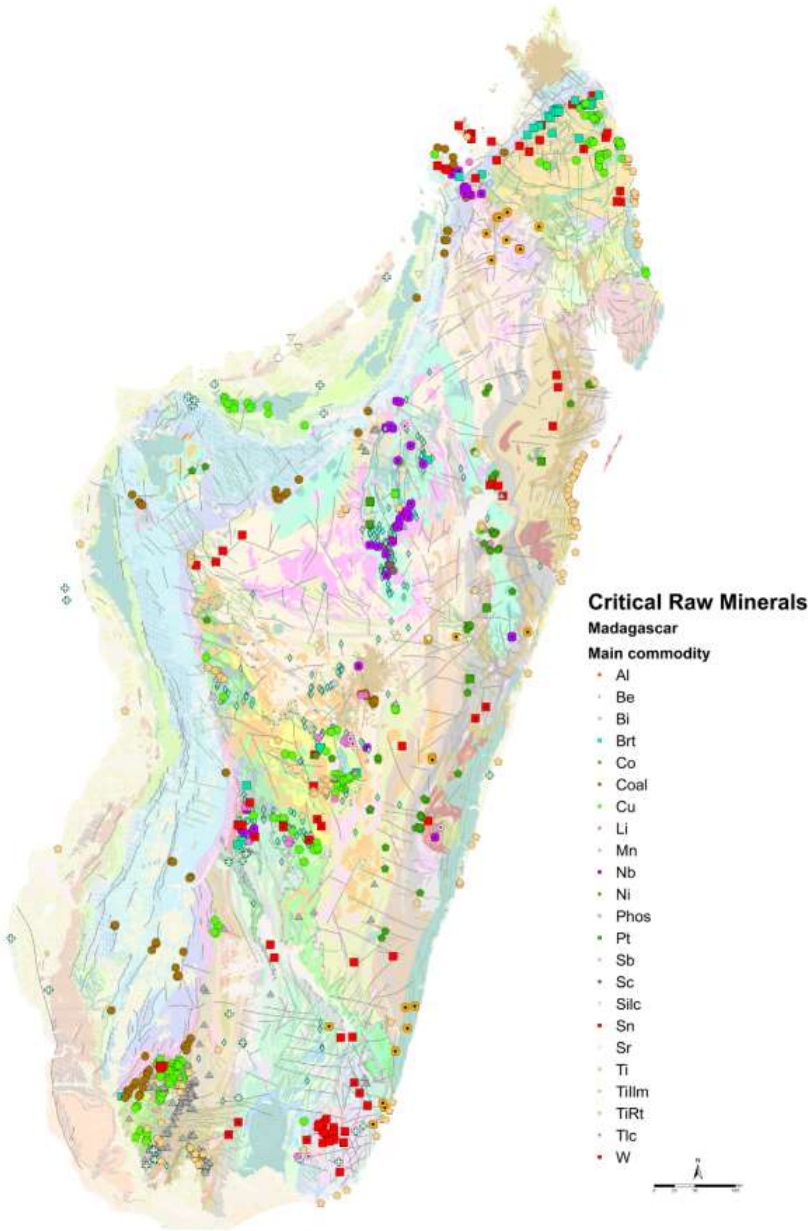


Figure 3: Main CRM occurrences in Madagascar[2]

[2] SigAfrique 1 :2,000,000 scale (Geology) and SigAfrique DB (occurrences)

1.2. Prospectivity and mineral high potential mapping

1.2.1 Selection of the ECRM for mineral prospectivity

On the basis of the extended list of ECRMs, most of them have been described in Madagascar, a country with an exceptional and promising geological potential. Borate deposits are the only exception. Neither are germanium, indium and gallium, but by taking into account that these metals are extracted exclusively as by-products of tin, zinc and bauxite/aluminium mining, their presence can be assumed with a high level of confidence.

Following discussion with the MMRS (Ministère des Mines et des Ressources Stratégiques / Ministry of Mines and Strategic Resources), **3 critical raw materials** have only been selected for their high discovery potential and investment attractiveness: **graphite, lithium and manganese**. The exploration potential for pegmatites and graphite in the country had previously been cartographically highlighted by Roig *et al.* (2012). The areas selected for prospectivity mapping are:

- The central part of the island centred on Antsirabe town is located at the south west of Antananarivo and covering numerous Li-bearing pegmatite vein fields (Ambatofinandrahana – Amborompotsy – Ikalamavony) and covers ca. 85,000 sq. km. The main issue is to segregate the different types of pegmatite (LCT and NYF), since NYF-type pegmatites have no interest for lithium.
- The extreme south of the country, nearby Ampanihy town where encompasses more than 100 manganese occurrences, and covers ca. 20,000 sq. km.
- As far as graphite potential is concerned, it was initially decided to analyse the Toamasina area. However, owing to the promising results, it was finally decided to carry out predictivity modelling all over the country.

The prospectivity methodology is based on Disc Based Association" (DBA) followed by the machine learning classification "Random Forest" (RF) developed by Vella (2022). The main dataset associated with the predictivity mapping exercise is the geological map of Madagascar at 1:1,000,000-scale (Roig *et al.*, 2012) and the "©SIG Afrique" BRGM occurrences and deposits database.

The DBA grid for predictive modelling is mainly defined by **five parameters**:

- Size of cell – d;
- Search radius for lithologies – R;
- R/d ratio;
- Search radius for mineral occurrences – R_1. It can be null, in this case the search radius will be restricted to the cell size (d);
- Search radius for faults – R_2. It can be null, in this case the search radius will be restricted to the cell size (d) or it can take into account the cumulative length of faults present in the cell size (d) or the distance to the nearest fault;
- In order to maximize the grid resolution while minimizing overlaps and cells with only one lithology, the parameters of DBA grid for **Mn and Li** in this study are: d = ca. 1000 m, R = 3000 m, R/d = 3, R_1 = 3000 m, R_2 = distance (distance to the nearest fault);
- The parameters of DBA grid for **graphite** used in this study are: d = ca. 1666 m, R = 5000 m, R/d = 3, R_1 = 5000 m, R_2 = distance (distance to the nearest fault);

1.2.2 Mineral high potential areas

Mineral high potential areas were highlighted for the four studied ECRMs in Madagascar. The criteria allowing the assessment of DBA-RF modelling can be found in the table below. All the favourability maps can be found in the **Appendix 1.2 MPM MADAGASCAR**

	TN	FN	FP	TP	TPR	FPR	PPA (%)	Precision (%)	Accuracy (%)	J-score	Treshold
Graphite	22 240	-	6 194	355	1.000	0.218	22.75%	5.4%	78.5%	0.833	0.644
Graphite	182 100	77	31 540	1 783	0.959	0.148	15.46%	5.4%	85.3%	0.813	0.505
Li	67 708	1 332	13 508	3 231	0.708	0.166	19.51%	19.3%	82.7%	0.571	0.440
Mn	15 931	412	2 082	1 312	0.761	0.116	17.20%	38.7%	87.4%	0.720	0.381

Notes: *True Positive (TP) and True Negative (TN) correspond to the number of grid cells which are correctly predicted by the RF model (i.e. mineralized and non-mineralized cells, respectively). Inversely, False Positive (FP) and False Negative (FN) correspond to the number of grid cells which are incorrectly predicted by the RF model (i.e. mineralized instead of non-mineralized cells and non-mineralized instead of mineralized cells, respectively).* ***FP could correspond to mineral high potential areas****. True positive rate (TPR), also called "Recall", correspond to TP/(TP+FN), False positive rate (FPR) correspond to FP/(FP+TN), Percentage of prospective area (PPA) correspond to (TP+FP)/All, Precision correspond to TP/(TP+FP), Accuracy correspond to (TP+TN)/All and J-score correspond to TPR – FPR.*

Lithium (Li): the predictivity map covers a large area of the central part of the island. Its shows three main areas of high prospectivity, located around Anbatofinandrahana, west of Ikalamavony and east of Miandrivazo. Cartographically, the lithological associations that characterise these areas are different. Near Ambatofinandrahana, the pegmatites are mainly associated with three units: "psammitic schists and gneisses" (It2 label), "quartzite and meta-arkose" (It3 label) and "granite and acidic orthogneiss" (II1 label). While the other two groups are linked to mafic paragneiss and amphibolite (Ik5 label) and/or quartzo-feldspathic gneiss (Ik3 label). In all cases, the distance from faults seems to play a role, but probably less important than the surrounding lithologies. These different associations of pegmatite swarms are difficult to understand; the clusters are likely to be of different origin or genetically linked to underlying rocks that outcrop less or not at all in the region. The model reveals that 15.8% of studied area can be prospected for lithium.

Manganese (Mn): the favourability map over south Madagascar shows that there is a strong association between manganese occurrences/deposits and "Graphitic paragneiss with biotite - sillimanite" (Ad6 label), anorthosite (Ad1 label) and faults. The correlation between manganese mineralisation and faults is particularly unsurprising in this area since a major shear zone is occurring at the transition between Vohibory and Androyan domains. There is very few information about manganese occurrences in this area and seem to be atypical: gossaneous materials developed at top of rhodonite lodes. The association of manganese with anorthosite is difficult to interpret. Indeed, it is likely that there is no genetic association between them and that they are only correlated with the major Ampanihy shear zone. This shear zone could play a major role as a preferred path for anorthosite magma ascension and also fluids circulation (responsible of rhodonite veins development). The model reveals that 10.6% of the studied area can be prospected for manganese.

Graphite: on the island-wide scale, the graphite occurrences and deposits are widely correlated to faults and shear zones. From a lithological point of view, many different units host mineralisations: "Schist and graphitic paragneiss of Andasibe" (At4 label), "Micaschist and migmatitic aluminous gneiss bearing sillimanite, graphite, marble, calcium silicate gneiss" (At1 label), "Basic migmatitic quartzo-feldspathic paragneiss with numerous intercalations of magnetite bearing quartzite and amphibolite" (At13 label), "Garnet-bearing quartzo-feldspathic gneiss" (Ad5 label), "Brickaville migmatitic orthogneiss with hornblende-garnet" (II3 label) and "Quartzo-feldspathic orthogneiss with garnet ± cordierite ± spinel" (An5 label). Unsurprisingly, most geological units hosting graphite are medium/high grade metamorphic. In some of them, graphite is even described in the paragenesis, supposing high concentration. The model reveals that 14.6% of Madagascar's surface can be prospected for graphite.

The results of this preliminary study are particularly interesting and have already highlighted some very promising new areas. However, these initial results are constrained by the quality and quantity of the data. There are many ways to improve the process so as to obtain more accurate predictivity maps.

The main limitation of this work is the scale of the geological map (currently 1:1,000,000), so undertaking further geological mapping campaigns could be of great benefit. Another possibility would be to reinterpret and vectorise older maps already existing in some areas.

Predictive tools could also benefit from the integration of high-resolution geophysical data. This is particularly the case for mineral deposits such as pegmatites, which are often linked to blind granitic intrusions which can have specific geophysical signature (magnetism, gravity etc.). It could also be used counterbalance the uncertainty inherent to geological mapping.

Another way of refining our results could be to carry out a field check of mineral occurrences before incorporating them into the model. The case of lithium occurrences/deposits is a good example as in Madagascar they are linked to one family of pegmatites, the LCT type (for lithium-cesium-tantalum). Unfortunately, the other family of pegmatites known as NYF (for niobium-yttrium-fluorine) do not carry lithium. It is noteworthy that the distinction is rarely made in the occurrences database between NYF and LCT types. The accuracy of the location of occurrences could also be improved to avoid misplaced points and to be more consistent with improved geological mapping.

1.3. Ore processing, refining and recycling capacities

Apart from Law 99.021 of August 19, 1999 regarding the management and the control of industrial pollution, there is no specific legislation articles about “recycling activities”. Not even as part of the mining legislation. Same issues with processing or refining capacities which are very limited with only one plant dedicated to nickel and cobalt processing as shown hereafter:

Name processing entity	Processing Facility	Status	ECRM	Owner	Operator	Technology / Process	Feedstock	Products	Capacity	Energy used
Ambatovy refinery	Refinery	Active	Cobalt (Co)	JV Sumitomo [54%], KOMIR [46%]	Sherritt until 2024	HPAL	Ni laterites from the “Ambatovy Deposit” and the “Analamay Deposit”	Co briquettes	5600 t/y Co	Coal
Ambatovy refinery	Refinery	Active	Nickel (Ni)	JV Sumitomo [54%], KOMIR [46%]	Sherritt until 2024	HPAL	Ni laterites from the “Ambatovy Deposit” and the “Analamay Deposit”	Ni briquettes	60,000 t/y Ni	Coal

Table 1: Main processing units.

With regard to graphite deposits, some are already being exploited on a semi-industrial scale or have been the subject of short-term pilot operations which are now awaiting further investment to ramp up production.

These operations are mainly focused on the extraction and production of a purified mineral concentrate, which is then shipped abroad for refining or manufacturing (e.g. production of graphite anodes in China).

The situation is very similar for ASM, where small-scale mining operations produce various mineral concentrates such as lithium-rich micas or small volumes of Nb-Ta concentrates (which are frequently hand sorted). These concentrates are then shipped directly abroad with no added value for the country.

2. Assessment of the ECRM value chain

2.1. Characterisation of the value chain for primary and secondary raw materials

The minerals industry value chain is a series of industrial processing steps that add value, both in terms of economy and usability from the discovery of valuable minerals to delivery to market as final products. These steps include mineral exploration, first-stage mineral processing, advanced stage mineral processing, product manufacturing, product marketing, and product end-of-life recycling. Each stage represents a value-add on the previous and there are opportunities to invest at each of the major stages. The mineral industry value chain is dynamic and shifts according to commodity market, which is influenced by supply and demand, price fluctuations, changing market structures, jurisdiction, and environmental concerns. An understanding of the mineral industry value chain is important for the effective management and optimization of each stage of the value chain ensuring the smooth flow of materials, maximizing resource use, and meeting market demand efficiently.

2.1.1 List of the mining, processing and recycling projects

Despite the richness of the mining context in Madagascar, large-scale mines are underdeveloped, processing units are rare and recycling activities are non-existent.

No	ECRM	Name of Deposit / Mine	Development Stage
1	Cobalt (Lateritic)	AMBATOVY	Mining Concession
		Several other occurrences	Geological occurrences
2	Ni (Lateritic)	AMBATOVY	Mining Concession
		Several other occurrences	Geological occurrences
3	Vanadium	GREEN GIANT Project - Nextsource Materials (ex- ERG Madagascar)	Exploration / Research Licence
		Several other occurrences	Geological occurrences
4	Lithium (spodumene)	MILLIE'S REWARD Greenwing resources (ex Base metals Ltd)	Exploration / Research Licence
		Several ASM	ASM
		Several other occurrences	Geological occurrences
5	REEs	AMBANJA Harena Resources	Exploration / Research Licence
6	Graphite	GRAPHMADA - Greenwing resource (ex Base metals Ltd)	Mining Concession
6	Graphite	TIRUPATI: Sahamamy & Vatomina projects	Exploration / Research Licence
		MOLO project - Nextsource Materials (ex-ERG Madagascar)	Exploration / Research Licence
		MANIRY Project- EVION group (former BlackEarth Minerals)	Exploration / Research Licence
		Several other occurrences	Geological occurrences

7	Titanium (HMS)	Rio Tinto - QMM SA	Mining Concession
		BASE TOLIARA (Ranobe deposit) – Base Resources	Mining Concession
		Several other occurrences	Geological occurrences

Table 2: List of the main mining activities.

The **Ambatovy Project** includes:

- The Ambatovy mine;
- The pipeline which carries the laterite pulp from Ambatovy to the Toamasina plant;
- The Toamasina leaching plant which includes several related units: power plant, steam generating plant, water treatment plant, hydrogen plant, hydrogen sulphide plant, sulphuric acid plant, and others.

Toamasina Leaching Plant: the laterite ore pulp from the Ambatovy plant arrives through the pulp pipeline. This pulp is partially dewatered/thickened in an ore thickener before being sent to the high-pressure acid leaching circuit. The water recovered by the thickener will be collected in a recovery pond or basin to be used as process water.

The high-pressure acid leaching (HPAL) has five parallel circuits, each consisting of a feed tank, a pulp heater, an autoclave, expansion tanks, and associated pumps. In the HPAL operation, the laterite ore is heated with steam in a series of direct heaters. The heated pulp is pumped into the autoclave, where it reacts with concentrated sulphuric acid. In the autoclaves, nickel, cobalt, copper, zinc, manganese, magnesium, and some aluminium are leached from the ore in the form of soluble sulphates. The majority of the iron, chromium, and titanium in the ore, as well as the remaining aluminium, are part of the solid residue consisting of stable oxides and hydroxides. The autoclave pulp is then brought back to atmospheric pressure and cooled by steam generation in three expansion tanks. The steam from the expansion tanks is used in pulp heaters and in other areas of the plant to optimize heat recovery.
This plant produces various types of waste, including calcium sulphate (gypsum) resulting from the neutralization of free acid with lime. The resulting gypsum pulp is thickened, and some of the underflow pulp from the gypsum thickener is recycled to the neutralization tanks to act as a seed for improving the sedimentation characteristics of solids; the rest of the pulp is pumped and sent to the residue storage area.

Condensates are also recycled. A portion of the ash from the coal burners (85,000 t/year) is used for runway maintenance. The remainder is disposed of in the residue storage area. In brief, recycling is rather limited.

The **Rio Tinto / QMM Ilmenite Project** and its recycling of the process water: the company uses a lot of process water for its ore separation system.

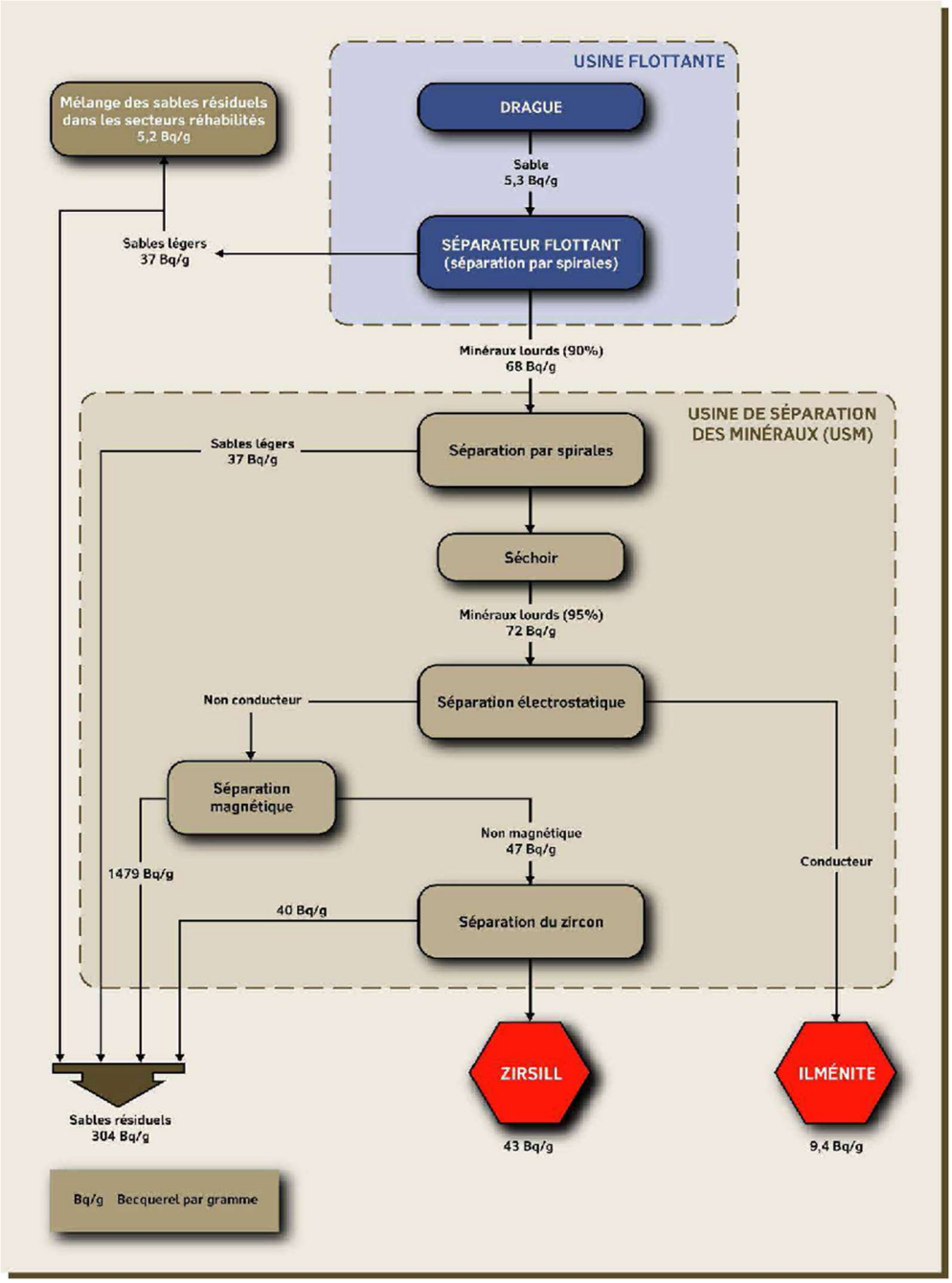


Figure 4: The floating plant and MSU separation circuits.

In this context, the water flow required to operate the MSU (Mineral Separation Unit) is approximately 14,120 m^3/day. Out of this quantity, 1400 m^3/day is directed to the wet circuit of Zirsill (Zircon - Sillimanite) and the ore preparation plant to supply water to the spirals. Additionally, 1000 m^3/day is allocated for general cleaning of the plant. Almost all of the water used is recycled after being collected in sedimentation basins and directed to the MSU's supply basin.

Using two pumps, the water from the basin is transported to a reservoir topped with two curved screens that prevent fine particles or contaminants from entering the process water. From this reservoir, eight pumps are used to distribute the water to various users within the MSU plant.

Rio Tinto / QMM Ilmenite Project and its by-products recycling: **Mineralogical composition of the deposit**
The total heavy mineral content measured in the deposit ranges from 4 to 12%. Minerals of economic interest – ilmenite, rutile and zircon – make up about 85% of the total heavy mineral concentration, with the remainder mainly composed of sillimanite, alumino-magnesian spinel, hercynite, monazite and garnet in traces. For the rest, the deposit contains 88 to 95% quartz sand (silica), with 1 to 2% clay. During mining, the majority of these minerals, unused, are put back into place after the extraction of economic minerals.

Radioactive minerals: the ore extracted from the QMM mining area contains low concentrations of radioactive minerals. The mechanisms of erosion and weathering of rocks formed, over time, mineralized sands which are transported by rivers to the sea, then deposited on beaches. All mineralized sands in the Mandena area come from these mountains and, as in the majority of such deposits in the world, contain small quantities of monazite and zircon.
The monazite (0.1% of the deposit) is a rare earth oxide phosphate containing 7 to 10% thorium oxide and less than 1% uranium oxide. Zircon (0.2% of the deposit) is a zirconium silicate containing less than 0.1% thorium oxide and uranium. All the measurements recorded inside the area show an average level of gamma radiation of 61 µR/h[3], with values varying from less than 1 µR/h up to 83 µR/h.

During the first ten years of operation, the monazite market was saturated due to increased production in China. It followed that monazite, which could not be made profitable, was therefore one of the mining by-products with no commercial value. However, since 2017, due to the increasingly growing global market, monazite, which was formerly a by-product, is on the market.

ASM recycling activities: substances that were previously discarded in tailings, due to their current critical and strategic nature, are now regaining interest. This is the case, for example, at the Andilana Avaratra site, known for its high-quality blue beryl, and currently reopened to extract beryllium, coltan, and mica. The Ibity site, famous for its gemstone-rich pegmatite fields, is now converted into mica and spodumene mines.

2.1.2 Existing ESG indicators

So far, no Malagasy company is ESG certified. However, major mining companies like Ambatovy SA and Rio Tinto/QMM SA are incorporating the ESG indicators into their decision-making processes.
Example of Ambatovy Nickel (Cobalt Project): Since 2018, the Ambatovy Project is publishing an "ESG Communication Book." The company has integrated a Director of ESG into its organizational structure. The reports includes the following sections:

- Sustainability policy;
- Environmental aspects;
- Social aspects, including labour management;
- Governance (taking into account the international situation);
- ESG quantitative data;
- Independent evaluation;
- Information dissemination.

What about ESG as part of the ASM activities?

In Madagascar, very few artisanal mining companies practice Corporate Social Responsibility (CSR) and even fewer the concept of ESG which is completely unknown to them. For CRM, exclusively exploited by ASM such as mica and manganese as well as beryllium, spodumene and malachite, actions to improve the social situation are mainly initiated under pressure of the consumers and governments concerned about the origin of the raw

[3] µR/h : Microroentgen / hour

materials, or by manufacturers motivated by responsible attitudes. ESG intervention are mainly education, health and safety, protection of biodiversity, and governance.

Operating system of organizations launching social and environmental initiatives:

1- **Actions initiated and carried out by the operator:** permittees, collectors, exporters of mining substances for the exclusive benefit of the stakeholders directly affected or concerned by these activities. Several artisanal mining operators have reported that they finance or directly contribute to social development plans for their employees and the communities affected by their activities.
Individual operators contribute financially or materially to:

- Basic infrastructure, including the rehabilitation of municipal roads, construction/rehabilitation of primary schools, community health centres, child nurseries;
- Establishment of a safety net during lean times or natural disasters (famine and bad weather) or during festivities, including National holidays and End-of-Year festivities.

2- **Agreement between suppliers-client-consumers** as conditions of **partnership**. Interested parties might finance social actions. The funds collected are managed by Non-Governmental Organizations (NGOs) or associations with a social vocation and/or non-profit goals. Large luxury jewelry companies allocate part of their profits to finance local associations in order to rehabilitate exhausted or abandoned mining sites, to diversify miners' income, to add value to mining products. This form of agreement mainly concerns gold and precious stones sector and is financed by world-renowned luxury jewelry companies. The financing of the projects is mainly, if not exclusively, granted by the latter and only its suppliers of stones and gold benefit from it, which gives it a good image and credibility with its customers.

3- **Sectoral manufacturers** come together and contribute to create a **common fund**. This common fund is intended to support a previously defined cause or concepts such as the eradication of child labor in mines, the fight against all forms of transactions to finance conflicts. These funds are managed by NGOs or non-profit associations to support social initiatives in the country or along the supply chain. The funds can be used to train state agents and other stakeholders in the fight against corruption and the establishment of dialogue between all ASM stakeholders in Madagascar.

For the ERCM, the eradication of poverty, the protection and the fight against child labor are part of the long-term initiatives initiated jointly by international NGOs and the government with the support of international partners including automobile and aeronautical manufacturers and other industries using strategic minerals. The Association of Industrial Product Operators (AEPI), based and operating in the South of Madagascar, is building child nurseries in order to fight against child labor and offer better working conditions for women mica sorters. This project mobilizes the members of the association and is supported by initiatives for the improvement of the Mica sector in Madagascar and around the world. Hundreds of women mica sorters and their offspring benefit from this project.

2.1.3 Status of economic links between the formal and informal sectors

The ASM sector plays a significant role in the economy of Madagascar, and although ASM actors operate informally, it is estimated that the sector is the second-largest source of employment after agriculture. ASM producers have traditionally focused on the extraction of gold, coloured gemstones, and mica. The recent increased demand of lithium and favourable market prices, especially between 2021 and 2022, has led many ASM actors to shift to the production on lithium-bearing minerals (except miners involved in gold mining). Trading mainly involves Indian and Chinese traders, who export unprocessed and low concentrations of lithium ores. In addition to lithium-bearing minerals, the ASM sector has also been producing manganese, which like lithium is mainly sold to Asian traders.
A comprehensive overview on the ore deposits and production parameters of ECRMS currently recovered by artisanal and small-scale mining in Africa is already available as part of the deliverable 1.4. While a more

detailed analysis of the ASM sector role in the production of ECRMs in Madagascar, including major challenges and investment opportunities on production, social, governance and environmental impacts and value chain, will be available as part of deliverable 7.2.

2.2. Identification of the bottlenecks along the value chain

Despite the recent boom in ECRM commodity demand, Madagascar's mineral value addition remains low, rendering a poor attainment of a substantive value chain state in this country. The mining value chain in Madagascar, like in many other countries, consists of various stages, from exploration and extraction to processing and export. Along this value chain, there are several bottlenecks and interdependencies that can affect the efficiency and productivity of the mining sector.

2.2.1 List of the main bottlenecks and the links between them

Madagascar is not covered by any recent Fraser Institute studies "Annual Survey of Mining Companies". The analysis of the bottlenecks will, therefore, mainly rely on the Logistics Performance Index (LPI) from the World Bank. The LPI is the weighted average of the country scores on the six key dimensions:

- Efficiency of the clearance process (i.e., speed, simplicity and predictability of formalities) by border control agencies, including customs;
- Quality of trade and transport related infrastructure (e.g., ports, railroads, roads, information technology);
- Ease of arranging competitively priced shipments;
- Competence and quality of logistics services (e.g., transport operators, customs brokers);
- Ability to track and trace consignments;
- Timeliness of shipments in reaching destination within the scheduled or expected delivery time.

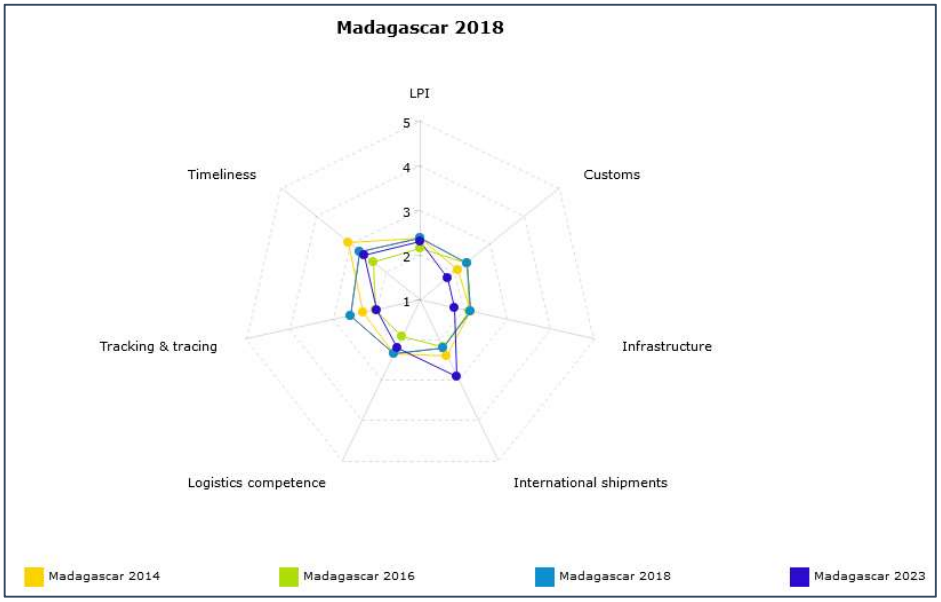


Figure 5: Logistics Performance Index (LPI) of Madagascar from 2014 to 2023[4]

The **Worldwide Governance Indicators** (WGI) from the World Bank aggregate data from more than 30 think tanks, international organizations, nongovernmental organizations, and private firms across the world selected on the basis of three key criteria: i) they are produced by credible organizations; ii) they provide

[4]https://lpi.worldbank.org/international/scorecard/radar/C/MDG/2018/C+MDG+2014+C+MDG+2016+C+MDG+2018+C+MDG+2023

comparable cross-country data; and iii) they are regularly updated. The data reflect the diverse views on governance of many stakeholders worldwide, including tens of thousands of survey respondents and experts.

- Government Effectiveness: 14.62/100;
- Political Stability – No Violence: 25.94/100;
- Regulatory quality: 20.75/100;
- Rule of law: 18.40/100;
- Control of Corruption: 17.92/100.

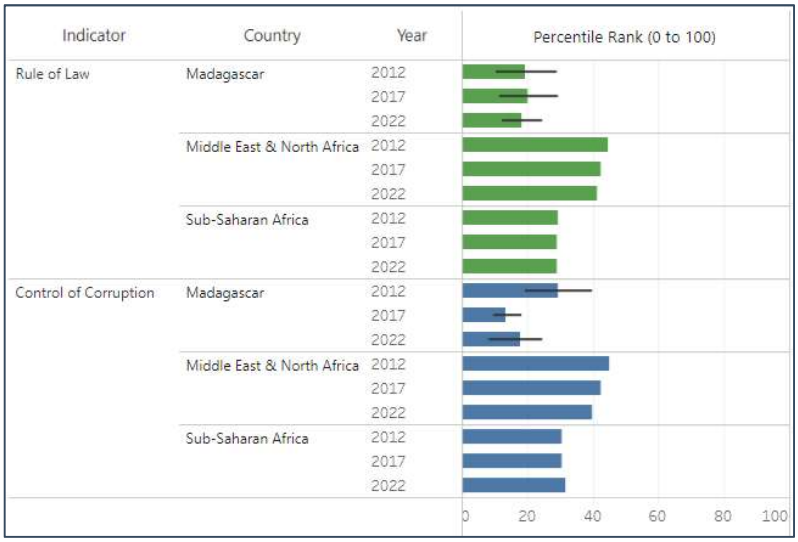
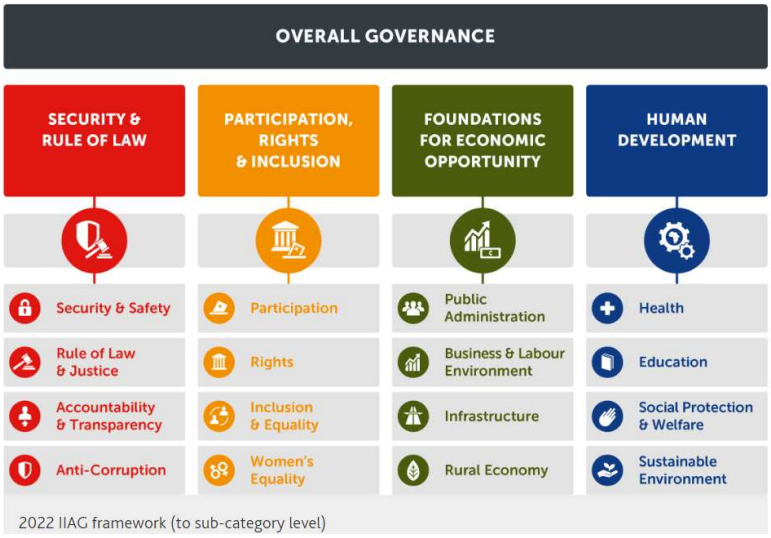


Figure 6: Worldwide Governance Indicators (WGI) of Madagascar from 2012 to 2022[5]

[5] http://info.worldbank.org/governance/wgi/Home/Reports

The Ibrahim Index of African Governance (IIAG): published since 2007, the IIAG assesses governance performance in 54 African countries over the latest available 10-year period. It provides a framework and dashboard for any interested audience to assess the delivery of public goods and services and public policy outcomes in African countries. The IIAG constitutes the most comprehensive dataset measuring African governance, providing specific scores and trends at African continental, regional, and national level, on a whole spectrum of thematic governance dimensions, from security to justice to rights and economic opportunity to health.



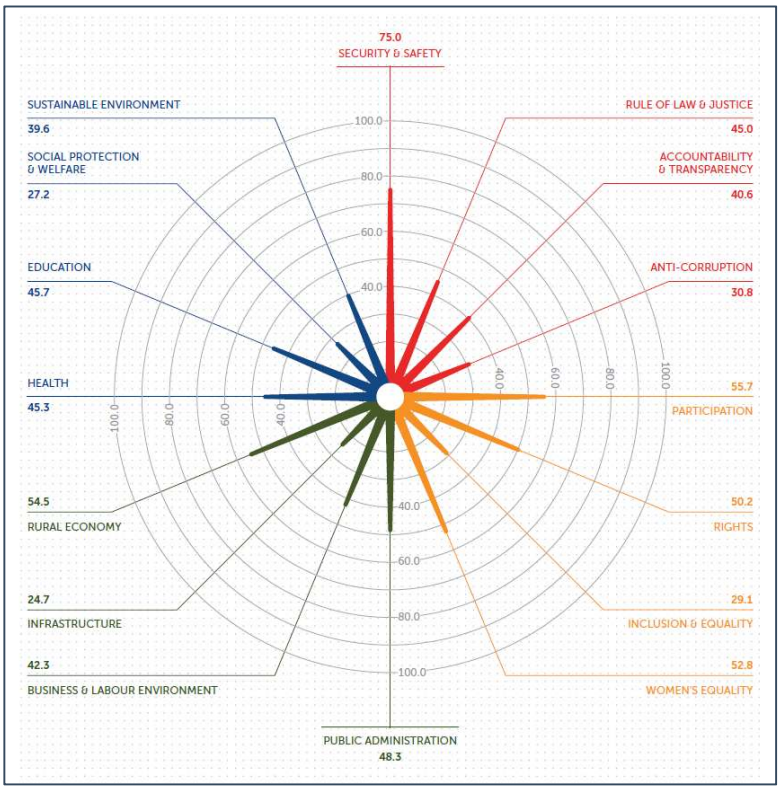


Figure 7: Ibrahim Index of African Governance (IIAG) for Madagascar in 2022[6]

[6] https://iiag.online/fr/

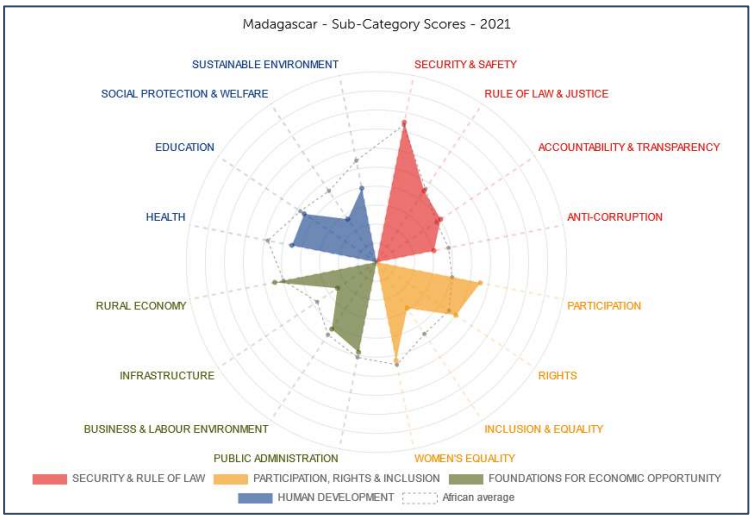


Figure 8: Ibrahim Index of African Governance (IIAG) for Madagascar in 2021[7]

Water and energy infrastructure

"Traditional" energies, firewood and charcoal, represent more than 80% of the total energy consumed in the country. Supplies of "modern" energies (17% of consumption) are characterized by a heavy reliance on the oil bill, which weighs heavily on the National Water and Electricity Company (JIRAMA), and therefore on public finances.

In 2015, the Malagasy Government launched its **New Energy Policy 2015-2030** (NPE 2015-2030), aiming for electrification of at least 70% of households by 2030 (including 15% thermal, 0.5% wind, 5% solar, and 75% hydroelectric). According to the World Bank, this objective could only be achieved to the extent of 25% through the extension of large networks and 75% through mini-grid solutions (20%) or individual systems.

Electricity production has been liberalized since 1999, promoting free competition in the production sector and establishing a regulator. However, for multiple reasons (insufficient available power, distance from energy production centres, energy independence, among others), mining companies ensure their own production. The exercise of Production, Transport, and Distribution activities is subject, depending on the installed capacities, to one of the following permitting regimes:

Declaration regime:

Hydroelectricity	P ≤ 500 kW
Wind farm	P ≤ 250 kW
PV solar farm	P ≤ 150 kW

Authorization regime:

Thermal	:	P ≤ 500kW
Hydroelectricity	:	500 kW < P ≤ 5MW

[7] https://iiag.online/locations/mg.html

Wind	:	250 kW < P ≤ 5 MW
Solar Thermal	:	P ≤ 5 MW
Solar Photovoltaic	:	150 kW ≤ P ≤ 5 MW
Biomass	:	P ≤ 5 MW
Geothermal and marine energy	:	P ≤ 10 MW
Waste	:	P ≤ 5 MW

Concession regime: Beyond the powers indicated above, it is the Concession Regime which applies.
In Madagascar, given the limited extension of interconnected networks and independent networks that often only supply district capitals, a significant portion of the population still lacks access to electrical services. The electricity access rate in Madagascar was 25.8% nationwide in 2018 (approximately 70% in urban areas) and decreased to 13.2% in rural areas by 2020.

In addition to JIRAMA, the Rural Electrification Agency (ADER) was established in 2002 to implement rural electrification policy. ADER is responsible for processing authorization and/or concession requests from private operators, granting them, and overseeing, in coordination with the regulator, compliance by operators in rural areas with applicable obligations.

At the forefront of renewable energies is hydroelectricity, as the country has an estimated hydroelectric potential of 7800 MW, with less than 3% currently exploited. This aspect is reinforced by the promotion of solar and wind energy: an annual estimate of nearly 2 800 hours of sunlight and a wind energy potential evaluated at 2000 MW.

JIRAMA has implemented rolling blackouts for over twenty years. Electricity is regularly cut for one or more hours per day and, in some cases, for several days.

For the mining industry in Madagascar, areas with potential mineral resources are generally located far from JIRAMA distribution centres. Most mining operations either have their own hydroelectric plants or thermal power plants. JIRAMA has stated that its production capacity is insufficient to meet demand. Therefore, all future mining units should equip themselves or build their own electricity-generating plants, as well as water pumping and treatment facilities. Regarding fuel, mining exploration companies source their supply from petroleum distributors present in the territory through a supply contract. There is no major issue in procuring fuel.

"Energy" projects: With the support of financial and technical partners, as well as the private sector, various projects are currently under study or development, including:

- DECIM Project (World Bank): Aims to expand access to renewable energies and digital services to enhance inclusion. There is synergy between the Ministry of Energy and Hydrocarbons (MEH) and the Ministry responsible for Digital Development (MNDPT). This project addresses a strong demand from the rural population;
- Rural Electrification Program (in collaboration with the ADER-AFD program);
- LEAD Project - Low-Cost Electricity Sector Development Project - DEMOS (World Bank): Follows the Project for Improving Governance and Operations in the Electricity Sector (PAGOSE), which was closed in December 2021;
- Mandraka III (hydroelectricity);
- Volobe (hydroelectricity);

- Namorona downstream (hydroelectricity);
- Sahofika (hydroelectricity);
- PRIRTEM Project - Project for Interconnection and Strengthening of Electricity Transmission Networks in Madagascar (African Development Bank);
- Mahitsy Hydro downstream (hydroelectricity).

Road infrastructure

4,598 kilometres of national roads, all in an advanced state of degradation. The overall penetration of the road network is low. Apart from national roads and a few regional routes, access to certain even inhabited areas is only possible through pedestrian paths or tracks for ox-cart carriages. Several localities in Madagascar are isolated from the rest of the country during the cyclone season. Generally, to ensure a continuous circulation possibility, the extractive industry must, at the very least, rehabilitate or even reconstruct existing roads, and sometimes, it must build a new road.

The above legal categorization allows identifying the Project Owner. Any access road, even those opened through private initiative and funding, must be made available to the public, except for their portions within enclosed private spaces.

Several road projects are currently underway:

- Madagascar Road Network Modernization Project: Since 2021, rehabilitation of RN 6 over 234 kilometers between Ambanja and the port of Antsiranana; and RN 13 over 114 kilometres between Ambovombe and the port of Taolagnaro (EU financing - €235.5 million).
- Road Infrastructure Development Project: Rehabilitation of the Toliara – Morondava road over 105 km (RN 9). Construction of a bridge over the Befandriana River. Rehabilitation of the Pomay bridge on RN 35 (Ivato south of Ambositra on RN 7 and Morondava). Co-financed by the African Development Fund, OPEC Fund for International Development (OFID), OPEC (Organization of the Petroleum Exporting Countries), and the Republic of Madagascar - 60.47 million UC.

In May 2023, the World Bank announced a tripling of its interventions in road projects until 2024 with the "objective of increasing access to rural roads from the current 11.4% to 30%."

Ultimately, if all road rehabilitation projects are completed, access to various ports will be easier.

Port infrastructure and maritime navigation

Madagascar is an island with 4,828 kilometres of coastline. Unfortunately, it has only 22 ports, of which only 6 can accommodate ships of a certain tonnage. These are:

- **Toamasina Port**: It is the best-equipped with modern facilities for both transit/customs operations and loading/unloading. 80% of Madagascar's international maritime traffic is handled by this port, accounting for approximately 1,600,000 tons of cargo and 18,900 TEUs (Twenty-foot Equivalent Units). It allows berthing of ships with a draft of 15 metres and weighing over 70,000 tons. Bulk carriers and general cargo ships can dock there. Its current capacities and logistics are largely the result of its modernization and expansion initiated in 2018 (65%, or USD 635 million via the Japan International Cooperation Agency, and 35%, or USD 228 million via the Malagasy Government). In 2026, the Port of Toamasina will rank 5th among African ports and 279th globally.
- **Ehoala Port** (since 2009): Built as part of the Fort-Dauphin Ilmenite Project, Ehoala Port resulted from a mutually beneficial solution for the Malagasy government and Rio Tinto QMM. Both parties funded its construction with Rio Tinto QMM contributing USD 240 million and the Malagasy government USD 35 million through the Integrated Growth Poles of Anosy (PIC) Project, financed by the World Bank.

Ehoala Port serves the public interest (the main dock used by Rio Tinto QMM approximately one week per month) and can accommodate ships with a draft of 15.75 metres.
- **Antsiranana Port**: With a depth of 8 metres at the mooring point.
- **Toliary Port**: Capable of receiving ships with a draft of 7.5 metres.
- **Mahajanga Port**: Primarily a transhipment port, it only accommodates ships with a draft of less than 5 meters.
- **Sainte Marie Port** (Nosy Boraha): Can only accommodate small vessels weighing less than 250 tons and with a shallow draft (less than 5 metres).

Other waterways

Apart from the Canal des Pangalanes, no developments have been made on Madagascar's various waterways. With the perspective of intensive transportation (regular and heavy-duty) and the fact that no appropriate adjustments have been made to their channels, none of Madagascar's rivers is navigable. The Canal des Pangalanes was built in the 20th century. It stretches 665 kilometres between Toamasina and Farafangana. It can be navigated by shallow-draft boats, subject to repeated dredging. It could be an ideal solution for transporting heavy loads (potentially including ores) to the port of Toamasina.

Rail infrastructure

The Malagasy railway network consists of four lines:
- Antananarivo – Toamasina via Moramanga ("Tananarive – Côte Est" or TCE): 372 km.
- Moramanga – Ambatosoratra ("Moramanga – Lac Alaotra" or MLA): 167 km.
- Antananarivo – Antsirabe ("TA"): 171 kilometres.
- Fianarantsoa – Manakara ("Fianarantsoa – Côte Est" or FCE): 163 km.

Before 1992, railway transportation was managed by the State company "Réseau National des Chemins de Fer Malagasy - RNCFM." In 1992, railways were abandoned in favour of road transport. In 2002, a 25-year management concession was granted to the company Madarail, which operates the TCE, MLA, and TA lines. The FCE line remains under the management of the Ministry of Transport. The main operation occurs between Toamasina and Antananarivo for the transportation of goods, fuel, and, until the closure of the chromite mines in Andriamena (2019), concentrated chromite to the Port of Toamasina. Railways are globally recognized as one of the most cost-effective means of transportation. This was the case in Madagascar before 1992.

Telecommunication

The telecommunications sector experienced strong growth of 8.5% in 2013. Then, a sharp slowdown in 2014 (-6 points), and growth of 4% from 2015 to 2017. Madagascar hopes to achieve Internet coverage of 90% of its territory in 2038, to meet the country's objectives in terms of digital transformation. In isolated places and far from coverage and, subject to conclusive results of a market study by an operator, the best way is to agree with them the installation of a relay pylon.

3. Investment/financing prospects for ECRM projects in Madagascar

3.1. Fiscal, legislative and regulatory context for in-country financings

This section of the report was prepared in May 2023, based on the practices and regulations in force in Madagascar at the date of this report. We are not responsible for any changes that may occur as a result of subsequent amendments to legislation, regulations or practice.

It should be noted that the current regulations provide for various types of regimes (legal, foreign exchange, fiscal, and customs) applicable to investors and operators in the mining sector[8]:

- The **common law regime**, governed by the Mining code and general regulations;
- The **stability regime**, also provided for by the Mining code, for mining investors with investments ranging from 500,000,000 MGA to 50,000,000,000 MGA[9], who choose the stability guarantee (art. 154 to 163 of the Mining Code);
- The **regime for large mining investments**, regulated by Law n°2001-031 of October 8, 2002, which establishes a special regime for major investments in the Malagasy mining sector (LGIM). This law was modified by Law n° 2005-022 of October 17, 2005; for investments exceeding 50,000,000,000 MGA in value as of April 30, 2005[10], implemented in Madagascar under an approved Investment Plan, and provided that the debt-to-equity ratio does not exceed 75:25 (art. 4 of LGIM). This regime is applicable to investors, license holders, transformation entities, and subcontractors (art.27 and subsequent articles of LGIM).

A mining operator can also benefit from a specific regime provided by an Establishment convention with the Malagasy State, which is promulgated as law and applicable solely to the operator that is a party to the convention. To date, the only Establishment convention in force is between the Malagasy State and QMM-Rio Tinto[11].

As the QMM-Rio Tinto's Establishment convention is only applicable to this operator, we will only consider the first three regimes in the following sections.

Legal form of different types of activities to the exploitation of mineral raw materials

The legal forms provided by Law n°2003-036 on commercial companies as amended, are as follows:

- **Branch** or commercial or industrial or service provision establishment, belonging to a company or individual and endowed with a certain degree of management autonomy (art. 101 and following)
- **General Partnership**, where all partners are traders and have joint several liability for the company's debts (art. 285 and following)
- **Limited Partnership**, in which one or more partners have unlimited joint and several liability for the company's debts, known as « general partners », and one or more partners have liability for their

[8] Malagasy legislation also provides for a regime called Zones and Free Zone Enterprises (ZEF), but mining operations are not eligible under this regime (Art. 8 of Decree n° 2015-1096).
[9] Or between 105,347.87€ and 10,534,787.97€ based on the exchange rate of 05/15/2023 (1€=4,746.18 MGA).
[10] This investment threshold should be updated annually by indexation to the value of the International Monetary Funds (IMF)'s Special Drawing Right (SDR). However, the most recent update dates back to 2015 (Order n° 18701/2015), which provides an eligible investment threshold of 106,161,682,882.36 MGA in value as at June 3, 2015.
[11] Establishment agreement between Malagasy State, represented by OMNIS and QMM Rio Tinto

contributions, known as « limited partners » or « silent partners », and the capital is divided into partnership units (art. 308 and following)

- **Limited Liability Company** (LLC) where partners are only liable for company debts up to the amount of their contributions, and their rights are represented by shares. It can be formed by an individual or a legal entity, or between two or more individuals or legal entities (art. 325 and following)
- **Public Limited Company** (PLC), which means a company in which shareholders are only liable for company debts up to the amount of their contributions, and their rights are represented by shares. A PLC can have a single shareholders (art. 407 and following)
- **Partnership Limited by Shares**, in which the capital is divided into shares and formed between:
    - One or more general partners, who are traders and have unlimited joint and several liability for company debts.
    - Limited partners who are shareholders and only bear losses up to the amount of their contributions. The number of limited partners must not be less than three (art. 876 and following)
- **Partnership** in which partners agree that it will not be registered with the Commercial and Companies Registry and will not have legal personality. It is not subject to publicity. The existence of the partnership can be proven by any means. (art. 892 and following)
- **De Facto partnership**, which occurs when two or more individuals or legal entities act as partners without having established one of the companies (art. 902 and following)
- **Economic Interest Grouping**, whose exclusive purpose is to implement, for a determined duration, all means to facilitate or develop the economic activity of its members and improve or increase the results of that activity. It activity must be essentially related to the economic activity of its members and can only have an auxiliary character in relation to it. (art. 907 and following)

The most common legal forms, including in the mining sector, are presented in the following table:

Topics	Limited Liability Company (LLC)	Public Limited Company (PLC)	Branch
Minimum capital	Free	10,000,000 MGA and if single shareholders 2,000,000 MGA	None
Social rights	Ownership units	Shares (Art. 407 of Law n° 2003-036)	At the holding company level
Number of shareholders	1 min and 50 max	1 to over 50	At the holding company level
Liability of partners/shareholders	Limited to their contributions	Limited to their contributions	At the holding company level
Nature of contributions	**In cash and in kind: full payment of funds when the company is registered**	In cash: 1- At least one-quarter must be paid up before the company is incorporated, with the remainder to be paid up within 3 years of registration 2- The funds arising from the payment of the shares are deposited immediately by the founder in the bank, against a receipt, in an account opened in the name of the company being formed, or in the office of a notary In Kind: 1- Absolute liberation upon company establishment.	None
Auditing by an external auditor	**Required if:** - share capital exceeds 20,000,000 MGA - the company meets one of these 2 conditions: 1- annual turnover exceeding 200,000,000 MGA 2- more than 50 permanent employees	**Required:** - 2 external auditor for PLC making public offerings - 1 external auditor for PLC not making public offerings	Depends on the legal form of the holding company
Directors	Manager(s): one or more individuals, who could be partners or not.	**PLC with Board of Directors (BD)** 1- or by a Chief Executive Officer, 2- or by a Chairman of the Board and a general manager. **PLC with Managing Director (MG)** mandatory if number of shareholders is three or less and if one- person company	- Representative and Resident Representative if the holding is a foreign company - Appointed by minutes of the holding company
Term of office	Term of 4 years and eligible for re-election, unless otherwise specified in the bylaws.	**Board member:** Duration freely determined by the arts of association, not exceeding 6 years in the event of appointment during the company's existence, and 2 years in the case of appointment by the bylaws or the inaugural general assembly.	Determined by minutes of the holding company

		Chairman of the Board (CB): do not exceed his term of office as Board member **General manager**: Freely determined by the Board directors **Managing director:** 1- First Managing Director: maximum 2 years. 2- During corporate life: maximum 6 years	
Annual General Meeting	**Ordinary General Meeting**: questions do not require an amendment to the bylaws-annual approval of financial statements and financial reports-regulated agreements **Extraordinary General Meeting:** Matters related to the amendment of the bylaws	**Ordinary General Meeting**: questions do not require an amendment to the bylaws-annual approval of financial statements and financial reports-regulated agreements **Extraordinary General Meeting:** Matters related to the amendment of the bylaws	At the holding company level
Rule for reconstituting shareholders' equity in the event of a loss	- If shareholders' equity is less than half the share capital, the manager or external auditors is obliged to consult the partners within 4 months of the decision to dissolve the company early - If this hypothesis is not accepted, the company is obliged, within 2 years of the end of the loss- making financial year, to reconstitute its shareholders' equity until it is equal to at least half of the share capital. Failing this, it must reduce its capital by an amount at least equal to that of the losses. - If the managers or the statutory auditor fail to bring about a decision, or if the partners are unable to deliberate validly, any interested party may ask the Commercial Court to dissolve the company.	- If shareholders' equity falls below half the share capital, the Board of Directors or General meeting must, within 4 months of approving the financial statements, convene an Extraordinary General Meeting to decide whether to dissolve the company. - If dissolution is not chosen, the company is obliged to reduce its share capital by an amount at least equal to the losses that could not be charged to reserves, no later than the close of the second financial year following the recognition of the losses if it has not been able to reconstitute shareholders' equity to a value equal to half the share capital. - In the event of failure to convene a shareholders' meeting, or if the meeting is unable to deliberate validly on final notice, any interested party may apply to the courts	At the holding company level

Table 3: Overview of most common legal forms[12]

The legal form does not determine the applicable tax regime for individuals fiscally registered in Madagascar (tax residents). For entities subject to common law, the tax regime varies depending on the activities undertaken and/or the annual turnover achieved. The tax regime is included in the regulations defining the exceptions and adjustments applicable to specific regimes.

[12] Source: Law n°2003-036 as amended and subsequent texts

Rules and practices regarding foreign exchanges

Condition for authorizing loan contracts with foreign entities : depending on the regime to which the operator is subject, the obligations concerning financial transactions with a foreign entity are as follows

	General law	Guaranteed stability of the Mining code	LGIM
Financial operations	Prior authorization (before arrival of funds) from the Ministry of Finance	In accordance with regulations in force at the date of option or favourable measures adopted after that date.	Notification of the control and monitoring body within the Ministry of Mines by the submission of 02 certified copies of any loan agreement concluded to implement the Investment Plan.
			Declaration approved by the head of department of the control and monitoring body within the Ministry in charge of Mines for the repayment of current account advances from associates/shareholders, and for the repatriation by investors of the proceeds from the sale of their shares/business assets or compensation for expropriation, and monetary compensation from arbitration awards
			Favourable measures in accordance with regulations applicable between December 31, 1999 and the LGIM certification date for other cases.

Table 4: Obligations relating to cross-border financial transactions[13]

In practice, prior authorization from the Ministry of Finance is requested from the External Finance Department (FINEX), by submitting the documents listed below, subject to any additional documents required:

Documents	Type	Number
Application on plain paper addressed to the chief of the External Finance Department	Original	1
Loan/current account/credit/cash flow agreement specifying purpose and financial conditions	Copy	1
Extract from the kbis of the contributor/lender or certificate of existence	Original	1
By-laws of the beneficiary company	Original	1
If the beneficiary is a public limited company, a document proving that the lender is a shareholder	Copy	1

Table 5: List of documents to be submitted to FINEX for prior authorization

Local currency convertibility and transfer of funds abroad: the exchange rate system is based on the floating national currency, whose rate is freely determined by the foreign exchange market or Interbank Foreign Exchange Market (MID). The operation of the Foreign Exchange Market Interbank (MID) is governed by the Market Convention and the Code of Conduct for the Foreign Exchange Market (art. 14 and 15 of Decree n° 2009-048 implementing the Foreign Exchange Code).

The conversion of local currency into foreign currency is provided for in the:

- **foreign fund transfers**:

[13] Source: Foreign Exchange code and subsequent texts, Mining code, LGIM

	General law	Guaranteed stability of the Mining code	LGIM
Payments for current operations	**Free-** Current operations are payments due in respect of foreign trade, including services, as well as normal short-term banking and credit facilities; payments due in respect of interest on loans or net income from other investments; moderate payments for amortization of loans or depreciation of direct investments; remittances for family expenses	In accordance with regulations in force at the date of option or favourable measures adopted after that date	**Declaration to the authorized intermediary** - The eligible routine operations are those directly related to the project, including the purchase of goods and services from foreign suppliers; the acquisition or leasing of imported equipment; payment of fees to individuals residing abroad for services rendered; payment of royalties for rights granted to the Holder or the Transformation Entity by foreign third parties; the cost of expatriate employees and training of Malagasy employees abroad; and funds corresponding to duly and legally declared dividends intended to be distributed to foreign shareholders of the Holder or the Transformation Entity.
Capital and financial transactions	**Declaration to the Ministry of Finance**, for sales of shares, business assets, liquidation bonuses and expropriation indemnities for foreign investors		**Notification of the control and monitoring body within the Ministry of Mines** by submitting 02 certified copies of any loan agreement concluded to implement the Investment Plan
			Declaration approved in advance by the head of department of the control and monitoring body within the Ministry of Mines, for the repayment of current account advances from associates/shareholders, and for the repatriation by investors of proceeds from the sale of their shares/business assets or compensation for expropriation, and monetary compensation from arbitration awards
	Prior authorization from the Ministry of Finance, for other capital and financial transactions		Favorable measures in accordance with regulations applicable between December 31,1999 and the LGIM certification date for other cases

Table 6: Obligations relating to transfers of funds abroad[14]

- **Imports of goods originating from abroad** (art. 10 of Decree n° 2009-048 and Order n°13312/2015-MFB/SG/DGT/DOF/SSOC dated April 2, 2015)

These operations are considered routine transactions. However, unless expressly exempted, they must be subject to the requirement of domiciliation, which means opening a file containing all the documents related to the importation through an authorized intermediary. Domiciliation must be done prior to customs clearance of the goods and remains valid for 12 months before such clearance.

[14] Source: Foreign Exchange Code and subsequent texts, Mining Code, LGIM and implementing decree

- **Travel allowances** (Circular n° 755-2018 of August 30, 2018, on foreign currency allowances): These allocations are also considered routine transactions and are not subject to limitations. However, the transportation of currency equal to or exceeding €7500 must be declared to the Customs Services at the borders.

Payments to foreign countries and the purchase of foreign currency must be made through an authorized intermediary, such as primary banks or authorized post offices. The nature of the transaction must be indicated to them (art. 9 of Decree n° 2009-048 implementing the Foreign Exchange Law).

In practice, requests for prior authorization and declarations to the Ministry of Finance are submitted to FINEX. The documentation typically consists of a request on plain paper accompanied by the necessary supporting documents.

Regarding authorized intermediaries, the required documents and fees for funds transfers or currency purchases may vary.

Obligation to repatriate funds and transfer currency: residents are required to repatriate all claims held abroad or on a non-resident that arise from the export of goods, remuneration for services, and, in general, all income and proceeds arising from financial transactions with foreign entities or non-residents in Madagascar, related to their activities in Madagascar (art. 11 of Decree n° 2009-048, modified by Decree n° 2022-1183).

The obligation to repatriate and transfer currency is as follows, depending on the regime to which the operator is subject:

	General law	Guaranteed stability of the Mining code	LGI
Exporting and providing services	Obligation to transfer 70% of export receipts/advances and pre-financing to the MID as soon as repatriation takes place, without exceeding the 30-day time limit.	In accordance with regulations in force at the date of option or favourable measures adopted after that date.	Exemption from repatriation is granted on the condition that a resident maintains a minimum balance in their foreign currency accounts in Madagascar equivalent to three months' worth of local expenses payable in Malagasy francs. If this requirement is not met, there is an obligation to repatriate the proceeds from the sales of exported mining products within 90 days, except for the amount of funds authorized to be kept in foreign currency accounts abroad for servicing external debt.

Table 7: Currency repatriation and transfer obligations[15]

Exports of goods are also subject to the domiciliation requirement, unless exempted or the value is less than or equal to MGA 3 million. Domiciliation is carried out with an approved intermediary and is valid for 6 months from the date of opening.

Offshore and onshore foreign currency accounts: the opening of a foreign currency account is organized as follows, depending on the operator concerned:

[15] Source: Foreign Exchange Code and subsequent texts, Mining code and LGIM

	General law	Guaranteed stability of Mining	LGIM
Foreign account	Prior authorization from the Minister of Finance	In accordance with regulations in force at the date of option or favourable measures adopted after that date.	CGIM notification within 5 days of opening: - Mandatory with a foreign bank of international repute-correspondent of its bank in Madagascar to receive export earnings; - Authorized with foreign banks of international repute for the management of its external debt servicing.
Foreign currency account with a local bank	Free for: - exporters of goods and services, including international online sellers, non-residents, financial institutions, and foreign exchange bureaus; - importers, exclusively for staggered purchases of foreign currency as part of the procedures and obligations relating to the domiciliation and payment of goods import operations (to be closed within 12 months of payment) - Non-profit institutions whose activities are carried out within the framework of with foreign partners for	In accordance with regulations in force at the date of option or favourable measures adopted after that date.	Free
	Prior authorization from the Minister of Finance for commercial companies or public bodies whose bylaws and activities and activities justify the need for them.		

Table 8: Opening a foreign currency account[16]

Prior authorization from the Minister of Finance is requested from FINEX, by means of a request on plain paper, specifying the reason for and context of the account opening; the bank opening the account; the operations envisaged (debit and credit); and the currency of the account.

Tax treatment of investment

- **Interest and dividends**: taxation of interest on current account advances from associates/shareholders and dividends is shown in the table below:

	General law	Guaranteed stability of the Mining Code	LGIM
Interest	20%		Exempted

[16] Source: Foreign Exchange code, Mining code, LGIM and subsequent texts

Dividends	10% for foreign partners/shareholders	In accordance with regulations in force at the date of option or favourable measures adopted after that date.	10% (dividends and other distributions)
	Exemption for resident individuals		
	Exemption of dividends received from subsidiaries for Malagasy companies that have opted for the "parent company-daughter regime": but subject to an obligation to add back to the income tax base the expenses of the parent company equivalent to 5% of the amount of dividends received.)		

Table 9: Taxation of interests and dividends[17]

Madagascar has signed double taxation agreements with France, Mauritius, Canada, and Morocco. Where shareholders/partners are resident in these countries, the taxation of interest and dividends is summarized below:

	France	Mauritius	Canada	Morocco
Interests	Taxable in Madagascar at a maximum of 15%	Taxable in Madagascar, If the person receiving the interest is the beneficial owner, the rate applied may not exceed 10%.	Taxable in Madagascar at a maximum of 10%	Taxable in Madagascar at a maximum of 10%
Dividends	Taxable in Madagascar, but not exceeding: - 15% if the beneficial owner is a company (other than a partnership) which directly holds at least 25% of the share capital - 25% in all other cases	Taxable in Madagascar, If the person receiving the dividends is the beneficial owner, the rate applied may not exceed: -5% if the distributing company is eligible under the investment Code / venture capital company - 10% in all other cases	Taxable in Madagascar, but not exceeding: - 15% if the beneficial owner is a company that directly or indirectly controls 25% of the voting rights - 25% in all other cases	Taxable in Madagascar at a maximum of 10%

Table 10: Taxation rules for interest and dividends under double taxation agreements[18]

The tax is withheld by the local company and paid on a declaration filed with the operational unit managing the company's file by the 15th of the month following the month of payment (art. I-27 of the Tax Procedures Code (CPF) 2023).

Thin capitalization rules: The limit on the deductibility of interest paid to partners/shareholders from the income tax base varies according to the regime to which the local company is subject:

[17] Source: CDI 2023, Mining code, LGIM and subsequent texts
[18] Source: Double taxation agreements concluded by Madagascar

	General law	Guaranteed stability of the Mining Code	LGIM
Thin capitalization rules	Deductible interest limited to that corresponding to the remuneration of a sum not exceeding double shareholders' equity at a rate not exceeding that granted by Banky Foiben'i Madagasikara increased by 2 points	In accordance with regulations in force at the date of option or favourable measures adopted after that date.	Interest deductible only if the interest rate and other borrowing conditions are as favourable or better favourable or better than those of non- affiliated lessors.
	Deductible interest limited to a total debt to equity ratio of 3 to 1 if the company is approved under the Industrial Development Act.		

Table 11: Thin capitalization rules[19]

Overview of tax regimes applicable to the mining sector in Madagascar

Main taxes applicable: the guarantee of stability provided for by the Mining code provides for the tax regime, the application of the regulations in force on the date of the option and the possibility of requesting the application of favorable measures applicable after that date. The table below attempts to summarize the main taxes and duties applicable to companies subject to the ordinary law regime (according to the Malagasy Tax Code (CDI) according to the initial finance law for 2023) and the LGIM.

Taxes	General law	LGIM
INCOME TAX	Applicable rate: 20% of net profit Threshold is subject: MGA 200 million	Applicable rate: 25% for the Data Controller and its subcontractors Applicable rate: 10% for the Processing Entity and its subcontractors When the historical results of the processing entity and the holder taken
	MGA of annual turnover – or option for the regime of the real (even if annual turnover not reached)	together reach an after-tax internal rate of return of 20%, the applicable income tax rate is 35%. This rate rises to 40% when the after-tax internal rate of return reaches 25% or more. Specific reliefs including exemptions, depreciation deductions and reductions are also provided.
FLAT-RATE TRANSFER TAX (TFT) / NON- RESIDENT INCOME TAX (IRNR)	Applicable rate: 10% of the amount paid to the no-resident person	Applicable rate: 15% of 45% of the amount paid to the non-resident for services rendered Exemption from transfers relating to external loans and insurance.
SYNTHETIC TAX	Applicable rate: 5% of gross income Threshold of liability: less than	N/A
TAX ON INCOME FROM MOVABLE CAPITAL	Applicable rate: 20% of income and 10% for dividends paid to non-residents.	Applicable rate: 10% for dividends and other distributions to shareholders and exemption from interest on external loans (subject to conditions).

[19] Source: CDI 2023, Mining code, LGIM and subsequent texts

TAX ON REAL ESTATE CAPITAL GAINS	Applicable rate: 20% of the capital gain.	Rate in accordance with the general law.
VALUE ADDED TAX (VAT)	Applicable rate: 20% of the value or amount of taxable business and 0% if export Threshold for liability: turnover greater than or equal to MGA 400 million	Applicable rate: 20% and 0% if export (including sale between Holder and processing entity) Exemption of loans in the investment plan and imports of personal effects of expatriate employees Possibility of refund of VAT Credit
REGISTRATION FEES FOR ACTS AND TRANSFERS	Applicable rate: (variable according to the nature of the act to be registered)	Reduced rates
	• 2% for commercial leases	• 4% Emphyteutic leases
	• 0.5% for acts of formation and extension of company	• Duty for acts of formation or extension of company and Capital duty: from 0% to 2% depending on the capital tranche
LAND TAX	Applicable rate: 1% market value of the land	Applicable rate: 1% limited to MGA 200 million per year
PROPERTY TAX ON BUILDING	Applicable rate: 5 to 10% of rental value	Applicable rate: 1%. limited to MGA 200 million per year and exempt for 5 years
TAX ON INSURANCE CONTRACTS (risks)	Applicable rate: 4% of sums stipulated for the benefit of the insurer and accessories	Applicable rate: 4 %

Table 12: Main taxes applicable[20]

Tax breaks specific to the mining sector: The adjustments considered in this section are those specifically granted by the CDI 2023 and which could benefit taxpayers involved in the mining sector. They apply only when ordinary law is applicable, in other words when the taxpayer is subject to the common law regime, and when the texts on the specific regime refer tacitly or explicitly to common law.

Taxes and levies	Arrangements
INCOME TAX	Tax deductibility: - expenses on donations and corporate social responsibility, provided for in mandatory specifications signed with a government body; - expenses incurred for site security, as well as labor-intensive work, subject to supporting documentation, and which are not excessive in relation to the services rendered. The corresponding sums paid must have been subject to withholding tax and to payment of intermittent corporation tax.
VAT	Eligibility for VAT credit refunds for export professionals and all VAT-registered companies making investments in tangible fixed assets, for a monthly amount more than MGA 100 million and generating VAT of at least 20,000,000 MGA.
PROPERTY TAX ON BUILDING	Exemption for new buildings, rebuilds and additions to existing buildings for 5 years from the year of completion.

Table 13: List of tax arrangements specific to the mining sector[21]

[20] Source: CDI 2023, Mining code, LGIM and subsequent texts
[21] Source: CDI 2023

Specific taxes applicable: sectoral taxes applicable to companies in the mining sector are detailed in the following table. As with the main taxes, the stability guarantee provided for in the Mining Code applies to parafiscal levies, in addition to the above, the employee is entitled to apply the regulations in force at the date of the option, and to request the application of favorable measures applicable after that date. As a result, the table below shows only the general law regime and the LGIM regime

Taxes by sector	General law	LGIM
MINING ROYALTIES	Applicable rate: 0.6% royalties and 1.4% rebates, applicable on the price of mining products at first sale.	Applicable rate: 2% (0.6% royalty and 1.4% rebate) applicable on a basis corresponding to 50% of the processing entity's selling price for processed products.
MINING ADMINISTRATION FEES (MAF)	Amount set annually by the BCMM	Amount set annually by the BCMM

Table 14: Taxes by sector[22]

Immigration rules and taxation for expatriates in Madagascar

Determination of the employee's tax residence: an employee is a tax resident of a given country if the wages and salaries he or she receives in respect of his or her employment are taxable in that country. Thus, the definition of tax residence implies the determination of the rules for taxing the salaries of an employee. The table below sets out these rules under ordinary law.

	CDI	Tax treaties
Taxable income in Madagascar	Income from employment in Madagascar	Salaries of a resident of a country having a tax treaty with Madagascar, from employment in Madagascar (stay of more than 183 days during the tax year in question, remuneration paid by an employer or on behalf of an employer resident in Madagascar and the cost of remuneration borne by a permanent establishment or fixed base of the employer in Madagascar)
	Income received from an employer in Madagascar	
	All Malagasy-source income received by persons not resident in Madagascar	
	Income from all sources earned by individuals resident in Madagascar	
Tax resident	Persons receiving salaried income from Malagasy sources	
	Employees with their usual place of residence in Madagascar	Employees working in Madagascar

Table 15: Tax residence of employees[23]

For operators subject to the stability guarantee provided for in the Mining code and the LGIM, reference should be made either to the wage taxation rules in force at the date of option or to favorable measures after that date (Stability guarantee in accordance with the Mining Code); or the most favorable payroll income tax rules in accordance with the regulations applicable between December 31, 1999, and the date of LGIM certification.

Tax and social security obligations for expatriate workers: expatriate workers taxable in Madagascar are subject to the payroll tax and social security contributions listed below:

[22] Source: CDI 2023, Mining code, LGIM and subsequent texts
[23] Source: CDI 2023, Tax treaties with France, Mauritius, Canada, and Morocco

Tax and social security obligations	General law		Guaranteed stability of the Mining Code	LGIM
Tax on salaried and similar income	Applicable rate • 20% of the portion exceeding MGA 600,000 of salaries, accessories, and benefits in kind • 15% of the income bracket from MGA 500,001 to MGA 600,000; • 10% of the income bracket from 400,001 MGA to 500,000 MGA • 5% of the income bracket from MGA 350,001 to MGA 400,000 • 0% for salaries below MGA 350,000		In accordance with regulations in force at the date of option or favourable measures adopted after that date.	
SOCIAL SECURITY CONTRIBUTIONS	**Employer**	**Employee**		Under General Law
Caisse Nationale de Prévoyance Sociale (CNAPS)	13%	1%		
Service Médicale Inter-entreprise (SMIE)	5%	1%		
Fond Malgache pour la Formation Professionnelle (FMFP)	1%	N/A		

Table 16: Employment-related taxes and contributions[24]

Export and import rules and practices

Rules governing the export of mining products: in general, the export of mining products is subject to prior declaration to the customs authorities. Depending on the regime applicable to the mining operator, export is subject to the following formalities:

Type of export	General law	Guaranteed stability of the Mining Code	LGIM
Export of non-prohibited mine products and fossils for non-commercial purposes	Subject to prior declaration to the Mining Administration and in limited quantities Export on production of regulatory pass	In accordance with regulations in force at the date of option or favourable measures adopted after that date.	Submission to the declaration formality provided for by the Mining Code "in force on the Investment Eligibility Certification Date".
Export of mining products, quarry substances and fossils for commercial purposes	Submitted: - prior declaration to the Mining Administration - checking the conformity of the declaration submitted by the mining administration - quality control by a mining analysis laboratory before shipment Declaration file: declaration, quality analysis certificate, duly completed regulatory passes for substances to be exported, or related purchase invoices.		

[24] Source : CDI, Labour Code, Social Security Code, Mining Code, LGIM and subsequent texts

Large-scale export of mining products for industrial use and of mining products processed by local industries	Submitted: - prior declaration to the Interregional Department of the Ministry of Mines responsible for the area concerned - conformity checks on samples of said products - to be deposited with the export declaration, against receipt, at the office of the aforementioned Directorate - quality control by a mining analysis laboratory before shipment Declaration file: the declaration, the categories, and quantities of samples to be deposited, and the duly completed Pass corresponding to all the products to be exported, or the relevant purchase invoices, as the case may be. Certificate of conformity issued by the Directorate is the single administrative act required for exit from the Territory.		

Table 17: Export formalities for mining products[25]

It should be noted that export is subject to proof of payment of rebates and royalties, and the obligation to repatriate foreign currency.

Customs regime: as with the tax regime, the customs regime for operators opting for the stability guarantee provided by the Mining Code is that in force on the date of the option, with the possibility of requesting the application of favorable measures applicable after that date. The General law and LGIM customs procedures are summarized below:

Customs transactions	General law[26]	LGIM[27]
Export of mining products	Customs and excise duties vary according to the nature of the mining products.	Export free of any customs duty, export tax, customs stamp or other fiscal charge levied on leaving the National Territory
	Exit duty at a rate of 15% for mining products other than precious and industrial stones and 20% for these products	
	2% export income tax instalment	
	0% VAT on exports unless exempted	0% VAT on exports, unless exempted
Imports of materials and equipment	- Customs and excise duties vary according to imported items - 2% import income tax instalment - Import VAT at 20%, unless exempted	For materials, items, equipment and other merchandise on approved lists: - Excise duty exemption - Research phase/ Project development and construction phase: Temporary admission under suspension of duties and taxes and definitive admission free of customs duties and import taxes, but stamp duty of 1% of the declared value is levied on removal. - Project operation phase: . Applicable duties and taxes paid annually on rental value for the rental year in question . For the Holder: application of customs duties and import tax at a cumulative rate of 5%, and exemption from customs stamp duty. . For the Processing Entity: exemption from customs duties import tax and customs stamp duty of 1% of the declared value

[25] Source: Mining code, LGIM and subsequents texts

[26] Mining companies can apply for customs warehousing status. (art.157, 157 bis, 157 Ter Customs Code) ; or the factory system (art. 216 à 224 Customs Code)

[27] Personal effects belonging to expatriate personnel employed by the Licensee the Processing Entity and Subcontractors under the Project are exempt from all import and export duties and taxes, as well as customs stamps (art. 78 LGIM)

		Application of the common law regime for materials, items, equipment, and other merchandise not included in the approved lists

Table 18: Customs treatment of imports and exports[28]

Conditions for the transfer of the investment

Forms of transfer: for the transfer of investment, the Law n° 2003-036 as amended provides:

- The transfer of shares: The shares are transferable, and the actions are transferable or negotiable (art. 43 to 51). Depending on the case, this transfer may be subject to the consent or approval of the shareholders/partners or directors by law (depending on the form of the company security and the company) or by the company's articles of bylaws.
- The merger, division, or partial contribution of assets, which are decided by the companies concerned. A declaration presenting the acts carried out to carry it out must be filed with the Trade and Companies Register (art. 204 to 212).
- The succession or transmission by death which is free or subject to the approval of the other shareholders/partners, depending on the form of the company and the provisions of the articles of association.

Local regulations also provide:

- the transfer of business, by private deed, authentic deed or act authenticated and published in a journal of legal announcements and in the Trade and Companies Register (Law n° 2003-038 as amended)
- the assignment of receivables to be established in writing (Law n° 2003-041 about the security act).

For operators subject to the LGIM, prior approval, by decree taken in the Council of the Government is necessary to maintain the certification of the eligibility of the Investment:

- when the transfer of the rights of the Initial Investors screw to screw the Holder, the Processing Entity implies a modification of the investment plan, or
- in case of transfer of the certification of the eligibility of the Investment to a purchaser of the Mining Permits of the Project before the realization of the Investment Plan (art. 24 LGIM).

Prior approval is not required for the transfer of rights of investors not amending the approved investment plan and the transfer of the certification of eligibility to mortgage investor. However, the latter must be notified to the control and monitoring body of the Ministry of Mines. (art. 23 LGIM)

Transferability of mining permits: The Mining Code provides for the movement of mining permit, the transmission or transfer, the partnership, the pledge, and the leasing. These movements are freely approved by the holder of a mining permit, for the benefit of any person eligible to hold a mining permit. However, these must be registered with the BCMM.

Tax implications: to the extent that the investment transfers in question relate to property located in Madagascar, they should be taxable in Madagascar, irrespective of the residence of the parties, as below

[28] Source: Custom Code, CDI 2023, LGIM and subsequent texts

Operations	General law	Guaranteed stability of the Mining code	LGIM
Transfer of actions/shares The merger, division, or partial contribution of assets	- Capital gains tax on disposal 20%[29] - Registration fee (RF) 0,5% - RF 0,5% (if merger, exempt if products intended for export) - Right to assume liabilities:	According to the regulations	Favorable measures according to
	10,000 MGA	in force on the date of the option or favourable measures after that date	the regulations applicable between 31 December 1999 and the date of certification to the LGIM
Succession (by death)	- RF 10,000 MGA to 40,000 MGA according to the degree of kinship		
Disposal of business	- RF 5%		
Transmission of mining permit	- RF 5%		
Assignment of receivables	- RF 0,5%		

Table 19: Taxes applicable to investment transfers[30]

Investment guarantees

Guarantees applicable to investments in Madagascar:

Law n° 2007-036 of January 14, 2008, on Investments in Madagascar guaranteed for national and foreign investments:

- The freedom of investment, in other words. the freedom to invest and settle in the national territory, in compliance with the laws and regulations in force, subject to the provisions applicable to certain sectors of activity that are subject to specific regulations.
- Equal treatment of foreign investors and investors of Malagasy nationality, subject to the more extensive rights and benefits to which the investor is entitled under agreements or treaties concluded between the Republic of Madagascar and other partner countries.
- The protection of individual or collective property rights, against any measure of nationalization, expropriation, or requisition, except for reasons of public utility legally provided for, which shall be the subject of fair and prior compensation in accordance with the laws and regulations applicable in the matter.
- Freedom for foreign investors to transfer all payments relating to current operations (after-tax profits, dividends, salary income, compensation, and savings for expatriate employees), and freedom to transfer capital and financial transactions such as sales of shares, corporate units, goodwill or assets, liquidation bonuses and expropriation compensation, subject to declaration to the Ministry of Finance.

[29] Taxable in Madagascar according to the tax treaties with France, Mauritius, Canada, and Morocco (art. 13.2)
[30] Source: CDI 2023, Mining code and LGIM

- Stability by:
  - Maintaining a simple, fair, and growth-friendly tax system for investors to carry out investment projects;
  - Enjoyment of any new, more advantageous legislative or regulatory measures adopted subsequently;
  - Enjoyment of the advantages provided for under the Investment Act, notwithstanding any new legislative or regulatory measures subsequently adopted to abolish or attenuate these advantages.

Investments governed by an Investment Protection and Promotion Agreement (IPPA) concluded by Madagascar with other countries, benefit from more extensive guarantees and protection and more favorable treatment. The IPPA in force in Madagascar[31] are those concluded with Germany (21 March 1966), Switzerland (31 March 1966), Sweden (23 June 1967), Denmark (26 July 1967), Norway (28 September 1967), Mauritius (29 December 2005), France (14 January 2005), Belgium-Luxembourg (24 November 2008), China (24 November 2006), Germany (27 July 2007), South Africa (27 July 2007). Recently, the setting up of an IPPA between Madagascar and Italy was discussed by high-level officials[32].

Specific guarantees granted under mining legislation: To ensure the stability of investments in the mining sector, the mining regulations provide the following guarantees for eligible mining operators opting for the specific regimes:

	Guaranteed stability of the Mining code	LGIM
Stability of the tax, customs and exchange regime applied	Application of regulations in force at the date of the option or favourable measures after that date	Application of favourable measures in accordance with regulations applicable between December 31, 1999, and the date of certification to the LGIM and the provisions of the LGIM and its subsequent texts.
Stability of the legal system		Application of the constitutional, legislative, and regulatory provisions in force on the Eligibility Certification Date, as modified by the provisions of the LGIM and its subsequent texts.
		Right and freedom to own, manage, use, enjoy and dispose of all their property, rights, titles and interests, and compensation by the State in the event of requisition or measures depriving them of these rights and freedoms.
		Guarantee not to expropriate or nationalize and compensation in the event of expropriation for public use.

Table 20: Investment guarantees specific to the mining sector[33]

Legal rules governing disputes

Definition of applicable law: the general rules of jurisdiction in the event of conflict of laws are set out below:

Object	Applicable Law
Applicable foreign law declares itself incompetent	Any other foreign law that accepts jurisdiction or, failing that, Malagasy law
Policies and securities law	Territorial law
Status and capacity of persons	National law (also applicable to stateless persons domiciled in Madagascar)
Properties/buildings (including real estate inheritance)	Law of the place where they are located
Contractual or quasi-contractual obligations	Law under which the parties intend to operate

[31] Base de données relative aux traités bilatéraux d'investissement | CIRDI (worldbank.org) and CNLegis
[32] Madagascar - Italie : Un Accord de protection et de promotion des investissements soucieux du développement durable en vue (orange.mg)
[33] Source: Mining code and LGIM

Obligations in tort or quasi-delict	Tort or quasi-crime law
Donations	Law of the donor
Estates	Deceased status law

Table 21: Jurisdictional rules of the law - Source: Ordinance n° 62-041 of September 19, 1962

The Mining code does not specifically provide for the law applicable in the event of disputes, so the above rules should apply whether the mining operator opts for the Mining code's stability guarantee.

Disputes between foreign investors and the Malagasy government are governed by the following rules:

- For the general law regime: the regulations in force at the time of the dispute, in other words, Law n° 2007-036 of January 14, 2008, on Investments in Madagascar.
- For the stability guarantee under the Mining code: the regulations in force on the date of the option or favorable measures after that date.
- For the LGIM: the regulations in force on the date of certification of eligibility for the LGIM for the LGIM and the provisions of the LGIM and its subsequent texts. Under the LGIM, it is specifically stipulated that the law applicable by the international arbitral tribunal in the event of a dispute with the Malagasy state is Malagasy law (art 139).

Arbitration: arbitration is an agreement between the parties to a contract (arbitration clause) or the parties to a dispute that has already arisen (arbitration agreement) to submit the settlement of a dispute to one or more arbitrators (art. 439 of the Code of Civil Procedure) instead of a court or tribunal settlement. It is the preferred method of dispute resolution for foreign investments and for investments in the mining sector.
Indeed, under Law n° 2007-036 of January 14, 2008, on Investments in Madagascar, disputes between the State and a foreign investor are settled in accordance with:

- Jurisdictional or arbitration proceedings arising from agreements and treaties relating to the protection of investments concluded between the Malagasy State and the State of which the foreign investor concerned is a national, or failing that, from the International Convention for the Settlement of Investment Disputes (CRDI) between States and Nationals of Other States, signed in Washington in 1965 and ratified by the Malagasy State under Law n° 66-011 of July 1966.
- The competent Malagasy courts if the foreign investor is the claimant.

During the period of guaranteed stability, the Mining Code provides for the submission to arbitration of disputes between the licensee and the Malagasy State (art.163 Mining code and 426 of the Mining Code implementing decree). And the LGIM provides for recourse to binding international arbitration in accordance with the CIRDI for unresolved disputes with the Malagasy government. This international arbitration is agreed by the State in the decree certifying eligibility (art. 137).

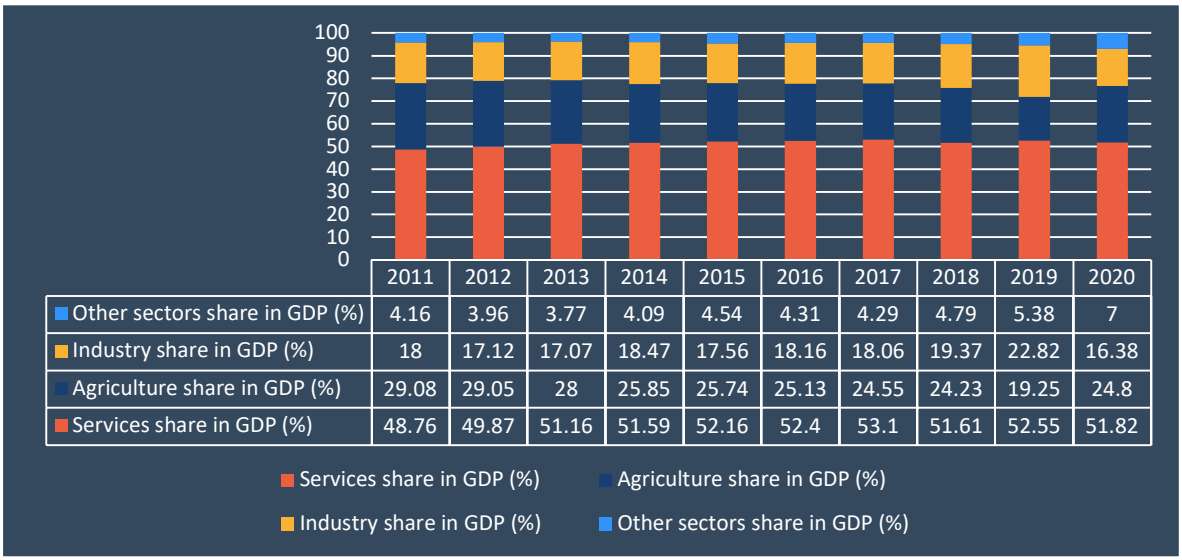
3.2. Macroeconomic context for in-country financings

Gross Domestic Product (GDP) analysis (World Bank, 2022)

Madagascar is the world's fifth largest island, situated in the Indian Ocean off the coast of southern Africa. Despite considerable natural resources, however, its population of about 28 million (2020) has one of the world's highest poverty rates.

The collapse of tourism and mining production as well as the moderation of private demand resulting from the containment have contributed to a GDP contraction estimated at 7.1% of GDP in 2020. Since mid-2021, a

slow recovery in activity has been observed, supported by exports of textiles and mining products but limited by the delayed reopening of the economy.



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Other sectors share in GDP (%)	4.16	3.96	3.77	4.09	4.54	4.31	4.29	4.79	5.38	7
Industry share in GDP (%)	18	17.12	17.07	18.47	17.56	18.16	18.06	19.37	22.82	16.38
Agriculture share in GDP (%)	29.08	29.05	28	25.85	25.74	25.13	24.55	24.23	19.25	24.8
Services share in GDP (%)	48.76	49.87	51.16	51.59	52.16	52.4	53.1	51.61	52.55	51.82

Figure 9: **Madagascar - Distribution of gross domestic product (GDP) across economic sectors from 2011 to 2020 [%] (Source: Statista)**

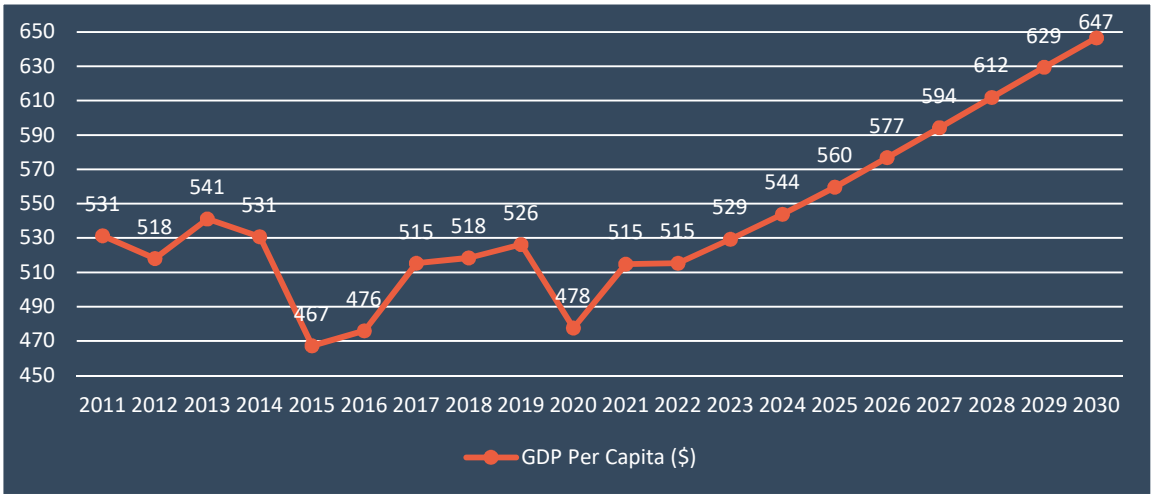


Figure 10: **Madagascar - Historical gross domestic product (GDP) per capita from 2011 to 2021 & projected estimations from 2022 to 2030 (Sources: World Data Bank, S&P)**

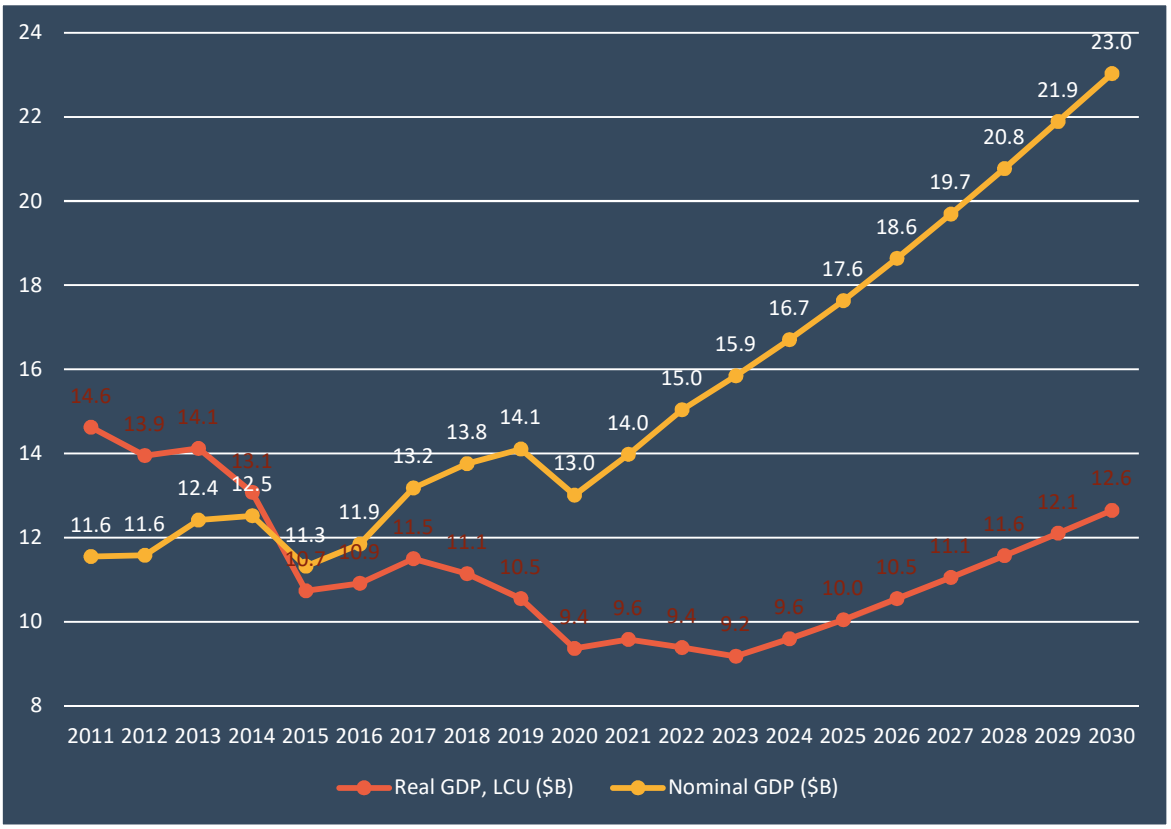


Figure 11: Madagascar – Historical and projected nominal GDP and real GDP growth (Sources: S&P)

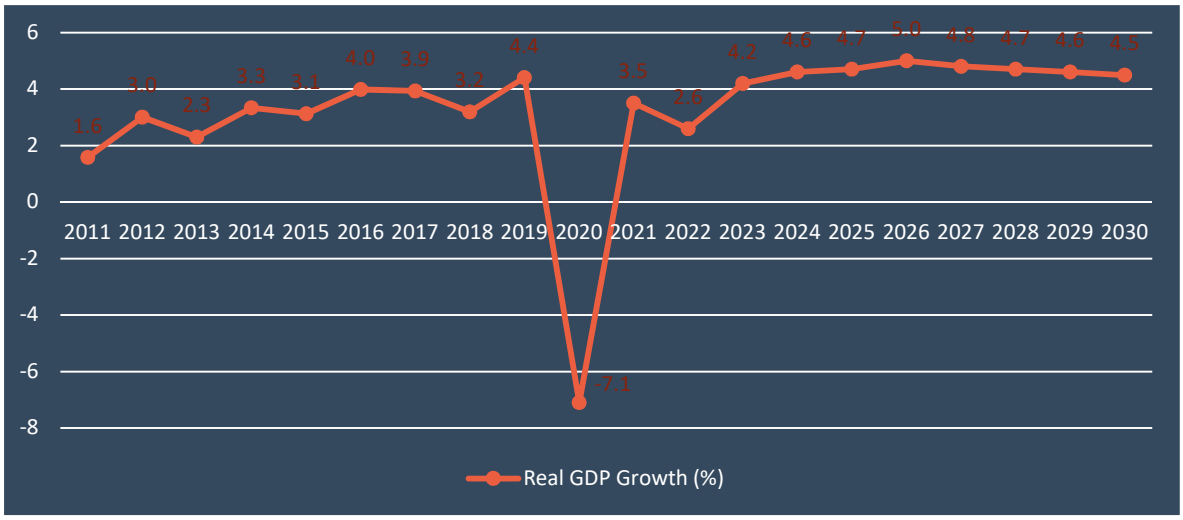


Figure 12: Madagascar – Historical and projected real GDP growth [%]

Madagascar continues to suffer the serious consequences of the COVID-19 pandemic

Actually, growth averaged about 3.5% a year in the years between the country's return to constitutional order in 2013 and the onset of the COVID-19 pandemic in 2020. However, it was followed by a recession about three times deeper than in most of the rest of Sub-Saharan Africa, with the sharp contraction of minus 7.1% in the economy due to the economic impact of pandemic closures on Madagascar's mining, tourism, transport, and service sectors, and to the impact of drought and livestock disease on agriculture in the South. As a result, the

COVID-19 crisis reversed more than a decade of gains in income per capita and pushed the poverty rate to a new record high of 81% (measured against the international poverty line of $2.15/capita/day). The crisis was compounded in the South of Madagascar by historic droughts that led to widespread crop failure, growing food insecurity, and internal migration.

The consequences of Ukraine war negatively impact Madagascar through its commercial partnerships

Growth had started to recover in 2021 but was interrupted again in 2022 by a third wave of the pandemic followed by a sequence of severe weather events and the adverse effects of the war in Ukraine. This latter is expected to have important repercussions, as it will negatively impact economic prospects in the European Union, Madagascar's main trading partner.

Prospective overview, a slow economic recover

Growth projections for 2022 were downgraded to 2.6% (from 5.4%), meaning GDP per capita will stagnate and remain about 8.5 % age points below pre-crisis levels. Growth is expected to pick up to 4.2% in 2023 and 4.6% in 2024, with structural constraints and slowing external demand preventing a faster rebound. The country will continue to benefit from high prices for nickel, cobalt, cloves and vanilla, and consumption is expected to strengthen after being impacted by the COVID-19 crisis and weather episodes. Furthermore, growth is expected to be driven by increased capital spending. The construction of new road infrastructure, the development of water supply, and investments in the energy and mining sectors should be carried out within the framework of the Plan Emergence Madagascar (PEM), financed by both public actors, primarily international partners, and private entities

Foreign direct investment (FDI) analysis

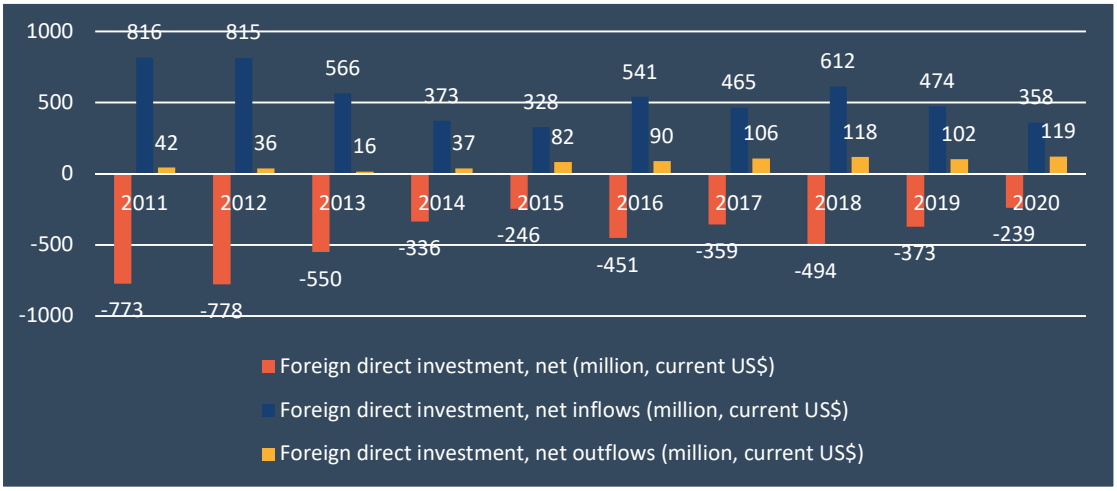


Figure 13: Madagascar - Foreign direct investment net, net inflows, net outflows from 2011 to 2020 (Source: World Data Bank)

Historical overview

The balance between FDI inflows and FDI outflows has been in favor of FDI inflows in recent years, but between 2018 and 2020 FDI inflows decreased by a third (from USD 612 million to USD 358 million) while FDI outflows remained relatively constant just over USD 100 million since 2017.

Policies Towards Foreign Direct Investment (U.S. Department of States, 2019)

The President of Madagascar is emphasizing the need to attract foreign direct investment (FDI) for economic development. The government is reviewing regulations and laws, including those related to public-private

partnerships, industrial development, mining, oil, and special economic zones, to streamline processes. However, concerns have arisen among energy and mining investors regarding potential changes to existing contracts and codes.

While Madagascar welcomes foreign investment, it faces significant challenges such as a weak judicial system, issues in the banking sector, unreliable electricity with high costs, pervasive corruption, and limited infrastructure. Although air and sea transportation options have expanded, the cost of air travel remains relatively high compared to other regions.

Madagascar's legislative framework for investment is non-discriminatory, allowing both domestic and foreign investors equal treatment in all sectors. There is no discrimination against foreign investors during or after the investment process, such as through special tax treatment, licensing, approvals, or procurement access

FDI outflows

The Malagasy Government has established an economic section within the Ministry of Foreign Affairs to promote local business growth and boost exports by registered companies in Madagascar. However, there are no government incentives for outward investment, and reports suggest that wealthy individuals have invested significant funds in offshore tax havens, as revealed in leaked documents. While there are no capital controls, the requirement to repatriate foreign currency from international trade serves as an indirect restriction on foreign investments.

FDI inflows (Export Entreprises, 2022)

Foreign direct investment (FDI) in Madagascar had been decreasing due to political instability, with FDI inflows dropping from USD 474 million in 2019 to USD 358 million in 2020 amid the global economic crisis caused by COVID-19. However, President Andry Rajoelina's reforms are expected to reverse this trend. The total stock of FDI reached USD 8.3 billion in 2020. While global FDI flows rebounded in 2021, African countries (excluding South Africa) saw only moderate increases.
The Malagasy government has implemented reforms to improve the business climate and attract investors, particularly in areas like company creation, construction permits, and trans-border trade. Special economic zones, however, have not attracted sustainable and quality investments. France, Mauritius, China, and the United States are the primary investors in Madagascar. In 2018, a significant agreement was signed between the Malagasy Economic Development and Business Development Agency (AMDP) and the Chinese consortium Taihe Century Investments Developments, with a USD 2.7 billion investment over ten years targeting various projects, including fishing, aquaculture, combating illegal fishing, shipyards, and recreational centers.

Forex (FX) and inflation

Exchange rate

Madagascar's real effective exchange rate has shown relative stability, but the COVID-19 pandemic has weakened the country's external position. The current account deficit increased to 5.4% of GDP in 2020 and 5.5% in 2021, primarily due to decreased exports of travel services, minerals, and vanilla, although imports of fuels and equipment decreased. The Malagasy currency initially stabilized against the US dollar but has since faced a downward trajectory, mainly due to a shortage of foreign currencies resulting from weak export earnings.

Monetary policy has focused on managing bank liquidity and stabilizing exchange rate volatility. The central bank injected liquidity into the banking system in 2020 and 2021, but exceptional support measures for the financial sector were withdrawn in 2021. In response to recent inflationary pressures, the central bank raised the deposit facility rate in late 2021 and early 2022.

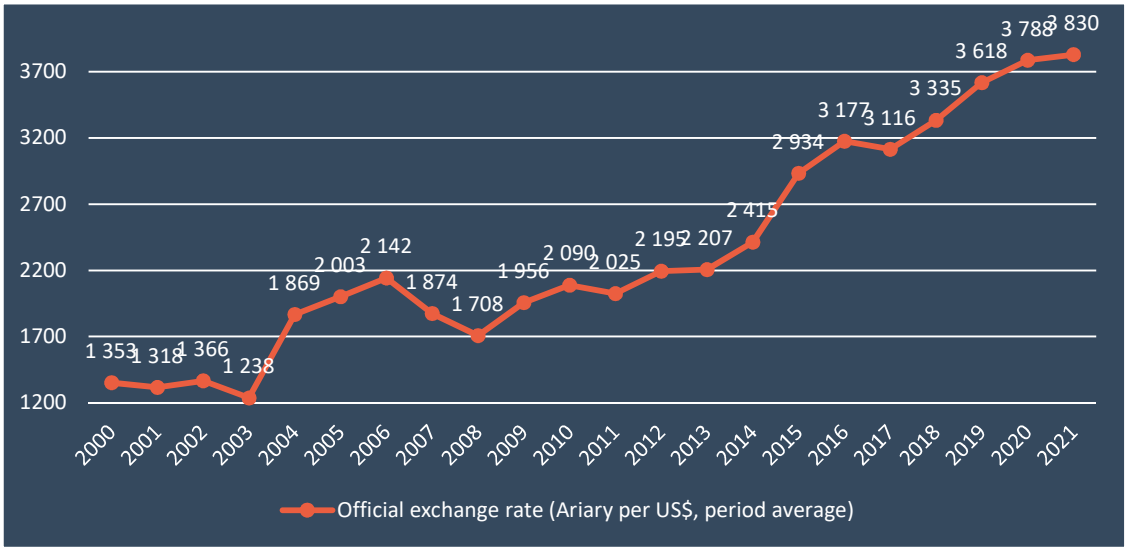


Figure 14: Madagascar - Historical official exchange rate (Ariary per USD, period average)

Currency depreciation in 2020 led to interventions in the foreign exchange market, with official reserves covering six months of imports by the end of 2020, aided by financial assistance from the IMF and other partners totaling USD 446 million. As of December 2021, reserves remained sufficient at 1,633 million SDRs, equivalent to six months of imports.

Inflation (IMF- International Monetary Fund, 2022)

Historical and prospective overview

First, Consumer Price Index (CPI) is based on the prices of goods and services consumers buy from a fixed basket of goods. On the other hand, the GDP deflator covers all domestic products and services produced in an economy. CPI includes foreign or imported goods, while the GDP deflator is exclusively for domestically produced goods. This is why the evolutions of these two indicators are different.

Inflation fell to 4.2% in 2020 but stood at 6.2% year-on-year in December 2021 with higher food and health care prices. Ukraine war has actually already led to significant upward pressure on global energy and food prices. In July 2022, the government raised the fuel price at the pump by an average 34%. Consumer price inflation increased in 2021 to reach 7.41% in 2022 but it is expected to steadily decrease over time and reach 4.6% in 2030.

Indeed, monetary policy still aims to contain inflation below 10% through interventions in the money market and the foreign exchange market and to maintain sufficient foreign exchange reserves. Therefore, inflation should be contained at around 6% in short term

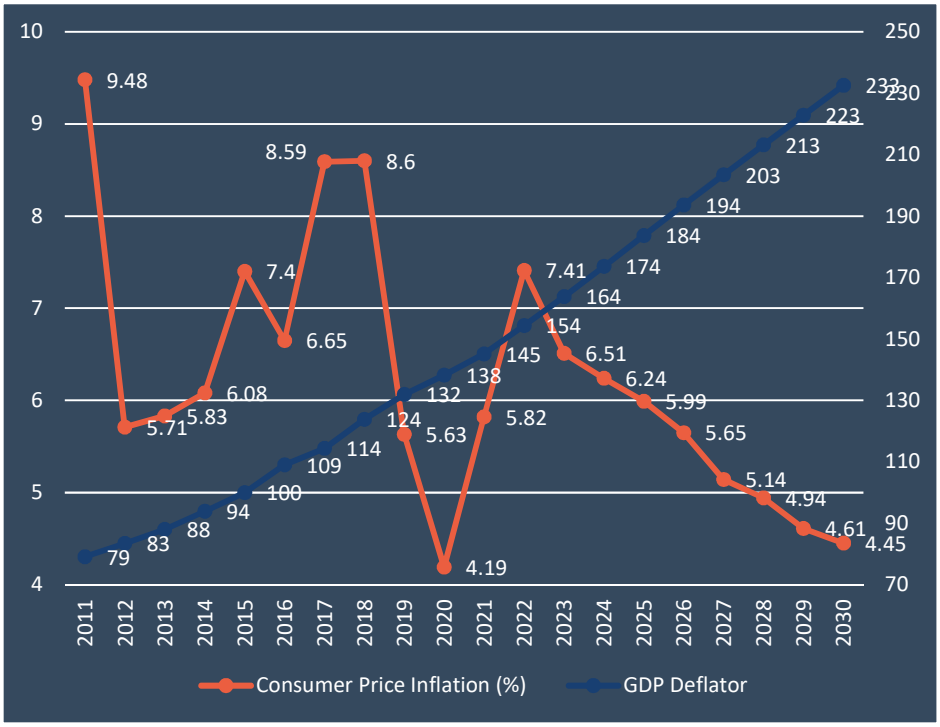


Figure 15: Madagascar - Historical and projected data on inflation indicators (S&P Global, 2022)

Focus on 2022 (Coface, 2022)

Although direct trade links with Russia and Ukraine are limited (around 0.6% of Madagascar's trade), the war in Ukraine will continue to weigh on the country, as the import bill will continue to be burdened by high energy and food prices, the recovery of the tourism sector hampered by international uncertainties, and demand for exports - particularly textiles - weakened by the slowdown in external demand, especially from the European Union, which receives 32% of Madagascar's exports. In this context, inflation, which reached a record level in 2022 due to the rise in energy and food prices, is expected to remain high and to continue to weigh on the purchasing power of households. Although the central bank has raised its key rate several times since 2021, bringing it to 8.9% at the beginning of August 2022, potential persistent inflation could lead to further increases, weighing on private investment. Moreover, a second-round effect linked to the rise in real wages in the public sector (which should average 17% in 2022) could be felt. However, inflation should remain below its 2022 level, as the government has shown its willingness to contain consumer prices, notably by capping prices on certain essential goods (rice, sugar, flour). The economy remains very dependent on the evolution of COVID-19, as the vaccination rate is still very low, and on the occurrence of new climatic episodes.

Sovereign debt[34]

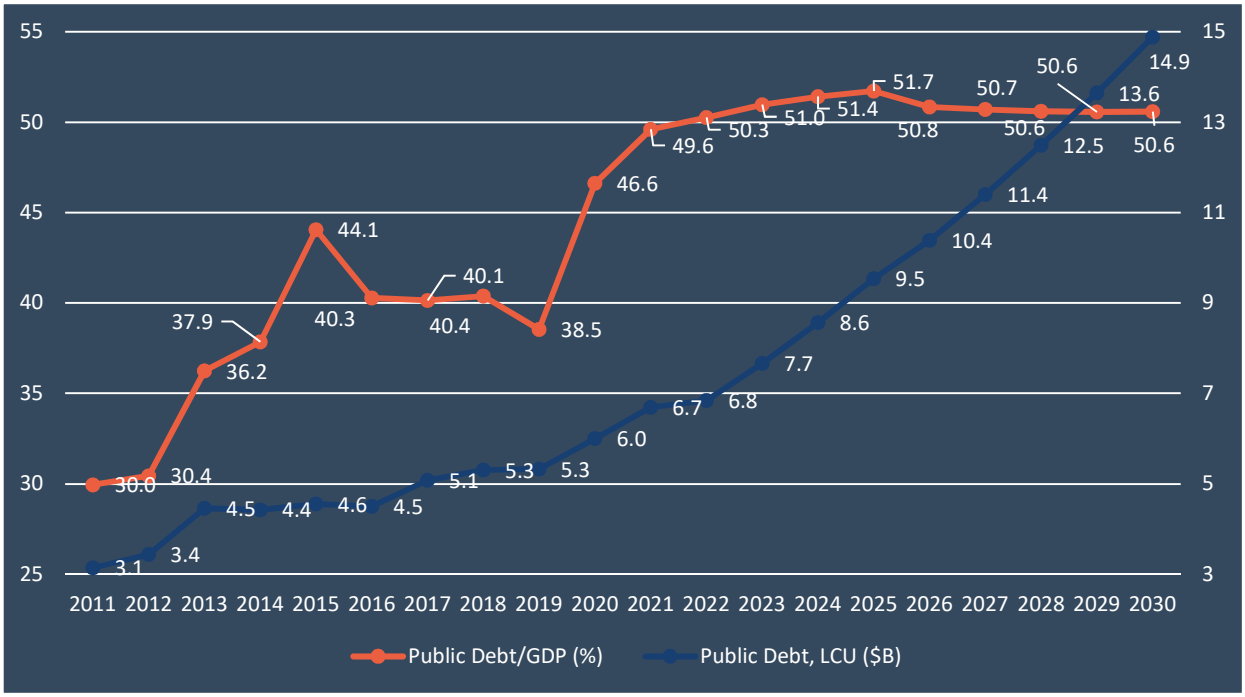


Figure 16: Madagascar - Historical and projected data public debt and debt/GDP (S&P Global, 2022)

Recent debt developments

The 2020 public and publicly guaranteed (PPG) debt ratio is projected to have reached 47%, up over 9% of GDP relative to 2019. The increase is owed to a large extent to an increase in the primary deficit and a decline in GDP growth due to the COVID-19 pandemic, occurring on the back of relative stability in this ratio since 2014. Domestic and external public debt have increased by 0.8 and 9.7% of GDP, respectively. External sources continue to account for almost three-quarters of PPG debt, with almost 60 % of external debt owed to multilateral sources including the World Bank, African Development Bank, and IMF.

Fiscal policy was able to play a stabilizing role during the crisis, as the government ramped up public spending, but as a result, public debt increased significantly, reaching a projected 53.8% of GDP in 2021. Debt distress risks are currently assessed to be moderate, assuming ambitious efforts to boost revenue mobilization and prudent management of public debt and contingent liabilities take place.

Overview

Madagascar, classified as having a medium debt carrying capacity, is still assessed at moderate risk of external debt distress with some space to absorb shocks and moderate risk of overall (external plus domestic) debt distress, in line with the assessment at the time of the program request. While no external public and publicly guaranteed (PPG) debt ratios breach their thresholds under the baseline, the present value (PV) of the debt-to-exports ratio, as well as both debt service ratios, breach their thresholds under an exports shock. Overall risk of debt distress remains moderate because of the moderate external PPG debt rating and possible materialization of liquidity pressures. The debt-service-to-revenue ratio could rise to 77 % within the medium term under the baseline. The government has some space to scale-up investment, assuming ongoing efforts to improve domestic resource mobilization, continued and disproportionate reliance on concessional external

[34] IMF - International Monetary Fund, 2022

financing, and progress in developing domestic bond markets and in the implementation of the governance reform agenda. The current assessment reflects an SDR allocation partly ceded by the central bank to the government as well as debt relief under the Debt Service Suspension Initiative (DSSI), supported by the G-20 and Paris Club, and the IMF's Catastrophe Containment and Relief Trust (CCRT). Updates with respect to the economic impact of COVID-19 (both domestically and externally) and policy response are rapidly evolving and risks remain tilted to the downside, including the heightened risk of a materialization of contingent liabilities, which could lead to a faster than expected deterioration in external and public debt indicators. However, the distance to risk thresholds under current baseline projections suggests some space to absorb additional shocks.

The outlook remains highly uncertain with risks tilted to the downside

The main risks pertain to reoccurring COVID-19 outbreaks linked to the arrival of new variants in a context of insufficient vaccination, negatively impacting trade and delaying the recovery in tourism; rising oil prices amid a recovery in some trading partners with bouts of volatility weighing on government transfers; disruptions in supply chain; and natural disasters (mainly cyclones for the north and droughts for the south), resulting in losses in lives, livelihoods, and physical capital. Protracted weak budget execution in health and education spending and reversals in the governance reform agenda could also result in social and political volatility especially ahead of the 2023 presidential elections, while weak investment implementation capacity could curtail growth. All downside risks would have negative implications for the debt sustainability of the country. Upside potential includes the unlocking of large-scale projects in the energy sector and extractive industry, which could improve the growth potential and attract additional investment.

Regional economic alliances/uniform regulatory, accounting, legal frameworks as these may facilitate trade and foster a business-friendly environment[35]

Overview

Countries that partner with Madagascar in preferential trading blocs such as the Interim Economic Partnership Agreement with the European Union (APEi), Southern African Development Community (SADC), the Indian Ocean Commission (IOC), and the Common Market for Eastern and Southern Africa (COMESA) can export their goods into Madagascar without paying customs duties.

The United States became Madagascar's biggest single national export market in 2018, but COVID-19 related trade disruptions caused Madagascar's exports to the United States to fall by 17 % from USD 533.6 million in 2019 to USD 439.3 million in 2020. Vanilla, cloves, essential oils, textiles, nickel, and cobalt comprise the bulk of Madagascar's exports to the United States and represent about 20 % of Madagascar's total exports. Prior to the reinstatement of AGOA (African Growth and Opportunity Act) benefits in late 2014, only 8.6 % of Malagasy exports went to the United States, whereas today the number is 37.3 %. While Madagascar's exports to the United States have improved significantly in the last five years, imports from the United States have lagged, stalling at around 2.4 % of total Malagasy imports in 2020 and in the first six months of 2021. The United States is only the twelfth largest exporter to Madagascar, notably behind countries like China, India, France, and UAE in 2020.

Trade agreements

- 1964: United Nations Convention on Trade and Development (UNCTAD);

[35] International Trade Administration, 2022

- 1968: GSP – Madagascar among the developing countries benefiting from the Generalized System of Preferences (GSP) for a wider range of products, as well as greater tariff reductions. Several countries have granted Madagascar GSP privileges including the United States and India;
- 1992: IOC – Indian Ocean Committee: Since 1998, there are no tariffs on goods originating from the IOC countries. It is an inter-governmental organization uniting some countries of the Indian Ocean, created in 1984 by the Victoria Agreement. The Comoros, France (La Réunion island), Madagascar, Mauritius, and the Seychelles are member countries of the IOC;
- 1993: COMESA – Free Trade Area since 2000. It is a 19-member regional organization for East Africa;
- 1995: World Trade Organization (WTO);
- 2000: Cotonou Agreement;
- 2005: SADC – Madagascar became a member of SADC in 2005 but the trade agreement came into force in 2008. SADC offers numerous commercial advantages including access to a market of more than 200 million consumers and preferential tariff treatment amongst members;
- 2009: APEi – Interim Economic Partnership Agreement with the European Union. The cooperation agreement between the European Union and African, Caribbean, and Pacific Ocean countries, has been in existence for over half a century;
- 2014: China – Two commercial and technical cooperation agreements provide Special Preferential Tariff (SPT) treatment for items exported under these agreements;
- 2014: AGOA – The U.S. government restored Madagascar's AGOA eligibility in December 2014 after a five-year gap. Nearly 7000 items are eligible for exemption from import duties when exported from eligible African countries to the U.S. market.

Restrictions on imports/exports[36]

Overview

Most imports into Madagascar do not require an import license, except for a limited group of strategic items, which are specially regulated by the Malagasy government. The importation of radioactive waste from nuclear power stations, pornographic materials, counterfeit products, pirated goods, and those with false labels of origin are prohibited. The imports of products such as arms, explosives, and drugs need prior authorization as do diamonds, gemstones, gold/ platinum jewelry, and vanilla. Madagascar also has special rules for the imports of tobacco leaf and requires import licenses for lubricants. In addition, Madagascar applies the same restrictions and/or concessions as required under the multilateral environmental agreements to which it is party.

Madagascar is a member of the World Customs Organization (WCO). Since November 2000, the Malagasy customs authorities have implemented the "transactional value" definition of the WCO. Customs duties are valued based on Cargo, Insurance and Freight (CIF) for all imports.

Trade barriers

Like many developing countries, Madagascar collects a significant share of government revenue through customs duties and value-added tax (VAT) on imports.

Customs duties range from five to 20% and are modified annually when the budget is developed. For further details, please visit http://www.douanes.gov.mg/tarifs-des-douanes/. The VAT on imports has held steady

[36] International Trade Administration, 2022

at 20% for several years. While Madagascar does not have significant formal non-tariff barriers to trade, its higher-than-average customs duties (in comparison with other developing countries) constitute an indirect tariff barrier. About 40% of imports are subject to a 20% customs duty, with beverages, fisheries, flora and fauna, and textiles being among the most protected products. During the COVID-19 pandemic, the government exempted medical equipment and accessories from import duties. Key sectors as mining and textiles receive fiscal benefits under industrial promotion schemes, including the waivers of customs import duties and VAT.

3.3. Political context for in-country financings

Introduction

Madagascar boasts a significant mining sector, particularly in graphite, nickel, and cobalt production, contributing significantly to its economy. Foreign investment has been on the rise, yet political instability stemming from weak democratic institutions and fragmented security forces remains a limiting factor. President Andry Rajoelina has managed to navigate these challenges through strategic alliances, but maintaining this balance is becoming increasingly difficult due to growing tensions with key allies and rising socio-economic pressures. While he's likely to secure another term in the November elections, asserting authority will remain a challenge in the polarized political landscape, risking destabilization attempts.

In the mining sector, foreign businesses face a challenging regulatory environment due to institutional weaknesses and political instability. Despite reform attempts, the sector remains largely informal. Authorities make ad-hoc changes to promote some formality in specific projects but regulatory risks persist, including political interference, erratic regulation changes. Large mining operators can mitigate these risks through negotiations, leveraging their contributions to government revenue for bargaining power.

Political environment

Background

Madagascar has faced chronic political instability due to a young, disenfranchised population, weak democratic institutions, and fractured security forces. Ethnic tensions, particularly between Merina elites and coastal communities, have exacerbated polarization. Frequent protests, coups d'état, and impeachments have ousted many post-independence presidents, with little progress in democratic reforms, judicial independence, or corruption control. President Andry Rajoelina's 2019 inauguration marked a rare transition between different candidates in a democratic election, only the third such occurrence since independence in 1960.

Current dynamics

Andry Rajoelina, who previously led the controversial High Transitional Authority (HTA) from 2009 to 2014, returned to power as president after winning the late 2018 elections. Despite attempting to distance himself from his authoritarian reputation, he has made limited efforts to strengthen Madagascar's democratic institutions, maintaining informality in government. Rajoelina has also exploited institutional weaknesses, such as reducing the number of senators and gaining power to appoint them, consolidating control over critical state institutions like the High Constitutional Court (HCC) and effectively centralizing power.

While Rajoelina's control over state institutions offers protection from external challenges, his power remains limited due to political polarization within his IRD coalition and other parties. To maintain alliances and counterbalance this, he frequently employs patronage, resulting in frequent and disruptive cabinet reshuffles and leadership changes in state institutions that hinder policymaking. Rajoelina has cultivated close ties with

influential business figures, who play a pivotal role in financing political activities and influencing policy decisions. These businessmen exert considerable control over governance and policymaking by leveraging their connections with political leaders to serve their commercial interests.

Rajoelina has prioritized maintaining support from military generals, despite the military's overall weakness. He has cultivated these relationships since his time with the HTA and strategically placed trusted allies in key military positions to strengthen his control over the armed forces.

Political stability

The president's ability to maintain authority by balancing military, business, and IRD interests has waned due to recent challenges. Severe drought and cyclones in 2021 and 2022 worsened socio-economic issues, leading to increased frustration and allegations of corruption. In response, former presidents Ravalomanana and Hery Rajaonarimampianina have engaged in talks for a potential election agreement since June 2022.

President Rajoelina's efforts to protect the interests of his business allies are becoming more challenging. Initially resisting reforms demanded by multilateral financial institutions, he can no longer delay these changes due to economic issues and the upcoming 2023 elections. To reassure his allies, he's taking actions like dismissing corrupt officials and cracking down on illicit mining networks, but this is causing concern within the business community.

Growing political challenges, defections within his IRD party, and recent coup and assassination attempts have left President Rajoelina in a precarious and increasingly paranoid position.

Stability outlook

To prevent destabilization attempts, President Rajoelina plans to solidify his allies by distributing patronage and appointing close associates to strategic positions, often at the expense of some allies. Frequent cabinet reshuffles aim to weaken potential rivals and minimize military support for any coup attempts. Rajoelina's relatively good relations with Western partners and the fear of losing donor funding may discourage prominent opposition leaders from unconstitutional ousting attempts.

The removal of influential figures from the government may lead to discontent among the IRD and business allies, potentially prompting some to collaborate with the opposition or create new political parties, raising the possibility of future coup attempts or actions by military elites to oust the president. President's vulnerability to destabilization attempts will persist due to opposition capitalizing on socio-economic challenges. While mass protests may be limited in the short term, the approaching elections could bring increased political instability over the next 1-2 years.

Civil War

Madagascar has a history of political instability but has never experienced a civil war. The closest it came was after the 2001 elections, with armed clashes between supporters of presidential candidates Didier Ratsiraka and Marc Ravalomanana. Although security forces are fragmented, there have been sporadic clashes, like a 2021 exchange of gunfire between army and gendarmerie members in Antananarivo.

Rajoelina's efforts to consolidate power over the military may worsen internal divisions within security forces, leading to clashes between units competing for presidential support. While these conflicts are likely in the capital, they won't escalate to a civil war. Rajoelina's influence in security agencies and the lack of political backing for any potential insurgency reduce the risk, and internal divisions don't mirror broader societal divides.

Attitudes towards foreign investment in the mining sector

While the government is friendly to foreign investment in mining, it hasn't actively sought it due to political instability. Officials' job insecurity drives them to focus on existing investors, who hold significant bargaining power. However, the government's failure to improve the regulatory environment has led to ongoing issues for investors, and socio-economic conditions for local communities remain neglected.

President Rajoelina, aiming to appeal to the population and multilateral institutions, introduced The Plan Emergence Madagascar (PEM) in 2018, envisioning accelerated economic growth and increased benefits from foreign investment for local communities. Despite concerns from the IMF and World Bank about the ambitious targets, they support PEM's economic and structural reforms, including those enhancing the government's negotiating power and mining sector regulations. Rajoelina's shift towards these policies reflects his efforts to address socio-economic issues and attract international investment. The PEM has faced delays primarily due to a lack of political will, but President Rajoelina has rekindled the project before the 2022 elections. Collaboration with the IMF and World Bank may help its implementation, driven by the need to accelerate investment, but political polarization will likely hinder progress, leading to a slow reform process.

Civil society

Local civil society groups in Madagascar monitor the mining sector due to concerns about mismanagement and illicit dealings between mining companies and governments. Supported by organizations like the Extractive Industries Transparency Initiative (EITI), they operate with some independence from the government, conducting investigations and advocating for regulatory reforms. While the government has occasionally responded to civil society concerns, it varies depending on the issue, public pressure, and the political climate. Civil society also focuses on protecting the interests of local communities affected by mining, particularly in areas where issues like corruption and human rights abuses are prevalent in resettlement and compensation schemes.

Despite concerns, local civil society groups in Madagascar are open to collaborating with foreign mining companies and investors on development and reform initiatives. They recognize the potential for sustainable mining sector development to drive economic growth and alleviate poverty, emphasizing the importance of partnerships to address institutional and regulatory challenges.

Labour issues

Shortages of skilled labor outside the capital, Antananarivo, are a challenge for commercial operations in Madagascar. While there are no strict local content requirements, prioritizing local nationals for mining jobs is encouraged, but it depends on skill availability. Failure to employ locals can lead to tensions and protests against mining operations. Trade unions in Madagascar are weak and stratified, with sporadic strikes mainly related to salary and working condition issues, although they often do not involve the entire workforce and tend to be short-lived.

Regulatory environment

Mismanagement in various sectors, including mining, stems from the ruling elite's distribution of patronage based on political allegiance rather than competence. Even technically skilled officials prioritize politics over sound policies in mining regulation. Fiscal challenges and underfunding of regulatory institutions like the Ministry of Mining exacerbate capacity constraints, hindering effective regulation enforcement. Political interference and capacity limitations have led to weak governance of the mining sector, with reform efforts mostly failing. Governments often sustain informality and use sporadic reforms to solidify control over illicit

networks. The suspension of mining licenses in 2011, ostensibly for reform, exemplifies this, with permits still awarded under opaque circumstances, benefiting government officials.

In Madagascar, most mining activities operate informally through opaque and often illicit dealings between companies and officials, legitimized during the HTA government with limited oversight. However, authorities sometimes make ad-hoc changes to the mining framework to encourage formal governance in specific projects, aiming to retain large investors by aligning them with international mining standards. There are thus three mining regulatory regimes:

- The 2005 Mining code which sets generis mining regulations;
- The Large Mining Investment Act (LGIM), which sets a preferential regulatory regime for mining projects worth at least MGA 50 billion (USD 10.7 million);
- The authorities also sign special agreements ("framework agreements") with mining companies that set out special regulatory regimes for certain projects.

Special regulatory regimes for large mining investors provide some stability but contribute to sector dysfunction and conflicts among different regimes. Political transitions pose a risk of reviewing these special arrangements, potentially causing disruption and reputational risks for large projects as new politicians may pressure them into informal arrangements.

Reforms

President Rajoelina has used concerns about the mining sector's informality to strengthen his control over patronage networks and pursue aggressive revenue mobilization. Despite institutional weaknesses, his 2019 mining code reforms have been erratic, often bypassing formal processes, and some have been reversed due to pressure from multilateral financial institutions.

New mining code

In April 2019, President Rajoelina made changes to the mining code, increasing government royalties and introducing a minimum government stake. After initial concerns, the World Bank pressured the government to consult with the private sector. The code review process stalled for over two years due to various factors but has recently accelerated, driven by the need to boost the president's reform record before the elections and meet IMF and World Bank conditions for budgetary support. The National Assembly and Senate approved the new mining code in May and June 2023. This paved the way for the HCC and the President to endorse the law in late July.

The implementation of Madagascar's new mining code is expected to face delays due to political resistance against provisions aimed at improving governance and transparency. Fear of backlash from the IMF and World Bank may prompt President Rajoelina to prioritize some provisions but progress will be slow. Lobbying by international organizations has already influenced the code's content, with the removal of the 3% bonus, reduction of the compulsory government stake to 10%, and easing of production-sharing provisions. The new code will give the government more leverage in negotiations with existing investors, but calls to end special regulatory regimes may not be granted to preserve operations, although amendments will be pursued to increase revenue mobilization.

Contract cancellation

Madagascar's weak mining regulatory system can jeopardize contractual stability, as some operators rely on informal agreements with influential officials to bypass administrative processes for licenses and permits. Authorities exploit this to challenge permit validity, potentially altering contract terms or increasing taxes

during license renewals. New governments often review previous contracts, like Rajaonarimampianina's administration did with HTA-issued mining licenses, although none were canceled. During his previous presidency (2009-2014), Rajoelina used quasi-legal justifications to threaten the licenses of major foreign investors, such as Madagascar Oil and the Ambatovy project, aiming to extract additional revenue or push for changes in fiscal terms without resorting to arbitrary expropriation, to safeguard investor confidence.

Since returning to the presidency in 2019, Rajoelina has employed similar tactics, such as suspending operations at the Base Toliara ilmenite mine. The suspension, driven by alleged community opposition and unfavorable fiscal terms, has led to ongoing discussions between Base Resources and the government, motivated by economic urgency and Rajoelina's desire to demonstrate his investment track record.

Local content and ownership requirements

The government heavily relies on the mining sector for revenue, making them generally inclined to facilitate mining operations. Limited socio-economic development hinders local capital mobilization for mining projects, leading the government to avoid ownership restrictions on mining permits. While the new mining code encourages local participation, strict enforcement is unlikely, and large mining companies will likely have room to negotiate favorable arrangements.

Expropriation

In Madagascar, there's generally a low risk of outright expropriation of commercial assets, especially for large-scale projects, including those in the mining sector. The government lacks the expertise and capital to run such enterprises, and it values its relationships with international partners like the World Bank and IMF. While past leaders like Ravalomanana faced criticism for land seizures from local communities, successive governments recognize the risks of targeting foreign investors for expropriation. President Rajoelina has used threats and license withholding to pressure companies but has avoided direct expropriation, opting for negotiation tactics in various projects.

External environment

Andry Rajoelina's 2009 coup led to international isolation, but his successor, Hery Rajaonarimampianina, worked to rebuild ties with the IMF, World Bank, and bilateral donors, leading to resumed financial support. Rajoelina, since taking office, has focused on strengthening relations with these institutions to maintain access to multilateral financing.

World Bank and IMF influence

The World Bank and IMF have become influential partners for the government, using budgetary support to push for economic and political reforms, including mining sector changes. Their significant funding role gives them substantial influence over policy development and implementation, while bilateral partners also leverage these institutions to advocate for policy changes in Madagascar.

International regulations, such as EITI and the ILO

Madagascar is a signatory to international labor protection conventions, with domestic labor laws recognizing international labor rights. However, enforcement is limited in the substantial informal sector, leading to common violations of minimum wage and safety standards. Child labor is prevalent in various industries, including agriculture, mining, tourism, and domestic work. While workers in the public and private sectors can establish unions, separate labor codes apply to civil servants and maritime workers, while the police, military, and firefighters cannot form unions. Madagascar is also a member of EITI, with its influence increasing due to

IMF and World Bank support, despite occasional political hindrances. EITI plays a significant role in monitoring the mining sector's management.

2023 Elections

Madagascar is preparing for upcoming presidential elections in November and December 2023. Concerns over logistical challenges, financial difficulties, and Rajoelina's failure to institute political reforms have raised doubts and worries among both the population and international partners. To address concerns and secure international support, Rajoelina is expected to make symbolic concessions, but logistical delays may still undermine public trust in the polls. While Rajoelina is likely to win re-election, maintaining political stability in his second term may prove challenging.

4. Assessment of social, environmental, and governance challenges

4.1. Country-level assessment and context

4.1.1. Context

Overview of the mining Sector

Madagascar has significant mining potential. However, the development of the sector has been slowed down by successive political crises (the most recent of these being in 2009).

The key institution governing the mining sector of Madagascar is the Ministry of Mines and Strategic Resources[37]. Through the Mining General Management Office, the Ministry of Mines and Strategic Resources is responsible for the management, supervision and control of mining activities. In addition, the Ministry of Mines and Strategic Resources, the Bureau du Cadastre Minier de Madagascar/ Madagascar Mining Cadastre Office (BCMM) is the other key government stakeholder in the management of the mining sector. The BCMM is responsible for the management and control of mining permits and the mining registry, including the preparation and documentation of the grant, renewal, transformation, transfer and cancellation of mining permits

Governance

The governance of the mining sector has been deeply disrupted following numerous crises that the country has experienced periodically from 1972-2009. However, the government of Madagascar has collaborated with various partners in acting to reverse this trend. The Africa Development Bank's country strategy paper 2005-2009, assessed Madagascar's governance profile according to the main elements of governance identified in the Bank Group policy adopted in 1999[38]. These elements are accountability, transparency, stakeholder participation, anti-corruption and the legal and judicial framework. This assessment showed that the Republic of Madagascar has made progress in promoting good governance in recent years. This progress was attributed, in particular, to:

- The creation of new institutions responsible for promoting good governance;
- The improvement of the legal framework in several areas;
- The preparation of development strategies integrating the promotion of good governance among the priorities of the country.

This assessment also found that, in general, and despite this progress, much remains to be done to establish good governance in all aspects of the country's management. The 2022-2026 Country strategic document highlighted that: previous strategies contributed to addressing the challenges of governance and fragility[39]. To this end, the strategy considers reforms aimed at improving the mobilization of domestic resources and building capacities to combat corruption. In addition to improving sector governance in the two (2) priority areas, the Bank's support through budget support and institutional support will also support reforms in order to promote enabling environment to attract private sector investment. As part of the political dialogue in synergy with the other partners, emphasis will be placed on strengthening budget transparency and the effectiveness of public expenditure management.

[37] https://mmrs.gov.mg/
[38] African Development Bank Group, 2005-2009- Madagascar Country Strategy Paper, https://www.afdb.org/en/documents/document/2005-2009-madagascar-country-strategy-paper-13007
[39] African Development Bank Group, 2022-2026, Madagascar Country Strategy Paper, https://www.afdb.org/en/documents/madagascar-country-strategy-paper-2022-2026

In general, and despite this progress, much remains to be done to establish good governance in all aspects of the country's management. Furthermore, the Mining Code of 2005 does not include any transparency measures. However, Madagascar joined the EITI in 2008 and has made meaningful progress (EITI, 2020). On 30 March 2023, The Council of Ministers adopted the decree governing the granting of legal status to Extractive Industries Transparency Initiative - Madagascar (EITI Madagascar). EITI Madagascar is responsible for compliance with international standards to be applied by all EITI member countries in the oil and mining sectors.

Legal Framework

The table below lists the main texts governing the mining sector.

Law n° 99-022 of July 30,1999, on the mining code, as amended by Law n° 2005-021 of July 27,2005
Law n°2001-031 of October 8,2002, establishing a special regime for major investments in the Malagasy mining sector (LGIM), amended by Law n°2005-022 of October 17,2005
Decree n° 2023-334 of March 30,2023, on the Gold Regime
Decree n° 2022-293 of March 09,2022, on the provisional allocation of financial resources from the Provinces to the Communes and Regions
Decree n°2019-1909 of October 02,2019, establishing the powers, organization and operation of the provincial committees and the national mining committee
Decree n°2015-663 of April 14,2015, creating and establishing the statutes of the National Agency for the Gold Sector (ANOR)
Decree n° 2010-023 of January 25,2010, amending certain amendments to Decree n° 2006-910 of December 19, 2006, setting out the application of the mining code
Decree n°2006-910 of December 19,2006, setting the terms and conditions for application of amended Law n°99-022 of August 19,1999, amended by Decree n° 2020-1000 of August 20,2020, on the distribution of administrative fees, royalties and mining rebates
Decree n°2003-784 of July 08,2003, implementing the law on major mining investments
Decree n° 2001-688 of August 03,2001, setting the conditions for application of certain provisions of law n°99-022 of August 19,1999 on the mining code.
Decree n° 2000-308 of October 02,2000, creating and establishing the statutes of the **Madagascar Mining Cadastre Office** (BCMM), supplemented by Decree n° 2017-175 of March 16, 2017, annexing Decree n° 2000-308 of May 10,2000 establishing the statutes of the **Madagascar Mining Cadastre Office** (BCMM).
Order n° 1455/2016 defining the procedures for granting approval to gold comptoirs and model specifications
Interministerial Order n°1454/ 2015 of January 20, 2016, defining the model for the various documents relating to collection activities
Order n°1453/2016 of January 20,2016, defining authorized equipment and the model for the various documents relating to gold panning
Order n° 2015/28066 of September 07, 2015, declaring gold stocks held by private individuals
Order n° 8887/2014 of February 21, 2014, defining the terms and conditions for the distribution and use of mining rebates from certain mining projects.
Order n° 9874/2013 amending certain provisions of Interministerial Order n° 52005/2010 of December 20, 2010, amending Interministerial Mine-Forests Order n° 18633/2008 of October 17,2008 placing sites covered by order n° 17914/2006 of October 18, 2006 under temporary global protection and lifting the suspension of the granting of mining and forestry permit for certain sites.
Order n° 7902/2013 of April 9, 2013, establishing the technical specifications of operating procedures, as well as the authorized tools, equipment, and materials for small-scale mining activities.
Order n° 7903/2013 of April 9, 2013, establishing the standard statutes for small-scale mining associations and artisanal gold mining associations
Order n° 7904 of April 9, 2013, regarding the activities of collecting mining products
Order n° 14519/2013 of July 5, 2013, establishing the methods for calculating transaction amounts for mining offenses
Order n° 28088/2012 of October 19, 2012, establishing the procedures and conditions for the accreditation of laboratories and private experts for the certification of quality of mining substances and marking
Order n° 5470/2012 March, 30, 2012 fixing the activity report template for each type of mining permit.
Interministerial Order n°14-421/2008 fixing transitional collection procedures for royalties and rebates on mining substances intended for exploitation
Order n° 8186/2008 April, 09, 2008 modifying the calculation of the duration of validity of mining permits.
Order n° 10901/2007 of July 4, 2007, establishing the fixed fees collected by the BCMM for each registration of an operation affecting the rights granted in mining permits.

Interministerial Order n° 21,985/2007, establishing the procedures for the collection of mining royalties and dividends
Order n° 4851/2001 of April 18, 2001, determining the basis for mining royalties for certain mining products

Table X: List of main texts governing the mining sector - Source: EITI Madagascar 2019 and 2020 relaxed report and CNLegis

4.1.2. Mineral/mining policies, industry policies

The Malagasy legal framework relating to the mining sector comprises the following statutes:

- Law 005-022 dated 17 October 2005 amending Law 2001-031 dated 8 October 2002 establishing a special regime for large-scale investments in the Malagasy mining sector (LGIM);
- Law 99-022 dated 19 August 1999 on the Mining Code, amended by Law 2005-021 dated 17 October 2005 relating to the Mining Code;
- Decree 2006-910 dated 19 December 2006 implementing the Mining Code amended by Decree 2010-023 dated 25 January 2010;
- Decree 2003-784 dated 8 January 2003 implementing the LGIM; and
- Inter-ministerial Order 12032/2000 dated 6 November 2000 regulating the protection of the environment in the mining sector.

The draft of the Mining Code under review was validated by the Council of Ministers on April 12, 2023 and was presented to the Parliament in May 2023. It was adopted on second reading by the national assembly on 7 June 2023 with the senate's amendments. The major changes concerns were:

- The halving of permit area and duration of mining permits;
- The mining taxation (significant increase in mining royalties and rebates which are now set at 5% of the FOB (Free On Board) value;
- The creation of the mining fund for social and community investment;
- The constitution of mineral substances;
- The introduction of a quarry regime;
- The establishment of a central agency (Centrale de l'or de Madagascar "COM") for the sale and purchase of gold;
- The establishment of precious gems counters;
- introduction of special measures concerning governance, respect for human rights, gender and environmental protection;

The following in the Draft Mining Code is also highlighted:

- At the Institutional Level, the draft law affirms the authority of the mining minister and establishes a structure of state bodies to oversee and administer different aspects of the country's mining activity.
    - The law gives the CNM (National Mining Committee -Comité National des Mines), which was created under the existing legislation, a more active role by insisting on its synergising powers to ensure that central and local government and the private sector work together effectively to develop the country's mining sector;
    - The law also introduces a newly named Mining Brigade (Brigade minière) responsible for policing mining activities, including uncovering and recording mining offences. The bill proposes some new structures, too.
        - The Geology Bureau of Madagascar (Bureau de Géologie de Madagascar) is tasked with managing geological data relating to the country's mining potential.
        - A National Mining Fund (Fonds Minier National) is created for the purpose of channelling part of the State's revenue from mining activities into national and local development programmes.
        - The law also establishes a special body to represent the State in transactions relating to the sale and processing of gold.

The draft law also identifies Strategic Mining Substances (SMS) as all substances that, depending on the national and international economic situation at the time, are of particular interest to the Nation with regard to their critical nature and the geostrategic context. The list of strategic substances is fixed by regulation, after consultation with the CNM or, failing that, the groups of mining operators. The holder of a permit containing strategic mining substances is authorised to sell on the national market or to export its production at the market price. However, the State reserves the right to determine the production quota that the holder must sell to domestic industry, based on actual needs.

4.1.3. Mining regulations

In regulating the mining sector, the Ministry of Mines and Strategic Resources and the BCMM have paid special attention to the following points:

- Maximization of state revenues;
- Community development;
- Proper management and rehabilitation of the environment;
- Promotion of the use of local goods and services;
- Creation of jobs and valorisation of national skills;
- Proper governance of the mining sector;
- A policy of first come, first served with respect to the grant of mining permits.

The granting, renewal, transfer and other related activities, suspended since 2010, have been lifted by the Council of Ministers on 30 March 2023. This was done in order to concretise the President of Madagascar Solemn Promise (velirano number 10), which relates to the sustainable management of natural resources in Madagascar. The Board approved the gradual review of mining permit applications that are pending at the BCMM.

Standard permits are issued by the Minister in charge of Mines. According Article 42 of the Mining Code, the Minister can delegate his power. The permits for Small Operators (“PRE”) are granted by the Interregional Director of the Ministry in charge of Mines. Any request for a mining permit is written on a form to be obtained from the Mining Cadastre office. After correctly completing the form, the applicant submits the application to the said office against receipt indicating the day, hour and minute of deposit, which are authentic (Article 43, Mining Code).

Only Malagasy registered entities can own mining rights. No restrictions apply regarding foreign ownership of mining companies. However, this may change depending on the outcome of the ongoing revisions to the Mining Code.

The Ministry of Mines and Strategic Resources plan to establish a Priority Plan. With the Priority Plan, the renewal of permits for small operators (PRE) will be examined first, followed by mining permits for research or (PR) and finally operating permits for large industries or (PE). The renewal of the PREAs are prioritised because these permits are the majority. Furthermore, the plan to clean up the Mining Cadastre will be implemented.

According to the Law 99-022 dated 19 August 1999 of the Mining Code, amended by Law 2005-021 dated 17 October 2005 relating to the Mining Code, the following mining permits may be allocated: Exploration Permit, Research Permit and Exploitation Permit. These permits are defined below and summarised in **Erreur ! Source du renvoi introuvable.**.

The Exploration Permit ("PR" licence):

- This permit gives the holder the exclusive right to carry out prospecting and research activities within a defined area.
- Does not vary depending on the type of mineral or the location of the activity. The main principle set out by the Mining Code is the 'first come, first served' approach. In addition to this, the following requirements should be satisfied:
    - Only Malagasy registered entities can acquire exploration permits (justified by the certificate of incorporation and memorandum and articles of association).
    - The applicant must provide proof of its capacity to carry out the activities (e.g., that it is not subject to any ban).
        - The applicant must pay the annual mining administration fees corresponding to the requested squares metres 25% of the fees as a processing fee upon filing the application dossier;
        - 56% of the fees 20 days after filing the application; and
        - 19% of the fees within five days of the BCMM decision to grant the permit (failure to pay results in cancellation of the granting decision).
    - The requested square metres must be confirmed as available (subject to a BCMM check based on the exact location of the squares provided by the applicant).
    - The limits on the number of squares the applicant can request must be observed (i.e., an entity can own several R permits, but the R permits cannot cover more than 10,000 square kilometres or 25,600 squares).
    - The references of the permits held by the applicant must be confirmed.
    - An investment plan and exploration programme, duly signed by the applicant, must be submitted.
    - An environmental commitment letter must be submitted confirming that the applicant will not commence activities until it has obtained the necessary environmental authorisation.
- The Exploration Permit covering a defined area will be granted by order of the Minister of Mines or his representative, within 30 working days, to the first eligible person to submit an application dossier that fulfils all requirements.
- The Exploration Permit may be transferred. The transfer agreement is signed and filed together with any relevant paperwork (e.g., corporate authorisations) at the BCMM, which then passes the transfer file to Ministry of Mines. In theory, approval is granted within 35 days.

The Exploitation Permit ("PE" licence):

- Covers the minerals mentioned in the permit that exist within the permit area for which it is granted. However, if the permit holder discovers a new mineral that was not initially mentioned in the exploration permit, they may request an extension of the permit to cover the discovery.
- Gives the holder the exclusive right to undertake exploitation and exploration within the defined perimeter.
    - Any application for an E permit for which an environmental impact study is required must be accompanied by a letter of commitment not to start any mining activity before obtaining the environmental permit, after approval of the environmental impact

assessment document prepared by the applicant in accordance with the environmental regulations in force.

- Is issued within 30 working days of submission of the application to the BCMM.

The Research licence and Operating licence

This permit confers on the holder, within the limits of its perimeter and for the period of its validity, a right of priority to apply for an **Exploitation Permit** or 'E' permit covering all or part of the perimeter covered by the R permit.

Licence Type or Authorisation	Description	Duration	Renewable	Restriction
Exclusive authorisation for Perimeter(AERPs)	Exclusive prospecting right maximum Area 15 000 Km² equivalent 38 400 square	3 months	Not Renewable	
Exploration licence « R »	Exclusive right of prospecting and research. Maximum Area: 1 000Km² equivalent to 2 560 square	5 years	renewable two (2) times for a period of three (3) years each renewal	
Exploitation licence « E »	Exclusive right of prospecting, research and mining. Maximum Area: 10 000Km² equivalent to 25 600 square	40 years	renewable one or more times for a period of twenty (20) years for each renewal	
Research and Operating licence for Small Operator "PRE"	Exclusive right of prospecting, research and mining Maximum Area: 100 Km² equivalent to 256 square	8 years	Renewable one or more times for a period of four (4) years for each renewal.	

Table 22: Licence, permit, authorisations for the mining sector in Madagascar

Types of permits	Rights	Maximum area per holder	Validity period
AERP	- Exclusive rights to prospect and subsequently apply for a PRE, PR, or PE on the first perimeter covered by the authorization. - Marketing of mining products prohibited	-	Maximum duration of 3 months and non-renewable
PRE	Exclusively for small-scale operators using artisanal techniques: - Rights to undertake both prospecting, exploration, and exploitation of the substance(s) for which the permit has been issued within the delimited perimeter - Rights to construct temporary or permanent infrastructure and utilize the forests and water resources within the perimeter in accordance with the applicable laws and regulations, subject to prior consent from the landowner. - Convertible into a PR and PE - Free trade of substances covered by the permit, subject to compliance with relevant regulations.	100 squares kilometres, equivalent to 256 squares	A maximal duration of 8 years, renewable one or more times for a period of 4 years each time
PR	- Rights to undertake both prospecting and exploitation of the substance(s) for which the permit has been issued within the delimited perimeter - Rights to dispose of the extracted mineral substances for laboratory analysis, prospecting for markets, or industrial testing purposes, within the authorized quantities in case of exportation for analysis, sampling, or industrial testing. - Rights to construct temporary or permanent infrastructure and utilize the forests and water resources within the perimeter in accordance with the applicable laws and regulations, subject to prior consent from the landowner - Priority rights to apply a PE - Marketing of mining products prohibited	10,000 square kilomètres, equivalent 25,600 squares	A maximum duration of 5 years, renewable 2 times for a period of 4 years each time

PE	- Exclusive rights to undertake the exploitation, prospecting, and exploration of the substance(s) covered by the permit within the delimited perimeter - Rights to construct temporary or permanent infrastructure and utilize the forests and water resources within the perimeter in accordance with the applicable laws and regulations, subject to prior consent from the landowner. For companies whose scope of business extends from extraction to commercialization and operate in an integrated manner: - Authorization to transport or have transported, within the project's perimeter, the mineral substances covered by the permit, their concentrates or primary derivatives, as well as metals an alloy of these substances to storage, processing, or loading location, dispose of them in domestic and foreign negotiated prices, and export them. - Permission to establish concentration, conditioning, treatment, refining, and transformation facilities for the mineral substances covered by the permit on national territory, subject to compliance with current legal and regulatory provisions. - Free trade of substances covered by the permit, subject to compliance with relevant regulations	1000 squares kilomètres, equivalent 2560 squares	A maximum duration of 40 years, renewable one or more times for a period of 20 years each time.

Table 23: *Types of mining authorization and permits* - Source: Mining code

4.1.4. Taxation and royalties

On the fiscal front, the draft Mining Code stipulate that mining operators are subject to the ordinary tax regime as shown in the table below

Tax Type	Tax Rate
Income Tax	20% of the net profit
Non-Income Tax	20% of the net profit
Non-Resident Income Tax	Withholding tax of 10% of any income realised in Madagascar by a non-resident
Tax on dividends	10% with respect to dividents paid to non-resident shareholders
Salary Income Tax	20% of the salary
Tax on income from movable capital (Impôt sur les revenus des capitaux mobiliers)	20% on loan proceeds
Value-Added Tax	20%
Registration fees	From 0.5 to 5%, depending on the nature of the transaction

Table 24 : Tax regime

Mining Royalty

Mining royalties are payable on the sale of the mineral and differ according to metal or mineral type as shown in the table below:

Mineral/Metal	Royalty Rate (%) -2005 Mining Code
Industrial Stones (cut)	3
Industrial Stones (uncut)	6
Precious Stones (cut)	4
Precious Stones (uncut)	8
Minerals such as Nickel & cobalt	4

Precious Metals	4

Table 25: Mining royalties

Mining royalties are a tax levied on operators' Gross profit, levied on the first invoicing of mining transactions and the rate of which is 2% according to Article 117 of the mining code. They are divided into mining royalties (0.60%) collected on behalf of various administrations and other central organisations, and in the rest rebate (1.40%) collected for the benefit of the Autonomous Provinces, Regions and Communes. The rates of distribution of revenue from mining royalties are set as follows:

- 10% for the Mining Cadastre office
- 15% for the Gold Agency;
- 10% for the National Mines Committee;
- 65% for the general budget on behalf of the Central Department in charge of Mines, the Interregional Directorate in charge of Mines concerned and the entity in charge of the Mining.

Taxes to be paid by foreigners engaged in the marketing or export of stones precious stones are levied at the rate of 6% and are distributed as follows by DSTM:

- 2% mining royalty;
- 2% entering from the General Budget and
- The remaining 2% is intended for the Ministries concerned, in particular the Ministry of Energy.

In addition to the two categories of taxes, there is a specific internal taxation which governs especially in the mining sector. These are the Excise Duty (DA) and the Special Duty on Mining Transactions (DSTM). This DA is a duty levied on harvested products, extracted, manufactured or imported in Madagascar. In the case of mineral substances, this duty applies to precious stones and semi-precious stones, precious metals, i.e. luxury products, as well as certain industrial stones necessary for the high-tech industry. The DSTM is a fee withheld in advance and non-refundable and often qualified as a mining parafiscal tax.

Following the granting of an operating permit, the BCMM charges a fee corresponding to the category and the number of years of possession of the permit. The value of this levy is fixed by interministerial order while its recovery is effected by the antennas of BCMM in provincial capitals. Hence, this central management holds 60% of these values and is distributed between the decentralised territorial community and the general budget.

Tax Incentive

Law 005-022 dated 17 October 2005 amending Law 2001-031 dated 8 October 2002 establishing a special regime for large-scale investments in the Malagasy mining sector (LGIM) introduced a specific incentive regime for large-scale investment projects involving an investment of more than MGA 50 billion[40], once certification has been granted by way of government decree. The LGIM regime mainly consists of a legal, financial and tax stability guarantee; the possibility to take advantage of any more favourable measures; and certain tax and financial exemptions, under certain conditions.

The draft law includes some provisions particularly relevant to companies. Any company holding a permit will be obliged to notify the land registry of any changes to its by-laws within thirty days of such changes being made, and any failure to do so will be treated as an infringement of the permit's specifications. Also,

[40] 1 ariary (MGA) = 0,00021 € on 15.05.23

registration duties will be payable in the event that rights accorded under mining permits are passed on through negotiation or transmission. The duty will be 5%of the amount of an investment in the case of the sale or purchase of a company or company shares, changes to a company's name or its shareholders, or transfers by inheritance; and 10% of the value of the right affected in the case of farm-outs, pledges, and partnering operations.

4.1.5. Land-use and mineral rights

All deposits of mineral substances located in surface, underground, waters and seabed of the National Territory are state properties (Article 3. Mining law), but the mining permit holder must enter into a lease agreement with the landowner with respect to:

- The use of land;
- The right to establish all constructions and infrastructure that may be necessary to conduct the exploration/exploitation activities; and
- The right to remove trees and other assets on the land.

The operator must maintain good neighbour relations with the landowner. Thus, the operator must:

- Inform the landowner of its right to occupy the land parcel covered by the mining permit;
- Obtain the landowner's authorisation before starting work on the land; and
- Enter into a lease agreement or any other form of contract with the landowner to cover all compensation for the use of the land and any damage caused to the property as a result of the mining activities.

If the landowner refuses to enter into an agreement with the permit holder, the latter may submit a request to the Ministry of Mines in order to arrange for the project to be declared a public utility project and to initiate an expropriation procedure. Expropriation is a detailed and time-consuming process that can last for a year or even more.

The concept of native title is broadly recognised. In this regard, even occupants without formal land titles must be considered by the permit holder. In principle, local communities must always be consulted whenever their land may be affected by a given project. Under these circumstances, their consent is generally required before any project can proceed. Consent is required regardless of the type of activity (exploration or exploitation).

In addition, the Ministry of Mines and Strategic Resources, the Bureau du Cadastre Minier de Madagascar/ Madagascar Mining Cadastre Office (BCMM) is the other key government stakeholder in the management of the mining sector. The BCMM is responsible for the management and control of mining permits and the mining registry, including the preparation and documentation of the grant, renewal, transformation, transfer and cancellation of mining permits.

4.1.6. Environment

The Ministry in charge of Mines and the Ministry is in charge of the Environment to ensure compliance with the rules aimed at the environmental protection by the holders of mining permits (Article 98, Mining Code)

Any natural or legal person who carries out mining activities has the obligation to take the necessary protective measures to minimise and repair any damage that may result from the work conducted in the course of its activity. This person is responsible for any degradation of the environment as a result of its

work. This liability is limited only to the extent that the person concerned exercises in compliance with the laws and regulations governing mining activities as well as those aimed at protecting the environment. Any execution of work related to mining activities, including the construction and maintenance of infrastructure necessary for this purpose, is made in accordance with the commitments in the environmental plan or the study of its impact on the environment previously elaborated according to the methods provided for by the relevant legal and regulatory provisions. (Articles 99 and 100).

Environmental Regulations

Any request for an operating licence is accompanied by a letter of commitment to start no mining activity before obtaining an environmental authorisation after approval of the Environmental Impact Assessment (EIA) document established by the applicant.

This authorisation or environmental permit is issued by the National Office for the Environment (ONE), after a favourable assessment in the EIA. Basis is the technical opinions of the CTE following the evaluation of the EIA of the project and the results of a public consultation (Article 6 of the Mecie Decree). This environmental permit must be included in any request for authorisation, approval or approval of work, works and developments projected (art 27 of the Mecie decree). The PRE licence request is also subject to an environmental commitment plan. The National Office was created in 1990, and is governed by Decree No. 2008-600 of June 23, 2008.

According to Chapter 2 of the Mining Code, 2005, a mining permit must be always be accompanied by an environmental licence to motivate the establishment and the start of the operating work of the project. The environmental licence, forms part of the prerequisites for the commencement of a mining activity. established in the Mining Code for constituting an authorisation or approval by the competent and mandated public power, conditions the beginning or not of any work. The environmental licence is issued by a competent and mandated public power.

The environmental impact assessment study report approved by the National Office for Environment sets out the environmental specifications of the project.

	Environmental authorization	Environmental permit
Scope	- PRE - PR	-PE -PRE in case of concentration of applications for PRE in a specific area -PR based on a threshold of research progress
Obligation of the holder/ project proponent	Preparation of a PEE	Preparation of an Environmental Impact Study (EIE)
Granting procedure	- Submission of the PEE to the environmental unit - Evaluation of the PEE by the environmental unit - Granting of the authorization by the Provincial Director of the Ministry responsible for Mines or by the Minister responsible for the Environment (in sensitive area) or by the Minister responsible for Mines (in areas with a concentration of mining operation)	- Submission of EIE to ONE by the holder[16] - Evaluation of the EIE by the environmental unit - Granting of permit by ONE

Table 26: Types of environmental permit - Source: Mining code and Decree MECIE

Mine Closure

Prior to commencing any mine closure works, the holder of an E permit must submit the following documents to the regional department of the Ministry of Mines:

- A topographical map of the mine works to be closed;
- A plan of the underground galleries and the drilled holes to be closed;
- The techniques to be adopted for undertaking the closing works;
- The techniques to be adopted to mitigate environmental impacts.

The regional department of the ministry must issue its approval or refusal within 15 days of submission of the above documents. A refusal must be explained and the permit holder will be given the opportunity to adjust the relevant document(s) accordingly.

Furthermore, the environmental impact study also must detail plans for the eventual closure and rehabilitation. The environmental impact study report sets out the environmental specifications of the project and includes:

- All environmental measures that must be completed by the permit holder during the life of the project until the definitive closure of the mine, including all works;
- The financing and budget for mitigation and restoration measures; and provision for the mitigation and rehabilitation works, along with any security or guarantee in favour of the state. This could take the form of funds deposited in a bank account in Madagascar in order to finance the rehabilitation works. Use of the funds will be subject to certain conditions, such as the following:
    - The funds must be used exclusively for the rehabilitation works;
    - Further deposits must be made if necessary to cover any changes to the rehabilitation works/measures; and
    - The funds will be under the control of the Ministry of Mines, the Ministry of Environment and the National Office for Environment, which can use the funds to finance any rehabilitation works as and when needed.

Before the effective closure of the mine, the permit holder must recruit an independent auditor duly approved by the National Office for Environment in order to conduct an audit of the performance and completion of all mitigation and rehabilitation works foreseen in the environmental specifications. The audit report is subject to the approval of the National Office for Environment, which will issue the definitive environmental clearance (*quitus environnemental*) that releases the permit holder from all its environmental obligations.

Water

According to the USAID 2021 report on the Water for the World Act High Priority Areas[41], Madagascar is water abundant and is not considered water-stressed at a national scale; however, there are regional water availability and water quality challenges. According to this report, the total annual renewable water resources endowment per person is just over 13,000 m^3, approximately eight times higher than the Falkenmark Water Stress Index threshold for water stress. Similarly, the total volume of freshwater withdrawn by major economic sectors amounts to only 11% of its total resource endowment. However,

[41] Madagascar Water Resources Profile Overview, USAID, 2021. https://winrock.org/wp-content/uploads/2021/08/Madagascar_Country_Profile-Final.pdf

the south is considerably drier, and more water-stressed than northern and central Madagascar. Most rivers in southern Madagascar disappear during the dry season and alternative groundwater sources are not always viable. The climate change-induced droughts also increase water-stress.

Deforestation in the Central Highlands from slash and burn agriculture, logging, animal husbandry, and firewood collection contribute to some of the highest levels of erosion in the world as well as extreme flooding. Naturally high precipitation rates, especially on the northern half of the island, and the presence of steep gullies called lavakas throughout the western central plateau compound these risks and impact surface water quality and biodiversity.

Inadequate municipal sanitation systems, including in Antananarivo, have resulted in fecal contamination of groundwater. Additionally, small-scale gold and gemstone mining, and larger nickel, chromium, and cobalt mines have contributed to chemical contamination of groundwater.
More intense cyclones and rising sea levels caused by climate change directly threaten coastal communities and intensify flooding and erosion in coastal areas. Further, rising sea levels are contributing to increased saline intrusion in low-lying coastal alluvial aquifers.

Surface and groundwater quality and hydrometric data are not comprehensive or routinely collected, which impedes decision-making for Integrated Water Resources Management (IWRM), particularly at the "commune" level.
Water resources management is decentralised; however, key IWRM decisions are still taken by the central government due to funding and human resources constraints within sub-national institutions. Water resources management is decentralised; however, key IWRM decisions are still taken by the central government due to funding and human resources constraints within sub-national institutions.

4.1.7. Societal and community aspects, cultural heritage

The local populations inside the perimeter of the object of the mining permit are the land owners. The permit holder must identify the owner of the plot in the first place. In cases where the permit holder cannot identify or locate the owner, the municipality concerned launches the official identification and research process. The identification and research process involve:

- communication to the chiefs and officials of the village and the municipality,
- by the display of the research notice at the Office of the Commune and its insertion into the newspapers with wide dissemination,
- by the development of a document noting the rights claimed and reported the evidence offered during the research period and finally by publication and display of the list of persons claiming a right.

The main law from which these persons benefit is the right to be compensated due to the use of the soil by the operator. However, this right is subject to the traditional occupant and the beneficial owner at the conclusion of a good and due form with the operator. They must also clearly identify themselves during the identification procedure, provide proof of the rights invoked, constitute themselves in association of their choice and designates their representatives who will deal with the mining permit holder.

The draft Mining law is in favour of the promotion of human rights, children's rights and gender equality; the elimination of all discrimination based on race, sex, origin, religion, trade union membership and political opinions in matters of employment and profession and the appointment of social leaders and other stakeholders; respect for equal treatment of all personnel: employee, corporate officer and other

stakeholders in accordance with the spirit of "equal work, equal pay", regardless of the physical abilities, disability, age or sex of the employees and respect for human rights throughout the value chain.

Any mining operator, at the time of issuing his PREA and/or PE, contributes to a Mining Fund for Social and Community Investment (FMISC). The contribution received for the benefit of the said Fund is: For PREAs: a lump sum set by regulation; For PEs: a rate of 3% of the amount of direct investment provided for in the pre-feasibility study submitted with the permit application for the development and initial equipment of the mine.

Following the granting of an operating permit, the BCMM charges a fee corresponding to the category and the number of years of possession of the permit. The value of this levy is fixed by inter-ministerial order while its recovery is effected by the antennas of BCMM in provincial capitals. Hence, this central management holds 60% of these values and is distributed between the decentralised territorial community and the general budget. The draft Mining Code also requires that an once-off payment towards national development be paid by permit holders on being granted their permits (MGA 2 billion for exploitation permits and MGA 200 million for exploration permits, revisable upwards depending on the substance mined, environmental factors, and the size of the investment).

Tangible and Intangible Cultural Heritage

The Mining Code does not mention tangible and intangible heritage, but specific laws and regulations govern the tangible and intangible heritage of Madagascar:

- Law No. 82-030 of December 9, 1982 ratifying Ordinance No. 82-029 of November 6, 1982 relating to the Safeguarding, Protection, and Conservation of National Heritage;
- Ordinance No. 82-029 of November 6, 1982 relating to the Safeguarding, Protection, and Conservation of National Heritage;
- Decree No. 83-116 of March 31, 1983 setting the terms of applying Ordinance No. 82-029 of 06 November 1982 on the safeguarding, protection and conservation of the National Heritage;
- Decree No. 91-017 of January 15, 1991 amending and supplementing certain provisions of Decree No. 83-116 of March 31, 1983 setting the terms of application of Ordinance No. 82-029 of 06 November 1982 on the safeguarding, protection and conservation of national heritage;
- Decree No. 2014-001 of January 7, 2014 creating, organisation and functioning of the National Heritage Office (ONP) and amending and supplementing certain provisions of Decree No. 2003-1041 of October 14, 2003 on the creation, organisation and operation of the Fund for the protection and development of Malagasy culture called "RAVAKA". On the proposal of the Minister of Culture and Heritage; In Council of the Government;

The Ministry of Communication, Culture and National Heritage Office (ONP) are responsible for the implementation of the national cultural heritage policy.

4.1.8. Public health and safety

The Ministry of Public Health and the Ministry of Labour, Civil Service and Social Laws are responsible for the enforcement of health and safety obligations. The ministries and their departments play an active role in regulating the mining sector from a health and safety perspective. This may involve anything from simple inspections to the application of sanctions where required.

Operational Health and Safety (OHS) and Labour Regulations

Workers' law is provided for in articles 108 to 111 of the 2005 Mining Code. It is particularly about security relating to safety, hygiene, protection against accidents of work. Paragraph 2 of article 108 provides that "for the conduct of mines or quarries, to ensure surface security and environmental protection, safety and the hygiene of the personnel employed, as well as the conservation of the mine or the neighbouring mines.

The following requirements apply to operators to establish and maintain healthcare systems and health facilities, taking into account:

- Preventive measures for the health of workers and their families;
- First aid care in case of illness affecting workers;
- Primary healthcare for workers and their families;
- Water treatment and regular supplies of drinking water to workers and their families; and
- Arrangements for medical evacuation, where necessary;
    - To establish periodically revised hygiene and health rules and set up a hygiene and health service;
    - To establish suitable medical centres;
    - To ensure adequate supplies of equipment, medical products and medicines and the presence of medical staff;
    - To conduct periodic medical examinations and provide reports on the state of health of the workers and their families;
    - To create individual record sheets, including medical information on each worker.

The operator must report any accident at the mine, within 10 days of its occurrence, to the Ministry of Mines, the Ministry of Labour and Ministry of Public Health, as well as to the territorially competent *gendarmerie*. This report must detail the circumstances and consequences of the accident, including the date, the damage and relief measures undertaken. Breach of these requirements is punishable by the temporary and immediate suspension of work, after formal notice by the Ministry of Mines. The permit/authorisation may also be suspended. The company may also incur civil liability and the managers and directors civil and criminal liability, depending on the nature of the breach.
Madagascar law does not prevent mining companies from implementing any available health and safety standards, as long as these do not constitute a breach of the national legislation.

4.2. Mining practices *vs.* Environmental, Social and Governance (ESG) goals

Madagascar is one of the most fragile countries in the world, showing socioeconomic indicators similar to those of areas facing protracted conflicts. It is a land endowed with abundant natural resources that, if managed responsibly, could generate sustainable growth and development. However, lack of transparency, high levels of corruption, land disputes, and human rights violations affect the extractive sector. The mining industry of Madagascar has the potential to grow. Therefore, mining is the key pillar in Madagascar development strategy. Furthermore, as part of the Madagascar Vision 2030/2040/2063, governance issues are widely considered in the medium, short and long-term strategic orientations.

4.2.1 Environmental challenges

The environmental management of the mining sector in Madagascar is based on precise principles and rules. In addition, Madagascar has developed an Integrated Environmental Management System (SIGE) at the Ministry of Mine with ramifications in the Regions and in connection with the Office National de l'Environnement, it makes it possible to monitor the environmental obligations of mining projects.

Despite this regulatory framework and existing systems, examples of conflicts between Mines and the Environment are not lacking. The mining cadastre grants mining titles according to legal and regulatory procedures, by fixed coordinates, and in a transparent manner. On the other hand, there is no similar precise delimitation for protected areas. It therefore remains difficult to identify possible overlaps.

4.2.2 Socio-economic issues

The allocation of mining royalties requires at the very least a clear, pragmatic, and official distribution. The Malagasy mining sector suffers from the lack of skilled manpower, insufficient training infrastructure, and inadequate higher education programmes.

Many social issues were raised such as land grabbing, child labour with more than 500,000 small informal miners, Dutch Syndrome (Inflation, local migration and unemployment), political harassment, impunity, lack of public consultation, popular uprisings, the energy crisis/climate crisis/poverty, etc.

4.2.3 Governance

Texts concerning the mining sector are generally adequate, but there are often shortcomings in their application. The granting of mining titles is ensured by the Mining Cadastre, but some consider the prices irregular, excessive practices in the sale of cadastral data have affected its reputation in recent years and undermined its credibility. In addition, it is important for investors to know in advance the "rules of the game" and to ensure that they will not change during project since its viability depends on it.

The allocation of mining royalties requires, at the very least, a clear, pragmatic, and official distribution. Currently, the collection of taxes and royalties presents a double challenge that varies according to the type of mining project: i) to improve practices in the artisanal sector, which is largely informal; and ii) to develop a close partnership between the tax administrations and the major mining projects so as to monitor and anticipate their tax payments. The latter will involve coordination between the administrations concerned, with regard to the royalty.

The Ministry of Mines is responsible for setting the level of taxation while the Ministry of Finance is responsible for the recovery. This duality requires real collaboration and capacity building between the services concerned. The representatives from the Ministry of Mines stated that the Ministry is challenged with insufficient human and financial resources to monitor and evaluate the activities in the field. The challenges include ageing of managers and that the Ministry was not able to recruit new staff for decades now.

The 2005 Mining law is in revision and Government with the new mining Code in preparation need to find balance between social, economic and environmental interests to better manage future projects and reframe current projects. The 2005 mining code has been suspended since 2010. However the new

government has been revising the draft of the new Mining Code which has been validated by Ministers' council of 12 April 2023.

4.2.4 What would be the best practices for a responsible mining?

ESG (Environmental, Social and Governance) practices are increasingly expected by stakeholders, including investors, customers, civil society, etc. In Madagascar, there are initiatives and projects that illustrate good ESG practices in the mining sector. Examples include the Ambatovy project, the QIT Madagascar Minerals (QMM) project and the Toliara Sands project.

The Ambatovy project is a nickel and cobalt mining project in the east of the country. It is the biggest project in Madagascar's history and one of the largest foreign direct investments in the country. The site is located near the town of Moramanga. The Ambatovy project is committed to complying with international environmental, social and governance (ESG) standards, in particular those of the World Bank, the European Investment Bank and the Extractive Industries Transparency Initiative. The site is recognised for its advances in ESG best practices:

- Ambatovy has drawn up specific Environmental Management Plans (EMPs) to reduce the environmental impact of its activities, such as deforestation, water pollution and greenhouse gas emissions. Other measures include restoring natural habitats, conserving biodiversity, managing wastewater and solid waste, reducing greenhouse gas emissions, promoting local employment, building the capacity of local stakeholders and supporting community development initiatives. These plans are regularly updated and approved by Malagasy Office National pour l'Environnement (ONE). Ambatovy also undertakes biodiversity conservation initiatives, in particular by supporting the creation and management of protected areas, funding research programmes on endemic fauna and flora, and raising awareness among local communities of the importance of preserving their environment. In addition, Ambatovy has developed a multi-faceted compensation programme comprising several sites and associated activities. This approach was deemed necessary given the scale of the operations, some of which are located in sensitive areas with high biodiversity.

- From a social perspective, Ambatovy strives to create economic and social opportunities for local populations by promoting local employment, vocational training, the development of infrastructure and social services, and capacity building for civil society organisations. Ambatovy also respects the human and land rights of communities affected by the project, by conducting public consultations, setting up complaints and conflict resolution mechanisms, and fairly compensating people displaced or affected by the project. The development of livelihoods has also helped to improve the living conditions of local communities. This programme aims to strengthen food security and increase the source of income for these communities. This involves capacity building, organisational support, the provision of agricultural inputs and opportunities for networking and market access. On health and safety, the company is committed to complying with all national and local health and safety regulations, tries to meet the expectations of neighbouring communities and commitments and regularly works with local stakeholders on health and safety risk awareness and emergency preparedness. Cultural Ambatovy is committed to ensuring that any cultural heritage sites, archaeological artefacts or remains are treated with

respect and in accordance with local customs, scientific procedures and the International Finance Corporation's cultural heritage performance standards.

- Finally, in terms of governance, Ambatovy complies with national and international laws and regulations relating to the mining sector, particularly in terms of tax, customs, environmental and social matters. Ambatovy regularly publishes reports on its ESG performance, its economic contributions to the country and its payments to the Malagasy government. Ambatovy also participates in dialogue with project stakeholders, such as public authorities, lenders, non-governmental organisations, the media and local communities.

QIT Madagascar Minerals project (Rio Tinto), which mines mineral sands with a high ilmenite content in the south-east of the country. The project claims to have adopted a participatory and inclusive approach to the sustainable development of the area in which it operates. In particular, it has set up a social and environmental fund (FSE) to finance projects run by civil society organisations in the fields of education, health, agriculture, fishing and environmental protection. However, the project has been heavily criticised by some stakeholders for its negative impact on the region's biodiversity and population. Some have questioned the real economic impact of the project, as well as its transparency and social and environmental responsibility. Some have also denounced the human rights violations, land disputes, corruption and damage to local culture associated with the project.

The Toliara Sands project, which aims to mine zircon in the Atsimo-Andrefana region, has drawn up an Environmental and Social Impact Assessment (ESIA) that identifies the risks and opportunities associated with its activity. The project is committed to complying with international standards in terms of human rights, environmental protection, health and safety at work, and stakeholder engagement. The project has also set up a complaints and conflict resolution mechanism to encourage dialogue with the populations affected.

5. Business network between the European Union and *"country"*

5.1. Assessment of the upstream and downstream business ecosystem

5.1.1 Context, formal and informal players

The Malagasy's mining sector encompasses both formal and informal players across the upstream and downstream segments of the business ecosystem. The following presents an overview of these players. Formal upstream players first of all include Government Ministries such as:

Organization	Missions	Website
Ministry		
Ministry of Mines and Strategic Resources (MMRS)	- Planning, implementation, and regulation of mining activities - Development of mining policies - Granting of mining titles - Managing relations with foreign investors in the mining sector	Ministère des Mines et des Ressources Stratégiques (mmrs.gov.mg)
Ministry of the Environment and Sustainable Development (MEDD)	- Establish reserved zones under the conditions specified by the Mining Code, authorize work within the protection zones, determine additional protection zones and inform the environmental authorities. - Approval or refusal of environmental permits on the advice of the ad hoc assessment unit or committee - Issuance to PR holders and, in some cases, to PRE permit holders, of environmental authorizations for PEE operations	Ministère de l'Environnement et du Développement Durable | République de Madagascar
Public Establishment		
Madagascar Mining Cadastre Office (BCMM)	- Management of mining permits and authorizations - Recovery of mining administration Fees (MAF) and distribution of quotas to beneficiaries - Public access to information on the mining cadastre and procedures for obtaining mining permit - Promoting the mining sector	Présentation - BCMM
National Agency for the Gold Sector (ANOr)	- Implementing policy for the gold sector - Administration, management, formalization of the gold sector	Agence Nationale de la filière OR Madagascar - ANOR | Antananarivo | Facebook
Office of National Mines and Strategic Industries (OMNIS)	- Enhancing basic geological data - Mining Promotion Office	Home - OMNIS - Office des Mines Nationales et des Industries Stratégiques
National Office for the Environment (ONE)	- Implementation of the Decree on the environmental compatibility of investments (MECIE) - Environmental risk prevention - Promotion of Strategic Environmental Assessment (SEA) - Management of the environmental information system	Office National pour l'Environnement - Madagascar (pnae.mg)

Table 27: List of the main authorities involved in the mining sector. Source: Mining code and websites of each organization

The **Ministry** is responsible for Madagascar's extractive sector. It interacts with stakeholders in the sector through several bodies:

- The **Direction des Études Géologiques et de la Promotion Minière** (DEGPM) for geology, prospecting and documentation;

- The **Direction Générale des Mines** (DGM) and the **Direction Générale des Ressources Stratégiques** (DGRS) provide administrative and technical assistance to operators and promoters;

The DEGPM, DGM and DGRS, as well as all the other MMRS departments, are represented in the regions by the "DRMRS" or "DIRMRS" Directions Régionales ou Interrégionales des Mines et des Ressources Stratégiques, which also assist operators and promoters in their relations with local communities. DRMRS and DIRMRS receive annual activity reports;

- The **Bureau du Cadastre Minier de Madagascar** (BCMM) and the Bureaux Inter-Régionaux du Cadastre for cadastral. The BCMM receives all applications and other requests from operators and investors on all matters relating to mining permits. The BCMM confirms the admissibility or otherwise of a file submitted to it, examines it and sends it to the Minister's office, together with its reasoned opinion, on the basis of which the Minister acts on the request (issuing an Order granting or notifying refusal). All operations relating to standard permits (operating permits and research permits): granting, conversion, transfer, renunciation, etc., are thus the responsibility of the MMRS, which decides by Ministerial Order. The same procedures are carried out for PREs by the Regional or Interregional Directorates of Mines and Strategic Resources, on the basis of a reasoned opinion from the DIRs of the Land Registry Office.

- The **National Mining Council** (CNM): a body for dialogue, facilitation, consultation and conciliation between the Mining Administration and the private mining sector.

-The CNM is consulted to give its reasoned opinion on any draft law, and where necessary, any draft decree regulating mining activities.
-The CNM supports the Mining Administration in the periodic determination of the local market value of mining substances.
- The CNM is also responsible for monitoring large-scale mining activities and facilitating the obtaining of sectoral authorizations for mining operators.
- When expropriation in the public interest affects a mining permit, the CNM is a member of the administrative commission set up as part of the expropriation procedure, and participates in its missions.
-The CNM is not yet operational.

- The **Madagascar Geology and Gemology Office** (BGGM): the government has decided to create a geology and gemmology office. This new structure will take on all the missions of the former Institut de Gemmologie de Madagascar (IGM), from promoting the fine and precious stone sector to gemmology training. But it will also be responsible for the equivalent of the Geological Survey, including the processing of Madagascar's geological data. To date, this office is not operational.

- The "**Office des Mines Nationales et des Industries Stratégiques**" (OMNIS) is a necessary step if the substances being prospected or mined are of a radioactive nature. In this case, the operator must sign an agreement with OMNIS to prevent any negative fallout from radiation. OMNIS was created in 1976 under the name "Office Militaire National pour les Industries Stratégiques" (National Military Office for Strategic Industries). From its inception to the present day, OMNIS's mission has been to promote subsoil substances, and it has always been made up of two operational Directorates:

- The Hydrocarbons Division. Its remit, on behalf of the Malagasy State, is to promote the upstream petroleum sector and relations with operators in this sector. It has a team of engineers (notably geologists) and prospectors;
- The Mining Resources Division (Direction des Ressources Minières - DRM).

OMNIS's involvement in the mining industry has evolved over time:

- In its early days, OMNIS only targeted radioactive minerals such as uranium ores and bastnaesite;
- Within the framework of cooperation between Madagascar, represented by OMNIS, and the Commonwealth of Independent States with Zarubezh Geologia as its operational representative), the agreed substances were rare metals, rare earths and quartz.

OMNIS has acquired and consolidated considerable expertise in the exploration of subsoil resources, and has also built up a wealth of know-how and exceptional experience. All this makes OMNIS a reliable partner.

Informal upstream players first of all include ASM engaged in manual or semi-mechanised mining activities, but most of them are dedicated to gemstones.

5.1.2 Relationships at local or regional levels

Madagascar's membership of regional and international: specifically for the extractive sector, Madagascar has been committed to implementing the EITI Standard, a global standard on transparency and good governance in extractive activities, since 2007. As part of this commitment, the country regularly publishes a report on the context and situation of extractive operations in the country and is periodically assessed on this basis.

At regional and international level, Madagascar is a member of several international and regional organizations, including:

- **The Indian Ocean Commission (COI),** whose aim is to ensure cooperation in sustainable development for its 5 member states, including: Madagascar, the Union of the Comoros and France on behalf of La Réunion, Mauritius and the Seychelles;
- The **Southern African Development Community (SADC)**, which aims to boost the economy, ensure a better quality of life for the peoples of its 16 member states and reduce poverty;
- **The African Union,** a pan-African organization of 55 states, whose vision is "an integrated, prosperous and peaceful Africa, led by its own citizens and representing a dynamic force on the international stage";
- The **World Trade Organization** (**WTO**) which aims to ensure smooth, predictable, and free trade between its 160 members;
- The **Common Market for Eastern and Southern Africa (COMESA)** which aims to overcome the various economic and trade obstacles encountered by member states.

5.2. Building new B2B relations

The BRGM, in charge of the Madagascar case study might organize a One-Day-Mining-Forum in March or April 2024. This event will be built around a half day technical meetings with officials (ministries, European Delegation, Embassies, chamber of mines, and the CRM whole chain actors) and a half day exhibition with stakeholders and local CRM actors / players.

Strengthening African mining clusters

Alternative Financing as “private funding”: Private funding takes the form of donations and sponsorships. They are managed by associations. Locally-represented banks or foreign banks such as KfW contribute to associative funds for development and nature conservation. Private financing is by mutual agreement between the parties involved. In the case of artisanal miners, financing takes the form of partnerships between foreign investors and local operators. In certain circumstances, foreign private operators finance mining operations directly with local artisanal miners. Activities financed include the collection, extraction and export of mineral substances. Some of these transactions can unfortunately fall foul of money laundering and natural resource trafficking.

Responsible finance programs exist, such as SUNREF Madagascar and the Green Bonds initiative.
SUNREF is the Agence Française de Développement (AFD) green finance label. Under certain conditions, it enables businesses, associations, energy service companies and private individuals to benefit from loans on attractive terms to finance green growth and sustainable development projects. For SUNREF Madagascar in particular, investments in Renewable Energies (RE) and Energy Efficiency (EE) are on the program's priority list. Projects eligible for a SUNREF loan include energy production: solar photovoltaic, wind, hydroelectric and biomass mini-power stations, for the company's own needs and/or for resale.

The **"Green bonds" market**, created in 2007 and also known as "responsible finance", encompasses operations designed to promote the Energy and Ecological Transition (TEE), combat global warming and prevent environmental damage resulting from economic activities. It is a financial product or service initiative, or a financial and fiscal regulation designed to protect the environment. The "green bond" is the principal tool of responsible finance, based on a loan issued on the market by a company or public entity to investors deemed responsible, with the aim of financing initiatives specifically linked to the environment. A "green bond" is characterized by the use of the funds raised for the purpose of carrying out investment projects favourable to TEE, provided that the issuer ensures that the funds are earmarked for green projects. SUNREF is deployed by the financial institution Solidis.

5.3. Promoting local content and enabling mining cluster actors

To improve the framework conditions for European and African companies and organisations to co-create new value, businesses, products and services by transforming the ways they interact, herafter, the list of relevant institution and academia:

Relevant institutions for the development of an Africa-focused critical minerals network (considering the technological, environmental, economic and social dimensions) bringing together research, academia, industry and governmental stakeholders, to facilitate international collaboration:

- The **Extractive Industries Transparency Initiative** (EITI), In line with the standards and materiality threshold of the Extractive Industries Transparency Initiative (EITI), the new Mining Code requires all mining permit holders to comply with the principles and requirements of transparency and good governance, in particular with regard to information on payments to the State, and to make public information on beneficial ownership, contracts and licenses.

- The **private sector** is organized into private-sector employers' associations (GEM, FIVPAMA, GEFP, SIM), and workers' unions (SEKRIMA, FISEMARE, FISEMA, SEREMA, TM).

In the mining sector, industrial mining operators are represented by the **Madagascar Chamber of Mines**. The Chamber is the most important organization in Madagascar's private mining sector, comprising the country's most emblematic mining companies involved in exploration, production and processing. It plays a decisive role as a counterweight to the public authorities in the governance and structuring of the legal framework of the mining sector.

In addition to the Chamber of Mines, **associations and cooperatives of artisanal mining operators** - mainly sole proprietorships and small and medium-sized enterprises - are grouped together in various not-for-profit associations as listed hereafter:

- Fédération des opérateurs miniers de Madagascar (FOMM),
- Fédération des opérateurs miniers de Vakinankaratra (Fedominvak),
- The Grandidierite association,
- Groupement des exportateurs des Produits Miniers (GEPM),
- Association des Exportateurs de Pierres Industrielles (AEPI) based in Taolagnaro,
- Groupement des opérateurs miniers (GOM) based in Vakinankaratra.

These groups are eligible to benefit from local support zones. These support zones are the first step in the initiative to formalize and professionalize artisanal miners. Legal associations and cooperatives can also benefit from various advantages, such as consultation by public authorities when preparing laws and regulations for the sector, training and sectoral support programs. For example, only representatives of associations and cooperatives have benefited from IGM training grants. Associations are also much in demand at consultative events for social and environmental policy purposes for the sector.

- Chambers of commerce: Madagascar has developed trade agreements with countries and regions around the world, some of which have set up chambers of commerce to facilitate trade. These include

- **Chambre de Commerce et d'Industrie d'Antananarivo** (CCIA) - a public professional body, under the technical supervision of the Ministry of Commerce and the financial supervision of the Ministry of Finance - provides technical assistance and support to SMEs, professional networking and mentoring programs to promote local industry;
- **Chambre du Commerce et de l'Industrie France-Madagascar** (CCIFM) aims to develop trade relations between Madagascar and France. Members and contributors to the CCIFM benefit from various privileges, including support in conquering new European markets, and promoting cultural and commercial exchanges between French and Madagascan industrialists;
- The **American Chamber of Commerce** (AmCham) is a non-profit association of mainly American and Malagasy companies and businessmen. AmCham Madagascar was created in 2008 and aims to strengthen commercial ties between the United States and Madagascar, maintain the highest standards of business practice, and support the expansion of an English-speaking business community in Madagascar;
- **Canadian Chamber of Commerce** (CanCham), founded in 2016 has a mission to develop exchanges and promote bilateral economic and cultural relations between Canada and Madagascar. Cancham regularly organizes economic missions to Canada with the aim of promoting Madagascar's private sector.

- Civil society organizations and affiliates: Civil society plays a key role in Madagascar's mining sector. Civil society organizations are regularly consulted at various events relating to the mining sector, and form part of the sector's overall landscape. The Platform of Civil Society Organizations on Extractive Industries (OSCIE) was created in 2016. It is a confederation of twelve Civil Society Organizations "CSOs" that have

united their skills, their respective experiences to achieve a common goal which is good governance of the extractive sector (mining and oil). OSCIE uses communication as its greatest working tool (need for reliable information, knowledge sharing). The member CSOs are:

- **Alliance Voahary Gasy "AVG":** Platform created in 2009. It brings together 30 CSOs working in the environmental field;
- **Blue Ventures for the reconstruction of the sea**; assistance, modernization and equipment for artisanal sea fishing; the fight against industrial overfishing;
- **KMF CNOE**: popular education, observation of public life and election observation;
- **SAF / FJKM**: created in 1974. It is related to the FJKM Protestant Church and has as its objectives the promotion and development of Man in his social and economic domains. Its areas of intervention are education, health and hygiene, environmental management and natural risk management;
- **Taratra**: water drilling and assistance to rural communities in their efforts to equip themselves;
- **TI-IM** (Transparency International - Initiative Madagascar): achieving Transparency International's objectives in Madagascar;
- **WWF Madagascar**: implementation of WWF principles and guidelines in Madagascar.
- **Rohy Movement**: a group of civil society organizations working to mobilize citizens against corruption and for transparency, good governance and respect for human rights;
- **SIF** (Sehatra Iombonana ho an'ny Fananantany) works in the land sector (land reform);
- **Tafo Mihaavo** (network of Fokontany natural resource managers): works for the sustainable development of communities.

- International non-governmental organizations (NGOs) present in Madagascar are mainly involved in activities with a direct or indirect impact, with the main focus on social activities and good governance. NGOs are active in setting up and financing initiatives to promote good governance, regulations, modernization of practices, the fight against child labor and formalization, access to healthcare, gender promotion and adult literacy. Among the international NGOs present in Madagascar in relation to the mining sector and related activities are:

- World Wide Fund For Nature (WWF),
- Extractive Industries Transparency Initiative (EITI),
- Responsable Mica Initiative (RMI),
- Transparence International (TI),
- Publish what you Pay (PWYP),
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ),
- Terre des Hommes,
- Alliance for Responsible Mining,
- PACT.

These NGOs have autonomous budgets and intervene in development activities with sustainable development and stakeholder inclusion as their main interests.

The two main players with influence on the mica sector: **PACT and RMI**.

- **PACT** works through the Madagascar shine project to combat child labour in mica-producing communities in Madagascar, particularly in the Anôsy region. PACT's efforts increase the immediate and long-term resilience of vulnerable households by connecting children with educational services and adults with support to improve their livelihoods. The project supports

civil society organizations and the media in raising public awareness of the issue of child labor in mining, and in building the capacity of government officials to coordinate child protection measures in the mica supply chain, including establishing a code of conduct in mica mining.

- The **Responsible Mica Initiative (RMI)** is a non-governmental organization created to establish fair, responsible and sustainable mica supply chains and eradicate child labor and unacceptable working conditions. This approach is unique in that it involves all players in the supply chain in creating the conditions for change, from the mine to the international buyer. RMI's multi-stakeholder, holistic and action-oriented approach revolves around the implementation of responsible labor standards, the establishment of a decent income, the empowerment of communities and the establishment of legal frameworks for the mica sector. RMI's members are drawn from industries associated with the mica supply chain, in partnership with civil society organizations and local stakeholders. It is an association, established in accordance with the French law of 1901 concerning non-profit organizations.

- Professional associations: A number of associations bring together students and professionals in the mining sector. Most of these associations are legally registered with the Ministry of the Interior as non-profit associations, in accordance with Ordinance N°60-133 of October 3, 1960. In the mining sector, the AIMIMA association of mining students and engineers and the Coalition des Ingénieurs Géologues (CIGN) are the exception.

- The **Coalition des Ingénieurs Géologues Malagasy or CIGN** was created in March 2022 with the vision of "an extractive sector (mining, oil and gas) at the service of the country's development". It campaigns for tangible social and economic benefits for the Malagasy population, while respecting the environment. The CIGN works to ensure that national graduates are given priority in all mining sector projects. To achieve these objectives, the CIGN is working to involve geological engineers in the development of legal and regulatory frameworks relating to the extractive sector in Madagascar, and in the promotion of associated projects.
- **A3Mada**, or the **Alumni Australia Awards Association**, brings together professionals who have benefited from long or short-term training scholarships in Australia. The not-for-profit association has several hundred members, including lawyers, doctors, mining engineers and geologists. Partly subsidized by the Australian government, the association is involved in development projects for its members and the Malagasy community in general.

- Other associations: Other associations worth mentioning include the **Association of Women in Mining Africa (AWIMA)**, a structure focused exclusively on promoting gender equality in the mining sector.
AWIMA was created as a network of women in mining, oil and gas associations that empowers all women in the African extractive sector. The association was established in 2015 and has 40 member countries including AWIM Madagascar with a common vision of "A strong, responsible and more inclusive African mining industry for women". AWIMA has developed partnerships with stakeholders to mobilize resources to carry out gender-focused activities and is called upon in the development of mining sector policy in Africa. AWIM Madagascar is in partnership with the AfricaMaVal project through AWIMA, but also with AFAI Consulting for mining sector development projects in general. These associations are financially autonomous, but are supported financially and technically by international institutions such as the African Development Bank, French Development Agency (AFD), CARE and the African Union.

- **Transit agencies and logistics companies**: these companies are well established in Madagascar. Madagascar's regulations require the intervention of an Authorized Customs Broker, more specifically a freight forwarder, for all customs operations.
The most active large-scale companies are:

- VELOGIC/UPS offers air and sea freight services, customs clearance, transport, warehousing and handling, as well as insurance, project management and maritime consolidation;
- "Bolloré Transport & Logistique" Madagascar offers air and sea logistics solutions and is present in the country's main ports and airports;
- CELERO is a Mauritian logistics group with operations in Madagascar and the Indian Ocean islands, specializing in overland transport, air and sea freight, express courier and logistics, and is an ISO 9001-certified freight forwarder.
- CMA CGM is well known as a professional in logistics, sea freight and air freight, in partnership with Air France KLM.

Geoscience/mining related accredited education and training programmes in the country

The training of people who can serve in the extractive sector has suffered something of a setback.

Prospector training: From 1955 to 1965, the Geological Survey of Madagascar trained and then recruited Geological Assistants, who were first required to take two-level courses. Candidates for second-level courses had to pass the Certificat d'Etude du Premier Degré. Learners who chose to remain in the first degree, or who were not authorized to enter the second degree courses, served in the Geological Survey as "Prospecteur" at the rank of "Agent Technique". Graduates of the Second Degree courses served in the Geological Survey as "Geological Assistants" at the rank of Technical Assistant.

Theoretical and practical courses were taught by French geologists from the Geological Survey and BRGM. From 1967 to 1985, Earth Sciences Technical Assistants were trained at the **Lycée Technique du Génie Civil d'Antananarivo** in the Geology and Mining department. Teachers of specific subjects were Geologists from the Geology Department.

Since 1985, no structure has provided training for Earth Sciences Technical Assistants. Nowadays, mining companies could only recruit baccalaureate holders from the scientific departments of general secondary education, and train their prospectors in-house.

When a prospector was trained in the Geological Survey, its main mission was to cover the entire country with 1:100,000 scale maps. Some of the Technical Assistants in particular demonstrated uncommon technical and organizational skills, filling in for the Geologists. Currently, if you are looking for an intermediate-capacity technicians, you have to recruit people with a **scientific baccalaureate (C and D) and train them in-house.** Madagascar's geosciences and mining sectors are currently lacking personnel at this intermediate level.

Professional training: A network of **technical high schools** has existed in Madagascar for several decades. These schools trained students in industry skills and award diplomas such as the "brevet" and "baccalauréat".

When the Geological Service stopped training technical assistants, the **Lycée Technique du Génie Civil** (LTGC) took over. Students could choose between two trainings: **Geology or Mining**. When training at LTGC **came to an end**, there was no longer any training for technical assistants in either geology or mining.

At the LTGC and the Geology Department, technical subjects were taught by geologists from the Geology Department. By this time, the trainees had received solid theoretical and practical training. They were efficient, and some of them were assigned to geological brigades.

Based on a public-private partnership, the **Fonds Malgache de Formation Professionnelle (FMFP)** was set up to fil the structural gap between the needs and availability of technical personnel for industry. The FMFP receives substantial technical and financial support from the "Agence Française de Développement". In addition, the FMFP has a permanent funding mechanism represented by a compulsory contribution from companies of 1% of their payroll. The technical and vocational training needs of mining companies are eligible for financing by the Fund.

Training about Construction / Strategic resources

Fonds Malgache de Formation Professionnelle
Enceinte Materauto Ankorondrano, Antananarivo 101
Website : https://www.fmfp.mg/

Higher Education : "**University of Antananarivo**", through the **Ecole Supérieure Polytechnique d'Antananarivo** (**ESPA**) and the **Faculty of Science**, trains **Techniciens Supérieurs des Sciences de la Terre (TSST).** The training prepares them for the practical aspects of mining exploration, and they have sufficient knowledge to transpose geological models into operational terms. The absence of people specially trained to be prospectors (Technical Assistants and Technical Agents) forces mining operators to make a choice between assigning prospecting duties to senior technicians, at the risk of either overloading them, or neglecting their actual duties and overloading the engineers. In practice, it has been observed that operators adopt both options simultaneously.

In 1973, the Établissement d'Enseignement Supérieur Polytechnique (EESP), now known as the Ecole Supérieure Polytechnique d'Antananarivo (ESPA), was created at the University of Antananarivo. The school's mission was to train engineers in various industrial disciplines, including Earth Sciences, with two training curriculums: **Geology and Mining**. These two curriculums have evolved respectively into the **Geology Department and the Mining Department**, which have now evolved into three specializations applied geosciences:

- The **Geological Engineering** specialization, which trains geological engineers;
- The **Mining Engineering** specialization, which trains mining engineers;
- The **Petroleum Engineering** specialization trains engineers specializing in the exploitation of fossil hydrocarbons.

Admission to ESPA is conditional on passing a **national entrance exam**, which is open annually to holders of a general scientific baccalaureate (series C or D) or a technical baccalaureate (Industrial or Civil Engineering). Those who have opted for the earth sciences option compete for admission to a core curriculum called "Mention Sciences de la Terre". At the end of the bachelor's degree cycle (L3), students are fully enrolled in one of the three above-mentioned majors. During the first two years of the bachelor's cycle, they are essentially taught mathematics, physical and chemical sciences, as well as the common scientific bases of the geosciences, such as general geology, petrography, mineralogy, etc. In L3, and depending on the major, they are taught the basic scientific specialties, such as:

- Elementary geochemistry in the Geological Engineering specialization;
- Mineralurgy in the Mining Engineering specialisation;

- Petroleum geology in the Petroleum Engineering specialization.

The courses offered are world-class. This is borne out by the fact that ESPA Master's graduates who go on to postgraduate studies in Europe have no particular problems, and have successfully defended their doctoral theses.

Despite the quality of the theoretical training given to future engineers, students are woefully lacking in practical experience due to the low investment and equipment capacity of the University of Antananarivo and ESPA in particular. This gap is filled by new graduates during their first few years on the job, when they prepare their Master's degree dissertations. The engineers trained at ESPA are much appreciated by both national and international operators. Some have been recruited to work abroad in international operations.

ESPA students can choose between "academic" and "vocational" training. Vocational training is much more practically oriented. Academic training is more scientific and theoretical. Vocational training is fee-paying.

Ecole Supérieure Polytechnique d'Antananarivo (ESPA)
Campus Universitaire Ankatso
Bâtiment Médecine au Rez de Chaussée
Website: https://www.polytechnique.mg/

When the **University of Madagascar** was founded in 1960, the Biology-Geology Department was opened, and evolved into the Natural Sciences Department of the Faculty of Sciences in 1972. The Geology Department integrated the Geology Laboratory, the Paleontology Laboratory and the Geochemistry Laboratory.

The **Geology Department** was subsequently **split** into two Departments:

- Anthropology and Sustainable Development Department
- Earth and Environmental Sciences Department.

Website: http://www.univ-antananarivo.mg/

Universities of Mahajanga and Toliara also have teaching and research departments in the natural sciences, including geology. Students in these Faculties of Science will become researchers and/or teachers in secondary and higher education. They are trained in two cycles:

- The Bachelor's degree cycle: basic knowledge of nature (animal biology, plant biology, geology, pharmacology, etc.);
- The Master degree where they join either the Earth and Environmental Sciences curriculum or the Anthropology and Sustainable Development curriculum;

Websites: https://www.univ-toliara.mg/ & https://www.univ-mahajanga.edu.mg/

Up to Master's level, teaching in science faculties is of a theoretical scientific way. Learners have not been introduced to geosciences in mining exploration. However, armed with their scientific knowledge, they can be retrained on the job in mining exploration, provided they receive sustained support during their first few years of practice.

The **Athénée Saint Joseph d'Antsirabe "ASJA"** trains engineers in Earth Sciences. The Earth Sciences department is made up of two courses: "**Mining Geology**" and "**Hydrogeology**". ASJA describes its training

in mining geology as training students for careers as prospecting mining geologists, research and mining, teaching, industry or administration in the various fields of earth sciences. With the agreement of the teaching staff, students can opt for a research or professional orientation, by choosing optional teaching units and the thesis internship program. Students are trained in general geosciences. ASJA mining geologists are generalists, unlike the ESPA training profile.

Website: https://www.asja.mg/

In comparison, a mining geologist graduating from ASJA will be less skilled than one graduating from ESPA, and will take a long time to reach the same level.

Two **research institutes** attached to the University of Antananarivo also train top-level executives in sectors contributing to the development of subsoil mineral resources:

- **Institut National des Sciences et Techniques Nucléaires** (INSTN)
- **Institut et Observatoire de Géophysique Appliquée** (IOGA).

INSTN trains researchers in the application of nuclear physics and in the safety of radionuclides in relation to the dangers, they pose to human communities, including the populations of extractive companies and localities in and around the areas where they operate. Many ores are radioactive, and their extraction, processing and transport require appropriate measures.

IOGA is based in Antananarivo. It houses a geophysics observatory and a university training center. The institute undertakes meteorological, astronomical, geodesic, magnetic and earthquake recording work. IOGA also houses the Time Service, research laboratories in geophysics (gravimetry, electricity, seismology, magnetometry, spectrometry/radiometry), geomagnetism, seismology, infrasound, applied geophysics and observatories (seismological, infrasound, geomagnetic and precision GPS stations). IOGA uses modern scientific communications such as satellite links and the Internet to distribute data.

Both institutes train scientists and technicians at Master's and Doctorate levels.

Website: https://instn.cea.fr/en/ & http://ioga.univ-antananarivo.mg/

In the past, most research on Malagasy geosciences was carried out abroad, in particular at French universities, but today, **doctoral schools** enable students to carry out scientific research, the results of which can be consolidated into thesis.

Two doctoral schools at the **University of Antananarivo** enable students to prepare doctoral thesis in the field of geosciences and on subjects relating to the development of mineral resources.

- **Engineering and Geosciences (INGE)** with research topics relating to mineral resources as:
  - EAD 1: Geosciences, Organic Mineral Materials and Gems
  - EAD 2: Mineral and Petroleum Engineering

Research focuses on the structural control and geochemistry of geological materials, and on the modeling of fractured rock masses and the distribution and behavior of trace elements during laterite alteration.

Website: https://univ-antananarivo.mg/Ingenierie-et-Geosciences-INGE

- **Earth and Evolution Sciences (STE)**
  - EAD 1: **Georesources and the Environment** (GéoEnvi) to address topics relating to mineral resources (Precambrian crystalline basement): its geological characteristics and associated mineralization linked to metamorphism or magmatism events.
  - EAD 2: **Sedimentary Resources and Global Change** (RSC), including exploitation and development of resources associated with the Phanerozoic sedimentary cover.

Website: https://univ-antananarivo.mg/Sciences-de-la-Terre-et-de-l-Evolution-STE

Due to the lack of equipment (age, number, analytical capacity, inadequacy or even shortage of chemical inputs, etc.), particularly in laboratories of Madagascar's faculties, higher education institutions, research centers and institutes, research work for the preparation of a thesis requires internships in university laboratories and research centers abroad, particularly in Europe and especially in France.

Research centres: Madagascar has **a number of research centres** attached to the University and the Ministry of Scientific Research. These research centers specialized in various disciplines such as scientific and technical research on innovations, technology, industry, nuclear research and geophysics.

- **National Centre for Industrial and Technological Research (CNRIT)**

CNRIT or Centre National de Recherches Industrielle et Technologique was created in 1987. It is a public scientific establishment attached to the Ministry of Higher Education and Scientific Research. CNRIT's missions are essentially to carry out the following activities:

- Participation in the development and implementation of the national Technological Research policy. Following actions are undertaken:
  – Research and innovation;
  – Making the most of local raw materials and resources;
  – Development of endogenous technologies;
  – Absorption and adaptation of foreign technologies.
- Valorisation and application of research results for sustainable development (economic, social, environmental). These activities include:
  - Supervise, assist and support development operators;
  - Strengthen regional capacities and skills by mastering clean technologies;
  - Managing and protecting the environment (industrial, physical and social, etc.)

The **CNRIT** aims to develop technologies and valorise **raw materials and natural resources**, including volcanic fertilizers, refractory bricks, biogas and agro-industrial applications. Within this framework, the Center's engineers conduct research in metallurgy, geology, energy, chemistry, computer science and applied electronics. The Centre has two laboratories, but they are poorly equipped.

Centre National de Recherches Industrielle et Technologique
38, rue Rasamimanana, Fiadanana
Antananarivo 101
Madagascar
Website: www.agro-oi.com/fr/7/29418/cnrit-centre-national-de-recherches-industrielles-et-technologiques-mg.html#.WUj6XqGUeKo

- **National Centre for Environmental Research (CNRE)**

The mission of the Centre National de Recherches sur l'Environnement is to promote **environmental compliance and environmental research** in line with the country's economic development policy. Within this framework, the **CNRE** aims to contribute to the implementation of Madagascar's **conservation strategy**, in the service of sustainable development.

Its a public establishment with commercial interest (EPIC) created by decree n°2016-612 of May 25, 2016 reorganizing the Centre National de Recherches sur l'Environnement (CNRE).

The **CNRE** has a food and water analysis laboratory (feed water and wastewater), a physicochemical analysis laboratory and a laboratory for biological experiments (malaria, others).

CENTRE NATIONAL DE RECHERCHES SUR L'ENVIRONNEMENT
Rue Rasamimanana Fiadanana,BP 1739. Antananarivo 101
Website: http://cnre.recherches.gov.mg/cnre/presentation.php

- **Relevant organisations across the African continent** and in Europe to host interns and apprentices with upstream and downstream players in the extractive industry.

- QMM https://www.riotinto.com/en/operations/madagascar/qit-madagascar-minerals
- Ambatovy SA (AMSA and DMSA): it has set up its own training center at its Tamatave processing site. https://ambatovy.com/en/
- Nextsources Materials Madagascar https://www.nextsourcematerials.com/
- Blackearthminerals https://eviongroup.com/maniry-project/
- And in general all mining companies operating in Madagascar and their mining equipment suppliers

6. Energy and digital transition: develop a strategy for the EU and Africa Partnership

Relations between the EU and Madagascar are dynamic. While Madagascar shares the values of the EU and our vision for global political priorities, a number of reforms remain to be implemented. The EU supports the country in its efforts to strengthen democracy and continues to assist it in matters of human development, resilience, and good governance.

Under Article 8 of the Cotonou Agreement, a periodic **political dialogue** is held between the Malagasy authorities, the Delegation of the European Union and its Member States with a view to exchanging information, encouraging mutual understanding and facilitate the definition of common priorities. This dialogue focuses primarily on the fundamental values and principles shared by the European Union and Madagascar, as well as all questions of general or regional interest.

One of the main axes of the European Union's foreign trade is the development of **bilateral trade** with third countries, concretized by free trade agreements. Europe is the first destination for Malagasy exports. The Big Island carries out 45% of its exports with the EU, while 20% of its imports come from the EU. The economic and commercial partnership aims to contribute to the increase in productive investments, the creation of jobs in Madagascar and the competitiveness of the Malagasy economy[42].

Two "**Team Europe Initiative**" programs to support the Great South of Madagascar have just been launched in Fort-Dauphin. These are two initiatives: "Green Deal" and "Renewable and Sustainable Energy" but which do not directly concern the mining sector.

The 2021-2027 multi-annual indicative program (MIP) for Madagascar should be based on the country's national development plan, the **Emergency Plan for Madagascar** (EPM), 2019-2023, which has not yet been formally approved. The framework for the MIP for 2021-2027 includes **three priority objectives**:

- **Governance and human development**: This area is based on an analysis of the evolution of the situation in Madagascar over the last ten years in terms of poverty, human development, and governance, which shows stagnation or even regression of indicators and an increase in inequalities. Madagascar is among the countries where access to quality social services is the weakest with strong inequalities between regions.
- **Sustainable growth and jobs**: This area aims to respond to one of the major challenges in Madagascar, which is to make economic growth contribute to job creation and the sustainable and inclusive improvement of the social and economic conditions of the population of Malagasy that is deeply marked by poverty. The business environment began to improve in Madagascar according to the Doing Business 2020 ranking, although there were still many indicators to improve.
- **Green Deal**: This area is supported by the analysis of the country's situation, strong demand from national authorities, and the achievements of EU rural development and environmental projects.

Support measures: the action of the EU Delegation in Madagascar in favor of civil society will be placed under the sign of a strategic partnership between the EU and CSOs. To achieve such a partnership, it is

[42] https://www.eeas.europa.eu/madagascar/lunion-europeenne-et-madagascar_fr?s=106

necessary to support civil society in order for it to become a real actor of governance, strong, legitimate, and structured, in favor of the consolidation of the rule of law, the culture of accountability, sustainable integrated development, and gender equality.

The EU will carry out targeted actions in favor of civil society such as:

- Accompany CSOs to move from a role of the basic service provider to a role of checks, balances and advocacy.
- Improve the legal and regulatory framework governing CSOs and support the empowerment of the common multi-donor support fund for civil society toward an entity permanent national.
- Create spaces for dialogue between the government and civil society to strengthen their role in the process of developing, monitoring implementing, and evaluating public policies.
- Contribute to creating a real civic space.

As part of the new Mining Code, strategic mining substances are of particular interest to the Nation in terms of their critical nature and geostrategic context, are referred to as Strategic Mining Substances. The **list of strategic substances** is set by regulation. The holder of a Permit containing strategic mining substances is authorized to sell on the national market or to export his production at the market price, subject to the State's right to determine the proportion of production that the holder must sell to national industry.

7. Opportunities for responsible investments

7.1. Identification of individual exploration, mining and refining projects

Investment opportunities for the development of a CRM value chain are mainly around mining production itself, through the development of local processing tools, but also through diversification of exploited minerals. Hereafter the project who could be of an interest for Europe:

1. Tantalus or Beravina (REE, Ta-Nb);
2. Green Giant (graphite ± V);
3. Millie's Reward (Li);
4. Toliara (heavy minerals, REE);
5. Molo, Maniry, Graphmada, Sahamamy or Vatomina (graphite);
7. Ambatovy (Ni, Co).

This proposed selection (detailed hereafter) covers different commodities and different stages of project development.

The training sector also requires investment or at least support, as an essential sector for skills development.

More broadly, as part of the institutional sector, support from the Malagasy State can be offered to improve the business environment.

Project Name	Location	Description	Resource estimate, reserves	Project phase and information level: scoping, prefeasibility, feasibility studies	What is investment needed for? e.g., exploration, infrastructure, construction (mine/ processing plants), expansion, ESG upgrade	Known offtake agreements?	Link to project web page
Green Giant Project (Nextsource materials)	Toliara Province, Fotadrevo village	Vanadium deposit (graphite) in metamorphosed black shales	Total Indicated resource is 49.5 Mt at 0.693% V_2O_5. The total Inferred resource is 9.7 Mt at a grade of 0.632% V_2O_5	Advanced Exploration	Exploration (metallurgical testwork)		https://www.nextsourcematerials.com/assets/green-giant-vanadium-project/
Toliara Project / Ranobe deposit (Base Resources)	45 km north of Toliara	Heavy mineral sands deposit Ti-Zr-(REE)	Mineral Resource of 2580 Mt at 4.3% heavy mineral (HM), with Ore Reserves of 904 Mt at 6.1% HM	DFS for Ti-Zr (not for REE/monazite yet)	Monazite (REE) recovery testwork, resolving social problems, construction		https://baseresources.com.au/our-assets/toliara-project/ https://toliarasands.com/?_ga=2.182618981.214574776.1689168313-2029223485.1689168313
Molo (Nextsource materials)	Toliara Province, Fotadrevo village	Graphite mine	Measured mineral resource of 23.62 Mt grading 6.32% C	Small scale production	Expansion	ThyssenKrupp (Tesla?)	https://www.nextsourcematerials.com/assets/molo-graphite-mine/
Graphmada (Greenwing resources)	100 km South Toamasina	Graphite mine	Mineral Resource of 61.9 Mt at 4.5% FC	Small scale production	Expansion		https://www.greenwingresources.com/graphmada
Millie Reward (Greenwing resources)	100 km South West Antananarivo	Li pegmatite exploration project	None	Greenfield exploration	Exploration		https://www.greenwingresources.com/millies-reward
Maniry (Evion)	SE Toliara	Graphite deposit	Probable Reserves 16.2 Mt @ 6.58% TGC; Indicated resources 16.7 Mt @ 6.9% TGC; Inferred	DFS (November 2022) – BFS underway	Construction	Anzaplan Germany?	https://eviongroup.com/maniry-project/

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			resources 23.3 Mt @ 6.1% TGC				
Marofody (DNI metals)	50 km South Toamasina	Graphite deposit	None	Exploration	Exploration		https://www.dnimetals.com/projects-2
Vohitsara (DNI Metals)	50 km south-southwest of Toamasina	Graphite deposit	Inferred resources (2019) 4 Mt @ 5% GC	Development	Pilot plant construction		https://www.dnimetals.com/projects-2
Sahamamy (Tirupati graphite)	70 km south Toamasina	Graphite mine	Total Mineral Resource 7.1 Mt @ 4.20% GC	Small scale production	Expansion		https://tirupatigraphite.co.uk/sahamamy-project/
Vatomina (Tirupati graphite)	70 km south Toamasina	Graphite mine	Total Mineral Resource 18.4 Mt @ 4.6% GC	Small scale production	Expansion		https://tirupatigraphite.co.uk/vatomina-project/
Beravina (DFR Gold)	220 km East Maintirano	Zirconium deposit with REE potential	Inferred Mineral Resources 1.5 Mt @ 15.3% ZrO_2	Exploration	Exploration		https://dfrgold.com/beravina-madagascar/

Table 28: List of mining projects proposed for investment opportunities.

7.2. ASM sector country profiles

Country profiles on ASM sector developments and investment

One of the core objectives of the AfricaMaVal is to identify investment opportunities in a number of commodities considered critical by the European Union, and there is a clear interest to include the ASM sector in the identification of such opportunities. The emphasis should be on identifying responsible investment opportunities that strengthen the artisanal sector's supply potential and address ESG impacts while also contributing to higher value addition and economic development.

To ease identification of opportunities, the following categories should be considered:

- Governance: focusing on the needs of the sector to strengthen its governance to ensure it contributes to socio-economic development. This could include support to government, knowledge sharing programmes, extension services to the ASM sector, etc.

- Support to existing initiatives: existing initiatives which focus on supporting the ASM sector to improve its social and economic impacts, and that could benefit from stronger / continued financing.

- Value chain projects (processing, trading, etc.): opportunities to support value addition projects which directly support and benefit the ASM sector.

- Small-scale mining projects: specific small-scale mining projects which might benefit from financing opportunities and investment (e.g., to improve mining techniques, production, environmental and social impact management.).

Conclusion

The complex and rich geological history of Madagascar led to build highly diversified geological settings. Numerous terranes encompass a promising geological potential for discovery various mineral deposits. There are currently many highly prospective areas and thousands of mineral occurrences, and most of these areas are virtually unexplored or underexplored. The main underexplored/unexplored ECRM potential are represented by lithium and graphite. It is noteworhty that nearly all other ECRMs, as well as many additional metals and minerals such as copper, platinum and nickel constitute a probable geological potential to be further investigated.

The results of our preliminary tests on mineral prospectivity mapping carried out on lithium, manganese and graphite on area mentioned by the Ministry are already particularly promising, but need to be further refined with the acquisition of new data (e.g. geological mapping on a more precise scale, geochemical and geophysical surveys).

Nowadays, very limited mines are in operation and, apart from Ambatovy nickel-cobalt mine, most only produce mineral concentrates exported directly abroad without any added value for the country.

Despite the richness of the mining context in Madagascar, large-scale mines are underdeveloped, processing units are rare and recycling activities are non-existent, except tailings recycling by ASM (The Ibity site, famous for its gemstone-rich pegmatite fields, is now converted into mica and spodumene mines). The ASM sector plays a significant role in the economy of Madagascar, and although ASM actors operate informally (the second-largest source of employment). The recent increased demand of lithium and favourable market prices has led many ASM actors to shift to the production on lithium-bearing minerals. Trading mainly involves Indian and Chinese traders, who export unprocessed and low concentrations of lithium ores. In addition, the ASM sector has also been producing manganese, mainly sold to Asian traders.

Along this value chain, there are several bottlenecks and interdependencies that can affect the efficiency and productivity of the mining sector. Infrastructure are underdeveloped. Mining companies has to ensure their own energy production and national roads are in an advanced state of degradation. However, 2 deep-water ports propose modern facilities.

Regarding the fiscal, legal and regulatory context, the mining code had been frozen for 12 years and the context was not favourable until 2023. Tax regime related to the Mining sector had been reviewed and approved in 2023, and the mining activities should therefore increase significantly. Since 2020, Madagascar is experiencing a sharp contraction of - 7.1% in the economy due to the economic impact of pandemic closures on Madagascar’s mining, tourism, transport, and service sectors. Growth had started to recover in 2021 but was interrupted again in 2022 by a third wave of the pandemic followed by a sequence of severe weather events and the adverse effects of the war in Ukraine. While the government is friendly to foreign investment in mining, it hasn't actively sought it due to political instability. The governance of the mining sector has been deeply disrupted following numerous crises that the country has experienced periodically from 1972-2009. However, the government of Madagascar has collaborated with various partners in acting to reverse this trend.

So far, no Malagasy company is ESG certified. However, major mining companies like Ambatovy SA and Rio Tinto/QMM SA are incorporating the ESG indicators into their decision-making processes. Nevertheless, Madagascar has been committed to implementing the EITI Standard, a global standard on transparency and good governance in extractive activities, since 2007.

The Malagasy's mining sector encompasses both formal and informal players across the upstream and downstream segments of the business ecosystem. Formal upstream players first of all include Government Ministries. Informal upstream players first of all include ASM engaged in manual or semi-mechanised mining activities, but most of them are dedicated to gemstones.

Relations between the EU and Madagascar are dynamic. While Madagascar shares the values of the EU and our vision for global political priorities, a number of reforms remain to be implemented. The EU supports the country in its efforts to strengthen democracy and continues to assist it in matters of human development, resilience, and good governance.

Seven project opportunities, mainly dedicated to the Large-scale Mining sector had been identified within the framework of this report. Geological mapping combined with airborne geophysics and geochemical and mineral assessment in specific CRM districts should be the entry point for a better understanding of the resource. The training sector also requires investment or at least support, as an essential sector for skills development. More broadly, as part of the institutional sector, support from the Malagasy State can be offered to improve the business environment.

References

AWIMA (2023). AfricaMaVal Deliverable 4.1 Report on mining regimes with respect to ESG objectives

Blengini, G.A., Latunussa, C.E.L., Eynard, U., Torres de Matos, C., Wittmer, D., Georgitzikis, K., Pavel, C., Carrara, S., Mancini, L., Unguru, M., Blagoeva, D., Mathieux, F., Pennington, D., 2020. Study on the EU's list of Critical Raw Materials (2020). Final report. European Commission, ISBN 978-92-76-21049-8, doi: 10.2873/11619, 158 p.

Kaufmann, D., Kraay, A., Mastruzzi, M., 2010. The Worldwide Governance Indicators: Methodology and Analytical Issues. World Bank Policy Research Working Paper 5430.

Arvis et al., 2018. Connecting to Compete 2018. Trade Logistics in the Global Economy. The Logistics Performance Index and Its Indicators. The International Bank for Reconstruction and Development/The World Bank, 82 p.

Carranza E.J.M., 2017. Natural resources research publications on geochemical anomaly and mineral potential mapping, and introduction to the special issue of papers in these fields. *Natural Resources Research 26*(4), 379-410.

Control Risk, May 2023. Assessment: Madagascar. Confidential. 11p.

Ernst & Young Madagascar, May 2023. Legal and tax review report. Confidential. 41p.

Roig, J.-Y., Tucker, R.D., Peters, S.G., Théveniaut, H., Delor, C., 2013. Cartes géologique et métallogénique de la République de Madagascar à 1/1 000 000. Rapport BRGM/RP-62330-FR, 17 p.

WR Consultants, avril 2023. Analyse des textes legislatifs et reglementaires - Etude de cas portant sur Madagascar. 62p.

WR Consultants, août 2023. Inventaire des chaînes de valeur. Etude de cas : Madagascar. 211p.

WR Consultants, septembre 2023. Promotion et habilitation des acteurs locaux. Etude de cas : Madagascar. 55p.

Websites for macroeconomic analysis

Coface, 2022. Economic analysis - Madagascar. Retrieved from Coface: https://www.cofacecentraleurope.com/Economic-analysis/Madagascar

Export Entreprises, 2022. Madagascar: Investing in Madagascar. Retrieved from LLoyds Bank: https://www.lloydsbanktrade.com/en/market-potential/madagascar/investment

IMF - International Monetary Fund, 2022. Republic of Madagascar: First Review Under the Extended Credit Facility Arrangement-Press Release; Staff Report; and Statement by the Executive Director for Republic of Madagascar.

IMF, International Monetary Fund, 2022. Première et deuxième revues de l'accord élargi au titre du mécanisme élargi de crédit, demandes de dérogations pour le non-respect de critères de réalisation, et examen des assurances de financement.

International Trade Administration, 2022. Madagascar - Country Commercial Guide. Retrieved from International Trade Administration: https://www.trade.gov/country-commercial-guides/madagascar-market-overview?section-nav=10657

U.S. Department of States, 2019. 2019 Investment Climate Statements: Madagascar. Retrieved from U.S. Department of States: https://www.state.gov/reports/2019-investment-climate-statements/madagascar/

World Bank, 2022. The World Bank in Madagascar. Retrieved from World Bank: https://www.worldbank.org/en/country/madagascar/overview

Websites for Best Practices (WP4):
https://ambatovy.com/en/
https://www.riotinto.com/Operations/madagascar/qit-madagascar-minerals
https://toliarasands.com/fr/

References for Legal and Financial overwiew (WP3)

Law n° 2001-031 of October 8, 2002, establishing a special regime for major investments in the Malagasy mining sector (LGIM) amended by Law n°2005-022 of October 17, 2005
Law n° 99-022 of August 19, 1999, on the Mining Code, amended by law n° 2005-021 of October 17, 2005
Decree n° 223-335 of March 31,2023 on the legal status of EITI Madagascar
Decree n° 2022-293 of March 09, 2022, on the provisional allocation of financial resources from the Provinces to the Communes and Regions
Decree n° 2019-1909 of October 02, 2019, establishing the powers, organization and operation of the provincial committees and the national mining committee
Decree of June 30, 2015, setting the Gold Regime
Decree n° 2015-663 of April 14, 2015, creating and establishing the statutes of the National Agency for the Gold Sector (ANOr)
Decree n° 2014-1590 of October 07, 2014, amending certain provisions of Decree n° 2000-308 of May 10, 2000, creating, and establishing the statutes of the Mining Cadastre office in Madagascar
Decree n° 2010-023 of January 25, 2010, amending certain amendments to Decree n° 2006-910 of December 19, 2006, setting out the application of the mining code
Decree n° 2006-910 of December 19, 2006, setting the terms and conditions for application of amended Law n° 99-022 of August 19, 1999, amended by Decree n° 2020-1000 of August 20, 2020, on the distribution of administrative costs, royalties and mining rebates
Decree n° 2004-167 of February 03, 2004, concerning the compatibility of investments with the environment
Decree n° 2003-784 of July 08, 2003, implementing the Law on major mining investments

Mining activities	Decree n° 2001-688 of August 03, 2001, setting the conditions for application of certain provisions of Law n° 99-022 of August 19 on the mining code
	Decree n° 2000-308 of October 02, 2000, creating and establishing the statutes of the Mining cadastre Office (BCMM), supplemented by Decree n° 2017-175 of March 16,2017 annexing decree n° 2000-308 of May 10,2000 establishing the statutes of the Mining Cadastre Office (BCMM)
	Order n° 9770/2020 Fixing the amount of the fee for the issuance of an Exclusive authorization to reserve a perimeter (AERP) and the mining administration fees for the year 2020
	Order n° 8902/2018 of April 12, 2018, defining the perimeter, the classification of the Communes concerned as well as the rates of distribution of the Mining Rebates by communities benefiting from the Project of Ambatovy
	Order n° 1455/2016 defining the procedures for granting approval to gold comptoirs and model specifications
	Interministerial Order n° 1454/ 2015 of January 20, 2016, defining the model for the various documents relating to collection activities
	Order n° 1453/2016 of January 20, 2016, defining authorized equipment and the model for various documents relating to gold panning
	Order n° 2015/28066 of September 07, 2015, declaring gold stocks held by private individuals
	Order n° 8887/2014 of February 21, 2014, defining the terms and conditions for the distribution and use of mining rebates from certain mining projects
	Order n° 9874/2013 amending certain provisions of Interministerial Order n° 52005/2010 of December 20, 2010, amending Interministerial Mine-Forests Order n° 18633/2008 of October 17,2008 placing sites covered by Order n° 17914/2006 of October 18,2006 under temporary global protection and lifting the suspension of the granting of mining and forestry permit for certain sites
	Order n° 7902/2013 of April 09, 2013 laying down the technical characteristics of operating procedures and the tools, materials and equipment authorized for small-scale mining activities
	Order n° 7903/2013 of April 09, 2013 laying down the standard . articles of association for groups of small-scale miners and groups of gold panners
	Order n° 7904 of April 09,2013 on mining product collection activities
	Order n° 14519/2013 of July 05,2013 setting the terms for calculating transaction amounts for mining offenses.
	Order n° 28088/2012 of October 19,2012 setting the terms and conditions for approving private laboratories and experts for quality certification of mining substances and hallmarking
	Order n° 5470/2012 of March 30,2012 setting the model activity report for each type of mining permit
	Interministerial Order n° 14-421/2008 setting the transitional collection terms for royalties and rebates on mining substances intended for exploitation
	Order n° 8186/2008 of April 09,2008 amending the calculation of the period of validity of mining permit
	Order n° 10901/2007 of July 04,2007 setting the flat-rate fees levied by the BCMM for each registration of operations affecting the rights allocated in the mining permit
	Interministerial Order n° 21.985/2007 setting out the procedures for collecting mining royalties and rebates

	Order n° 4851/2001 of April 18,2001 setting the basis for the mining royalty on certain mining products
	Settlement agreement between QMM-SA and the Malagasy Government
Trading company	Law n° 2014-04 of September 04,2014 on commercial companies with public shareholdings
	Law n° 2001-026 of September 03,2004 on partnership contracts and civil partnerships
	Law n° 2003-036 of January 30,2004 on commercial companies, amended and supplemented by Law n° 2008-032 of December 17,2008 and Law n° 2014-010 of August 21,2014
	Decree n° 2011-050 of February 01,2011 amending Decree n° 2005-151 of March 22,2005 and Decree n° 2004-453 of April 06,2004 setting the conditions for application of Law n° 2003-036 of January 30,2004 on commercial companies
	Decree n° 2008-440 of May 05,2008 on the trade and companies register and the publicising of movable property credit
	Decree n° 2005-151 of March 22,2005 amending certain provisions of Decree n° 2004-453 of April 6,2004 setting the conditions for application of Law n° 2003-036 of January 30,2004 on commercial companies
	Decree n° 2004-453 of April 06,2004 setting the terms and conditions for the application of Law n° 2003-036 of January 30,2004 on commercial companies
Changes	Law n° 2006-008 of August 02,2006 on the Foreign Exchange Code
	Decree n° 2017-122 of February 21,2017 setting the terms and conditions for access to the integrated foreign exchange management system
	Decree n° 2016-1349 of November 08,2016 on the creation, organization and operation of the National Committee on Trade Facilitation
	Decree n° 2009-048 of January 12,2009 setting out the terms and conditions for the application of Law n° 2006-008 of August 02,2006 on the Foreign Exchange Code, amended by Decree n° 2022-1183 of August 10,2022
	Circular n°755-2018 of August 30,2018 on foreign exchange allocations
	Order n° 13312/2015-MFB/SG/DGT/DOF/SSOC of April 02,2015
Taxation	Tax convention between Madagascar and Morocco
	Tax convention between Madagascar and Mauritius
	Tax convention between Madagascar and France
	Tax convention between Madagascar and Canada
	Tax Code 2023 following LFI n° 2022-015 of December 22,2022
	Tax procedure codes following LFI n° 2022-015 of December 22,2022
Customs	Customs code 2023 following LFI n° 2022-015 of December 22,2022
Labor	Convention N° 97 on Migration for Employment of January 22,1952
	Law n° 2008-031 of December 31,2018 authorizing the ratification of Convention n° 143 on migrant workers
	Law n° 2003-044 of July 28,2004 on the Labor Code
	Decree n° 2014-1355 of August 21,2014 acceding to the International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families.
	Decree n° 69-145 of April 8,1969 establishing the Social Security Code

	Interministerial Order n° 5410/99 of June 3,1999 amending Decrees n° 1703 - VP/TR/F of April 23,1969 and n° 2431 - TR/F of June 17,1969 setting the rates of contributions due to the Caisse Nationale de Prévoyance Sociale and regulating the distribution key for these rates
	Order n° 2806 of July 8,1968 organizing company medicine
Immigration	Law n° 1962-002 of June 6,1962 on the organization and control of immigration
	Decree n° 1994-652 of October 11,1994 repealing the implementing decree for law n° 1962-002 on the organization and control of immigration
Investment	Agreement on the reciprocal protection and promotion of investments between Madagascar and South Africa, dated September 22,2006 and ratified by the Law n° 2007-003 of July 27, 2007
	Agreement on the reciprocal protection and promotion of investments between Madagascar and the Federal Republic of Germany, signed on April 8,2006 and ratified by the Law n° 2007-006 of July 27,2007
	Agreement on the Protection and Promotion of Reciprocal Investments between Madagascar and the People's Republic of China, concluded on November 4,2005 and ratified by the Law n° 2006-027 of November 24,2006
	Agreement on the reciprocal encouragement and protection of investments between Madagascar and the Belgo-Luxembourg Economic Union concluded on September 29,2005 and ratified by the Law n° 2006-008 of November 24, 2008
	Agreement on the reciprocal encouragement and protection of investments between Madagascar and France of January 14,2005, ratified by the Law n° 2004-043 of January 14,2005
	Agreement on the protection and promotion of investment between Madagascar and Mauritius dated April 06,2004, ratified by the Law n° 2005-001 of May 25,2005
	Agreement on the protection and promotion of investment between Madagascar and Norway dated September 28,1967
	Agreement on the protection and promotion of investment between Madagascar and Denmark dated July 26,1967
	Agreement on the protection and promotion of investment between Madagascar and Sweden dated June 23,1967
	Agreement on the protection and promotion of investment between Madagascar and Germany dated March 21,1966
	Agreement on investment protection and promotion between Madagascar and Switzerland dated March 31,1966
	International Convention on the Settlement of Investment Disputes between States and Nationals of Other States signed in Washington in 1965
	Law n° 2007-036 of January 14, 2008, on investments
	Law n° 2005-022 of October 17,2005 amending certain provisions of Law n° 2001-031 of 08/10/2002 establishing a special regime for major investments in the Malagasy mining sector (LGIM)
	Law n° 66-011 of July 05,1966 authorizing ratification of the Convention on the settlement of investment disputes between States and nationals of other States

	Decree n° 99-954 of December 15,1999 on making investments compatible with the environment, amended by Decree n° 2004-167 of February 03,2004 on making investments compatible with the environment. (Decree MECIE)
	Circular n° 5286 of August 04,1987 supplementing Circular n° 28046 of 25/11/1972 setting out the terms and conditions for the application of Order n° 4100 of 25/11/1972 relating to foreign investment in Madagascar
Dispute resolution	Code of Civil Procedure amended and supplemented by Law n° 97-038 of October 30,1997, Law n° 2001-022 of 09 April 2003, Law n° 2015-035 of February 03,2016, Law n° 2016-039 of January 25,2017 and Law n° 2017-012 of July 18,2017 amending and supplementing the provisions of the Code of Civil Procedure instituting a special procedure for small civil and commercial disputes
	Law n° 66-022 of December 19,1966 promulgating the second, third and fourth parts of the Code of Civil Procedure and amending certain articles of the first part of the said code
	Law n° 59-006 of September 23,1959 amending art. 146 of the Code of Civil Procedure and art. 62 of Decree n° 198 of 11/06/56 (modern Malagasy civil procedure and traditional Malagasy civil procedure)
	Ordinance n° 60-107 of September 27,1960 reforming the organization of the judiciary and the Code of Civil Procedure and creating a court of appeal in each provincial capital, amended by Ordinance n° 76-014 of May 17,1976.
	Ordinance n° 62-041 of September 19,1962 on general provisions of domestic law and private international law
	Order n° 62-058 of September 24,1962 promulgating a code of civil procedure

APPENDICES

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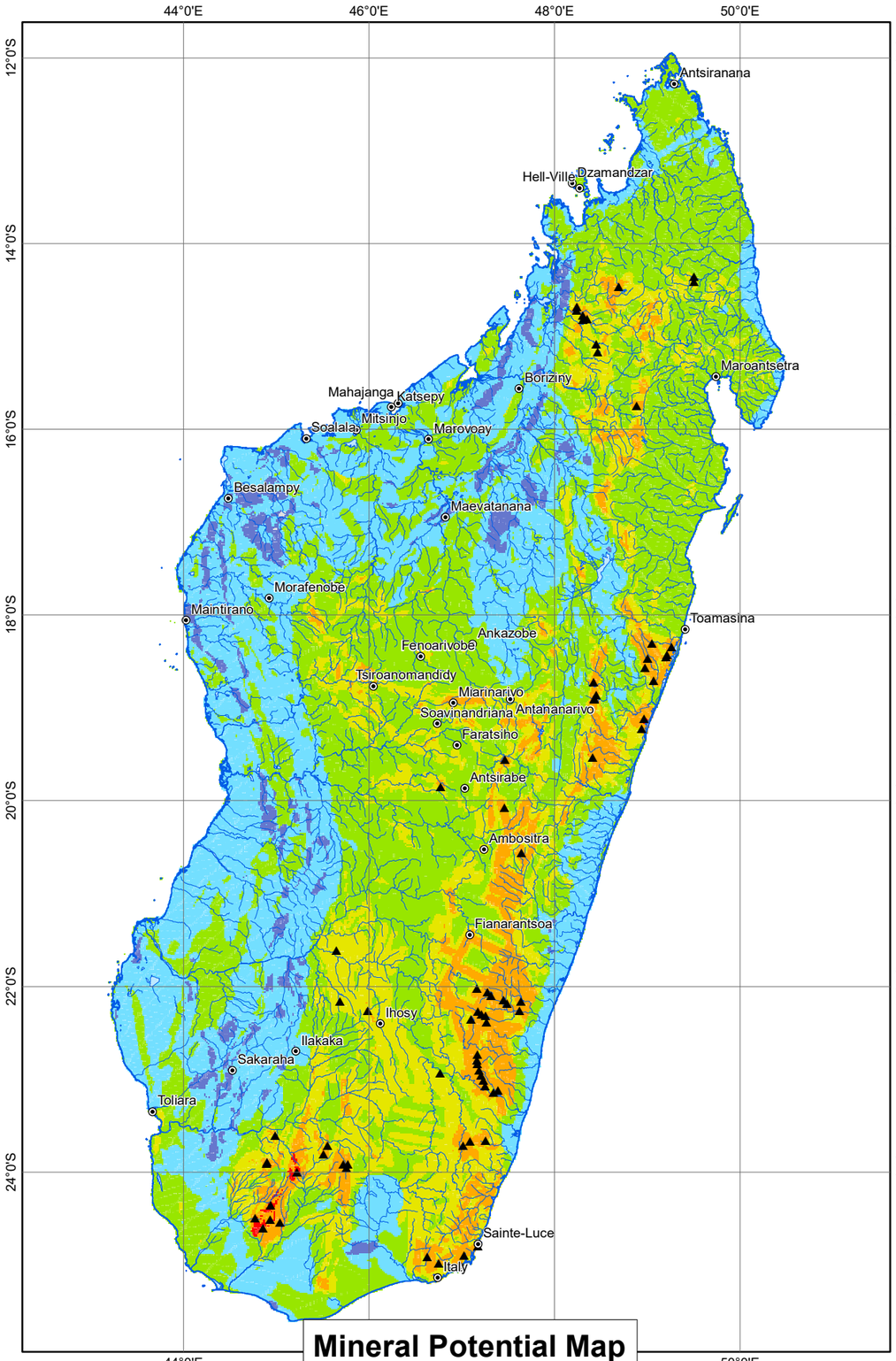
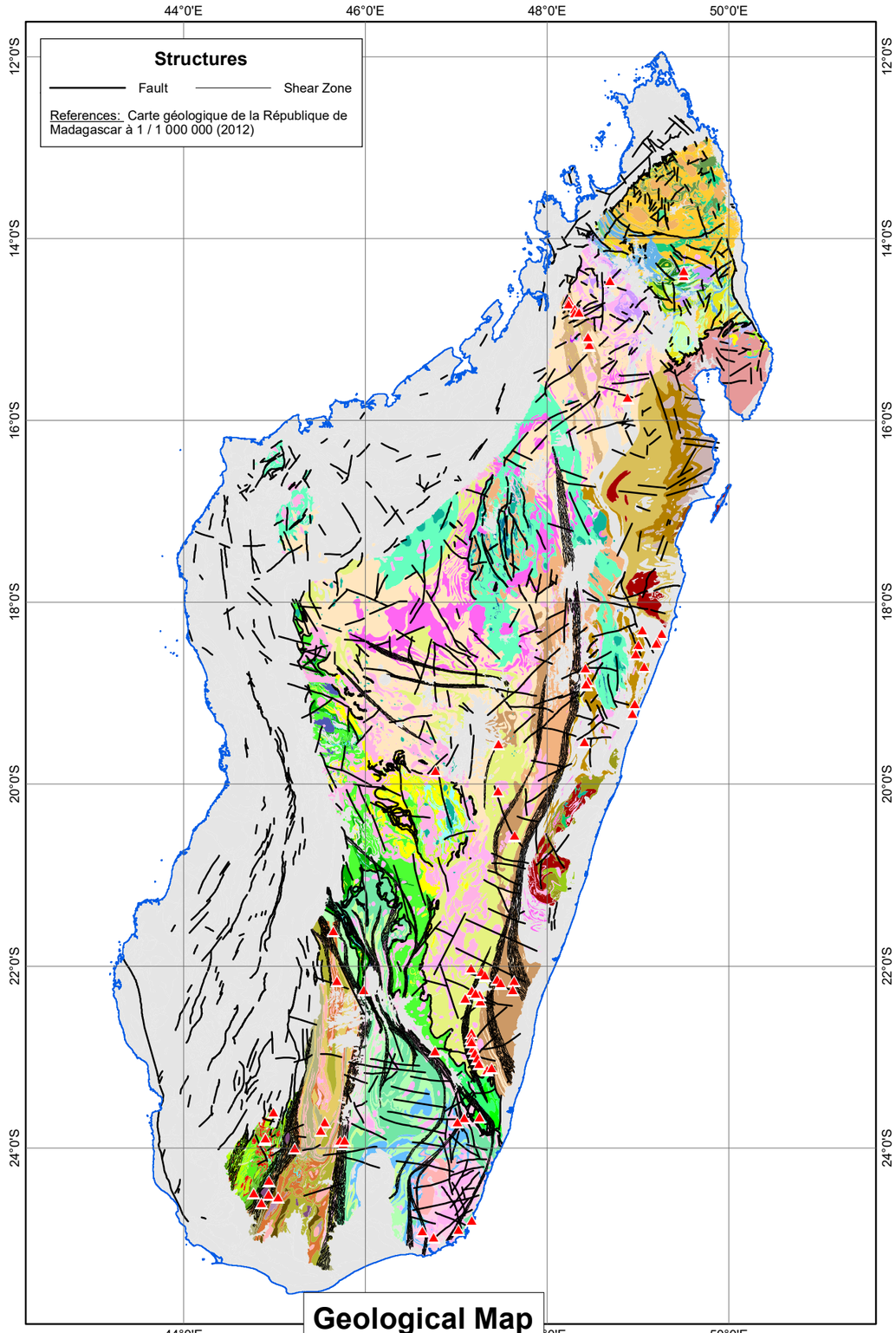
Country: MADAGASCAR

MINERAL POTENTIAL MAP - *GRAPHITE (Gr)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

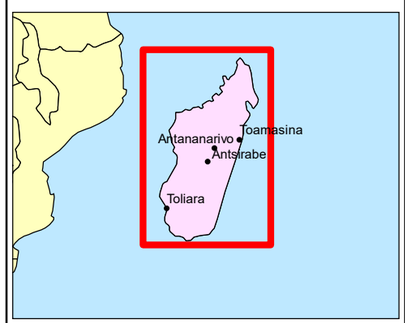
Known occurrences

▲ ▲ Graphite (Gr)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 182100 84.49% Non-occurrence in database Non-occurrence predicted	False positive Cells: 31540 14.64% Non-occurrence in database Occurrence predicted
False negative Cells: 77 0.04% Occurrence in database Non-occurrence predicted	True positive Cells: 1783 0.83% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.51
Cell size: 1667 m



N

0 50 100 200 Km

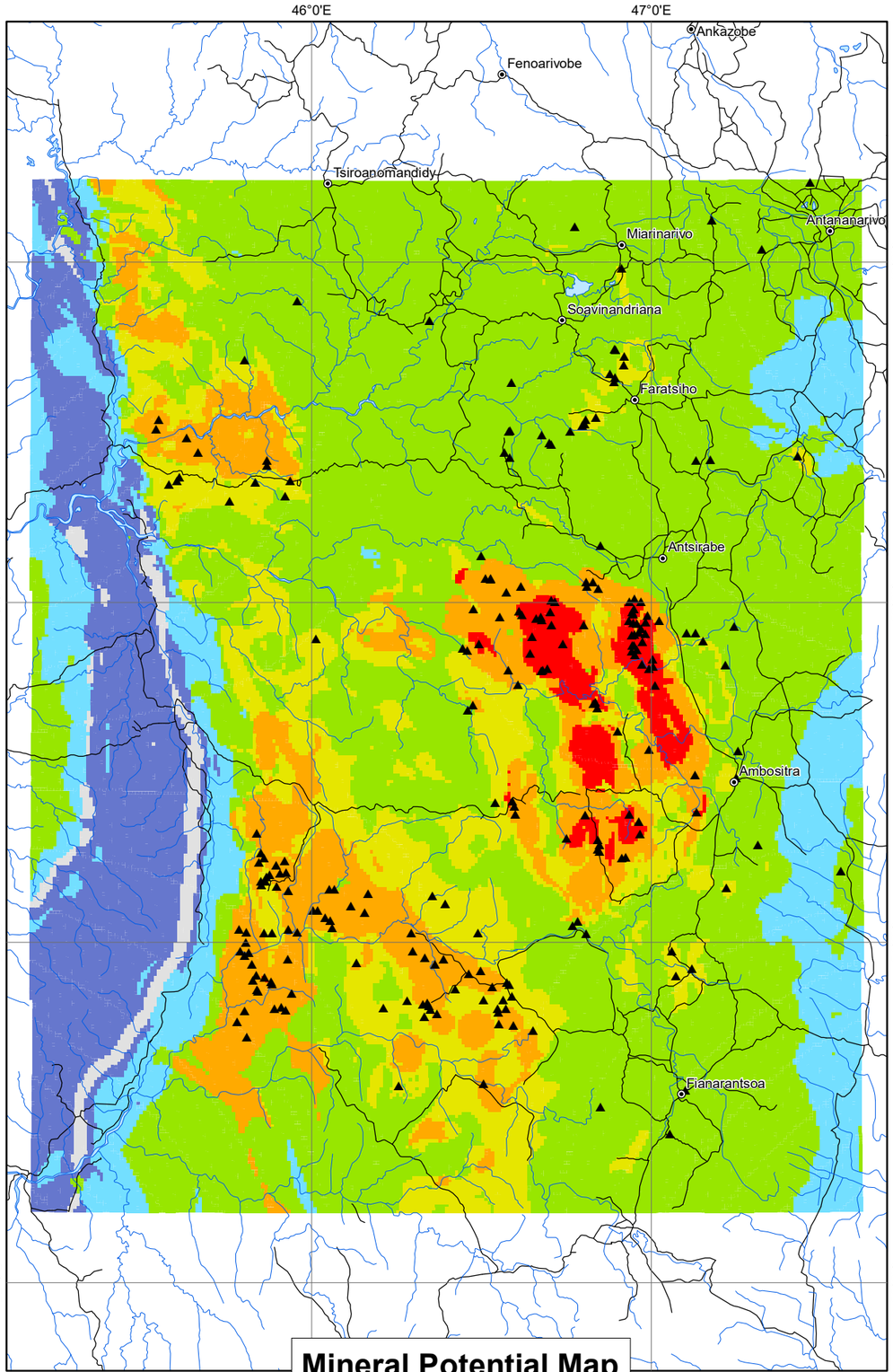
Datum : WGS84 (World Geodetic System 1984)

January 2024

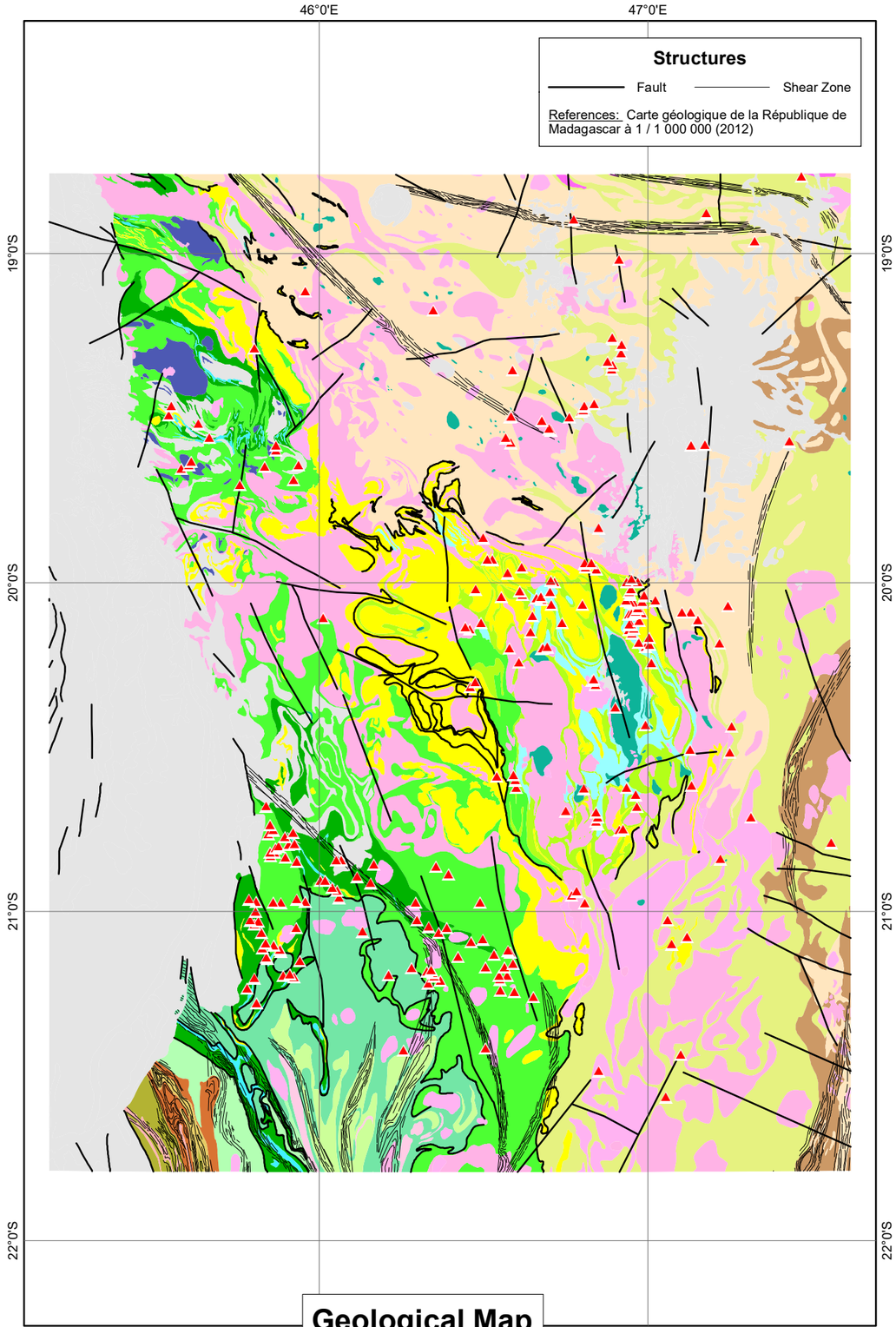
Géosciences pour une Terre durable
brgm

Country: MADAGASCAR (Antsirabe)

MINERAL POTENTIAL MAP - *LITHIUM (Li)*



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

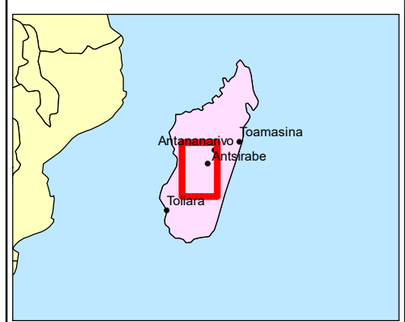
Known occurrences

Lithium (Li)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 67708 78.93% Non-occurrence in database Non-occurrence predicted	False positive Cells: 13508 15.75% Non-occurrence in database Occurrence predicted
False negative Cells: 1332 1.55% Occurrence in database Non-occurrence predicted	True positive Cells: 3231 3.77% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.44
Cell size: 1000 m



N

0 20 40 80 Km

Datum : WGS84 (World Geodetic System 1984)

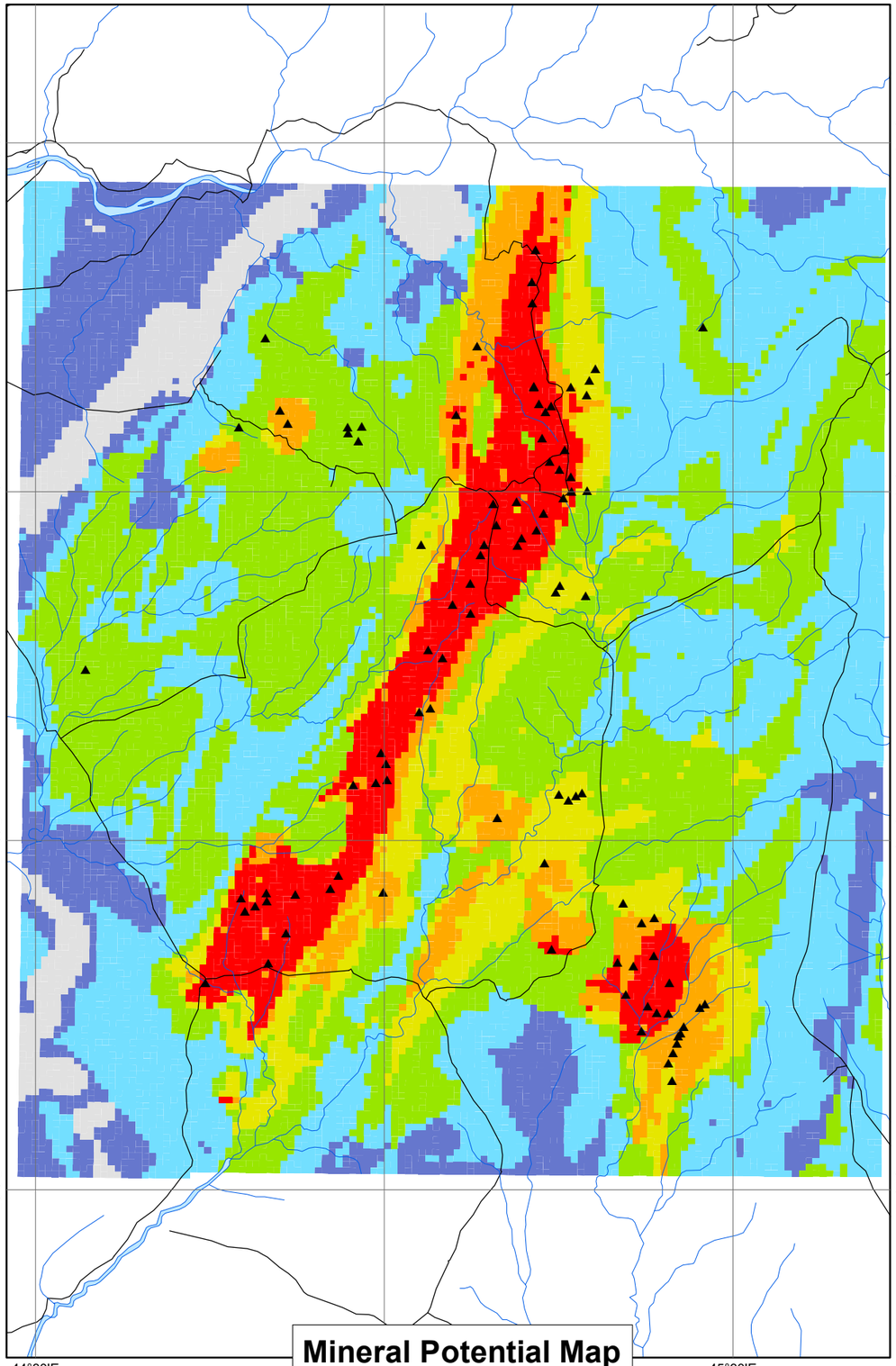
January 2024

Géosciences pour une Terre durable
brgm

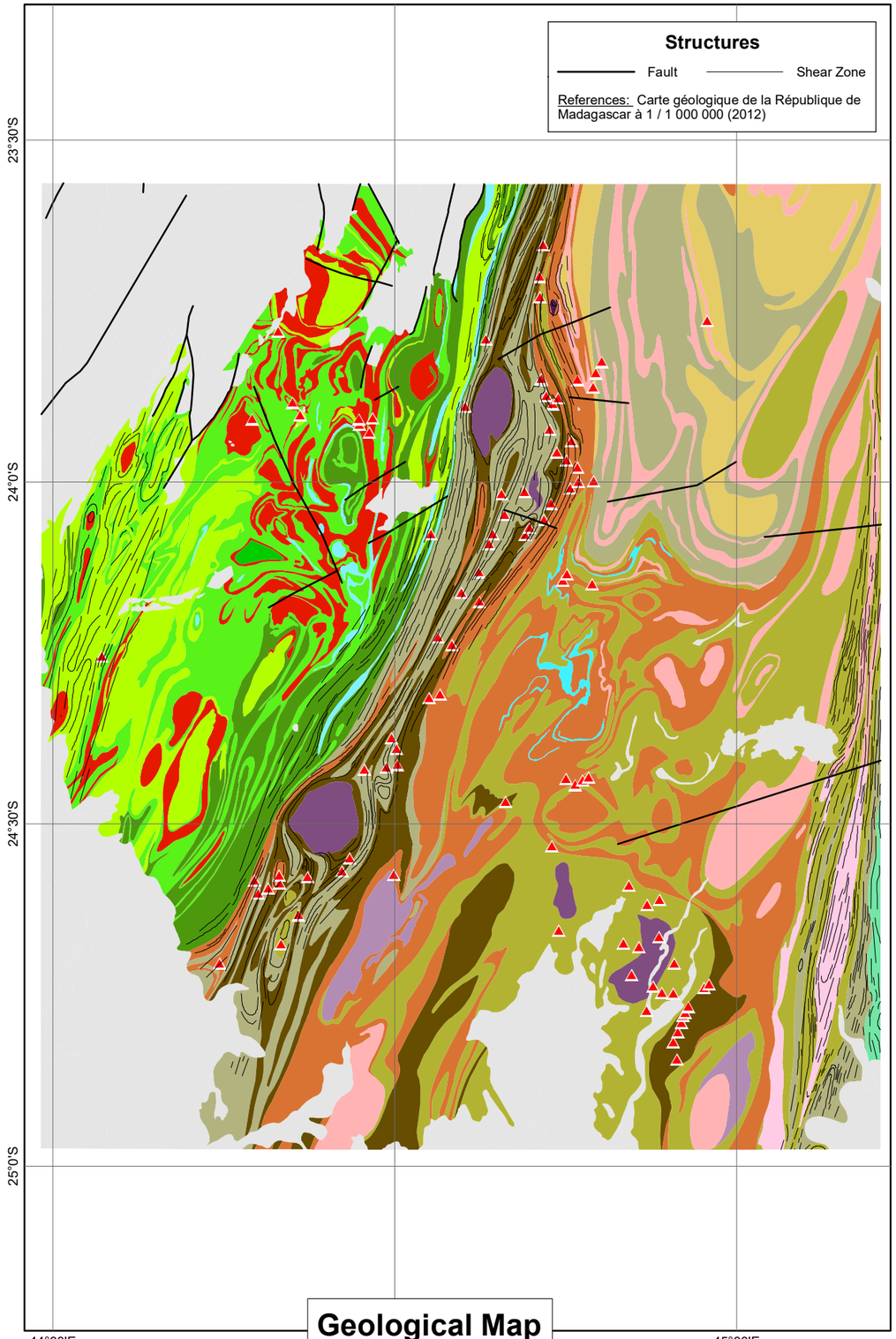
Country: MADAGASCAR (Ampanihy)

MINERAL POTENTIAL MAP - *MANGANESE (Mn)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

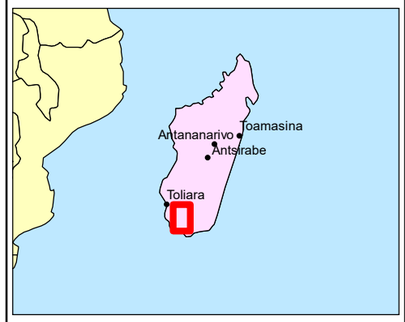
Known occurrences

Manganese (Mn)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 15931 80.71% Non-occurrence in database Non-occurrence predicted	False positive Cells: 2082 10.55% Non-occurrence in database Occurrence predicted
False negative Cells: 412 2.09% Occurrence in database Non-occurrence predicted	True positive Cells: 1312 6.65% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.41
Cell size: 1000 m



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0 10 20 40 Km

Datum : WGS84 (World Geodetic System 1984)

January 2024

Géosciences pour une Terre durable
brgm

Horizon Europe Framework Programme (HORIZON)

D9.3 – MOROCCO case study

WP9 - Task 9.4

Date [19/12/2023]

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Table of Contents

1. Extended Critical Raw Materials (ECRM) supply potential of Morocco 9
1.1. Inventory of the ECRM 9
1.1.1 Geological setting 9
1.1.2 Known Ore deposits and occurrences 12
1.2. Prospectivity and mineral high potential mapping 15
1.2.1 Selection of the ECRM for mineral prospectivity 15
1.2.2 Mineral high potential areas 16
1.3. Ore processing and refining capacities 20
2. Assessment of the ECRM value chain 23
2.1. Characterization of the value chain for primary and secondary raw materials 23
2.1.1 List of the mining and recycling projects 23
2.1.2 Existing ESG indicators 24
2.1.3 Status of economic links between the formal and informal sectors 24
2.2. Identification of the bottlenecks along the value chain 25
3. Investment/financing prospects for ECRM projects in Morocco 29
3.1. Fiscal, legislative and regulatory context for in-country financings 29
3.2. Macroeconomic context for in-country financings 31
3.3. Political context for in-country financings 35
4. Assessment of social, environmental, and governance challenges 38
4.1. Country-level assessment and context 38
4.1.2. Mineral and Mining Policies 39
4.1.3. Mining Regulations 39
4.1.4. Taxation and Royalties 40
4.1.5. Land-use and Mineral Rights 41
4.1.6. Environment 42
4.1.7. Societal and Community Aspects, Cultural Heritage 43

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4.1.8. Public Health and Safety 43
4.2.Mining practices vs. Environmental, Social and Governance (ESG) goals 44
4.2.1 Environmental challenges 44
4.2.2 Socio-economic issues 45
4.2.3 What would be the best practices for a responsible mining? 45
5. Business network between the European Union and Morocco 47
5.1. Assessment of the upstream and downstream business ecosystem 47
5.1.1 Context, formal and informal players 47
5.1.2 Relationships at local or regional levels 48
5.2.Building new B2B relations 49
5.2.1 Promoting local content and enabling mining cluster actors 49
6. Energy and digital transition: develop a strategy for the EU and Africa Partnership 51
7. Opportunities for responsible investments 53
7.1. Identification of individual exploration, mining and refining projects 53
7.2. ASM sector country profiles 54
Country profiles on ASM sector developments and investment 54

List of Figures

Figure-1: Physiography of northwestern Africa with limits of the main natural regions and young 9
Figure-2: Tectonic map showing the northern part of the West African Craton (WAC) and the adjoining fold belts. 10
Figure-3: Geological map of southern Morocco showing the main structural domains and lithological units along with location of Oulad Dlim massif (ODM) within the Souttoufide belt (i.e., Northern Mauritanides) and western Reguibat shield 11
Figure--4: Mineral occurrences in Morocco overlaying simplified map of geological ages (source SIGAfrique). 14
Figure-5: Main processing units. 21
Figure 6: Government Effectiveness and the Control of Corruption 25
Figure -7: Government Effectiveness, political stability rule of law and the Control of Corruption ranks 26

Figure -9: Historical GDP 31
Figure -10: Morocco GDP and Debt 33

List of Tables

Table 1: List of the main active mines. 15
Table 2: List of the main processing units. 22
Table 3 : List of the main ECRM mining units 24
Table 4: Common Investment Incentives (Ernest & Young, December 2023) 30
Table 5: Projected economic growth 32
Table 6: The various licence / permit types / authorisations available for the mining sector of Morocco. 40
Table 7: Permit fees per licence type 40

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Abbreviations and Acronyms

Acronym	Description
CADETAF	Central Buying and Development of the mining region of Tafilalet and Figuig
CTT	Compagnie de Tifnout Tighanimine
DBA	Disc-based association
ECRM	Extended Critical Raw Materials
EIA	Environmental Impact Assessment
EITI	Extractive Industries Transparency Initiative
ESG	Environmental, social and governance
GDP	Gross domestic product
ILO	International Labour Organisation
IMACID	Indo Maroc Phosphore S.A
MEM	Ministry of Energy, Mines and Sustainable Development
MPM	Mineral Predictivity Mapping
NWP	National Water Plan
OCP	Office chérifien des phosphates
ONA	Omnium nord-africain
ONHYM	Office national des hydrocarbures et des mines / National Office of Hydrocarbons and Mines
RF	Random Forest
SEIAs	Social and Environmental Impact Assessments
WP	Work Package

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Executive Summary

This report provides the reader with an overview of the key aspects regarding mineral resources, supporting regulations and institutions, as well as any related provisions in the prospecting of Critical Raw Materials (CRMs) in Morocco. The report is an integral part of the larger AfricaMaVal project and, in that context, provides this country overview specifically aimed at European Union (EU) investors and decision-makers.

AfricaMaVal is focusing on the minerals and metals present in the fourth list of CRMs for the EU as well as on Copper (Cu), Nickel (Ni), Tin (Sn) and Manganese (Mn) that are particularly pertinent considering Africa's geological potential and their critical status in the digital and energy transitions. Morocco hosts some of the ECRM such as Phosphate and Phosphate rocks, Cobalt, Fluorspar, Barite, Tin, Antimony, REE and Copper and in this case study report it was explained the availability of these raw materials and the market possibilities ensuring the European market in various strategic and critical minerals from Morocco resources.

The report will also include value chain of the ECRM, therefore activities such as exploration, extraction, processing, and recycling will be evaluated. Fiscal regulation as well as the macroeconomic and political context will be scanned to give an overview of the country regime. Environmental, social and governance (ESG) regulations and challenges will be depicted for the investors to better understand the background and questions to address when it comes to launch activities on the ground. A list of downstream to upstream actors related to the mining sector will assist deciders to build their Business to Business network. This country profile will try to address the needs of the EU green deal according to the country strategies and planification.

Eventually, this report will underline some project opportunities or recommendations.

Acknowledgements

This work was done for the EU-funded horizon project on Critical Raw Materials (CRMs) entitled "Building EU-Africa Partnerships on Sustainable Raw Materials Value Chain", acronymed "AfricaMaVal".

The authors acknowledge the input and support provided by all the local contractors who participated in key relevant information dedicated to the minerals value chain sector. A special mention goes to the following:

- Ernst and Young Morocco for providing the overview on the fiscal, legislative and regulatory context.
- MiningFile for their assistance regarding the actors of the ECRMs whole chain and institutions dedicated to the mining sector.
- Control Risk for providing the overview on the political context.

Keywords

ECRM, Mineral potential, Ore processing, Refining capacities, Recycling units, Value chain, Primary raw material, Secondary raw material, Bottlenecks, Finance, Investment, Sustainability, ESG, Land-use, Taxation, Mining regulation, Mining policies, Child labour, Responsible extraction, Morocco, Pan-African

Wording

Mineral prospectivity: “Mineral potential mapping is concerned with quantifying and mapping the likelihood that mineral deposits are present in a study area. It is synonymous to mineral prospectivity mapping, which is concerned with quantifying and mapping the likelihood that mineral deposits may be found by exploration in a study area.”

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1. Extended Critical Raw Materials (ECRM) supply potential of Morocco

1.1. Inventory of the ECRM

1.1.1 Geological setting

Morocco is located at a triple junction between a continent (Africa), an ocean (the Atlantic) and an active plate collision zone (the Alpine belt system). This results in a rugged topography with a wide range of outcropping terranes spanning from Archean to Cenozoic in age, as well as diverse tectonic systems from sedimentary basins to metamorphic fold belts. It is characterised by three geological domains: The Rift Domain, The Atlas Domain and the Meseta and The Shara and Anti-Atlas Domain. The Rif domain is dominated by Alpine belt, the Atlas and Meseta consists of the epi-Variscan platform and the Mesozoic and Cenozoic cover, the Sahara and Anti-Atlas domain is where the Archean terrains occur in the south and SE and in the north is where the Proterozoic and Paleozoic formations occur.

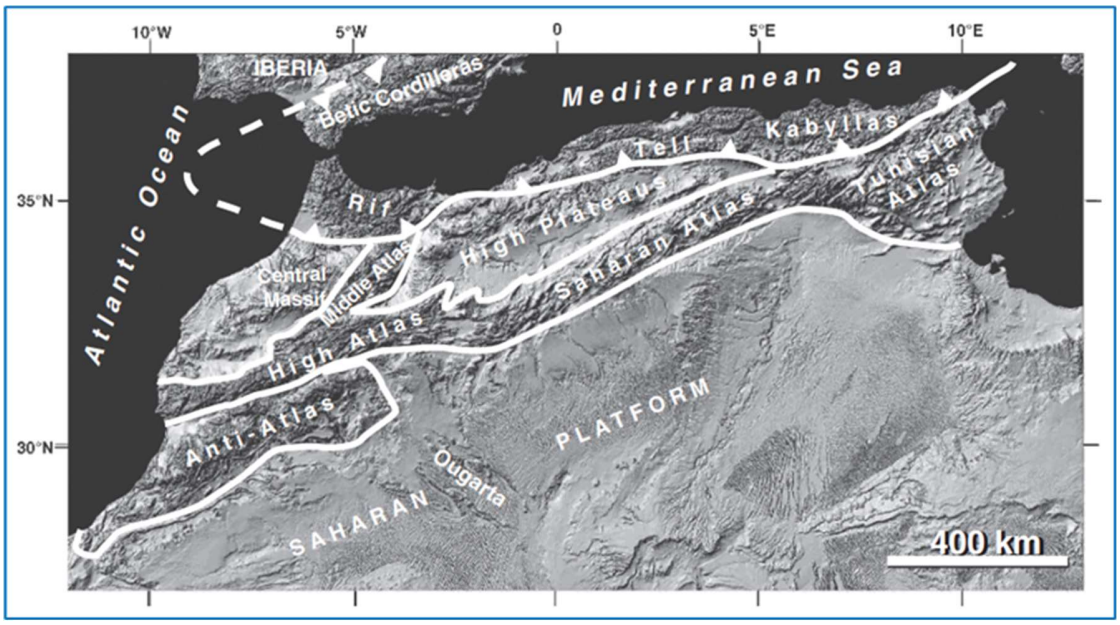


Figure-1: Physiography of northwestern Africa with limits of the main natural regions and young mountain belts[2]

At first sight, the topography of Morocco is comparable with that of the neighboring countries of North Africa. To the north (Figure 1), the Rif Range extends along the Mediterranean coast (Alboran Sea), ensuring the continuity of the Kabylian-Tellian belts (Maghrebides) up to the Gibraltar strait. South of these coastal ranges, a domain of elevated plateaux or mesetas occur (Algerian High Plateaux and Oran Meseta, Moroccan Meseta), including intramontane basins. Then the Atlas system rises, providing a northern boundary to the extended, and generally low elevation Sub-Saharan and Saharan domains. However, Morocco differs from Algeria and Tunisia in several ways. On the one hand, the elevation of

2

most of the country (except the Rif and Atlantic areas) is particularly high [Frizon de Lamotte et al., 2008]. The High Atlas displays several massifs close to 4000 m high, including the highest peak of northern Africa (Jebel Toubkal). A branch of the Atlas system extends obliquely across the Mesetan domain, namely the Middle Atlas, which exceeds 3000 m in elevation. The northern border of the Sub-Saharan domain also rises and forms a massive mountain belt, the Anti-Atlas, up to 2700 m high in J. Saghro, and even higher in the case of the J. Sirwa volcano (3300 m). The elevation decreases westward away from the Middle Atlas Mountains to the Central Massif of the Moroccan Meseta, towards the Atlantic coastal basins, and eventually to the Atlantic abyssal plains. South of Anti-Atlas and Saghro mountains, the plateaux (hamadas) elevation decreases southward from c. 1000 m to less than 400 m (Tindouf basin), and westward to less than 200 m, close to the Atlantic (Tarfaya basin) [Michard et al., 2008].

Neogene basins are shown along the High Atlas borders (Haouz-Tadla and Bahira Basins to the north, Souss and Ouarzazate Basins to the south) or north and east of the Middle Atlas (Guercif and Missour Basins), whereas a large foredeep basin (Gharb) extends southwest of the Rif belt. In contrast with Algeria and Tunisia, the continental basement of North Africa is more uplifted in Morocco than in the countries further east, causing Paleozoic and Precambrian rocks to outcrop extensively (Figure 2). Paleozoic rocks form large culminations within the Mesozoic Atlas domain, whereas Precambrian rocks form similar culminations ("boutonnieres") in the middle of the Anti-Atlas Paleozoic terranes. Paleozoic units also occur in the Maghrebide internal zones, similarly, developed in Morocco (Alboran domain) and Algeria (Kabylias), but they belong to a disrupted allochthonous terrane ("AlKaPeCa") and not to the African basement itself [Michard et al., 2008].

In Morocco, exploitation of mineral resources is done everywhere, especially in the High Atlas and the Anti-Atlas. It is of precious metals (Au, Ag), base metals (Cu, Zn, Pb, Ni), and industrial minerals (barite, fluorspar, phosphate).

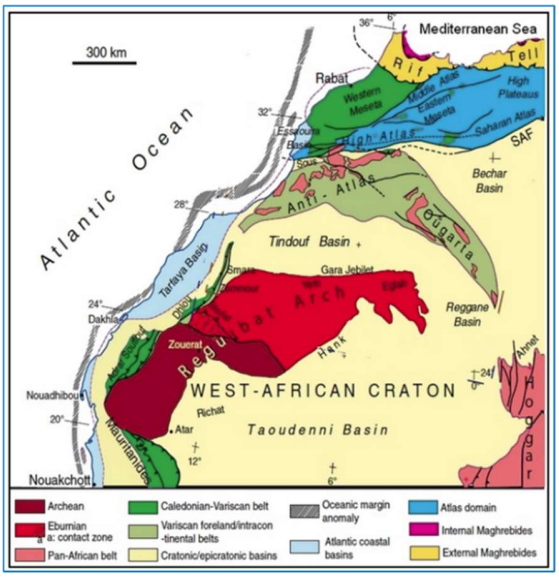


Figure-2: Tectonic map showing the northern part of the West African Craton (WAC) and the adjoining fold belts.[3]

[3] Michard et al. 2008

The geology of southern Morocco is extremely varied and complex (figure 3). The region is home to a wide range of geological formations, from ancient Precambrian rocks to young Quaternary sediments. The main geological units in southern Morocco can be divided into three broad categories[4]:

- The Precambrian basement: This consists of ancient igneous and metamorphic rocks that date back to the Precambrian era, which began about 4.6 billion years ago and ended about 541 million years ago. The Precambrian basement in southern Morocco is made up of two main formations: the Reguibat Shield and the Anti-Atlas Inliers. The Reguibat Shield is a large, coherent block of Precambrian rocks that covers much of the western Sahara Desert. The Anti-Atlas Inliers are smaller blocks of Precambrian rocks that are found scattered within the Anti-Atlas Mountains.
- The Paleozoic and Mesozoic sedimentary rocks: These rocks were deposited during the Paleozoic and Mesozoic eras, which spanned about 541 million to 66 million years ago. The Paleozoic and Mesozoic sedimentary rocks in southern Morocco are mainly made up of limestones, sandstones, and shales. These rocks are found in a variety of tectonic settings, including basins, platforms, and orogenic belts.

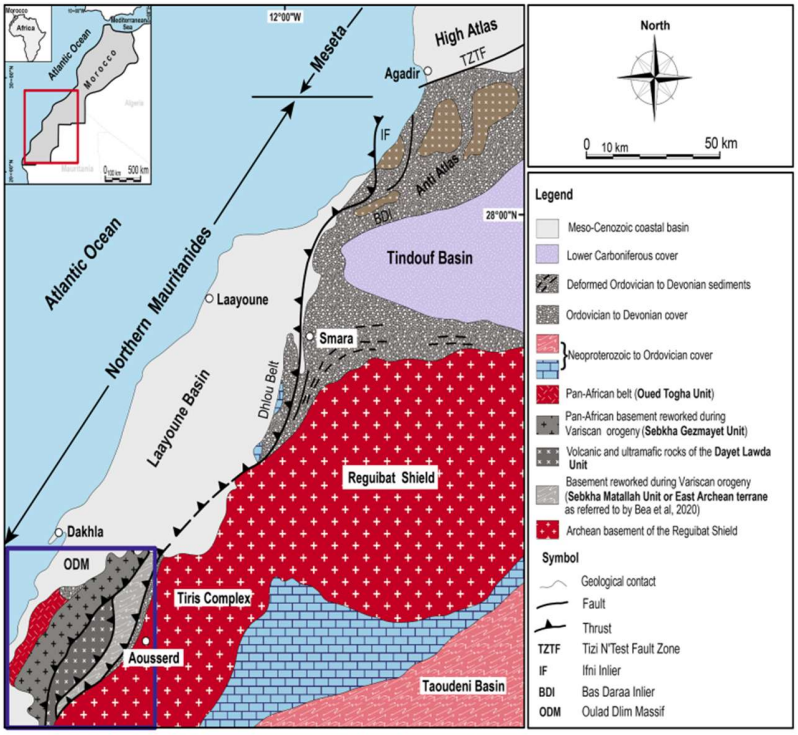


Figure-3: Geological map of southern Morocco showing the main structural domains and lithological units along with location of Oulad Dlim massif (ODM) within the Souttoufide belt (i.e., Northern Mauritanides) and western Reguibat shield[5]

[4] Bea et al., 2020; Benaouda et al., 2022, Bouabdellah et al., 2022
[5] Bouabdellah et al., 2022

- The Quaternary sediments: These are the most recent rocks in southern Morocco, dating back to the past 2.6 million years. The Quaternary sediments in the region are mainly made up of alluvial deposits, fluvial deposits, and aeolian deposits. These deposits are found in a variety of environments, including valleys, plains, and deserts.

The Oulad Dlim Massif is a prominent geological feature in southern Morocco. It is a large, isolated block of Precambrian rocks that is in the western part of the Souttoufide belt. The massif is composed of Mesoproterozoic and Neoproterozoic gneisses and granites. The Oulad Dlim Massif is surrounded by younger Paleozoic and Mesozoic sedimentary rocks.

The Oulad Dlim Massif is a significant geological feature because it provides insights into the geological history of southern Morocco. The rocks in the massif have been subjected to a long and complex history of deformation and metamorphism. The massif also provides most of the world's strategic metals production such as niobium (Nb), rare earth elements (REE), tantalum (Ta), phosphorus (Phos), copper (Cu), iron (Fe) and fluorine (F)[6].

The complexity of Morocco's structural domains is thus the basis of the richness and diversity of its mineral and mainly mining resources, located in different mineralized zones, although Phosphates dominate the country's mining production both in terms of tonnage and value. Apart from Phosphates, several REE-Nb-Ta-F prospects hosted by carbonatites have been identified, and roughly evaluated by the ONHYM. Morocco has great mining potential and ranks first in Africa in terms of attractiveness of mining investments (according to the Fraser Institute's Political Perception Index).

1.1.2 Known Ore deposits and occurrences

Among the 34 raw materials assessed as ECRM by the EU in the new list of 2023, **22** ECRMs have been identified to varying degrees in Morocco (Figure 4) and, except Phos and Ti commodities, they are all located in the northeast part of Morocco in the Paleoproterozoic basement.

Morocco is a significant producer of various critical raw materials, playing a crucial role in global supply chains. Among the numerous minerals extracted in Morocco, three stand out as the most critical and economically important due to their wide-ranging applications and substantial production. The identified ECRMs are briefly described below, in order of importance:

The currently most important two ECRMs, with active mines:

- Phosphate rock / phosphorus – P: Fifteen (**15**) phosphates deposits and one (**1**) phosphate district are identified within different regions:
    - Region Laayoune-Sakia el Hamra: has **1** Large deposit, operating Continuously, named **Oued Eddahab** or **Bou Craa** (is an important phosphate mine managed by the OCP Group (Office Chérifien des Phosphates). In this region there is another deposit (**1** Medium deposit) with little information associated, named Had Labadila.
    - Region Marrakesch-Safi: has **3** Large deposits named respectively, Imi N'Tanout (Phos), Chichaoua or Bou Sbaa and Nzalet-El-Harrach (Gantour district). Their deposit Type are: sedimentary Phosphorite and sandstone Hosted. Also, in this region is known **1** district,

[6] Bouabdellah et al., 2022

named Gantour District or Gantour, operating Continuously in sedimentary Phosphorite deposit type. In this region **3** more deposits are known with few information available.

- Region Casablanca-Settat: has **1** occurrence named Morocco (Phos. du Plateau continental), in sedimentary Phosphorite and alluvial Placer deposit type. The Mining status of this occurrence is unknown.
- Region Béni Mellal-Khénifra: has **6** deposits with few information available. Only one deposit, the Khouribga or Oulad Abddun, is operating Continuously. The **Khouribga phosphate mine**, located in this region, is the largest phosphate mine in Morocco and one of the largest in the world. The mine is operated by the Moroccan company OCP. Also, there is **1** Large deposit, the Tessaout (Phos) or Tessaout I, with barite and talc as secondaries commodities.
- **Boucraa mine (Laayoune)** - Bou Craa is the site of a phosphate deposit of over 1.7 billion tons. Mining operations by Phosboucraa started in 1972.The mine produces around 3 million tonnes annually, which represents 10% of Morocco's total production. The mine is also operated by OCP.

- Barite – Brt: Sixty-six (**66**) Barite deposits, **3** Brt districts, **8** Brt occurrences and **1** Brt province are identified within different regions:
  - Region Oriental: has **1** Very Large deposit, operating Continuously, named **Zelmou or Djebel Zarouk**, with vein Polymetallic and carbonate Hosted deposit type. In this region there are more **6** deposits and **2** occurrences with polymetallic substances (Pb, Zn, Cu) and Ag, Cd associated.
  - Region Fès-Meknès: has **6** deposits and **1** province with no information available about their deposit size or mine status, with polymetallic substances (Pb, Zn, Cu) associated.
  - Region Drâa-Tafilalet: has **24** deposits, **2** occurrences and **2** districts (with large deposit size). The Zeïda (district) is operating Intermittently and the Aouli - Mibladen (district) or Haute Moulouya (district) is not Operating.
  - Region Béni Mellal-Khénifra: has **12** deposits, **1** occurrence. The **Bou Ousel deposit** has a Large size with Fe, Hg and Pb as secondaries substances associated. The **Zrahina Djebel deposit** has a medium size and vein Polymetallic deposit type with Fl, Ag, Pb, Zn as secondaries substances associated.
  - Region Casablanca-Settat: has **1** deposit named Sidi Ghanem with few information available.
  - Region Marrakesch-Safi: has **3** Large deposits named respectively, Seksaoua or Seksawa (operating Continuously), Matate (under Development) and Jebilet district (operating Intermittently). Although, in this region there are **10** more deposits and **2** occurrences with no information available.
  - Region Souss-Massa: has **2** deposits and **1** occurrence with few information available.

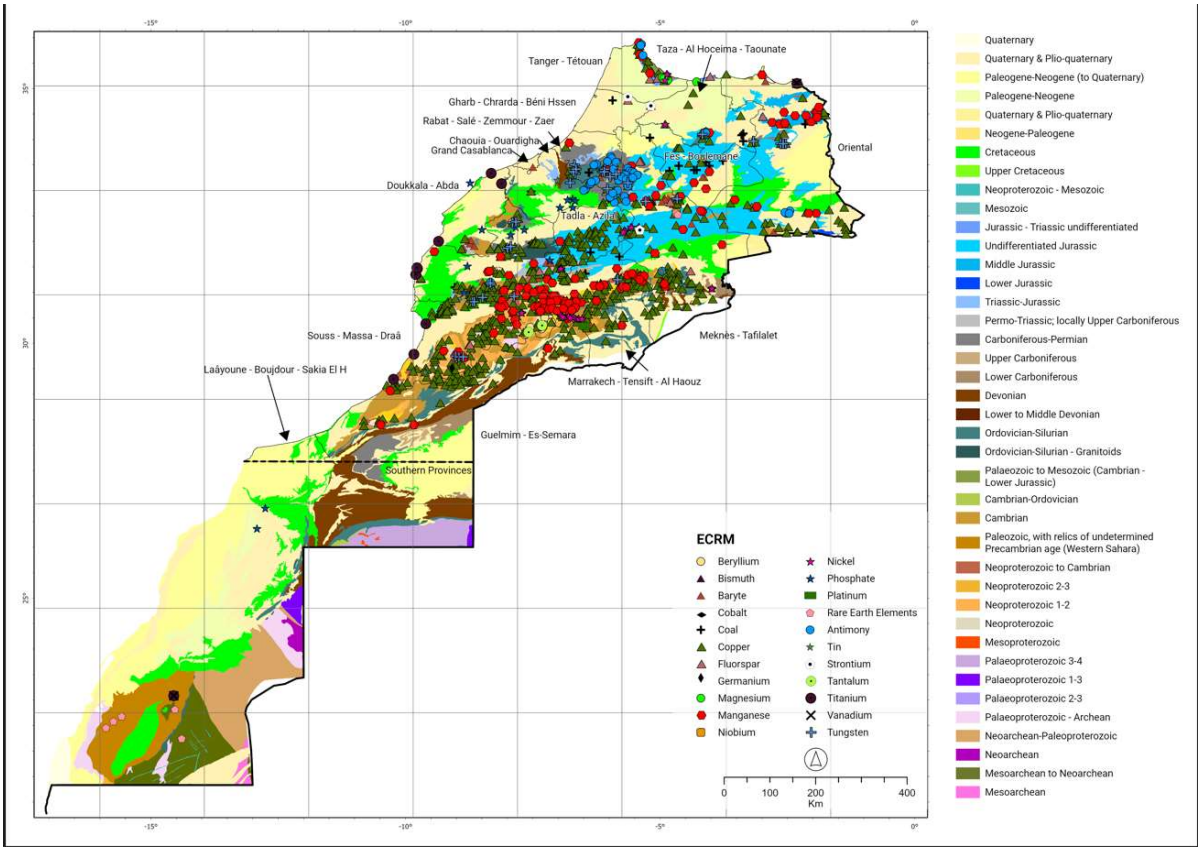


Figure--4: Mineral occurrences in Morocco overlaying simplified map of geological ages (source SIGAfrique).

Others ECRMs, with active mines:

- Copper – Cu: Six hundred and forty-five (**645**) Copper deposits (6 Medium deposits and 17 Small deposits), **2** Cu districts, **154** Cu occurrences, **1** project, **4** prospects and **4** provinces are identified within different regions, but only very few are operating or under development.
- Manganese – Mn: One hundred and five (**105**) manganese deposits (3 Large deposits in Oriental region, Drâa-Tafilalet and Souss-Massa); **1** Mn district and **25** Mn occurrences. Only 2 are operating Intermittently and 1 operating Continuously.
- Fluorspar – Fl: Eighteen (**18**) fluorspar deposits and **1** fluorspar province are known. There is a large deposit operating Continuously in Rabat-Salé-Kénitra region named Achmmach (El Hammam, Fl) and one medium deposit in Béni Mellal-Khénifra region and other Medium deposit in Oriental region, with several associated secondary substances.
- Cobalt – Co: Twenty-three (**23**) Cobalt deposits and **1** Cobalt occurrence are known. Only 3 deposits are operating Continuously in Drâa-Tafilalet region: 2 Large deposits and 1 with no information available, but all deposits with several associated secondary substances (Ag, As, Au, Bi, Cr, Cu, Mo, Ni).
- Antimony – Sb: Forty-seven (**47**) Antimony deposits (3 Medium deposits in Béni Mellal-Khénifra region and 1 Medium deposit in Tanger-Tetouan-Al Hoceima region), **1** Sb field and **2** Sb occurrences. All deposits are identified within different regions and within orogenic Gold or vein Polymetallic deposit type.

- Tungsten – W: Thirty-one (**31**) Tungsten deposits (3 Small deposits in Marrakesch-Safi and Rabat-Salé-Kénitra region) and **3** W occurrences. All deposits and occurrences known has few information available or unknown about their mining activities.
- Southern Provinces: **cobalt-nickel -gold** deposits of Bou Azzer are associated with the Elgraara Panafrican greenstone belt extending over 30 Km. The main orebodies consist of elongated lenses of massive Ni-Co-Fe arsenide minerals. These lenses occur in a core of carbonate or siliceous gangue and are almost exclusively located along the contact between serpentinite and a quartz diorite intrusion (Tourneur et al., 2021), . Mining was initiated in 1934 by SMAG (Société Minière de Bou Gaffer) on the central deposits in Bou Azzer and on the Ightem deposit to the east of the district. From 1969 to 1971, the Russian group Technoexport conducted a comprehensive research program that led to the discovery of the Taghouni, Bou Azzer East, and Tamdrost deposits, the mine was put back into production and closed again in 1983 due to depletion of mineral reserves. In 1987, the geological team of CTT resumed work and discovered the Méchoui deposit. Production thus recommenced after an ambitious research and development program, resulting in two beneficiation processes enabling the production of cobalt cathodes, cobalt derivatives, nickel, and gold ingots.

Table 1 includes the main active mines.

LONG	LAT	Occurrence	ECRM	OtherSubst
-1.8100	34.4730	Beddiane	Cu	Ag, Brt, Pb, Zn
-8.3667	30.0833	Talaat N'Ouamane	Cu	Ag, Mo, Pb
-8.7333	29.7500	Tazalaght (Ait Abdellah)	Cu	Ag, Pb
-1.7833	34.5000	Touissit District	Cu	Ag, Pb, Zn
-4.9167	32.8667	Zeïda (district)	Brt	Pb
-2.7667	32.2000	Zelmou	Brt	
-8.7330	30.9500	Seksaoua	Brt	Ag, Au, Cu
-12.9167	26.3667	Oued Eddahab	Phos	U
-5.7833	33.5000	Achmmach	Sn	Au
-7.9667	31.1500	Matate	Brt	
-5.8333	33.5333	El Hammam (MAR, Fl)	Fl	
-6.8000	30.5333	Aghbar (Bou Azzer)	Co	Au, Ni, U
-6.9106	30.5208	Bou Azzer	Co	Ag, As, Au, Bi, Cr, Cu, Mo, Ni, U
-6.9106	30.5208	Bou Azzer	Ni	Co, Ag, As, Au, Bi, Cr, Cu, Mo, U
-7.2667	31.0667	Imini (distr.)	Mn	Pb
-8.1800	31.8500	Jebilet district	Brt	Zn, Ag, Cu, Pb, Py
-8.1800	31.8500	Jebilet district	Cu	Ag, Brt, Zn, Pb, Py
-8.2000	31.3800	Guemassa district	Cu	Ag, Zn, Pb

Table 1: List of the main active mines.

1.2. Prospectivity and mineral high potential mapping

1.2.1 Selection of the ECRM for mineral prospectivity

Among the ECRMs present in Morocco, **8 ECRMs** were selected for mineral prospectivity mapping (MPM): **Phosphate, Copper, Barite, Manganese, Antimony, Cobalt**, **Tungsten**, and **Fluospar**. The choice of those commodities was constrained by the dataset used, as it needs at the very least more than 10 occurrences for a given ECRM to perform a correct prediction. The Mineral Predictivity Mapping (MPM) was performed

using the Disc-based association (DBA) grid method coupled to Random Forest (RF) method (*see Vella, 2022*). This method focusses on the local spatial associations of geological variables and features of various natures to describe the relationships between the predictors and the mineralization. This allows the identification of geological environments in the study area around each node of the DBA grid, and the integration of both quantitative and non-quantitative spatial data, such as geophysical anomaly maps and location of geological map units, respectively. Then, RF classification is used here to perform a generalization of complex geological environments and features and evaluate their likelihood to host potential mineralization occurrences by giving a score comprised between 0 (low potential) and 1 (high potential). In Morocco, the data used for MPM are:

- SIGAfrique Geological maps at 1:2,000,000 scale
- SIGAfrique mining database

The DBA grid for predictive modelling is mainly defined by **five parameters**:

- Size of cell – d.
- Search radius for lithologies – R.
- R/d ratio,
- Search radius for mineral occurrences – R_1. It can be null, in this case the search radius will be restricted to the cell size (d)
- Search radius for faults – R_2. It can be null; in this case the search radius will be restricted to the cell size (d) or it can take into account the cumulative length of faults present in the cell size (d).

To maximize the grid resolution while minimizing overlaps and cells with only on lithology, the parameters of DBA grid for all the commodities used in this study are as follows: d = 3000 m, R = 9000 m, R/d = 3, R_1 = 5000 m, R_2 = 5000.

1.2.2 Mineral high potential areas

Mineral high potential areas were highlighted for the eight studied ECRMs in Morocco. The criteria allowing the assessment of DBA-RF modelling can be found in the table below. All the favorability maps can be found in the **Appendix_1.2.2_MPM_MOROCCO.**

Morocco	TN	FN	FP	TP	TPR	FPR	PPA (%)	Precision (%)	Accuracy (%)	J-score	Threshold
Phosphate	90121	3	10156	125	0.9765625	0.1012795	10.2395	1.2	89.9	0.88	0.358
Copper	78005	546	17811	4043	0.8810198	0.1858875	21.7658	18.5	81.7	0.695	0.459
Barite	90140	40	9670	555	0.9327731	0.0968841	10.1838	5.4	90.3	0.836	0.491
Manganese	89936	80	9437	952	0.9224806	0.0949654	10.3471	9.2	90.5	0.828	0.401
Antimony	96174	2	3878	351	0.9943343	0.0387598	4.21194	8.3	96.1	0.956	0.401
Cobalt	97264	4	2962	175	0.9776536	0.0295532	3.12435	5.6	97	0.963	0.412
Tungsten	96496	1	3644	264	0.9962264	0.0363891	3.89224	6.8	96.4	0.962	0.53
Fluorspar	97070	5	3191	139	0.9652778	0.0318269	3.31657	4.2	96.8	0.943	0.457

Notes: *True Positive (TP) and True Negative (TN) correspond to the number of grid cells which are correctly predicted by the RF model (i.e. mineralized and non-mineralized cells, respectively). Inversely, False Positive (FP) and False Negative (FN) correspond to the number of grid cells which are incorrectly predicted by the RF model (i.e. mineralized instead of non-mineralized cells and non-mineralized instead of mineralized cells, respectively).* ***FP could correspond to mineral high potential areas****. True positive*

rate (TPR), also called "Recall", correspond to TP/(TP+FN), False positive rate (FPR) corresponds to FP/(FP+TN), Percentage of prospective area (PPA) correspond to (TP+FP)/All, Precision correspond to TP/(TP+FP), Accuracy correspond to (TP+TN)/All and J-score correspond to TPR – FPR.

Phosphate rock / phosphorus – P: Morocco is a major global producer of phosphate rock, a critical raw material used primarily in fertilizer production. Large-scale mining operations dominate the phosphate industry, but there may be smaller-scale, artisanal activities in some regions. The favorability map of P (Appendix 1.2.2a) produced by the DBA-RF model display **two large mineral high potential areas**, mainly (1) Gantour Basin (Region Marrakesch-Safi) and the (2) Southern Provinces region:

- Khouribga Mines: The Khouribga region in central Morocco is home to some of the most significant phosphate deposits globally. Mines in this region are operated by the OCP Group (Office Chérifien des Phosphates), a state-owned company and one of the leading phosphate producers in the world.
- Bou Craa Mine: Located in the Southern Provinces region, the Bou Craa mine is another important phosphate operation managed by the OCP Group.

Morocco's phosphate rock deposits are of high quality and are relatively easy to mine. The country also has a strong infrastructure in place for transporting and processing phosphate rock. As a result, Morocco is well-positioned to continue to be a major player in the global phosphate rock market.

Barite – Brt: Morocco is one of the largest producers of barite in northwestern Africa, with a long history of mining that dates back to 1949 when production was only 600 tons (Eyssautier, 1952; Azza, 1998). Today, the country produces 1,100,000 tons per year, making it the third-largest producer worldwide after China and India [Samaoui et al., 2023]. Baryte deposits are found in various regions, including the Atlas Mountains, where the mineral is extracted and processed for various industrial applications. The favorability map of Barite (Appendix 1.2.2b) produced by the DBA-RF model display **three mineral high potential areas**, mainly:

- The Drâa-Tafilalet region - Is the most important barite production area in Morocco. It is home to the Tafraoute and Ijoukak mines, which are the two largest barite mines in the country. Other major barite mines in the Drâa-Tafilalet region include the Assa mine and the Tizi mine.
- The Central Atlas region - Is also a significant producer of Barite. It is home to the El Jadida and Moulay Bousselham mines, which are two of the largest barite mines in the country. Other major barite mines in the Central Atlas region include the Guercif mine and the Jbel Ayachi mine.
- The Anti-Atlas region - Is the smallest producer of barite in Morocco. However, it is home to the Tissint and Ait Oualili mines, which are two of the largest barite mines in the country. Other major barite mines in the Anti-Atlas region include the Ouarzazate mine and the Kelaat Mgouna mine.

Copper – Cu: The favorability map of Copper (Appendix 1.2.2c) produced by the DBA-RF model display **four mineral high potential areas** along the axe SW-NE Atlas Mountain (High, Central and Middle Atlas) in the following regions:

- Souss-Massa region – In this region there is a Bou Azzer mine, who is the second largest copper mine in Morocco. This mine produces about 50,000 tonnes of copper per year.
- Drâa-Tafilalet region - Where is the largest copper mine in Morocco: The Oumjrane mine is a large, open-pit copper mine that covers an area of approximately 10 square kilometers (4 square miles).

It is one of the largest and most productive copper mine in Morocco, producing approximately 150,000 tons of copper per year. The mine is operated by the Canadian company Kinross Gold Corporation.

- Marrakech-Safi region - The Sidi Rahal mine in the Marrakech-Safi region is a smaller copper mine. This mine produces about 5,000 tonnes of copper per year.
- Fès-Meknès region - The Sefrou mine in the Fès-Meknès region is a smaller copper mine. This mine produces about 10,000 tonnes of copper per year.

Manganese – Mn: The favorability map of Manganese (Appendix 1.2.2d) produced by the DBA-RF model display **three mineral high potential areas** along the axe SW-NE Atlas Mountain in the following regions:

- Souss-Massa-Draâ region – In this region, specifically in the province of Zagora there is the Aït Benhaddou Manganese Mine (it's a sedimentary deposit), who is the largest manganese mine in Morocco, producing approximately 200,000 tons of manganese per year. In this region there are also another important mines: The Oued Souss Manganese Mine, located in the province of Agadir, is the fourth largest manganese mine in Morocco, producing approximately 40,000 tons of manganese per year; and Bou Azzer Manganese Mine, a sedimentary deposit located in the province of Ouarzazate. This mine is the fifth largest manganese mine in Morocco, producing approximately 30,000 tons of manganese per year.
- Drâa-Tafilalet region - The Imini mine is located in the Drâa-Tafilalet region in southern Morocco. More specifically, the mine is located in the Ouarzazate Province, Amerzgane Caïdat, Amerzgane Cercle. The mine is located about 50 kilometers southeast of the city of Ouarzazate. The mine's manganese deposit is Cretaceous in age and has an estimated reserve of 100 million tons of manganese. The mine is operated by the Moroccan state-owned company Managem.
- Marrakech-Safi region - A sedimentary deposit located in this region, specifically in the province of Marrakech, named Sidi Rahal Manganese Mine, is the second largest manganese mine in Morocco, producing approximately 150,000 tons of manganese per year.
- Tanger-Tetouan-Al Hoceima region – The Mâ'der Manganese Mine is a sedimentary deposit situated in the foothills of the Rif Mountains. This mine is the third largest manganese mine in Morocco, producing approximately 50,000 tons of manganese per year. The mine is operated by the Moroccan company Managem.

These five mines together produce approximately 470,000 tons of manganese per year, making Morocco one of the leading producers of manganese in the world. Manganese is a critical mineral that is used in a wide variety of industries, including the production of steel, batteries, and fertilizers.

Fluorspar – Fl: The favorability map of Fluorspar (Appendix 1.2.2e) produced by the DBA-RF model display **three mineral high-medium potential areas** along the axe SW-NE Atlas Mountain in the following regions:

- Draâ-Tafilalet to Béni Mellal-Khénifra region – Here is located the Zelmou Mine, specifically in the province of Drâa-Tafilalet. It is situated in the Anti-Atlas Mountains, approximately 75 kilometers (47 miles) south of the city of Ouarzazate. The Zelmou mine is a large, open pit mine that covers an area of approximately 5 square kilometers (2 square miles). It is one of the largest and most productive fluorspar mines in Morocco, producing approximately 800,000 tons of fluorspar per year. The mine is operated by the Moroccan company Managem. The Boumalne Dadès Mine, located specifically in the province of Tinghir (High Atlas Mountains) is a smaller, open pit mine

that covers an area of approximately 2 square kilometers (0.8 square miles). It is one of the more productive fluorspar mines in Morocco, producing approximately 300,000 tons of fluorspar per year. The mine is operated by the Moroccan company Managem.

- Tanger-Tetouan-Al Hoceima region - Rif Domain - Internal zone (district)
- Oriental region – The Taourit Mine is located specifically in the province of Nador. It is situated in the Rif Mountains, approximately 180 kilometers (112 miles) east of the city of Oujda and 50 kilometers (31 miles) south of the town of Nador. The Taourit mine is a smaller, open-pit mine that covers an area of approximately 1 square kilometer (0.4 square miles). It is one of the less productive fluorspar mines in Morocco, producing approximately 100,000 tons of fluorspar per year. The mine is operated by the Moroccan company Managem.

These mines represent approximately 85% of the total fluorspar production in Morocco. Fluorspar is an important mineral that is used in a variety of industries, including the production of aluminum, steel, and glass. It is also used in the manufacturing of paint, plastics, and pharmaceuticals.

Cobalt– Co: The favorability map of Cobalt (Appendix 1.2.2f) produced by the DBA-RF model display **three mineral high-medium potential areas** along the axe SW-NE Atlas Mountain in the following regions:

- Souss-Massa to Draâ-Tafilalet region – The Oumjrane Mine, is the largest cobalt mine in Morocco, producing approximately 150,000 tonnes of cobalt per year. It is a skarn deposit located in the Oriental region, specifically in the province of Drâa-Tafilalet, approximately 120 kilometers east of the city of Ouarzazate and 30 kilometers south of the town of Boumalne Dadès. The Bou Azzer Mine is the third largest cobalt mine in Morocco, producing approximately 30,000 tonnes of cobalt per year. It is a porphyry deposit located in this region, specifically in the province of Ouarzazate. The Ben Haddou Mine is the fourth largest cobalt mine in Morocco, producing approximately 25,000 tonnes of cobalt per year. It is a porphyry deposit located in the Souss-Massa-Draâ region, specifically in the province of Zagora.
- Fès-Meknès region – Located in this region is the second largest cobalt mine in Morocco - Sefrou Mine, producing approximately 50,000 tonnes of cobalt per year. It is a porphyry deposit located specifically in the province of Sefrou, approximately 80 kilometers east of the city of Fès.
- Tanger-Tetouan-Al Hoceima region - The Mâ'der Manganese/Cobalt Mine is a sedimentary deposit located in the foothills of the Rif Mountains. The mine also contains cobalt, with an estimated reserve of approximately 25,000 tonnes. The Mâ'der Manganese Mine is an example of the diversity of mineral deposits in Morocco. While it is primarily a manganese mine, it also contains cobalt, making it a valuable source of both minerals. The mine is an important part of Morocco's mining industry and contributes to the country's economic development.

These mines together make Morocco one of the leading producers of cobalt in Africa. Cobalt is a critical mineral that is used in a wide variety of industries, including the production of rechargeable batteries for electric vehicles and electronic devices.

Antimony – Sb: The favorability map of Antimony (Appendix 1.2.2g) produced by the DBA-RF model display **three mineral high-medium potential areas** along the following regions:

- Fès-Meknès region – The Sidi Slimane is the largest antimony mine in Morocco, producing approximately 200,000 tonnes of antimony per year. It is a vein deposit located in the Fès-Meknès

region, specifically in the province of Moulay Yacoub, approximately 80 kilometers (50 miles) east of the city of Meknes.

- Tanger-Tetouan-Al Hoceima to Rabat-Salé-Kénitra region – there is the second largest antimony mine in Morocco - Oulad Abdoun mine, producing approximately 100,000 tonnes of antimony per year. It is a smaller, open-pit mine that covers an area of approximately 1 square kilometer (0.4 square miles).
- Souss-Massa region – The Tizi Ougoula located in this region, is a small and open-pit mine that covers an area of approximately 1 square kilometer (0.4 square miles) and is the third largest antimony mine in Morocco, producing approximately 50,000 tonnes of antimony per year.

These three mines together produce approximately 350,000 tonnes of antimony per year, making Morocco one of the leading producers of antimony in the world. Antimony is a critical mineral that is used in a wide variety of industries, including the production of batteries, flame retardants, and pigments.

Tungsten – W: The favorability map of Tungsten (Appendix 1.2.2h) produced by the DBA-RF model display **three mineral high-medium potential areas** along the following regions:

- Béni Mellal-Khénifra region – Has the Oued Zem Mine, the largest tungsten mine in Morocco, producing approximately 60,000 tonnes of tungsten per year. It is a skarn deposit located in this region, specifically in the province of Khouribga. It is a large, open pit mine that covers an area of approximately 5 square kilometers (2 square miles).
- Souss-Massa region – The Oued Eddahab Mine is the second largest tungsten mine in Morocco, producing approximately 40,000 tonnes of tungsten per year. It is a skarn deposit located in the province of Zagora.
- Draâ-Tafilalet region – The large, open-pit mine that covers an area of approximately 2 square kilometers (0.8 square miles), Zaouit Sidi el Mekki Mine is the third largest tungsten mine in Morocco, producing approximately 30,000 tonnes of tungsten per year.

These three mines together produce approximately 130,000 tonnes of tungsten per year, making Morocco one of the leading producers of tungsten in the world. Tungsten is a critical mineral that is used in a wide variety of industries, including the production of steel alloys, tools, and electrical contacts.

1.3. Ore processing and refining capacities

Morocco was the world's leading exporter of phosphate rock, phosphoric acid, and phosphate fertilizers [S&Q, 2023]; it was the world's second-ranked producer of phosphate rock after China and accounted for about 11.2% of the world's phosphate rock output in 2017. The country also was the world's third-ranked producer of barite after China and India and accounted for 11.0% of world output. Morocco was the world's seventh-ranked producer (excluding United States production) of acid-grade fluorspar, accounting for 1.3% of world output. The country was the 11th-ranked and 17th-ranked producer of cobalt and silver, respectively, and accounted for 1.8% and 1.4% of world output, respectively. Morocco also accounted for 1.4% of the world's copper production. Other mineral commodities produced in Morocco included arsenic trioxide, cement, clays (bentonite, fuller's earth, and montmorillonite), feldspar, gold, iron ore, lead, manganese, mercury, natural gas, nickel, petroleum condensate, salt, and zinc.[7]

[7] table 2; OCP Group, 2018, p. 20–21; Silver Institute, The, 2018, p. 26; Jasinski, 2019; McRae, 2019a, b) [Taib, 2018]

Morocco has a well-established and modern mining industry, with a range of processing and refining facilities for a variety of minerals.

The types of processing facilities in all Africa (AfricaMaval Database Processing Plants) are divided into 4 main types:

- 6 Concentrators,
- 117 Plants,
- 45 Refineries, and
- 47 Smelters.

The main differences between these processing facilities lie in their specific functions and industries of application. A "plant" is a general term for various industrial facilities, while a "smelter" focuses on extracting metals, a "concentrator" enhances the concentration of valuable minerals within raw ore and a "refinery" mostly deals with refining petroleum or chemicals. However, the term refinery is the location where the concentration of metal/s and purity is increased.

And Morocco has in terms of ECRM processed elements[8]:

- 14 Plants (5 for Barite, 1 for Cobalt (Co), 1 for Nickel (Ni), 1 for Phosphate rock)
- 1 Refineries (1 for Cobalt (Co))

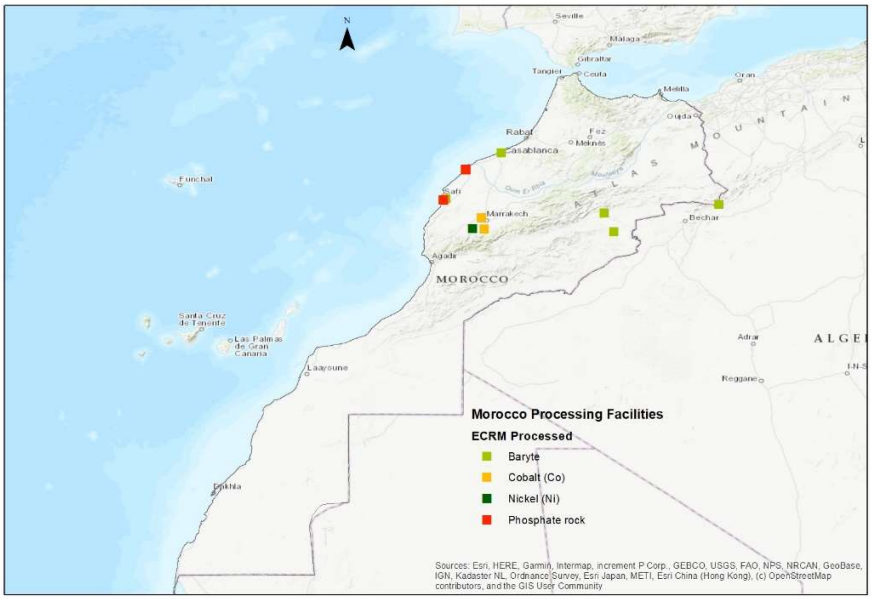


Figure-5: Main processing units.

[8] AfricaMaVal, Delivrable 1.3, 2023

Name processing entity	Processing Facility	Status	ECRM	Owner	Operator	Products	Capacity
Facility at Errachidia	Plant	Assumed Active	Barite	Broychim S.A.R.L. [100%]	CADETAF- ASM	Chemical grade, Barite	6000 mt/y, 500000 mt/y
Facility at Figuig	Plant	Assumed Active	Barite	Broychim S.A.R.L. [100%]	CADETAF- ASM	Chemical grade, Barite	6000 mt/y, 500000 mt/y
Facility at Tafilate	Plant	Assumed Active	Barite		ASM	Chemical grade	6000 mt/y
Plant at Casablanca	Plant	Assumed Active	Barite	Broychim S.A.R.L. [100%]	CADETAF- ASM	Barite	120000 mt/y
Plant at Safi	Plant	Assumed Active	Barite	Broychim S.A.R.L. [100%]	CADETAF- ASM	Barite	30000 mt/y
Guemassa Polymetallic Plant	Plant	Assumed Active	Cobalt (Co)	Managem Group [100%]	CTT	Metal	2500 mt/y
Marrakesh Refinery	Refinery	Active	Cobalt (Co)	Managem S.A. [99,77%], Unnamed Owner [0,23%]	CTT		
Guemassa Metal Complex	Plant	Assumed Active	Nickel (Ni)	Managem Group [100%]	CTT	Metal	250 mt/y
Maroc Chimie I and Maroc Chimie II	Plant	Assumed Active	Phosphate rock	Government [100%]	OCP	Phosphoric acid, P2O5	500000 mt/y
Maroc Phosphore I and Maroc Phosphore II	Plant	Assumed Active	Phosphate rock	Government [100%]	OCP	Phosphoric acid, P2O5	1150000 mt/y
Maroc Phosphore III and Maroc Phosphore IV	Plant	Assumed Active	Phosphate rock	Government [100%]	OCP	Phosphoric acid, P2O5	1500000 mt/y
Plant at Jorf Lasfar I	Plant	Assumed Active	Phosphate rock	Office Chérifien des Phosphates (OCP) [100%]	Jorf Fertilizer Co. V	Phosphoric acid, P2O5	375000 mt/y
Plant at Jorf Lasfar II	Plant	Assumed Active	Phosphate rock	Office Chérifien des Phosphates (OCP) [33.33%]	IMACID	Phosphoric acid, P2O5	430000 mt/y
Plant at Jorf Lasfar III	Plant	Assumed Active	Phosphate rock	Office Chérifien des Phosphates (OCP) [50%]	Bunge Maroc Phosphore S.A. Or Pakistan Maroc Phosphore	Phosphoric acid, P2O5	375000 mt/y
Plant at Jorf Lasfar IV	Plant	Assumed Active	Phosphate rock	Office Chérifien des Phosphates (OCP) [33%]	Euro-Maroc Phosphore Co.	Phosphoric acid, P2O5	150000 mt/y

Table 2: List of the main processing units.

2. Assessment of the ECRM value chain

2.1. Characterization of the value chain for primary and secondary raw materials

2.1.1 List of the mining and recycling projects

The Moroccan mining sector is dominated by a handful of large companies which hold around 60% of the national mining assets compared to 40% for hundreds of small, under-equipped and poorly supervised companies.

If the management of the sector does not present any particular difficulties for large Companies, having regard to the provisions of the Mining Law, it is not the same for small entities which take advantage of a historical heritage (customary law or advantages economic measures decreed since Independence), which seriously slowed down the development of the Sector.

Thus, the geological constitution of the surrounding lands often allows us to suspect the presence of deposits that are significantly larger and richer than the preliminary superficial reconnaissance allows. In this case, the mineralized showings held by many artisanal miners may only be the tip of the "iceberg", which encourages them to be taken in hand by competent professionals for their development.

By way of illustration, let us note that the almost fortuitous discovery of the current large mine of Hajjar (Guemassa), held by the ONA group (Omnium nord-africain), was made following an airborne reconnaissance, which made it possible to detect an unsuspected mineralized mass not detected at the surface.

The task facing us will therefore be to identify these promising potentials held by companies who are technically and financially deprived, to identify the business opportunities available to EU investors for ensure the European market in various strategic minerals from Morocco. This can thus be done, through partnerships with stakeholders in the Sector, in a socio-economic environment beneficial to both Moroccan and European companies working in the field. Table 3 represents the most important projects ongoing and whereas some also have investments ongoing, such as expanding facilities.

PROPERTY	OWNER(S)	DEVELOPMENT STAGE	ACTIVITY STATUS	COMMODITY(S)	PRIMARY COMMODITY	PRIMARY RESERVES AND RESOURCES tonnes
Khouribga	OCP S.A.	Operating	Active	Phosphate	Phosphate	26,800,000,000
Youssoufia	OCP S.A.	Operating	Active	Phosphate	Phosphate	8,020,000,000
Tizert	Managem S.A.,Unnamed Owner	Construction Started	Active	Copper, Silver	Copper	1,184,000
Achmmach	Atlantic Tin Ltd, Toyota Tsusho	Construction Planned	Active	Tin, Gold	Tin	156,000

	Corp., Nittetsu Mining Co. Ltd.					
Bouskour	Managem S.A.	Construction Started	Active	Copper, Silver	Copper	327,000
Akka	Managem S.A.,Unnamed Owner	Operating	Active	Copper, Gold, Silver	Copper	161,000
Bou-Azzer	Managem S.A.,Unnamed Owner	Operating	Active	Cobalt, Nickel, Copper, Arsenic	Cobalt	24,000
Jbel Laassal	Managem S.A.,Unnamed Owner	Operating	Active	Copper, Gold	Copper	107,000
Oumjrane	Managem S.A.	Operating	Active	Copper	Copper	92,000
SOP Plant	Emmerson PLC	Prefeas/Scoping	Active	Potash, Potassium Sulfate	Potash	
Guemssa Marrakesh	Glencore/Managem S.A.	Recycling		Cobalt, Nickel Lithium	Cobalt	

Table 3 : List of the main ECRM mining units

2.1.2 Existing ESG indicators

Within the framework of this study, we manage to identify only one company certified for ESG indicators. A range of ESG rating agencies are scoring OCP environmental, social and governance practices each year. OCP Group recognizes the importance of ESG metrics performance as equal to financial performance. Our best-in-class ESG practices shape our resilience to short, medium and long-term risks. In 2021, OCP had achieved results reflecting its ability to manage ESG risks and be transparent on its sustainability performances and impacts (OCP Sustainability Integrated Report, 2021).

2.1.3 Status of economic links between the formal and informal sectors

The ASM sector in Morocco contributed to 90% of barite production. Barite is one of the minerals which the ASM sector is allowed to produce based on Law no. 74-15, together with zinc and lead. The ASM production of barite, lead and zinc take place in a designated region of 58,799.41 km^2, which until recently was reserved only for ASM production. The ASM sector is regulated, supervised and supported by the CADETAF. Based on available information and stakeholders' interviews, the ASM sector is largely formalised and barite production is sold in the form of unprocessed ore to enterprises who perform beneficiation before export. However more forward linkages would be desirable to increase value capture by ASM producers.

Informal mining occurs in coal mining, especially in Jarada region. Although the mining sector is important for the national economy (26% of national exports in 2022 according to official figures provided by the Ministry of Energy Transition and Sustainable Development), Morocco's positioning towards new energies (notably solar) and the predominance of phosphate in the mining sector does not place coal as a priority in production, even though its consumption has grown with the establishment of several coal-fired power plants in Morocco over the past six years, including one in Jerada in 2017 (Dessertine, 2023).

A comprehensive overview on the ore deposits and production parameters of ECRMS currently recovered by artisanal and small-scale mining in Africa is already available as part of the deliverable 1.4. While a more detailed analysis of the ASM sector role in the production of ECRMs in Morocco, including major challenges and investment opportunities on production, social, governance and environmental impacts and value chain, will be available as part of deliverable 7.2.

2.2. Identification of the bottlenecks along the value chain

The identified bottlenecks during this project have been compiled from data from the World Bank through several pertinent and scored indicators, as following:

- Two criteria from "**Worldwide Governance Indicators** (WGI)": the government effectiveness and the control of corruption (Figure 6). Concerning these, Morocco did not increase its Government Effectiveness and the control of corruption from 1996-2022, although is above the average from North Africa countries.

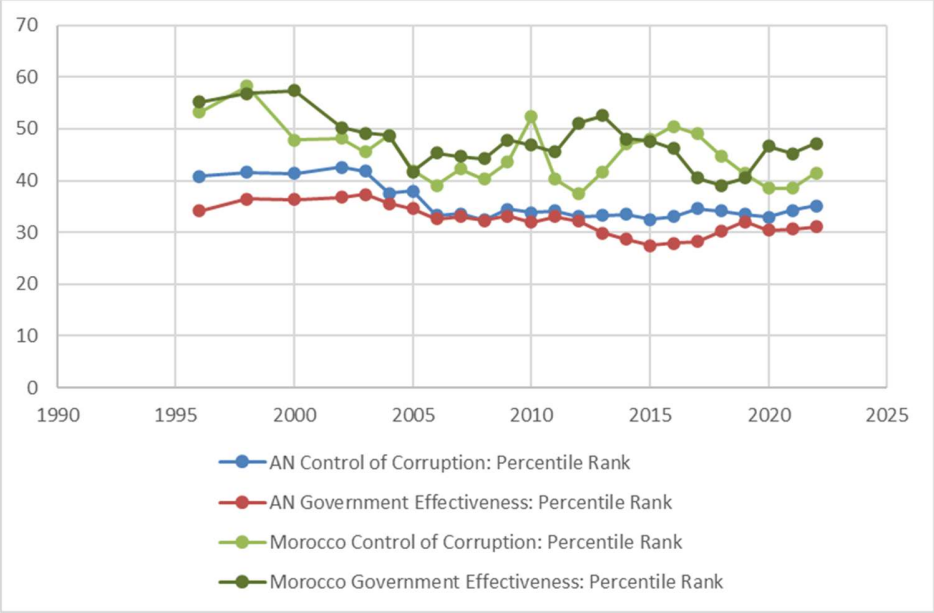


Figure 6: Government Effectiveness and the Control of Corruption

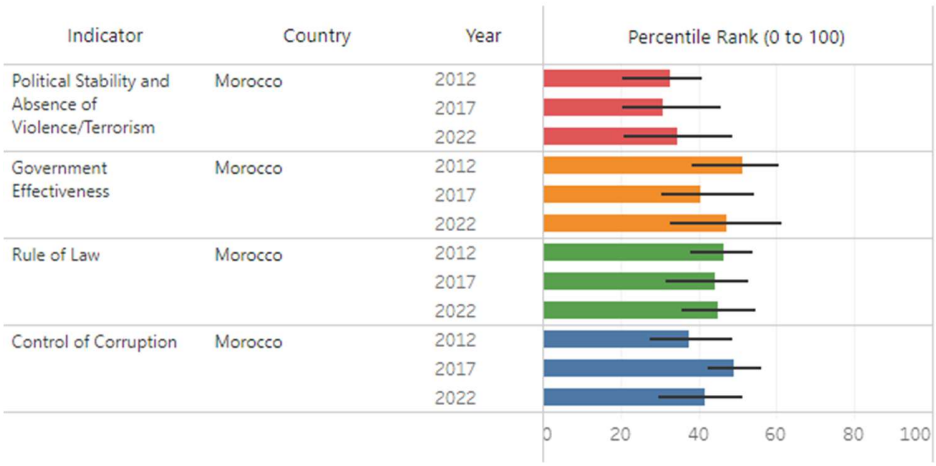


Figure -7: Government Effectiveness, political stability rule of law and the Control of Corruption ranks

Morocco performs below 50% rank in terms of political stability, absence of violence and terrorism, although a small increase was verified in 2022. Government effectiveness decreased in 2017 although it increased again in 2022. The Control of corruption rank decreased in 2022. In general, a lot still needs to improve in terms of governance indicators in terms of world ranks.

Logistics performance index: Overall (1=low to 5=high) in Morocco was reported at 2.54 1=low to 5=high in 2018, according to the World Bank collection of development indicators, compiled from officially recognized sources. Morocco - Logistics performance index: Overall (1=low to 5=high) - actual values, historical data, forecasts and projections were sourced from the World Bank on December of 2023. The international score uses six key dimensions to benchmark countries' performance and also displays the derived overall LPI index. The scorecard allows comparisons with the world (with the option to display world's best performer) and with the region or income group (with the option to display the region's or income group's best performer) on the six indicators and the overall LPI index.

The logistics performance (LPI) is the weighted average of the country scores on the six key dimensions:

- Efficiency of the clearance process (i.e., speed, simplicity and predictability of formalities) by border control agencies, including customs;
- 2) Quality of trade and transport related infrastructure (e.g., ports, railroads, roads, information technology);
- 3) Ease of arranging competitively priced shipments;
- 4) Competence and quality of logistics services (e.g., transport operators, customs brokers);
- 5) Ability to track and trace consignments;
- 6) Timeliness of shipments in reaching destination within the scheduled or expected delivery time.

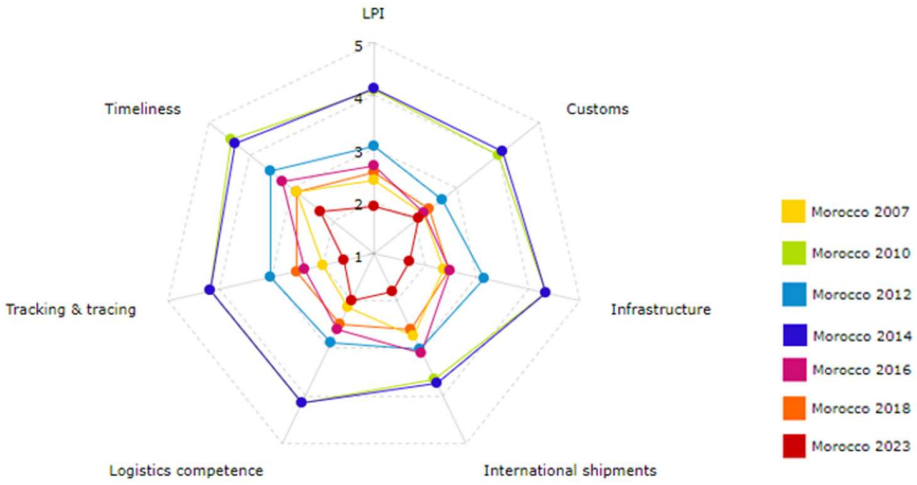


Figure 8: Logistics performance index[9]

Morocco with investment supported by the Bank implemented of its Transport and Logistics Infrastructure Investment Plan, notably through the National Rural Roads Program - Phase II (NNRP II), the Marrakech-Agadir Highway Construction and the 3rd Airport Project of Morocco. The Marrakesh-Agadir Highway Construction Project offers a double opportunity for tourism and agro-industrial potential, from the center of the country up to the North (Tangier) and to the Atlantic (Agadir), and has enabled more than 1.4 million Moroccans to have improved access to road transport (African Development Bank Group, 2019).

Road: Over the past 20 years, the government has built approximately 1100 miles (about 1770.28 km) of modern roads, connecting most major cities via toll expressways. The Moroccan Ministry of Transport and Logistics aims to build an additional 2,100 miles (about 3379.62 km) of expressways and 1,300 miles of highway by 2030 (https://www.trade.gov/country-commercial-guides/morocco-infrastructure).

Rail: Morocco's railway network includes 800 miles of track, with 120 stations serving passengers, and 15 serving freight. The government currently has plans to extend the 225-mile Tanger-Casablanca high-speed rail line, inaugurated in 2019, by 140 miles to connect Casablanca with Marrakesh. The extension will require the creation of new maintenance centers dedicated to high-speed rail activity.

Morocco's 2040 Rail Strategy ("Plan Rail Maroc 2040") is a long-term strategy for the development of the national rail network and its various components by 2040 and require $37 billion. (https://www.trade.gov/country-commercial-guides/morocco-infrastructure).

Port capacities: Morocco, occupied the 96th position in the 2016 Logistics Performance Index, is now 109th, putting it far behind many MENA countries: Egypt and Tunisia both outperformed their North African neighbor in the index.

[9] The International Bank for Reconstruction and Development/The World Bank 2023

Morocco's current position is near the bottom, among the region's worst performers, whereas United Arab Emirates (11th), Qatar (30th), Oman (43rd), Saudi Arabia (55th), Bahrain (59th), and Kuwait (63rd) are the region's top performers, and Egypt (67th), Iran (67th), Lebanon (76th), and Jordan (84th) fared relatively well at the global level.

Morocco's regression in this year's index is partly due to the decreasing quality of delivery speed and tracking. Although Moroccan shipments are reported to meet quality criteria by 82 percent, the report notes that airport and port supply chains take more time than is usually necessary when exporting or importing goods.

The kingdom ranks 115th in terms of customs, 103rd in international shipments, 101st in logistics quality and competitiveness, 112th in tracing and tracking, and 114th in timeliness—suggesting sluggish delivery systems despite efforts to boost connectivity both domestically and internationally. https://www.moroccoworldnews.com/2018/07/251429/global-logistics-performance-index-morocco-ranks-109th-algeria-117th

Energy: The Government of Morocco seeks to increase security of supply by reducing dependence on energy imports, including increasing use of renewable sources for electricity production. Nevertheless, the country imports approximately 90 percent of its energy needs. Total primary energy consumption has increased by about 5 percent per year since 2004, but Morocco plans to decrease energy consumption by 15 percent from 2016 levels by 2030 through energy efficiency measures.

3. Investment/financing prospects for ECRM projects in Morocco

3.1. Fiscal, legislative and regulatory context for in-country financings

Mining sector in Morocco requires obtaining prior authorizations from the relevant administrative body, namely the Ministry of Energy, Mines, Water and Environment granted by:

- Law no. 33-13 relating to mining (hereinafter the “Mining Law”); and

- Decree no. 2-15-807 enacted for the application of the Mining Law.

The Mining Law provides that any exploration, prospecting or mining activity is subject to the prior granting of mining titles, which are requested from the Administration by submitting files attesting "technical and financial capacities". Article 3 of the Mining Law provides that mines are part of the State's public domain.

Mining Law provides for 3 categories of mining titles namely:

- Exploration authorization – The mining exploration is defined by the Mining Law as geological, geochemical and geophysical work, evaluation by excavation, probing and exploration drilling, carried out on the ground and/or in water, or by aerial methods, with the aim of identifying sites or areas with mining potential that may give rise to a prospecting permit;

- Prospecting permits – The mining research is defined by the Mining Law as studies and work relating to geology, geochemistry, geophysics and prospecting, as well as extraction and processing tests aimed at delimiting deposits of mineral resources considered as "mines" and their reconnaissance, determination of their morphology, reserves, nature and the possibility of their exploitation and processing; and

- Mining license – The mining exploitation is defined by the Mining Law as studies and work concerning the extraction, processing, recovery and marketing of mining products.

Tax regulations

The main fiscal regulation is part of the Moroccan Tax Code (“MTC”) and Law No. 47-06 relating to local taxes. In addition, as Morocco has signed several Double Tax Treaties (“DTT”) with other countries, their provisions override domestic law (Ernest & Young, December 2023).

Under the Moroccan Constitutional system, neither the Government nor any other State body is entitled to grant specific tax exemptions or regimes to local or foreign investors that are not provided by the law.

The tax regulations in Morocco do not provide for major tax incentives applicable to mining activities.

Consequently, mining operators are subject to general regulations while benefiting from the tax incentives and exemptions outlined herein regardless of the chosen legal structure. In Annex 3.1 tax regulation related to mining activities are explained in detail. Moroccan companies including mining operators are subject to CIT according to the following rules.

Legal environment

Morocco does not impose general restrictions on foreign investments. Nevertheless, the mining sector falls under a specific regulatory framework. Foreigners intending to proceed with the incorporation of an entity in Morocco may choose to operate through a branch or a subsidiary.

From a legal perspective, a branch is an affiliated entity that does not have its own legal personality and is under the management of its head office. The advantages of operating through a branch stem from its relative ease of establishment and management when compared to a subsidiary. The legal perspective that views the branch as an extension of its foreign parent company without independent legal personality, there exists joint and several liability between the branch and the parent company. Consequently, the foreign company assumes responsibility for all obligations of the branch, in contrast to a subsidiary.

Investment Charter

Law no. 03-22 establishing the Investment Charter (hereinafter referred to as "Law no. 03-22" or the "Investment Charter") was introduced to maximize the impact of investment, particularly in terms of creation of stable employment, equitable regional development, prioritization of growth sectors for the national economy and sustainable development. Table 4 shows the common incentives and criteria to be granted.

Common Investment Incentives			
Criteria Rate			**Rate**
1	Creation of stable employment*	Employment ratio between 1 and 1,5	5% of eligible investment amount
		Employment ratio between 1,5 and 3	7% of eligible investment amount
		Employment ratio >3	10% of eligible investment amount
2	Gender ratio** (>=30%)		3% of eligible investment amount
3	Future-oriented sectors or upgrading of sectors		3% of eligible investment amount
4	Sustainable investment projects		3% of eligible investment amount
5	Local integration projects		3% of eligible investment amount

Table 4: Common Investment Incentives (Ernest & Young, December 2023)

Immigration and visa procedures for foreign employees

The recruitment of foreign employees in Morocco is subject to specific rules. Article 507 of the Labor Code provides that employers may recruit employees when necessary, taking into consideration the professional experience, education and the professional recommendations. As a principle, the priority is given to Moroccan nationals whereas foreigners may be recruited in Morocco in the absence of Moroccan nationals with the requisite professional skills. As per article 516 of the Labor Code, Moroccan employers may freely hire foreigners provided that they do not find Moroccan nationals with equivalent professional skills. For that, Moroccan employers should obtain an authorization from the Ministry of Employment. This authorization is issued in the form of a visa on the employment contract.

Visa prerequisite - there are certain nationalities who are required to obtain a prior consular visa before entering Morocco. As such, they will be required to apply for a consular visa to enter the Moroccan territory and be able to start their immigration procedure, which will enable them to obtain a work permit and a resident permit.

The recruitment of foreigners in Morocco can be done in two ways:

(i) Either through a local entity (company or branch) by the conclusion of a local employment contract;

(ii) By the conclusion of a secondment agreement to the benefit of a local entity. In this regard, if a foreigner is seconded to a Moroccan entity, the authorization from ANAPEC is not required (Ernest & Young, December 2023).

3.2. Macroeconomic context for in-country financings

Gross domestic product (GDP) analysis

The GDP growth is projected to accelerate to 3 percent in 2023, mainly due to in agricultural output and its positive spillovers to the rest of the economy. Inflation is forecast to gradually decline to about 4 percent in 2023, as the commodity price shock gradually dissipates, and the monetary stance becomes less accommodative. Remittances and tourism flows are projected to moderate somewhat owing to the deterioration in euro area growth, and investment is expected to remain subdued, but lower inflation and measures to support demand from the 2023 Budget are expected to sustain private consumption. Over the medium term, GDP growth is projected to stabilize at around 3½ percent, as the initial positive effects of the structural reforms help offset the scarring effects from the pandemic and Russia's war in Ukraine.

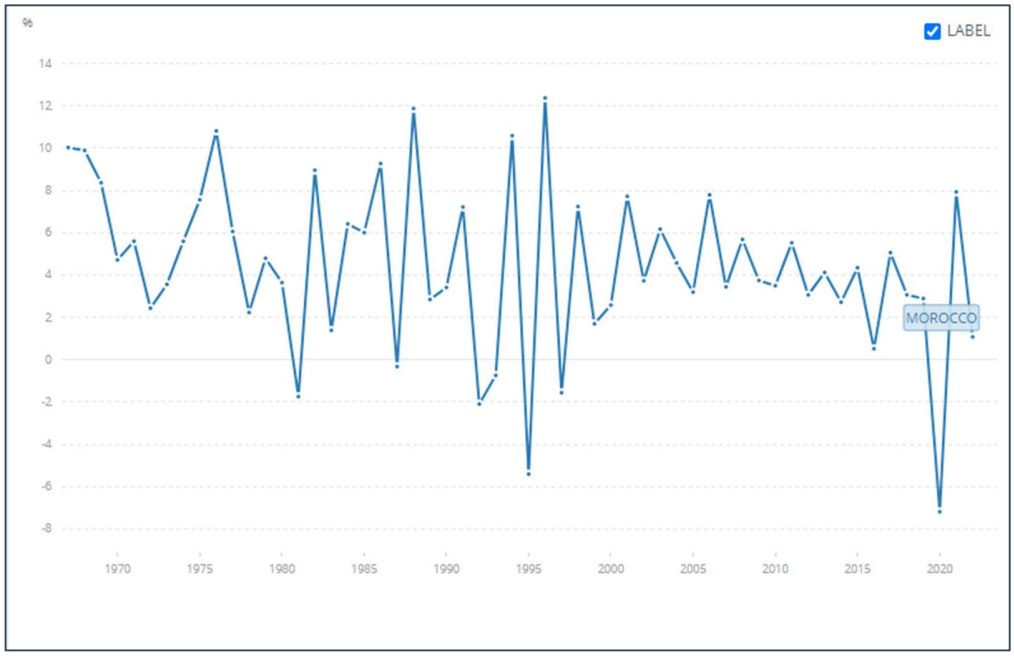


Figure -8: Historical GDP

It is estimated grow of GDP, which is 2 points higher than in 2021 but 3-5 points lower than the prevailing level in 2010 and the years that followed, when Brent prices also exceeded USD 100. Although a drop cannot be ruled out depending on the scale of the crisis in Europe, these two major sources of currency should remain at high levels. At 3.9% of GDP in 2023, the current account deficit would remain high, but should be covered without difficulty. The Moroccan economy continues to attract significant capital flows, mainly in the form of foreign direct investment (approximately 2% of GDP), of which more than a third is now directed towards the development of industry (Table 5).

Macroeconomic Stability	2020	2021	2022	2023	2024
Consumer Price Inflation (%)	0.4	1.34	6.66	6.07	3.65
Consumer Price Index Avg	100.4	101.75	108.52	115.11	119.31
Producer Price Inflation (%)	-1.8	5.02	12.74	1.74	-1.75
Producer Price Index Avg (%)	98.2	103.13	116.27	118.29	116.22
GDP Deflator	122.98	126.8	132	133.92	137.76
Domestic Credit Growth (%)	4.48	4.21	7.38	7.06	7.52
Money Market Interest Rate (%)	2.87	2.6	2.48	2.81	3.12
Bond Yield (%)	2.78	2.53	2.75	4.67	4.76
Budget Balance/GDP (%)	-7.14	-5.51	-5.22	-4.06	-5.11
Budget Expenditure/GDP (%)	29.66	28.07	31.17	28.9	29.9
Public Debt/GDP (%)	74.44	71.31	72.86	76.04	79.42
Debt Int Payment GDP (%)	2.58	2.33	2.24	2.23	3.59
Public Debt, LCU ($B)	96.31	98.28	92.75	104.1	114.32
Budget Revenue, LCU ($B)	27.38	31.99	34.04	34.06	35.68
Interest Payments ($B)	29.68	29.64	29.73	31	52.48
Interest Payment Growth Rate (%)	-2.4	-0.13	0.3	4.27	69.29
Gold Reserves ($B)	1.35	1.29	1.29	NA	NA
Gross Domestic Savings ($B)	256.12	281.04	261.08	245.12	273.87
Stock Market Index	11,287.38	NA	NA	NA	NA

Table 5: Projected economic growth

Morocco has repeatedly demonstrated a strong capacity to respond effectively to setbacks in recent years. The September 8 earthquake in Al Haouz is the last of a series of shocks that have struck Morocco since the COVID-19 pandemic. The quake had devastating human and material consequences localized primarily in remote mountain communities but is unlikely to have significant macroeconomic impacts.

Morocco's external resilience is also evidenced by a solid external demand for the country's goods and services, despite the international economic slowdown. Equally, Foreign direct investment inflows remain strong and increasingly directed towards the manufacturing sector. Various modern industrial niches well connected to global value chains have emerged and the country maintained access to international capital markets despite the ongoing tightening of global financial conditions.

Morocco has launched ambitious reforms to improve human capital and encourage private investment. These reforms will achieve the desired economic and social development impact only if, though, combined with other critical initiatives, including the removal of regulatory and institutional barriers that limit competition and slow the reallocation of factors of production to more productive firms and sectors.

Moreover, a paradigm shift is still needed to empower Moroccan women economically which will be necessary to meet the high ambitions of the country as expressed in the NDM. Beyond its importance in promoting gender equality, increasing Female Labor Force Participation (FLFP) would also have a significant economic impact and be a powerful driver of socioeconomic development. The report shows that meeting the NDM objectives of a 45 % FLFP could boost growth by almost one percentage point a year (https://www.worldbank.org/en/country/morocco/publication/morocco-economic-monitor-fall-2023-from-resilience-to-shared-prosperity).

Morocco Public debt

In 2021 Morocco public debt was 98,493 million dollars, has increased 10,821 million since 2020. This amount means that the debt in 2021 reached 68.94% of Morocco GDP, a 3.31 percentage point fall from 2020, when it was 72.25% of GDP. If we check the tables we can see the evolution of Morocco debt. It has risen since 2011 in global debt terms, when it was 53,267 million dollars and also in terms of GDP percentage, when it amounted to 48.56%. According to the last data point published, Morocco per capita debt in 2021 was 2,712 dollars per inhabitant. In 2020 it was 2,439 dollars, afterwards rising by 273 dollars, and if we again check 2011 we can see that then the debt per person was 1,635 dollars .

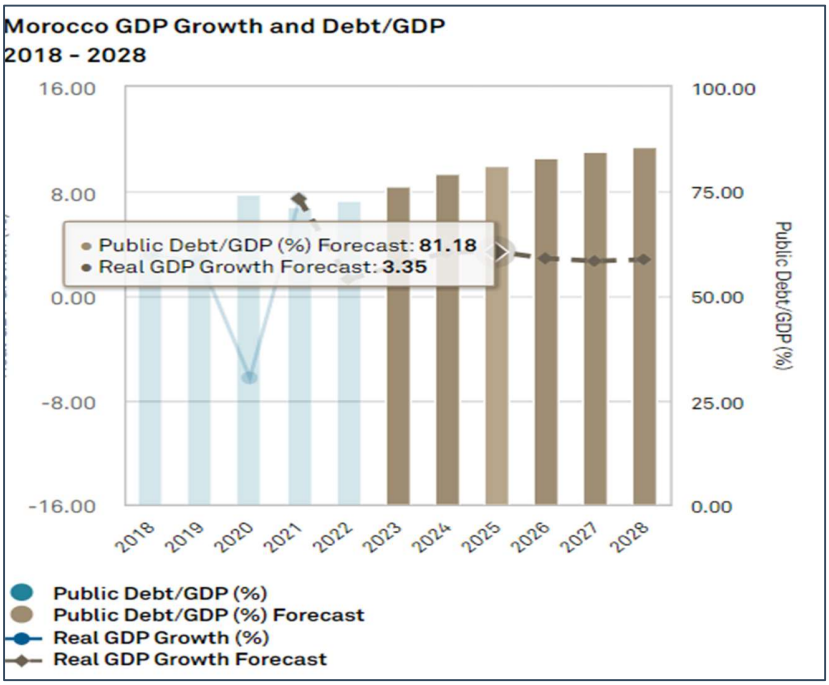


Figure -9: Morocco GDP and Debt

Restrictions on imports/exports and overview of time and costs relating to customs clearance

Overview

In Morocco except for a limited number of branches regarded for example: phosphates, international road transport and basic telecommunications services, the various economic activities are open to both nationals and foreigners. Most quantitative restrictions on trade have been lifted. Those still in force relate to basic agricultural products: oils, sugar, cereals and their derivatives. Morocco is waiting until the accompanying measures are in place before replacing these restrictions with their tariff equivalents. The authorities have confirmed that all basic agricultural products will be subject to tariff equivalents in accordance with Morocco's commitments under the WTO Agreement on Agriculture. Customs duty rates have been significantly reduced across the board. Because of the various tariff exemptions and reductions, the nominal rates do not truly reflect the level of effective protection. The application of tariff equivalents should lead to relatively high rates on the agricultural products in question. 4. Morocco's trade policy strongly emphasizes export. Thus, most taxes on exports have already been abolished.

Measures directly affecting exports/imports

Since the starting of the pandemic, Morocco has established a total of 9 circulars concerning both the export and the import of covid-related products, concerning mainly masks, protective plastic face visors and medicines for human use.

Measures on exports:

- Fully lifted (as of June 2022)

- Customs circular n°6021/311 of 03/03/2020 - licencing system for the export of surgical masks.
- Customs circular n°6041/311 of 22/04/2020 - licencing system for the export of protective plastic face visors
- DMP circular n°91DMP/00 of 31/03/2020 - specific authorisation issued by the DMP (Ministry of Health) to industrial pharmaceutical establishments for the export of medicines for human use.
- Customs circular n°6064/311 of 25/06/2020 - licencing system for the export of nonwoven fabrics

- Partially lifted (as of June 2022)

- Customs circular n°6024/311 of 13/03/2020 - licencing system for the export of antiseptic preparations and protective masks (the part lifted is on the export of protective masks). There is still a licencing system for the export of antiseptic preparations.

Measures on imports (all in place):

- customs circular n°6058/311 of 05/06/2020 - licencing system for the import of protective masks
- customs circular n°6054/311 of 28/05/2020 - compliance check for the import of non-woven fabric protective masks for non-medical use

- Customs circular n° 6088/311 of 16/09/2020 - compliance check for the import of fabric protective masks for non-medical use
- Customs circular n° 6096/311 of 21/10/2020 - licensing system for the import of ethyl alcohol

3.3. Political context for in-country financings

Political environment and background

The monarchy of King Mohammed VI is the highest political authority in the country, and has been at the centre of political power for centuries. It is largely perceived by Moroccans as essential to stability, even more so since the wave of uprisings in the Arab world in 2011. Since the beginning of the rule of King Hassan II, Morocco has maintained a pro-Western stance aligned with French and US foreign policies, and since the 1980s the kingdom has adopted liberal economic policies. This has allowed Morocco to develop strong relations with several European countries, which have been strong supporters of the monarchy, helping to sustain its rule.

During the Arab Spring the 20 February Movement arose to demand democratic reforms and the end of political corruption and nepotism. The state has engaged in widespread repression of members of this movement using threats, harassment, and arrests, effectively suppressing any threat of major civil unrest. Although the movement has been unable to expand due to state repression parts of civil society continue to sympathise with its ideals. The movement remains present through the engagement of its activists in a number of social issues.

Human rights organisations continue to criticise the crackdown on liberties in the kingdom. Hundreds of activists, journalists and citizens who have denounced political corruption or publicly criticized the political establishment are in prison.

Morocco has a history of civil unrest linked to the mining sector. In December 2017, two men died in the rural north-eastern city of Jerada (Oriental province) while working in an illegal coal mine. The incident prompted several weeks of sustained unrest, with thousands of protesters calling for an end to illegal mines and demanding improved economic prospects and an end to their marginalisation. Although the protests did not significantly spread outside of Jerada, they demonstrate the higher potential for sustained mass unrest in rural and impoverished areas.

The state has also faced recurrent episodes of labour-related unrest. Protests are mainly driven by local labour unions protesting changes to their administrative or financial status due to changes to their professions imposed by the authorities. Those protests have mainly occurred in main urban centres. However, the continued expansion of the mining industry will drive a threat that miners in rural areas will attempt to unionise and stage similar protests. There are currently no major unions for mining workers in Morocco and attempts to form an active union in the aforementioned Jerada mine for instance were repressed by the state.

Attitudes towards foreign investment

Morocco remains a business-friendly destination, and the government has succeeded in positioning the kingdom as a major destination for foreign direct investment (FDI) in North Africa. The government is keen

to attract foreign investors and seeks to facilitate investments through favourable regulations, economic reforms and other incentives. Enforcement of regulation varies depending on the sector and state institution responsible. However, there is no clear pattern of discrimination against foreign investors, including in the mining sector. Morocco is struggling to address the gap between the often-inadequate skills of its unemployed population and the requirements of the modern jobs market, and it is common for companies to hire foreigners or Moroccans educated abroad for positions that require advanced technical skills. The local market favours candidates with a foreign education, particularly degrees from France, Canada and other countries where French is an official language, due to the overwhelming use of French in the Moroccan business sector.

Contract risk and expropriation

Contract risk in Morocco remains low and nationalizations are unlikely. The most recent round of nationalization occurred in the 1970s. The current political establishment is highly unlikely to conduct any nationalizations as it seeks to project an image of a secure business environment to attract foreign investors.

Foreign companies have periodically faced contract frustration when dealing with the government given endemic corruption and occasional conflicting interests with the local economic elite. However, the government is wary of undermining foreign interest in the non-phosphate mining sector, limiting the threat of similar contract risks for foreign companies. Contract risk to foreign companies occur when companies – or the governments of the countries in which they are based – have expressed support for Western Saharan independence.

External environment

War

Although the security environment in Morocco remains broadly benign, the kingdom has been engaged in a decades-long, low-intensity conflict with Sahrawi independence movement the Polisario Front over sovereignty of the disputed territory of Western Sahara. In recent years, Morocco has explicitly designated the recognition of its sovereignty over Western Sahara by the international community as its priority in its foreign policy. This has undermined some of its diplomatic relationships, including with neighbours such as Algeria. Morocco considers Western Sahara to be its “southern provinces” and fully part of the kingdom, despite the fact that its sovereignty over the territory is not recognised by the majority of the international community.

International regulations

Morocco is yet to join the International Extractives Transparency Initiative (EITI). The state-owned OCP – the country’s largest mining company – nonetheless joined the Extractive Industries Transparency Initiative (EITI) as a supporting company in September 2022. As its status as a supporting company is relatively recent, reports on its compliance with the EITI are yet to be collected and published.

Morocco has been a member of the International Labour Organisation (ILO) since 1956. Morocco has ratified ILO’s eight fundamental conventions and all four governance conventions. Local laws largely adopt

the content of the conventions, and guarantee the right to unionise and strike. In practice over the past few years however, representative figures of powerful unions or labour movements have been the target of state repression.

Human rights and mining in Morocco

Morocco is demographically split into three main ethno-cultural groups: the Arabs, Amazighs (commonly referred to as Berbers) and the Sahrawis. The Amazighs are the indigenous people of North Africa and the biggest ethnic minority in Morocco. The community consists of around 15 million people, amounting to roughly 40% of Morocco's total population, and is divided into three groups: the Riffis in the northern Rif region, the Amazighs of the plains and northern part of the Atlas mountains, and the biggest sub-group, the Chleuhs, located in the southern range of the Atlas mountains which is also referred to as the Anti-Atlas. The overwhelming majority of areas where the Moroccan state seeks to develop mining activities in the coming years are located in predominantly Amazigh land.

4. Assessment of social, environmental, and governance challenges[10]

4.1. Country-level assessment and context

4.1.1. Overview of the mining sector

The mining sector plays a vital role in the country's socio-economic development, contributing close to 10% to its GDP and providing employment opportunities with 49,572 people directly employed in the sector. The country is known for its vast mineral deposits, including phosphates, zinc, copper, lead, silver, and gold. Morocco is major producer of phosphates (Pistilli, 2021)32, and in 2021, the country was ranked as the world's second-largest producer of this mineral.

Phosphate mining accounts for a significant portion of the country's export revenue and employs thousands of people across the country.

In 2021, the total volume of mining production amounted to 41 million tonnes, of which, 38 million tonnes was from phosphates. Total turnover for the year was approximately 100 billion MAD ($9.57 billion). The total contribution to Morocco's exports was 26% of which 19.3% was phosphate in 2021.

The Moroccan Government has set out a national strategy for the development of its mining sector (excluding phosphates) with the goal of tripling the mining sector's turnover to more than MAD15 billion by 2025. This would involve multiplying the volume of investment in mining exploration and research tenfold to nearly 4 billion Moroccan dirham (MAD), and doubling the jobs generated by the sector.

Mines form part of the state's public domain under Article 3 of the Mining Law. The initial duration of an exploration authorisation is two years, renewable once for a one-year period if additional exploration is required based on the results of the exploration and the contemplated investment. Exploration work must begin within three months of the date of issuance of the authorisation and be continued regularly in accordance with the work programme agreed between the MEM and the investor. An exploration authorisation provides its holder with exclusive rights to explore the area described in the authorisation. The award of research permits in the exploration area, provided that the application for a research permit is submitted while the exploration authorisation is still in force. The initial duration of a research permit is three years, renewable once for a four-year period. Renewal is subject to the completion of the applicable minimum work programme and related expenditures and must be requested at least three months before the expiry of the three-year initial period. An mining license is granted for a period of ten years and can be renewed for successive periods of ten years until available reserves are exhausted (http://uk.practicallaw.tr.com/w-018-4123).

[10] Most of the information of this section if from AfricaMaVal, deliverable 4.1 by AWIMA

4.1.2. Mineral and Mining Policies

Mining resources belong to the Moroccan state (Article 3). Mining is categorised into Mining resources and Quarries (Article 2). Exploration, Prospecting and production should all be done within the confines of the law.

The regulatory framework for the Moroccan mining sector is mainly based on the following laws and regulations:

Law No 33-13 Related to Mines (The Mining Law and Mining Decree), which set out the:

- administrative regime applicable to the award of mining titles;
- main rights and obligations of mining title holders in the context of exploration, research or exploitation activities;
- rules governing relations between mining title holders and landowners;
- rules applicable to the supervision of mining activities by the competent authorities; and
- administrative and criminal sanctions applicable to mining operators for violation of their statutory obligations.

The Mining Law and Mining Decree replaced old legislation dating back to the 1950s and adapt the regulatory framework to new market trends at an international level.

The reform had the following main impacts:

- Extending the application of mining legislation to all mineral substances used in industry, other than construction and civil engineering materials.
- Establishing the new mining title of exploration authorisation, allowing investors to develop exploration programmes over a wider area.
- Introducing an operating licence for tailings and slag heaps that are planned for enrichment and/or for recovery of masses consisting of waste and residues from mining products.
- Provisions relating to natural or artificial cavities for the underground storage of liquefied or gaseous natural gas and liquid hydrocarbons, or chemicals for industrial use.
- Introducing express provisions relating to environmental impact assessments and the requirement to implement a closure plan dealing with post-exploitation phases.

In addition to the abovementioned mining related regulations, Morocco has implemented a range of policies to regulate and promote sustainable development in its mineral and mining sector. These policies include the National Strategy for Mining Sector Development, the National Charter for the Environment and Sustainable Development, the National Water Plan, the Renewable Energy Policy, and Social and Environmental Impact Assessments (SEIAs).

4.1.3. Mining Regulations

The main law regulating the exploration and extraction of mineral resources in Morocco is the Mining Law, which requires the obtaining of a mining title before commencing mining activities. It distinguishes between exploration, research and exploitation activities as follows:

For each of these activities, Article 4 of the Mining Law sets out an administrative regime that describes the process for obtaining the relevant mining title and the rights and obligations associated with each mining title. The application for exploration authorisation, research permit or mine operating licence must be filed with the administration responsible for mines.

Licence Type or Authorisation	Description	Duration	Renewable	Restriction
Exploration Permit	Legal Person, Exclusive rights (article 22) Area btwn 100sqkm and 600sqkm.	2 years (Art 26)	Renewal once for one year (article 26)	A holder cannot have more than 4 exploration licences
Research Permit (Article 31)	Legal Person, Exclusive rights. Area for this permit cannot be more than for exploration but it is determined by the Holder. It should cover at least 4 km in length.	Valid for 3 years (Article 37)	Renewal once for a 4-year period	This is dependent on field work, reporting and financial expenditure for the planned field work (article 37)
Mining Licence	Legal Moroccan Entity (Art 46)	10 years	Renewable for 10 years till exhaustion of resource	You can only have a mining licence if you had the Exploration & Research permit

Table 6: The various licence / permit types / authorisations available for the mining sector of Morocco.

Each licence type attracts different permitting fee as detailed below:

Licence Type	Amount	Details
Exploration	MAD2,000	Exploration authorisations are subject to the performance of a minimum amount of work per square kilometre ranging between MAD10,000 and MAD66,000
Research	MAD50 per square kilometre	Research permits are subject to the performance of a minimum amount of work per square kilometre ranging between MAD10,000 and MAD66,000
Mining	MAD 18,000	A local annual tax applicable to mining exploitation activities is payable to the relevant region under Article 4 of Law No 47-06 related to local taxes, promulgated by Dahir No 1-07-195 dated 30 November 2007

Table 7: Permit fees per licence type

4.1.4. Taxation and Royalties

Mining companies are subject to a corporate income tax rate of 17.5%, which is the standard rate for all companies in the country. Additionally, mining companies are subject to a resource tax, which is calculated based on the quantity and value of the minerals extracted. The resource tax rate varies depending on the type of mineral, and ranges from 2.5% to 10% of the value of the extracted minerals (Mining Code, 2015).

The granting and renewal of mining permits are subject to the payment of certain application fees, which have been revised by the New Mining Code and the Decree. In addition to the taxes stipulated by the Tax Code that are applicable to all economic activities in Morocco, a local annual tax applicable to mining

exploitation activities is payable to the relevant region (under Article 4 of Law No 47-06 related to Local Taxes, promulgated by Dahir No 1-07-195 dated 30 November 2007).

The amount of this tax is based on the quantity of mining products extracted during mining exploitation. The rate varies depending on the extraction region between MAD1 and MAD3 per ton extracted. The taxpayer is either the concessionaire or the owner of the mining activity.

Royalties

The Mining Law does not stipulate any further taxes or royalties. Royalties are only applicable in the ASM sector, if and when, production happens.

Foreign Direct Investment

There is no restriction on the nationality of shareholders of a company engaging in mining activities. In December 2022, Morocco adopted an Investment Charter that repealed the Investment Charter No. 1-95-213 of 8 November 1995. This charter is the principal regulatory document for foreign and domestic investments with an exception to investment in agriculture, as well as the exclusion of real estate and commercial sector investors from some provisions of the charter.

The Moroccan government can sign specific agreements and contracts with investors, providing subsidies for certain expenses, custom duty and Value Added Tax (VAT) exemptions when the agreed criteria are met. Morocco has ratified 72 investment treaties for the promotion and protection of investments and 62 economic agreements, including with the United States and most EU nations, that aim to eliminate the double taxation of income or gains.

4.1.5. Land-use and Mineral Rights

Land Use and Mineral Rights are governed by a legal framework that includes the Mining Code and several other laws and regulations. The Mining Code provides for the exploration, exploitation, and processing of mineral resources, while also setting out the rights and obligations of mining companies.

Under the Mining Code, mineral rights are owned by the state, and mining companies must obtain exploration and mining licences in order to carry out mining activities. The licence application process includes a review of the mining company's technical and financial capabilities, as well as an assessment of the potential environmental and social impacts of the proposed mining activities.

Once a mining licence is granted, the mining company has the right to explore and extract minerals within the designated area, subject to compliance with all applicable laws and regulations. However, the government retains the right to terminate the licence if the mining company is found to be in violation of any of its obligations.

In addition to the Mining Code, land use is governed by several other laws and regulations, including the Land Use Planning Law and the Environmental Protection Law. These laws are designed to ensure that land use and mining activities are carried out in a sustainable manner, with due regard for environmental protection, social responsibility, and the rights of local communities.

Generally, the legal framework governing land use and mineral rights is designed to promote sustainable mining practices and protect the rights and interests of all stakeholders. However, there are ongoing

debates over the allocation of mineral rights and the potential impact of mining activities on local communities and the environment, which continue to be the subject of research and policy discussions (El-Baraka and Kasmi, 2016; Bechri et al., 2018).

4.1.6. Environment

Dahir no. 1-03-59 promulgating Law no. 11-03 relating to the protection and enhancement of the environment lays out basic rules and general principles of national policy on protection and development of the environment. Within this law is the establishment of a specific requirement, guaranteeing the repair of damage to the environment and the compensation of victims.

A very important policy is the requirement of an Environmental Impact Assessment (EIA). Under Law No 12-03 Relating to Environmental Impact Assessment (Law 12-03), mining activities are subject to a prior authorisation granted based on both, an:

- Environmental impact study prepared by the promoter of the project, which is reviewed by the national or regional committee on environmental impact studies.
- Environmental acceptability decision (décision d'acceptabilité environnementale) granted by the governmental authority in charge of the environment (autorité gouvernementale en charge de l'environnement).

The EIA process includes public consultations to ensure that stakeholders are informed and involved in the decision-making process. For example, the Environmental Impact Assessment Law No. 01-09 of 2010 requires an EIA for all mining projects, including exploration, exploitation, and mine closure plans.

Environmental Regulations

Moroccan environmental regulations provide for specific further rules:

- waste management is regulated by Law No 28-00 dated 22 November 2006 Relating to Waste Management and Disposal.
- sewage water use or discharge is regulated by Law No 36-15 Related to Water, promulgated by Dahir No 1-16-113 dated 10 August 2016.
- air pollution is regulated by Law No 13-03 Related to Air Pollution Control promulgated by Dahir No 1-03-61 dated 12 May 2003. This forbids discharges, emissions and release into the air of pollutants that do not comply with the quantities and concentration limits set out in Decree No 2-09-631 dated 6 July 2010.

Mine Closure

The Mining Law also requires the holder of an operating licence to prepare a Mine Closure Plan. Mining companies must develop a plan to manage the environmental impacts of mine closure, including the reclamation and rehabilitation of the land.

The mine closure plan must be submitted to the Ministry of Energy, Mines and Sustainable Development for approval. The Environmental and Social Impact Assessment Guidelines for Mining Projects, published in 2018, require mining companies to develop a mine closure plan that includes measures to minimise soil erosion and water pollution.

Water

Morocco is among the world's most water-stressed countries (World Bank, 2022). At 600 cubic metres of water annually per capita per year, the country is already well below the water scarcity threshold of 1,700 cubic metres, according to the World Health Organization.

The National Water Plan (NWP), adopted in 2009, is a policy initiative aimed at promoting sustainable water management practices in the mining industry. The plan recognises the importance of water as a critical resource for the mining sector and the need for efficient and sustainable use of it.

The NWP in the mining sector aims to improve water resource management by promoting the use of advanced technologies and techniques to minimise water consumption and reduce water pollution. The plan also emphasises the importance of stakeholder engagement and public participation in decision-making processes related to water management in the mining sector.

The successful implementation of the NWP will require active participation from stakeholders, effective management of potential social and environmental risks, and adequate financial resources to support the implementation of sustainable water management practices.

4.1.7. Societal and Community Aspects, Cultural Heritage

Morocco has a legal framework for Social and Environmental Impact Assessments (SEIAs) in the minerals and mining industry. The SEIA process is intended to ensure that mining projects are carried out in a socially and environmentally responsible manner, and to minimise any negative impacts of mining activities on local communities and the environment.

The SEIA process in Morocco involves the identification and assessment of potential impacts of mining activities, as well as the development and implementation of measures to mitigate any negative impacts. The SEIA process also involves the consultation and participation of local communities and other stakeholders in the decision-making process.

The Kingdom of Morocco has a rich cultural heritage, both tangible and intangible. Law 22-80, promulgated in 1981 and supplemented by law 19-05 is the primary framework that regulates the conservation of the country’s cultural heritage (Royaume de Maroc, 2021). In 2021, the Ministry of Culture, Youth and Sports in partnership with the Foundation for the Safeguarding of Heritage Culture of Rabat organised a roundtable alongside international and local cultural experts to deliberate on ways to strengthen the national legislation in accordance with global standards. Recommendations at the end of the discussion included the creation of a single national code including all cultural heritage and accompanying regulations, updates introducing new concepts and universal terminology as well as the introduction of mechanisms supporting the inclusion of civil society in the management and protection of its heritage (ibid.).

4.1.8. Public Health and Safety

Public health and safety in the Moroccan mining sector is a top priority for the government and stakeholders involved (Mining Technology, 2021). The sector poses significant risks to workers and local communities due to exposure to harmful chemicals and physical hazards. Therefore, regulatory policies have been implemented to mitigate these risks and ensure the safety of everyone involved.

Operational Health and Safety (OHS) and Labour Regulations

The holder of a mining title must operate mining activities in compliance with laws and regulations related to health, hygiene and environmental protection (Article 56, Mining Law). Vizirial Order dated 18 February 1938 Forming Internal Rules for the Exploitation of Mining Products Other Than Combustibles Mining Products (as amended by Vizirial Order dated 9 September 1953) sets out detailed health and safety requirements for carrying out exploitation activities, including obligations to:

- Maintain work areas in a constant state of cleanliness and to respect the hygiene and sanitary conditions necessary to preserve employees' health.
- Make devices such as telephones or acoustic pipes available in underground circulating areas to enable communication between employees, supervisors and extraction technicians.
- Take measures to prevent water stagnation and the accumulation of mud in the working area and galleries.

Labour Practices

Labour unions represent the interests of workers in the mining sector and advocate for their rights and welfare. The General Confederation of Moroccan Workers (CGTM) is the largest labour union in the country and represents workers in the mining sector, among others.

It is stated in the Regulatory, status of personnel of mining companies (Article 21) that women may not go underground and secondly that in the small-scale sector the socio-cultural view is that women should only undertake work relating to catering, sorting and cleaning minerals. However, the mining sector in Morroco especially the formal sector has very skilled and high-profile women involved. There is currently an upward trend in the number of women in the mining industry. Under the supervision of the Ministry of Mines and the Academic level. In the "Ecole Nationale Supérieure" des Mines de Rabat, for the 2020-2021 academic year, out of a total of 825 future engineers, there were 415 female and 410 male engineering students.

4.2.Mining practices vs. Environmental, Social and Governance (ESG) goals

4.2.1 Environmental challenges

The key issues in the environmental management of the mining sector in Morocco are related to water, air and biodiversity as well as how to implement and monitor the various activities to deliver the desired results for relevant stakeholders. Mining operations can be water-intensive, and in Morocco, water resources are already under pressure due to a combination of factors including climate change, population growth, and agricultural demands. Mining companies operating need to pay attention to the National Water Plan and to implementing water conservation and management practices to reduce their impact on the local water supply. Companies should consider implementing measures to reduce dust emissions and monitor air quality to ensure that emissions remain within acceptable levels. Companies should implement measures to minimize their impact on local flora and fauna. The regulations and various strategic plans already make these recommendations and companies need to implement and adhere to them. Activities and actions around these issues implemented need to be communicated to communities affected by mining.

4.2.2 Socio-economic issues

Social issues

Social issues in Morocco include unemployment, poor education, and regional disparities (Kabis-Kechrid, 2015). With more than 50% of its population made up of youth, this demographic is disproportionately affected by these issues, resulting in youth marginalization (USAID, 2012).

A National Framework Law N0: 09.21[53] on social protection was adopted in March 2021. The scope of the framework includes:

- The generalisation of the compulsory health insurance (AMO) by the end of 2022, by broadening the base of beneficiaries of this insurance to include vulnerable categories benefiting from the Medical Assistance Scheme (RAMED) and the category of self-employed and non-salaried professionals, so that an additional 22 million people benefit from AMO, which covers the costs of treatment, medicines and hospitalisation.
- The generalisation of family allowances by 2023/2024, enabling households not receiving these allowances to receive benefits covering child-related risks, or lump-sum benefits for protection against child-related dangers (school drop-out) for 7 million school-age children.
- Broadening the pension schemes coverage in 2025 to include around 5 million people who are employed and not receiving a pension, through the inclusion of self-employed professionals and informal economy workers.
- The generalisation of the unemployment benefit scheme (Indemnité pour perte d'emploi - IPE) in 2025 to cover all persons in stable employment through the simplification of the eligibility conditions and the extension of beneficiaries.

4.2.3 What would be the best practices for a responsible mining?

In 2012, Morocco launched the Moroccan Code for Good Governance Practices in public enterprises and institutions, with the aim of ensuring the transparent and accountable management of public institutions and enterprises (MEF, 2020). This Code was created by a working group from the National Governance Commission, led by the Ministry of Economy and Finance through the Department of Public Enterprises and Privatisation, and involved many institutional actors and public enterprises

Morocco is signatory to and has ratified the New York Convention on the Recognition and Enforcement of Foreign Arbitral Award. This establishes a framework for enforcement of foreign arbitral awards, although the enforcement process is submitted to local law.

Morocco has put in place all the necessary laws and regulations for the management of their mining sector. However, the implementation and monitoring of the various regulations and their impact is key to achieving maximum benefit for the industry and communities.

Governance

Governance plays a crucial role in natural resource management. Organisations such as Transparency International include Morocco in their work, which gives an opportunity to have an external opinion on corruption and governance.

Morocco is a politically stable constitutional monarchy and this stability helps in the promotion of investment and business in this North African country. According to the Ministry of Energy, Mines and Sustainable Development, their strategic plan is to closely look at the issues of mining and energy transition, strategic and critical minerals, local content, and reclamation and rehabilitation of old mines.

In order to enhance on the governance of the natural resources of Morocco, the mining companies must comply with local laws and regulations. Moreover, Morocco should be encouraged to sign up with the EITI and follow the international standards for governance of natural resources.

5. Business network between the European Union and Morocco

5.1. Assessment of the upstream and downstream business ecosystem

5.1.1 Context, formal and informal players

The key institution governing the mining sector of Morocco is the Ministry of Energy, Mines and Sustainable Development (MEM).

The MEM has delegated authority to:

- the Walis (representative of the central government in the local region) for the award of exploitation authorisations for projects of a value less than MAD200 million; and
- Regional Directors of the Energy and Mines Department of the MEM for the award of research permits. (Order of the MEM No 2360-16 dated 9 December 2016.)

In addition to the MEM, other key stakeholders in the mining sector of Morocco are:

• The National Office of Hydrocarbons and Mines (ONHYM). The ONHYM is subject to the state supervision and financial controls applicable to Moroccan public establishments. ONHYM's mission is to:

- carry out in the authorised zones, all studies, research and prospecting activities for the discovery of hydrocarbons deposits or any other fuel, mining deposits or any mineral substance, with the exception of phosphates;
- undertake in the authorised areas, the development and exploitation of hydrocarbon or mining deposits or mineral substances, and to carry out all related activities, in particular ensuring the transport and upgrading of hydrocarbons and mining products in accordance with the regulations in force; and
- promote any action likely to contribute to the development of hydrocarbon, mining and mineral products' exploration and exploitation.

• Land Registry. The Land Registry (ANCFCC: Agence Nationale de la Conservation Foncière du Cadastre et de la Cartographie) is a public establishment (établissement public) regulated by Law No 58-00, promulgated by Dahir No 1-02-125 dated 13 June 2002. It is subject to the state supervision and financial controls applicable to Moroccan public establishments. The Land Registry is in charge of the issuance of special titles (titres spéciaux) relating to each mining title registered with it.

Current aim of mining legislation in Morocco is to improve the appeal of the mining sector for national and international private investment, as evidenced by the new mining law 33–13 of 2015, following the reform of the last mining code of 1951. This law governs all mineral substances, with the exception of phosphates (reserved for the State) and construction materials. The political choice of an industrial orientation for the mining sector is all the more visible in that nowhere in this new law is artisanal mining stipulated. Artisanal mining is only officially allowed in the mining region of Tafilalet and Figuig, under a law created by the dahir (royal decree) of 1960, extended in 1975 and currently governed by the new law 74–15 enacted in 2016. The regulation of artisanal mining in Morocco is therefore above all a regional exception and falls into a certain political pragmatism (Dessertine, 2023).

5.1.2 Relationships at local or regional levels

To ensure that the people of Morocco benefit from mining revenues, mining companies pay annual mining taxes to the state. The applicable tax rates range from one to three dirhams per ton of mineral extracted. Currently tax amounts are fixed by the regional authorities of areas in which mining activities take place. There is no provision for state development projects for the benefit of local communities, to be specifically funded by mining tax in terms of 2015 Mining Code.

The 2015 Moroccan Mining Code and its implementation decree provide for mining companies to contribute towards local development in terms of corporate social responsibility (CSR). The current Mining Code provides for mining companies to contribute to rural development and poverty alleviation in areas where mining takes place. After paying mining tax, mining companies are therefore required under CSR to contribute to the best of their abilities towards the building of schools, hospitals, roads etc. in and around areas where mining activities take place.

Following mining communities' complaints, the Moroccan government has observed, however, that lack of infrastructure suggests that local mining communities still do not benefit from mining, despite the 2015 legal reform. The Minister of Energy, Mines and Sustainable Development admits that the current distribution of tax revenues by the 2015 Mining Code between the national and regional government is inappropriate. Currently, a portion of mining taxes is paid by mining companies directly to the national government and a portion to the regional government. No taxes are allocated to local government in the areas where mining takes place. Communities still lack basic infrastructure, as all revenues from mining end up at national and regional level.

To aggravate the situation, it also appears that locals are not employed in the mining sector. Local communities, therefore, believe that they are left in poverty by mining companies, in spite thereof that the mineral resources supposedly belong to them as the original inhabitants of the areas where the resources were discovered. They feel strongly that mining companies cannot be the only parties that benefit from the profits created by mineral extraction.

Conflicts in mining areas prompted the Minister to initiate the revision and reform of the current system of mining tax distribution under the 2015 Mining Code. The aim of this process is to ensure that the sharing of mining revenues becomes more beneficial to local communities. The image of mining communities lacking basic infrastructure, in spite of the mineral riches extracted around them, is far too prevalent in mining areas in Africa. It seems as if mining areas in Morocco provide no exception. The situation of these communities and their relationship with mining companies can be ameliorated if the proposed tax reform is implemented (Bernard Kengni, 2018).

Despite all of the local problems associated with poor revenue of mining taxes to the local population, Morocco kips trying to do business with neighboring countries and in that sense applied in 2017 to be a member of the Economic Community of West African States (ECOWAS), which includes 15 countries in West Africa. However, Morocco's bid for membership was stalled as West African economic actors feared that goods imported through Morocco's free trade agreements would flood the market of states within ECOWAS. During COP27 a MoU on Critical Raw Materials was signed with Namibia and is also expected to be signed with Morocco, Uganda, South Africa, Rwanda, Senegal, DRC, Zambia, Burundi and Algeria.

Morocco expected to remain the world's leading supplier of phosphate rock and phosphate-based fertilizers for the next 5 years as OCP continues to invest in expanding capacity at existing mines.

Managem is increasing its output of cobalt cathode, copper concentrate, and silver by developing its mineral resources in Morocco through exploration studies in partnership with ONHYM.

Cobalt cathode output by Managem at the Guemassa complex is expected to increase in the next 5 years with the beginning of the supply of cobalt from the company's share at the Pumpi Mine in Congo (Kinshasa) in 2020.

Silver production by Maya is expected to increase. Morocco's standing as a significant world supplier of fluorspar was further solidified with the entry of GFL into Morocco's fluorite production in Taourirt Province and exports by way of Nador Port.

5.2.Building new B2B relations

Morocco is linked to the European Union by an association agreement with full tariff removal of industrial products since 2012. After having obtained "most favoured nation status" with the EU, Morocco is now negotiating a comprehensive free trade agreement.

In 2021, the United Kingdom and Morocco signed an agreement that aims to ensure the continuity of bilateral relations following the U.K.'s exit from the EU.

Morocco is a member of the Agadir Agreement, the free-trade area that also includes Egypt, Jordan and Tunisia, and a signatory to bilateral free trade agreements with the United Arab Emirates, Turkey and the United States, Canada and Morocco are discussing an exploratory foreign investment promotion and protection agreement.

5.2.1 Promoting local content and enabling mining cluster actors

Relevant institutions for the development of a Morocco-focused critical minerals network

State institutions:

- **Ministry of Energy, Mines and Sustainable Development (MEM).** Under Decree No 2-20-413 Establishing Attributions and Organisation Rules of the Mining and Energy Department of the MEM dated 3 July 2020.
- **National Office of Hydrocarbons and Mines (ONHYM)**. ONHYM is a public establishment regulated by Law No 33-01 promulgated by Dahir No 1-03-203 dated 11 November 2003 and its Decree No 2-04-372 dated 29 December 2004.
- **Land Registry.** The Land Registry (Agence Nationale de la Conservation Foncière du Cadastre et de la Cartographie) is a public establishment (établissement public) regulated by Law No 58-00, promulgated by Dahir No 1-02-125 dated 13 June 2002.

Academic institutions and other training establishments in the field of geosciences and mining

- R**abat National School of Mine**s
  Underground and open pit mining techniques;
  Ore processing and valorization;
  Civil engineering associated with mining (soil mechanics, geotechnics and rock mechanics);

Spatial modeling in 2D and 3D (Geomatics and geostatistical modeling);
Quality and quality control for the control of production chains (Supply chain) and planning;
mining digitalization through mastery of CAD techniques and instrumentation technologies;
Innovation for research and development.

- **Institute des Mines de Marrakech**
  Master the techniques related to geological investigations
  Ensure the proper conduct of a drilling site
  Use technical equipment
  Lead a team in carrying out a mission in the field or in a mine
  Manage human and material potential

- **Faculté Polydisciplinaire de Khouribga BP: 145 Khouribga principale, 25000, Maroc**
  The Geo-Resources and Geo-Mining sector provides training for students in order to acquire skills to integrate into the mining sector. The training course allows the acquisition of general and professional training in the field of exploration and exploitation of mines, ore processing and ore quality control in a circular economy concept. This training is supported by soft skills lessons which will ensure the student's development on a personal, behavioral and relational level.

- **Faculté des Sciences Kénitra Campus UniversitaireKénitraBP 133Maroc – Departtement de Géologie**
  The basic degree in "Earth Sciences" is open to holders of a Baccalaureate in Science. This sector aims to prepare students for professional life in the private and public sectors of application of Geosciences. The proposed modules and scheduled internships aim to train specialist graduates who master, on the one hand, the main methods and techniques of applied geology and, on the other hand, the practice of IT tools and digital cartography. This training also aims to equip students with appropriate knowledge on natural resource management techniques.

Also important training and Networking are expected to Morocco in 2024:

PanAfGeo-2 training in Mineral Resources Assessment is expected to be carried out in Morocco co-organized by the Geological Survey of Morocco. It will include training in classroom approaching subjects such as: Mineral Resources of Morocco, Exploration techniques, field equipment and sampling, treatment of geological data and GIS mapping. Subjects such as: Circular Economy, ECRM and UNFC classification as well as AMREC which is based in UNFC adapted for African Countries will also be part of the theoretical classes. Field visits to important mineral projects are also expected.

Mining the Connections 2024, International Multi-Network Conference on Mining, May 21-23, 2024 - Marrakech, Morocco. Following the success of the 1st edition of the international conference Mining the Connections, held at Château Laurier in Quebec City on April 25-27, 2022, we are planning a second edition in May 2024 at the Kenzi Rose Garden Hotel in Marrakech, Morocco.

6. Energy and digital transition: develop a strategy for the EU and Africa Partnership

Existing partnerships/projects dealing with responsible sourcing, CRM, with synergies to the AfricaMaVal objectives

The Moroccan Government implemented a national strategy for the development of its mining sector modernising the legislative and regulatory framework applicable to mining activities in 2015 and 2016 through the Law No 33-13 Related to Mines (Mining Law) and Law No 74-15 Related to the Mining Regions of Tafilalet and Figuig (Tafilalet and Figuig Mining Law)[11]. The reform of the law consisted in extending the application of mining legislation to all mineral substances used in industry other than construction and civil engineering materials. Legislative reforms include also:

The status of mining companies' employees, which is currently regulated by Dahir No 1-60-007 Forming the Status of Mining Companies Employees;

The definition of mining products, which would include natural hydrogen. The draft law also creates a specific process to determine whether a product is considered a mining product under the Mining Law;

The obligation for companies applying for a mining permit to be awarded first with a categorisation certificate (attestation de categorisation) by Moroccan authorities;

The obligation for companies applying for a mining permit;

The mining companies will have to hire individuals located in the region where mining operations are located or use local products;

Risk assessments and safety controls to be carried out annually by mining companies;

The use of a competitive process for the award of slag heaps operating licences;

The possibility for mining permits holders to subcontract mining operations, subject to the approval of Moroccan authorities.

Morocco is making a significant transformation of its economy to increase medium-high tech industries in Northern Africa. This structural transformation results from a significant acceleration in foreign and domestic investments in the automotive, aerospace, and renewable technology sectors, as well as chemicals.

Eight critical minerals account for 97% of its export value. Lithium is the first critical mineral in terms of export value and accounts for 21% of the critical mineral export basket, followed by iron ore (18%), nickel (17%), phosphate rock (15%), and PGM (15%).

[11] http://uk.practicallaw.tr.com/w-018-4123

There is no restriction on the nationality of shareholders of a company engaging in mining activities. In December 2022, Morocco adopted an Investment Charter which is the principal regulatory document for foreign and domestic investments with an exception to investment in agriculture, as well as the exclusion of real estate and commercial sector investors from some provisions of the charter.

The Moroccan government can sign specific agreements and contracts with investors, providing subsidies for certain expenses, custom duty and Value Added Tax (VAT) exemptions when the agreed criteria are met. Morocco has ratified 72 investment treaties for the promotion and protection of investments and 62 economic agreements, including with the United States and most EU nations, that aim to eliminate the double taxation of income or gains.

In 2016, the European Bank for Reconstruction and Development (EBRD) provided a EUR 28 million loan to CMT, a Moroccan listed mining company to support the upgrade of the Tighza mine located in the north-east of Morocco. The EBRD funds will support the construction of a new shaft at the mine's Ighraem Aoussar site to increase productivity. It will also improve working conditions within the mine to meet national health and safety and environmental protection regulations and also international good practice. All projects financed by the EBRD must be structured to meet the Banks Environmental and Social Policy (2014) requirements which include compliance with National laws in addition to GIIP. Also, in the Banks Environmental and Social Policy Performance Requirement 4 (Health and Safety) makes a specific requirement to projects meeting EU OSH Directives. https://www.ebrd.com/sites/Satellite?c=Content&cid=1395271995517&d=Touch&pagename=EBRD%2FContent%2FContentLayout&rendermode=live%3Fsrch-pg

Morocco is linked to the European Union by an association agreement with full tariff removal of industrial products since 2012. After having obtained "most favoured nation status" with the EU, Morocco is now negotiating a comprehensive free trade agreement with the bloc. In 2021, the United Kingdom and Morocco signed an agreement that aims to ensure the continuity of bilateral relations following the U.K.'s exit from the EU. Morocco is a member of the Agadir Agreement, the free-trade area that also includes Egypt, Jordan and Tunisia, and a signatory to bilateral free trade agreements with the United Arab Emirates, Turkey and the United States.

7. Opportunities for responsible investments

7.1. Identification of individual exploration, mining and refining projects

The examples, presented in the form of sheets, illustrate the approach methodology that we intend to adopt:

- Sheet 1: Barite (COMABAR);
- Sheet 2: Manganese (SACEM);
- Sheet 3: Cobalt (CTT – MANAGEM);
- Sheet 4: Antimony

The first three sheets are representative of the three mining regions present in Morocco. The operations are held by big companies with documentation provided. These examples are given in Annex 7.1 and could be a good starting point for cooperation with EU countries.

Morocco was the 11th-ranked and 17th-ranked producer of **cobalt and silver**, respectively, and accounted for 1.8% and 1.4% of world output, respectively. Managem is focusing on increasing its output of cobalt cathode, copper concentrate, and Silver, also leveraging African wide regional value chains and shares in mining sites across the continent, such as the Pumpi Mine in Congo (Kinshasa).

Located 120 km south of the town of Ouarzazate, **Bou-Azzer cobalt mine** is one of the oldest of the Managem mines. It has been operational since 1928 and is managed by Compagnie de Tifnout Tighanimine. Its activity consists of research, exploitation and processing of primary Cobalt. Although Managen is now cooperating with Glencore for recycling cobalt.

It is one of the few mines in the world producing cobalt as a mono-product. The Bou-Azzer mine supplies the hydro-metallurgy plants of Guemassa with most of their Cobalt concentrate or Cobalt spoil heaps.

The Khemisset Potash Project it is approximately 90km from the capital city, Rabat, and the planned bulk port of Kenitra Atlantique and 150km from the port of Mohammedia. It is close to the significant regional town of Khemisset and benefits from outstanding infrastructure including a network of toll roads, and electricity distribution grid and enjoys a supportive local government. Emmerson Plc has identified pre-production capital cost savings of over US$1.2 billion relative to the average Canadian potash mine development, with cost savings of over 90% on key mine access and infrastructure. JORC compliant resources were estimated at 537 Mt @ 9.24 % K_2O (hhtps://www.emmersonplc.com).

Atlantic Tin Ltd engages in the mineral exploration and development of **Achmmach Tin project** in Morocco. The company was formerly known as Kasbah Resources Limited and changed its name to Atlantic Tin Ltd on January 12, 2023. Atlantic Tin Ltd was incorporated in 2005 and is based in Perth, Australia.

The Achmmach tin deposit is hosted within a tightly folded sedimentary sequence of Visean Namurian turbidite beds locally showing shear corridors overprinted by tourmaline alteration. The area has also been intruded by magmatic sills of intermediate and mafic composition. The tin mineralisation occurs as

cassiterite (SnO_2) in disseminated form within the tourmaline, in association with sulphide veins or within quartz veins. (Kasbah PR 8/18/14) Achmmach geology is dominated by a north-east trending metamorphosed greywacke sequence crosscutted by near vertical east-west structures. These structures are usually marked by outcrops of tourmaline and silica altered breccias. Tin mineralization is commonly associated with these breccias. (Kasbah 3/08 QR). In 2018, ore reserves were estimated at 7 Mt @ 0.82 % SnO_2

Bou El Jaj prospect (Sn), located 8 km south-southeast of the Achmmach Tin Project is also hold by Atlantic Tin. The prospect is located at the southernmost extension of a mineralised corridor that is about 2.5 to 3 km wide and almost 12 km long, extending south-southwest from Achmmach through to the Oued Beht river.

Atlas Lion Deposit (V-Pb) -Vanadium District • Vanadinite deposit with desirable concentration of Vanadium and Lead • Surface deposits allow for simple, efficient and low-cost mining • Large, under-explored region in Morocco • High geological upside for other battery metals.

Three (3) main carbonatite intrusions were identified by the ONHYM during the exploration of the Southern Provinces: Lamlaga and Twinhinate located in the western part of the Oulad Dlim Massif and Glibat Lafouda located in the eastern part of the ODM. Exploration works performed by the ONHYM led to the discovery of significant resources in Nb-REE-(Ta)(Table X). The development of these prospects faces several challenges (in terms of infrastructures, energy, recovery of REE, …) that may constitute investment opportunities.

	Tonnage	REE content (%)	Nb_2O_5 grade (%)	Ta_2O_5 grade (ppm)	U_3O_8 grade (ppm)
Lamlaga	618 Mt	0.64	0.28		
Twihinate	597 Mt	0.90	0.32		111
G. Lafhouda	114 Mt		0.30	272	400

Table 8: Resources of the carbonatites prospects of the Southern Provinces[12]

7.2. ASM sector country profiles

Country profiles on ASM sector developments and investment

Artisanal miners had been legally mining for barite, kohl (black powder used for cosmetics), lead, and zinc at the Figuig and the Tafilalet regions near Meknes City since 1960. Dahir No. 1–60–019 of 11 Joumada II 1380 Hijri (Royal decree no. 1–60–019 of december 1,1960) created centrale d'Achat et de Développement de la Region Minière du Tafilalet et de Figuig (CADETAF) as an independent public agency with financial and legal authority. The Ministry of Energy and Mines was responsible for the technical supervision of mining operations in the Figuig and Tafilalet mining zone. Artisanal miners produced barite, lead, kohl, and zinc ores within an area of 60,000 km^2. Artisanal miners sold ores to collection centers, which were equipped with chemical analysis, storage, and weighing facilities. Prices were based on cost,

[12] https://mining.onhym.com

insurance, and freight (c.i.f.) value after subtracting taxes, which were 10 Moroccan dirham (MAD) (US$1.00) per metric ton for barite, 300 MAD (US$30.00) per metric ton for kohl, 10% for lead, and 15% for zinc. In 2017, 1,083 artisanal miners produced 472,102 t of barite ore, 20,778 t of zinc ore, and 5,183 t of lead ore (USGS, 2017-2018 Minerals Yearbook).

In 2021, the country produced 38.1 million tons of phosphate ore with a value of US$ 10.5 billion. Beyond phosphate, Morocco is also recognized for its global output shares of arsenic (12%), barite (15%), cobalt (1.4 %), fluorspar (0.9 %), silver (0.75 %) and lead (0.65 %) (USGS, 2022). Of these, barite is the only mineral, which has a considerable portion derived from artisanal and small-scale producers, estimated to account for 30 – 50 % of the country's production. In the period 2016 – 2020 the ASM sector in Morocco was producing about 4.5 – 7.5 % of the global barite supply (CADETAF 2020). Traditionally, ASM activities also exploit small amounts of lead and zinc ores that usually are not associated with barite veins. However, in industrial mining in Morocco it is common to exploit vein structures that contain lead, barite and fluorspar minerals in complex ores (BGR 1975). More recently, the southern part of the country has witnessed a growth in small-scale gold mining (DELVE 2019).

ASM activities in Morocco could play a role for the European supply with barite since the Moroccan ASM share in global barite production is at least 4.5 %. However, currently the ASM production is mostly sold to the petroleum industry that use the API standard to control the quality of barite products.

The extracted barite ore at the mine site is only handpicked and at the CADETAF stockyard, the ore is not subjected to any type of processing or dressing like, for example, washing, jigging, flotation, crushing or grinding. The introduction of enhanced processing techniques could improve the grades of the barite products and reduce the number of harmful substances, opening the way to barite markets other than the petroleum industry. However, the scarcity of water needed for most processing activities would present a challenge in the CADETAF zone.

Conclusions

Morocco is expected to remain the world's leading supplier of phosphate rock and phosphate-based fertilizers expanding capacity at existing mines, adding new mines, and adding new concentrating, floating, and washing units. Managem is focusing on increasing its output of cobalt cathode, copper concentrate, and silver by developing its mineral resources in Morocco through exploration studies in partnership with ONHYM and in partnership with Glencore for recycling cobalt and also nickel and lithium. Morocco has a well-established and modern mining industry, with a range of processing and refining facilities for a variety of ECRM minerals, namely 14 Plants (5 for Barite, 1 for Cobalt (Co), 1 for Nickel (Ni), 1 for Phosphate rock) and 1 Refineries (1 for Cobalt (Co).

Nevertheless, Morocco still has projects identified with interest for partnership with EU, complying with criteria of available information, stable prices and need to EU market which makes the country attractive for foreigner investment.

The artisanal and small-scale mining sector is regulated, supervised and supported by the CADETAF contributing 90% of barite production. The ASM sector is largely formalised and barite production is sold in the form of unprocessed ore to enterprises who perform beneficiation before export.

In relation with mining employment, Morocco is struggling to address the gap between the often-inadequate skills of local unemployed population and the requirements of the modern jobs market whereas foreigner employment is often needed. This is especially important in mining areas because people and local authorities still think that mining does not sufficiently benefit local populations where probably promotion of training is needed to locals and to governmental institutions such as the Geological Survey. EU projects such as PanAfGeo-2 offers this opportunity to countries such as Morocco, in fact, one training is planned to 2024 in mineral resources and training in field skill for geological mapping occurred in 2022.

Apart from adjustments needed, Morocco remains a business-friendly destination for foreigners, and the government has succeeded in positioning the kingdom as a major destination for foreign direct investment (FDI) in North Africa. The government is keen to attract foreign investors and seeks to facilitate investments through favorable regulations, economic reforms, and other incentives to decrease corruption and increase market confidence.

Morocco participates and complies with international agreements and regulations invests in partnerships with foreign countries such as joining the International Extractives Transparency Initiative (EITI), International Labour Organisation (ILO). Participates in international mining conferences and promotes these events in Morocco to attract foreigner investment. However, there are sectors, including mining phosphates, that are not yet open to foreigners.

References

Andreoni A. Avenyo, E. Critical Minerals and Routes to Diversification in Africa: Opportunities for Diversification into Renewable Energy Technologies - The Case of Morocco. Background paper commissioned by the UNCTAD secretariat for the 2023 edition of the Economic Development in Africa Report, 20p.

AWIMA (2023). AfricaMaVal Deliverable 4.1 Report on mining regimes with respect to ESG objectives

Bea, P. Montero, F. Haissen, J.F. Molina, F.G. Lodeiro, A. Mouttaqi, Y.D. Kuiper, M. Chaib. The Archean to Late-Paleozoic architecture of the Oulad Dlim Massif, the main Gondwanan indenter during the collision with Laurentia. Earth-Science Reviews, Volume 208, 2020, 103273, ISSN 0012-8252, https://doi.org/10.1016/j.earscirev.2020.103273.

Control Risk, 2023. Political and regulatory environment in the mining sectors in Morocco. Confidential Report, 8p.

D. de Oliveira, C. Fortes, P. Patinha, M. Gleuher, H. Cornelissen, N. Christou, J. Vasters, P. Schütte. AfricaMaval, D1.3 – Pan-African inventory of existing ore processing and refining capacities. WP1 - Task 1.3. Sept 2023

Dessertine, A. 2023 Mining formalization in Morocco: A critical analysis of coal mining cooperatives in Jerada. The Extractive Industries and Society 14 (2023)101230 https://doi.org/10.1016/j.exis.2023.101230.

El-Baraka, H. and Kasmi, A. (2016), Public participation in the environmental and social impact assessment process in the mining sector in Morocco, Natural Resources Forum, Vol. 40, No. 4, pp. 232241.

Ernest & Young, December 2023. Moroccan tax and legal environment of mining activities. Confidential Report, 43p.

Frizon de Lamotte D., Leturmy P., Missenard Y., Khomsi S., Ruiz G., Saddiqi O., F. Guillocheau. 2009. Mesozoic and Cenozoic vertical movements in the Atlas system (Algeria, Morocco, Tunisia): An overview. Tectonophysics, 475, p. 9-28.

Kengni B. (2018) Morocco: Mining Tax Reform to Benefit Local Communities. https://law.uct.ac.za/mineral-law/articles/2018-11-13-morocco-mining-tax-reform-benefit-local-communities.

Michard, André & Saddiqi, Omar & Chalouan, Ahmed & Frizon de Lamotte, Dominique. (2008). Continental Evolution : The Geology of Morocco. 10.1007/978-3-540-77076-3.

Mohammed Bouabdellah, Wissale Boukirou, Michel Jébrak, Florent Bigot, Johan Yans, Abdellah Mouttaqi, Mohamed El Gadarri, Abdellatif Errami, Gilles Levresse. Discovery of antiskarn-hosted strategic metal mineralization in the Upper Cretaceous Twihinate carbonatite intrusion (West African Craton Margin, Moroccan Sahara), Ore Geology Reviews, Volume 149, 2022, 105105, ISSN 0169-1368, https://doi.org/10.1016/j.oregeorev.2022.105105.

Rachid Benaouda, Dennis Kraemer, Sara Bejtullahu, Abdellah Mouttaqi, Michael Bau. Occurrence of high-grade LREE allanite-pegmatites and calcite carbonatite dykes in the Ediacaran complex of Aghracha, Oulad Dlim massif (South Morocco), Journal of African Earth Sciences, Volume 196, 2022, 104727, ISSN 1464-343X, https://doi.org/10.1016/j.jafrearsci.2022.104727.

Snineh et al., 2018 - Snineh, Meriem & Laftouhi, Nour-Eddine & Khalid, Mehdi & A., Abdennabi & Hejjaj, Abdessamed & Mandi, Laila. (2018). Contribution of the MRS method to identifying fractured basement rock aquifers in an arid area: a case study near the Bleida mine site in Morocco. Environmental Earth Sciences. 77. 10.1007/s12665-018-7269-x.

Souad, Kilani, 2019 - Lancement d'une application géospatiale des cartes géo-scientifiques du Maroc. 13 mars 2019. https://labass.net/27630-lancement-dune-application-geospatiale-des-cartes-geo-scientifiques-du-maroc.html

Taib, 2018 - The Mineral Industries of Morocco and Western Sahara. U.S. Geological Survey Minerals Yearbook, Vol. III, Morocco Country Chapter, 2017–2018. https://pubs.usgs.gov/myb/vol3/2017-18/myb3-2017-18-morocco-western-sahara.pdf

Tourneura, E., Chauveta, A., Kouzmanovb, K., Tuduric, J., Paqueze, C., Sizaretd, S., Karfal, A., Moundig, Y., El Hassani, A. 2021. Co-Ni-arsenide mineralisation in the Bou Azzer district (Anti-Atlas, Morocco): Genetic model and tectonic implications. Ore Geology Reviews 134:104128. https://doi.org/10.1016/j.oregeorev.2021.104128

Samir Samaoui, Ayoub Aabi, Mohamed Amine Nguidi, Abdellah Boushaba, Mohammed Belkasmi, Lahssen Baidder, Abdellah Nait Bba, Othmane Lamrani, Mohammad Taadid, Addi Zehni, Fault-controlled barite veins of the eastern Anti-Atlas (Ougnat, Morocco), a far-field effect of the Central Atlantic opening? Structural analysis and metallogenic implications, Journal of African Earth Sciences, Volume 204, 2023, 104970, ISSN 1464-343X, https://doi.org/10.1016/j.jafrearsci.2023.104970.

S&P, 2023 - Capital IQ Pro Database 2023. S&P Global Market Intelligence, a division of S&P Global Inc. S&P Global Market Intelligence, 55 Water Street, New York, NY 10041

Vella, Alex, 2022 - Highlighting mineralized geological environments through a new Data-driven predictive mapping approach. Mise en évidence des environnements géologiques minéralisés par une nouvelle approche de cartographie prédictive Data-driven. PhD thesis, pp. 281. UNIVERSITÉ D'ORLÉANS École doctorale Energie, Matériaux, Science de la Terre et de l'Univers Institut des Sciences de la Terre d'Orléans

CADETAF (2020), Rapport Annuel 2020, Version 1. https://cadetaf.com/wp-content/uploads/2021/08/Rapport-annuel-2020-VF.pdf (last accessed: 11.4.2023)

DELVE (2019), 2019 State of the Artisanal and Small-Scale Mining Sector.https://delvedatabase.org/resources/state-of-the-artisanal-and-small-scale-mining-sector (last accessed: 11.4.2023)

World Bank Group (2022), Country Climate and Development Report, 87p.Morocco Country Climate and Development Report (worldbank.org)

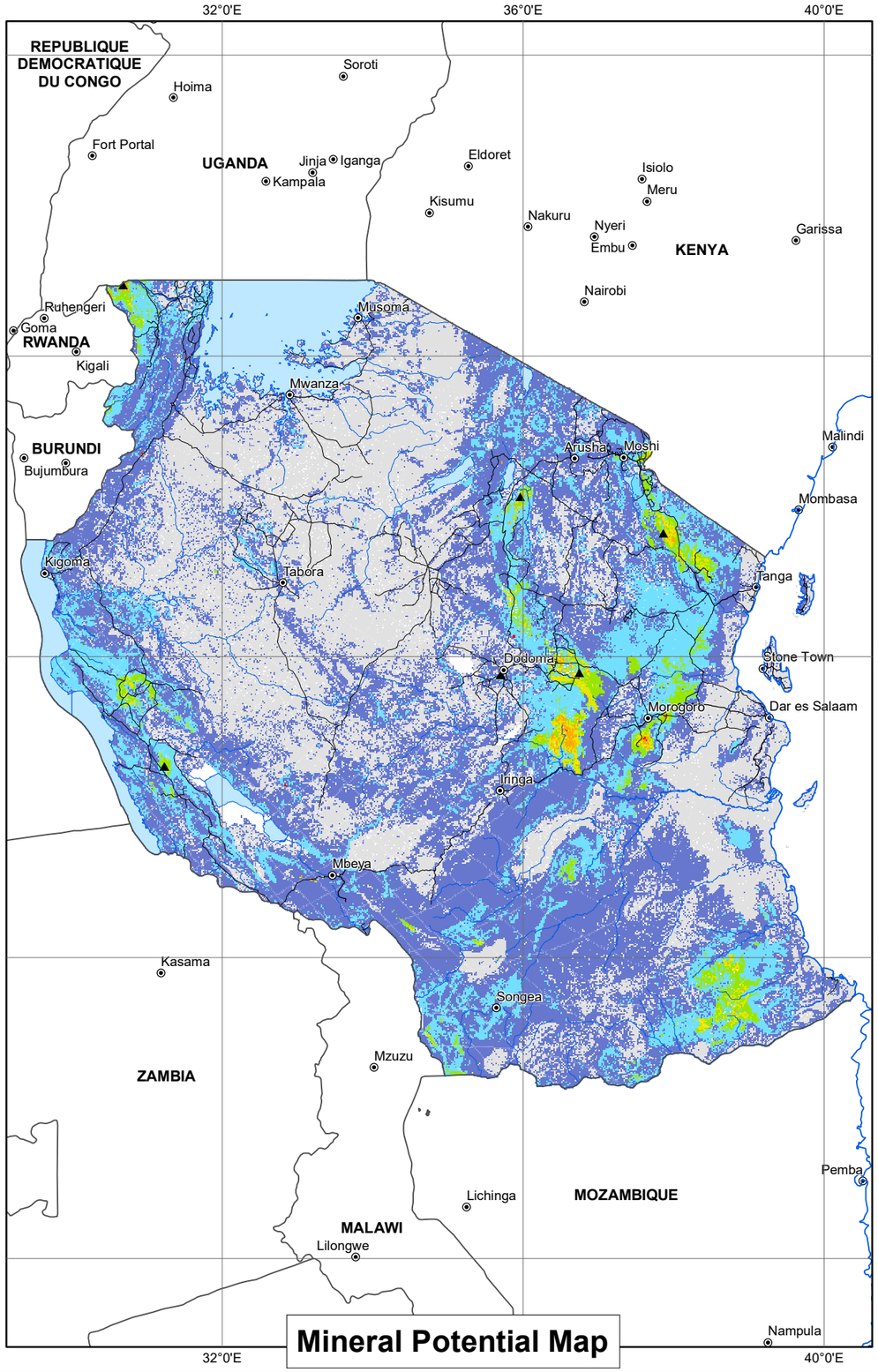
APPENDICES

Funded by
the European Union

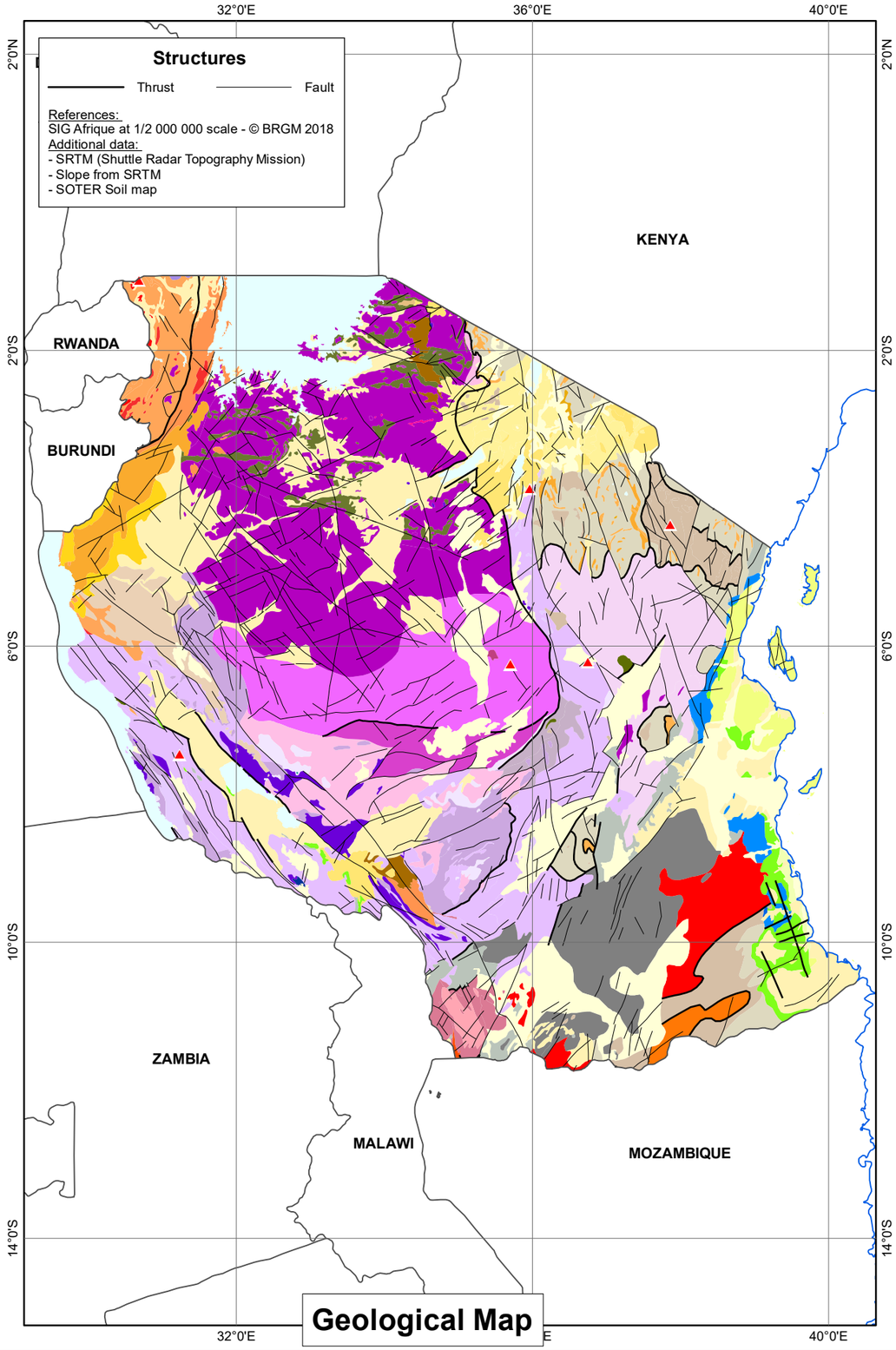
Country: TANZANIA

MINERAL POTENTIAL MAP - *BERYLLIUM (Be)*

Africa MaVal



Mineral Potential Map



Geological Map

Structures

Thrust — Fault

References:
SIG Afrique at 1/2 000 000 scale - © BRGM 2018
Additional data:
- SRTM (Shuttle Radar Topography Mission)
- Slope from SRTM
- SOTER Soil map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

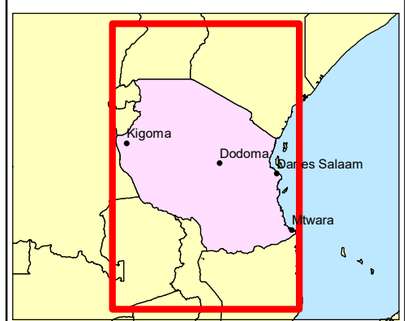
Known occurrences

Beryllium (Be)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 219950 99.54% Non-occurrence in database Non-occurrence predicted	False positive Cells: 956 0.43% Non-occurrence in database Occurrence predicted
False negative Cells: 1 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 63 0.03% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.54
Cell size: 2000 m



N 0 100 200 400 Km

Datum : WGS84 (World Geodetic System 1984)

January 2024

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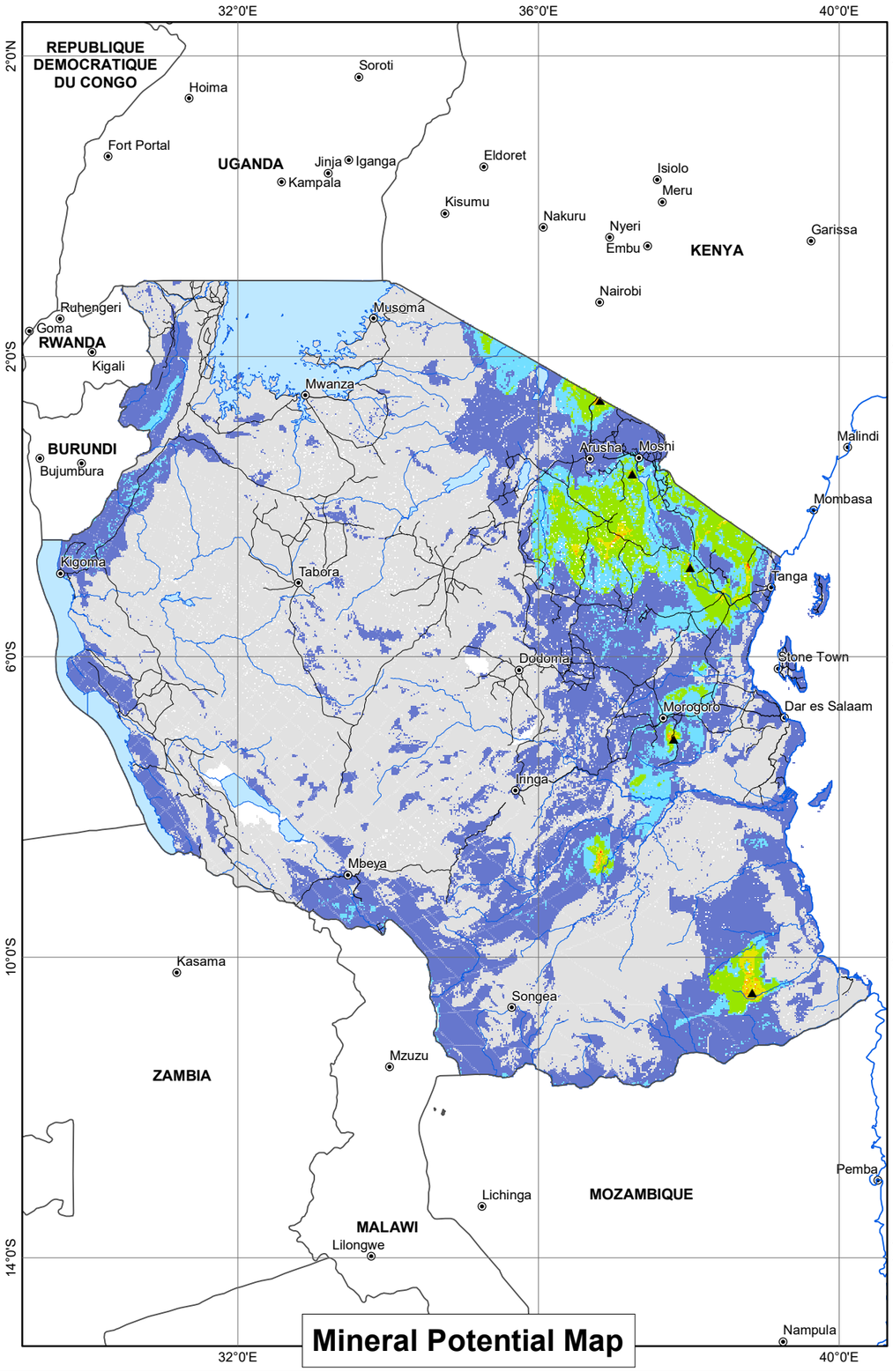
brgm

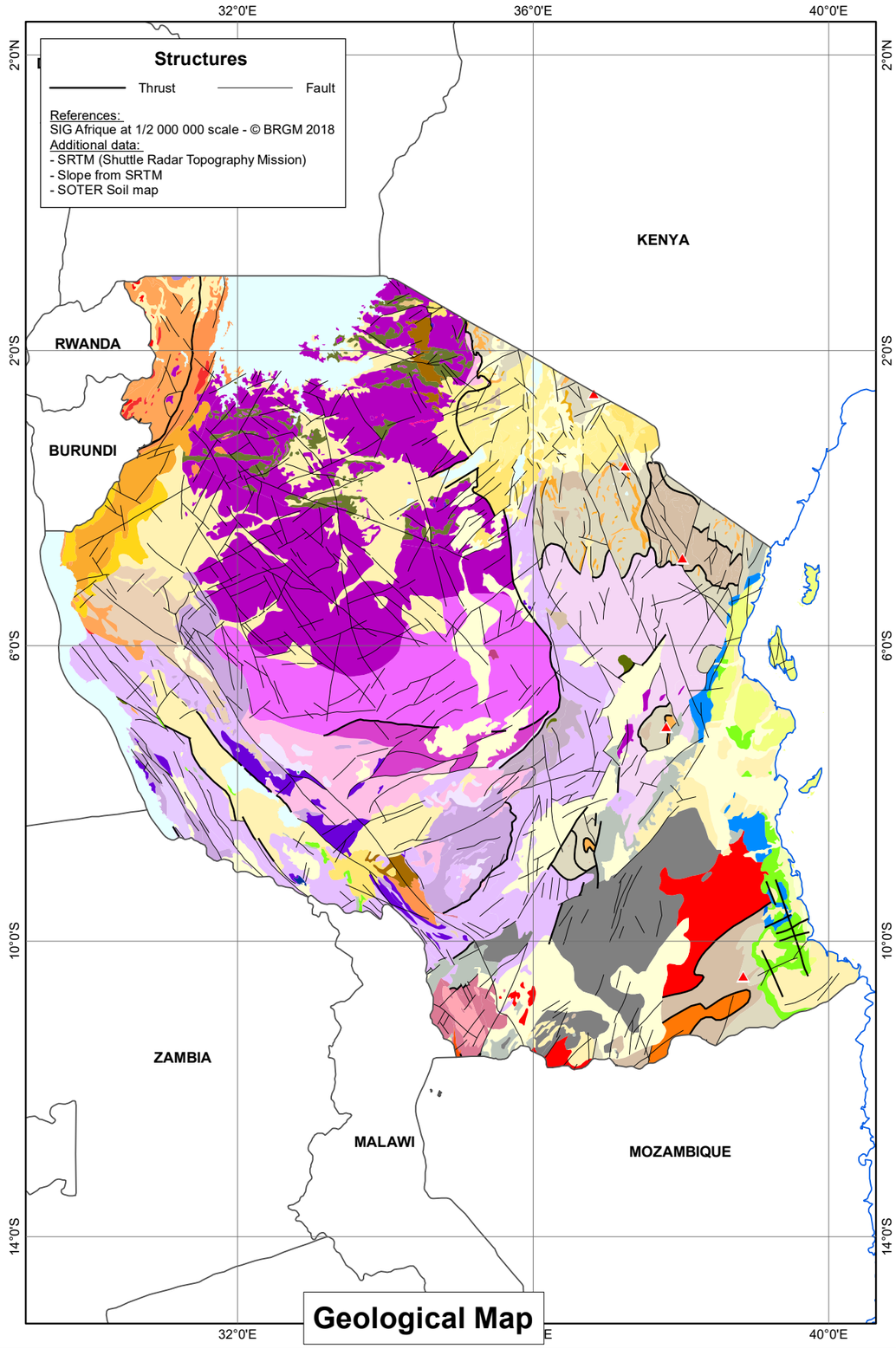
Country: TANZANIA

MINERAL POTENTIAL MAP - *GRAPHITE (Gr)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

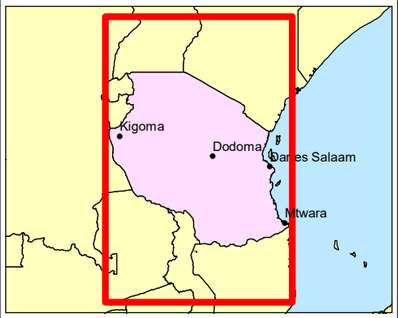
Known occurrences

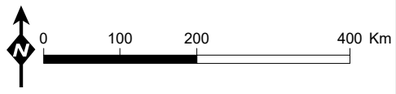
▲ ▲ Graphite (Gr)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 220877 99.96% Non-occurrence in database Non-occurrence predicted	False positive Cells: 68 0.03% Non-occurrence in database Occurrence predicted
False negative Cells: 0 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 25 0.01% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.65
Cell size: 2000 m





Datum : WGS84 (World Geodetic System 1984)

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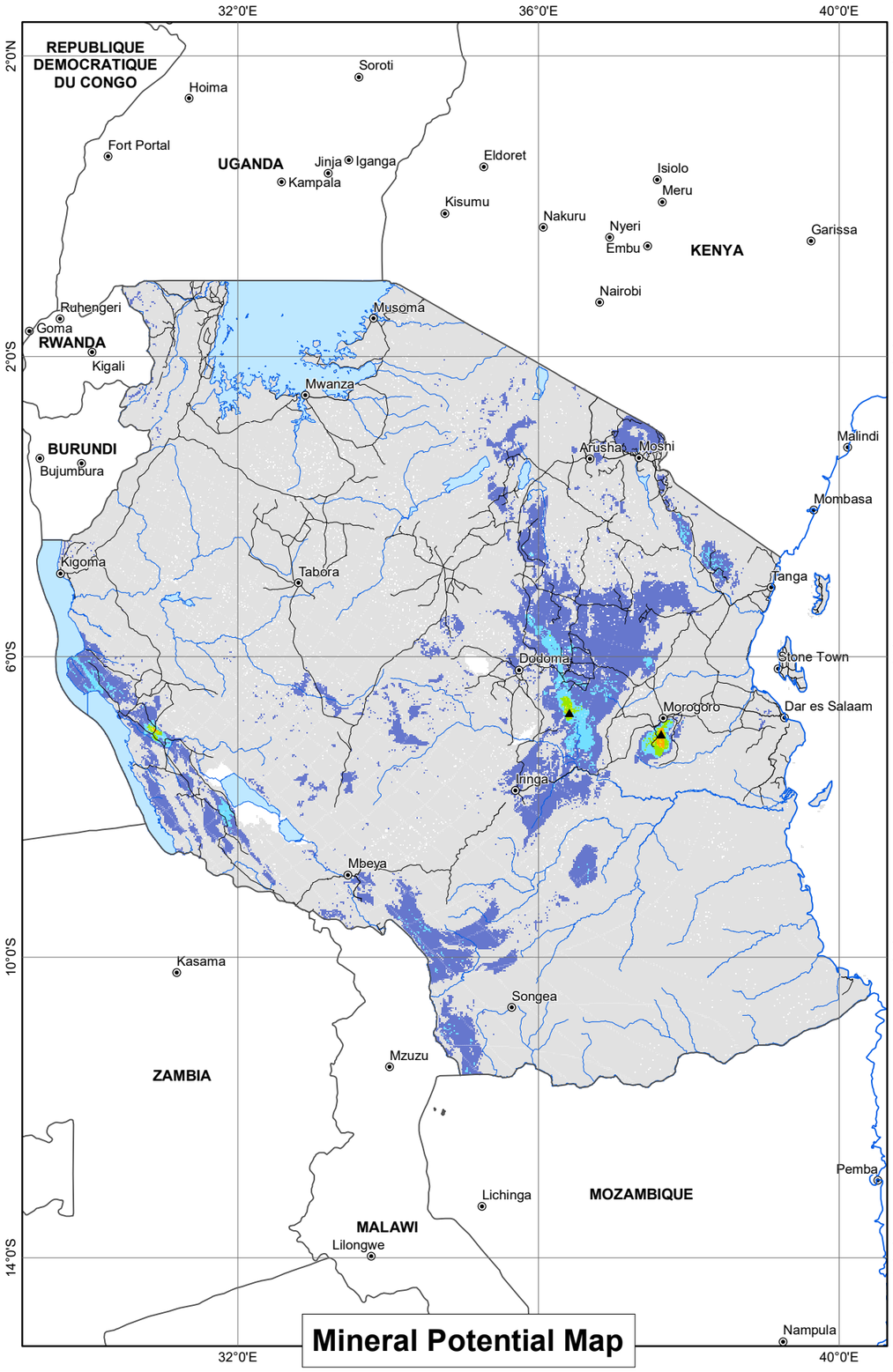
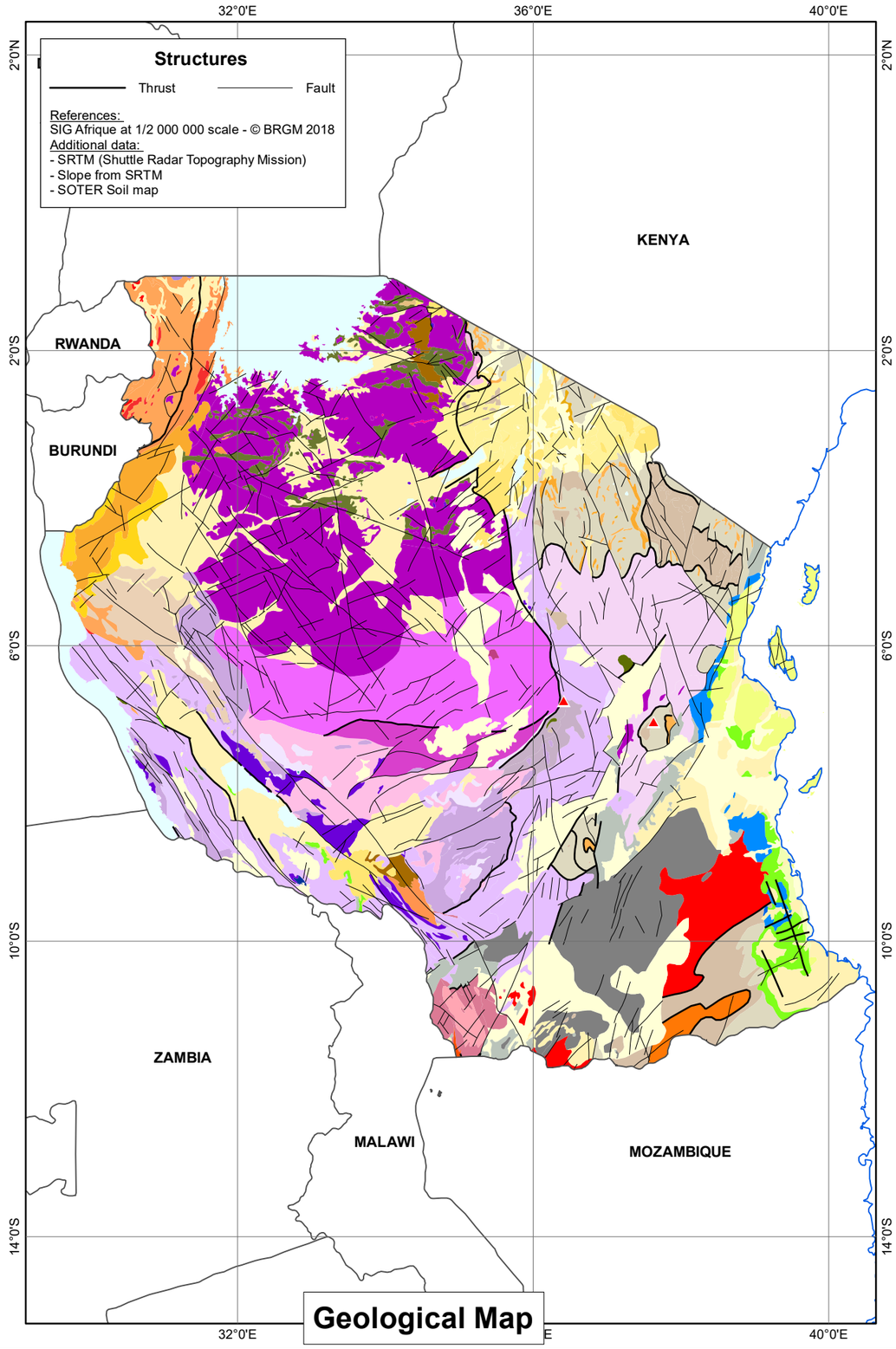
Country: TANZANIA

MINERAL POTENTIAL MAP - *MANGANESE (Mn)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

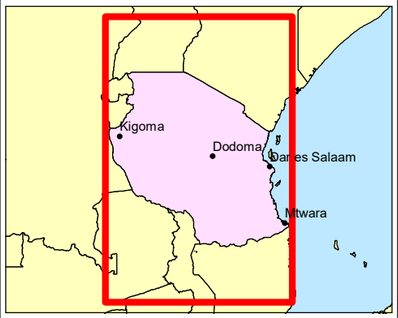
Known occurrences

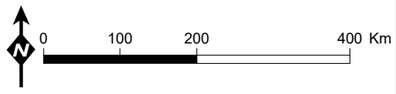
▲ ▲ Manganese (Mn)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 220960 100.00% Non-occurrence in database Non-occurrence predicted	False positive Cells: 1 0.00% Non-occurrence in database Occurrence predicted
False negative Cells: 1 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 8 0.00% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.71
Cell size: 2000 m





Datum : WGS84 (World Geodetic System 1984)

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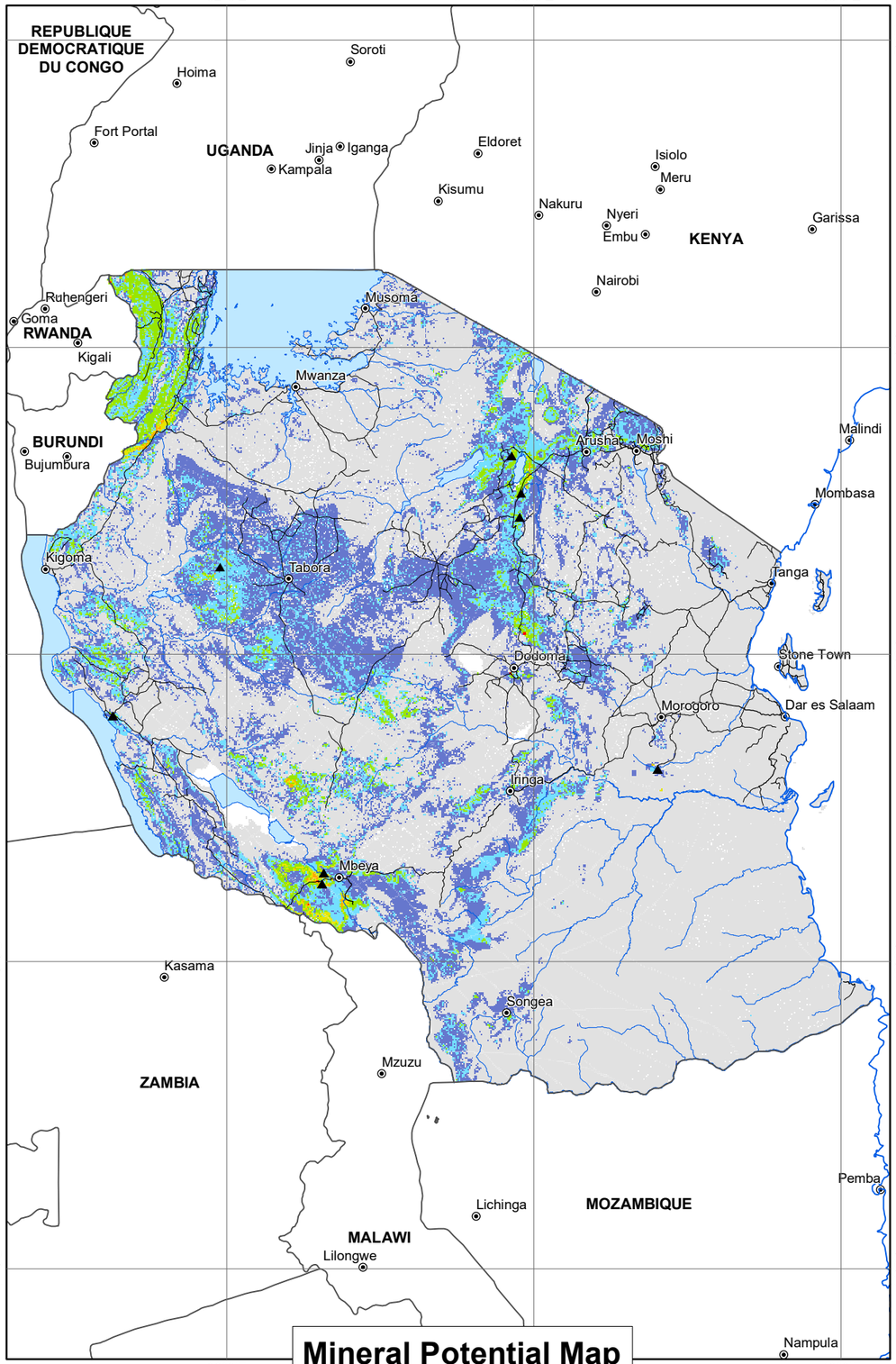
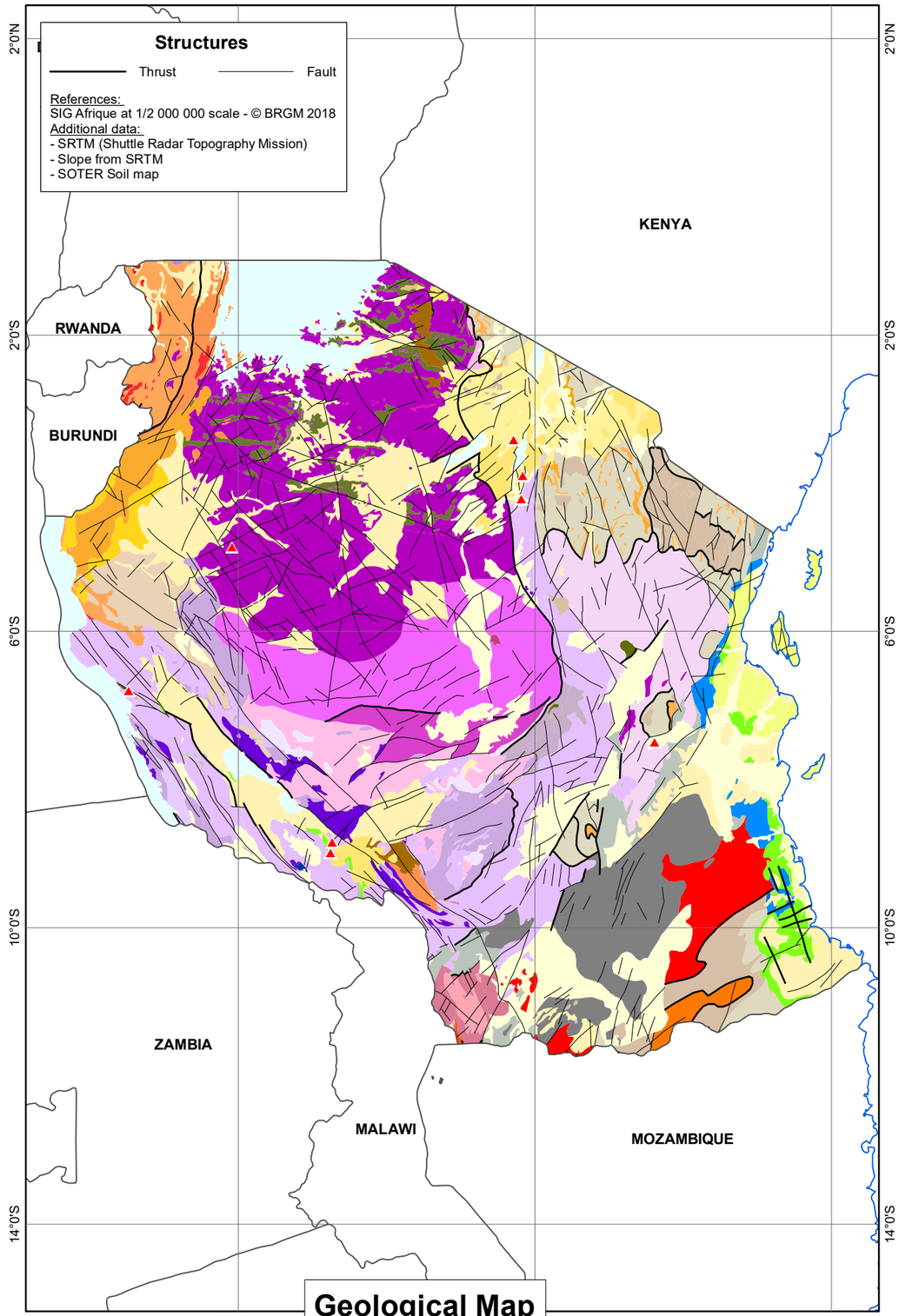
Country: TANZANIA

MINERAL POTENTIAL MAP - *NIOBIUM (Nb)*

Africa MaVal



Mineral Potential Map



Geological Map

Structures

Thrust — Fault

References:
SIG Afrique at 1/2 000 000 scale - © BRGM 2018
Additional data:
- SRTM (Shuttle Radar Topography Mission)
- Slope from SRTM
- SOTER Soil map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

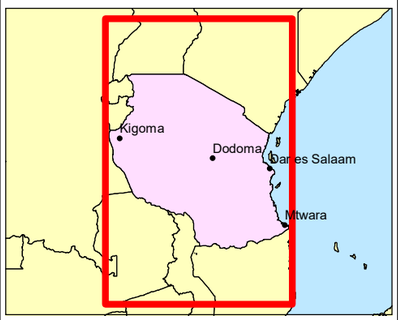
Known occurrences

▲ ▲ Niobium (Nb)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 220157 99.63% Non-occurrence in database Non-occurrence predicted	False positive Cells: 763 0.35% Non-occurrence in database Occurrence predicted
False negative Cells: 0 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 50 0.02% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.43
Cell size: 2000 m



N 0 100 200 400 Km

Datum : WGS84 (World Geodetic System 1984)

January 2024

Géosciences pour une Terre durable
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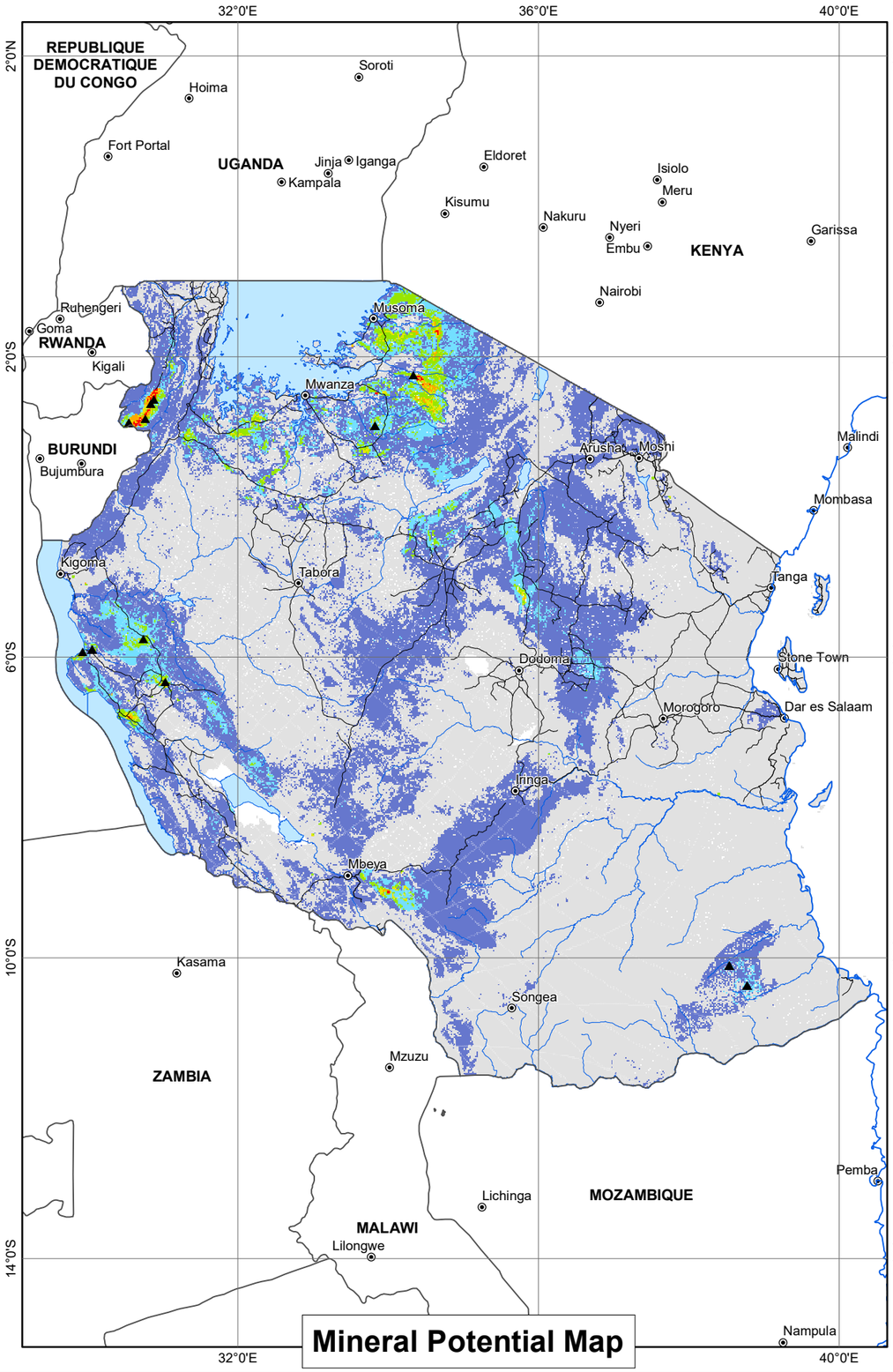
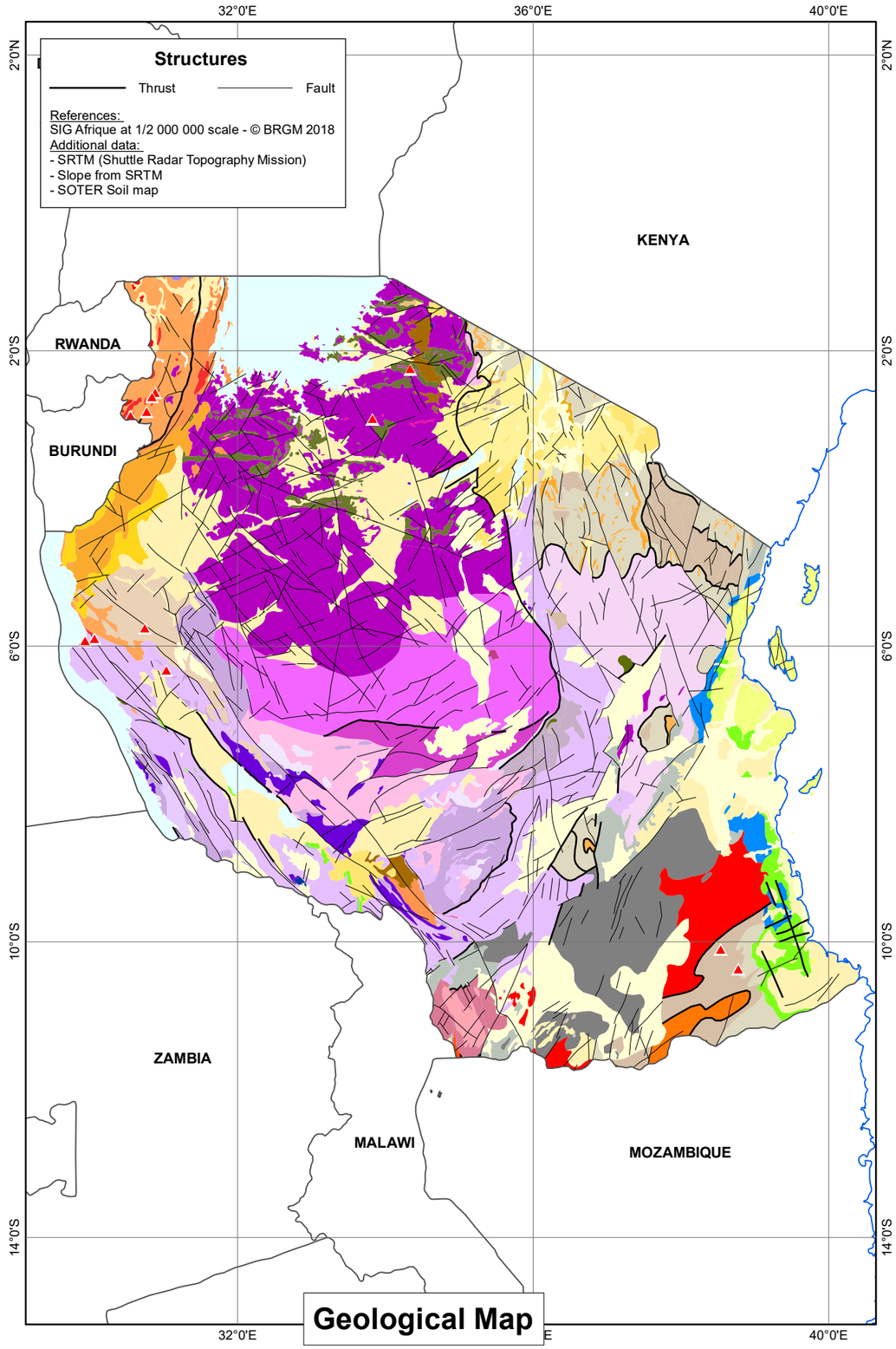
Country: TANZANIA

MINERAL POTENTIAL MAP - *NICKEL (Ni)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

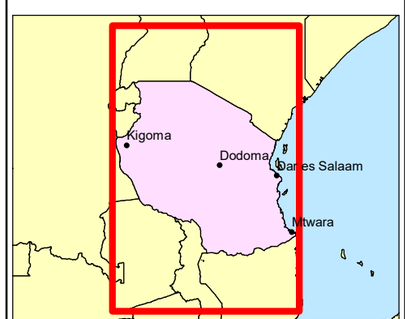
Known occurrences

▲ ▲ Nickel (Ni)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 220333 99.71% Non-occurrence in database Non-occurrence predicted	False positive Cells: 573 0.26% Non-occurrence in database Occurrence predicted
False negative Cells: 0 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 64 0.03% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.50
Cell size: 2000 m



N 0 100 200 400 Km

Datum : WGS84 (World Geodetic System 1984)

January 2024

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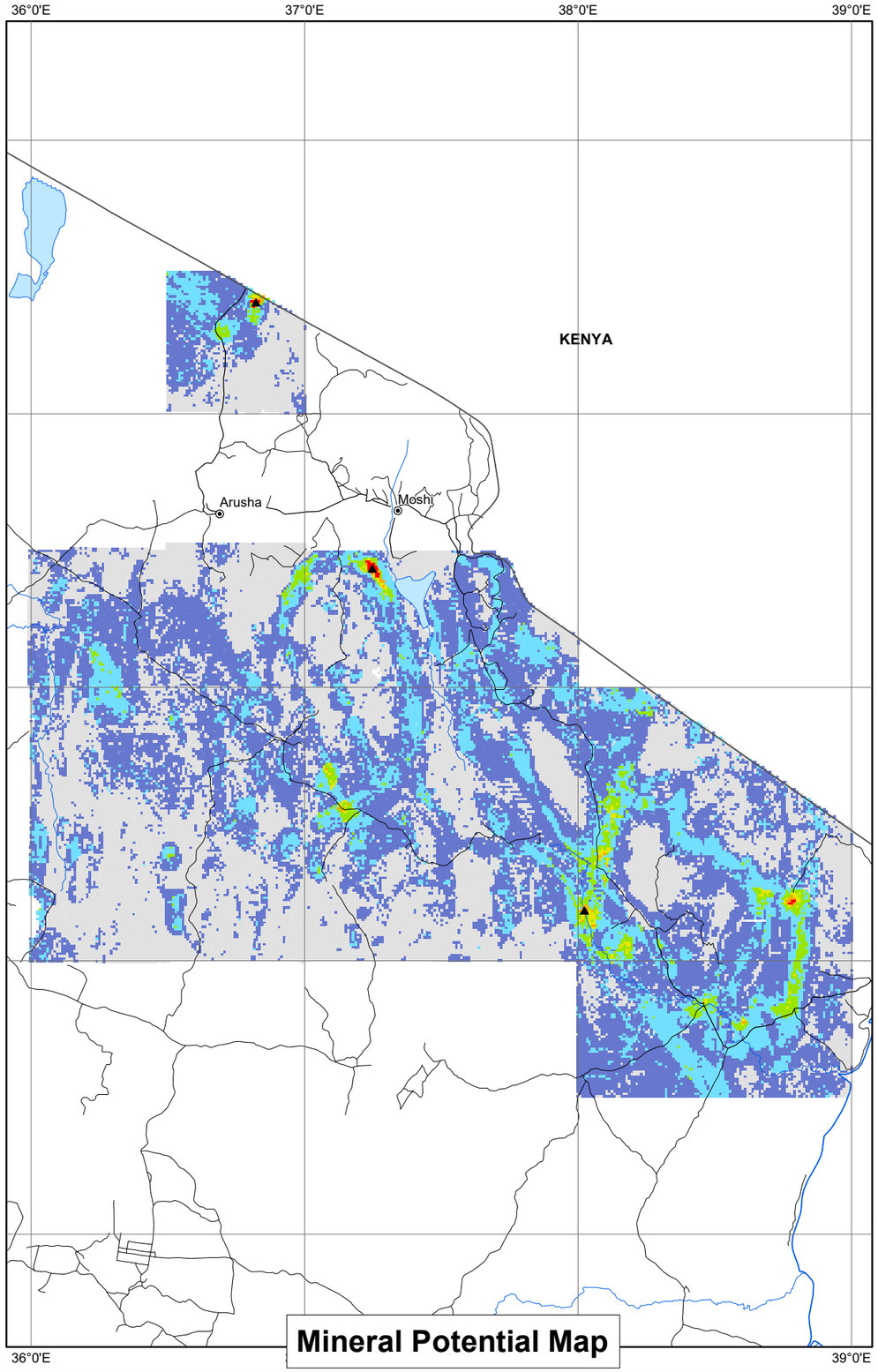
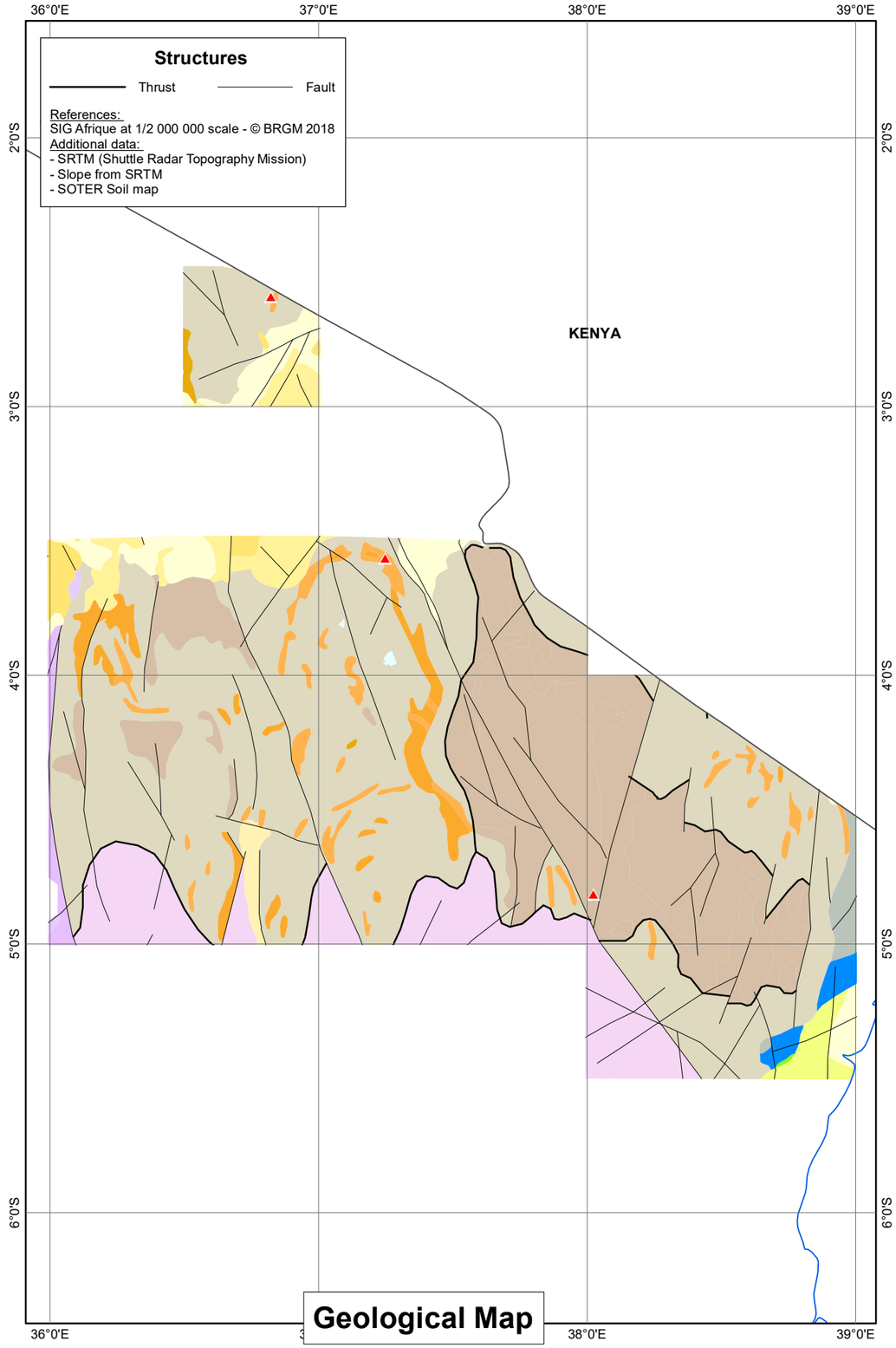
Country: TANZANIA (North East)

MINERAL POTENTIAL MAP - *GRAPHITE (Gr)*

Africa MaVal



Mineral Potential Map



Geological Map

Structures

Thrust — Fault

References:
SIG Afrique at 1/2 000 000 scale - © BRGM 2018
Additional data:
- SRTM (Shuttle Radar Topography Mission)
- Slope from SRTM
- SOTER Soil map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

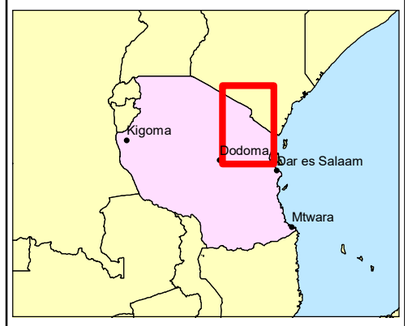
Known occurrences

Graphite (Gr)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 55398 99.84% Non-occurrence in database Non-occurrence predicted	False positive Cells: 39 0.07% Non-occurrence in database Occurrence predicted
False negative Cells: 0 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 48 0.09% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.60
Cell size: 1000 m



N

0 25 50 100 Km

Datum : WGS84 (World Geodetic System 1984)

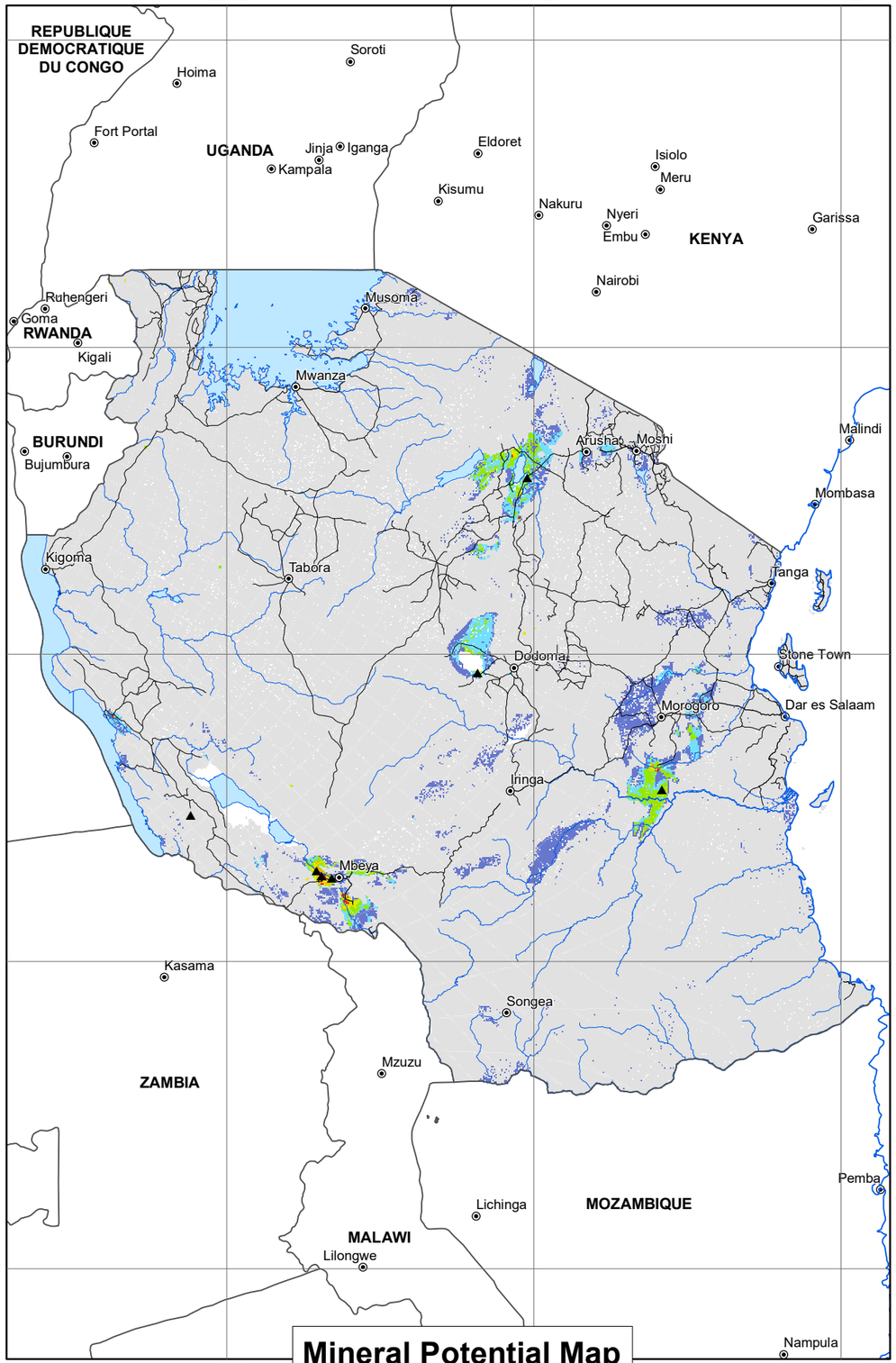
January 2024

brgm — Géosciences pour une Terre durable

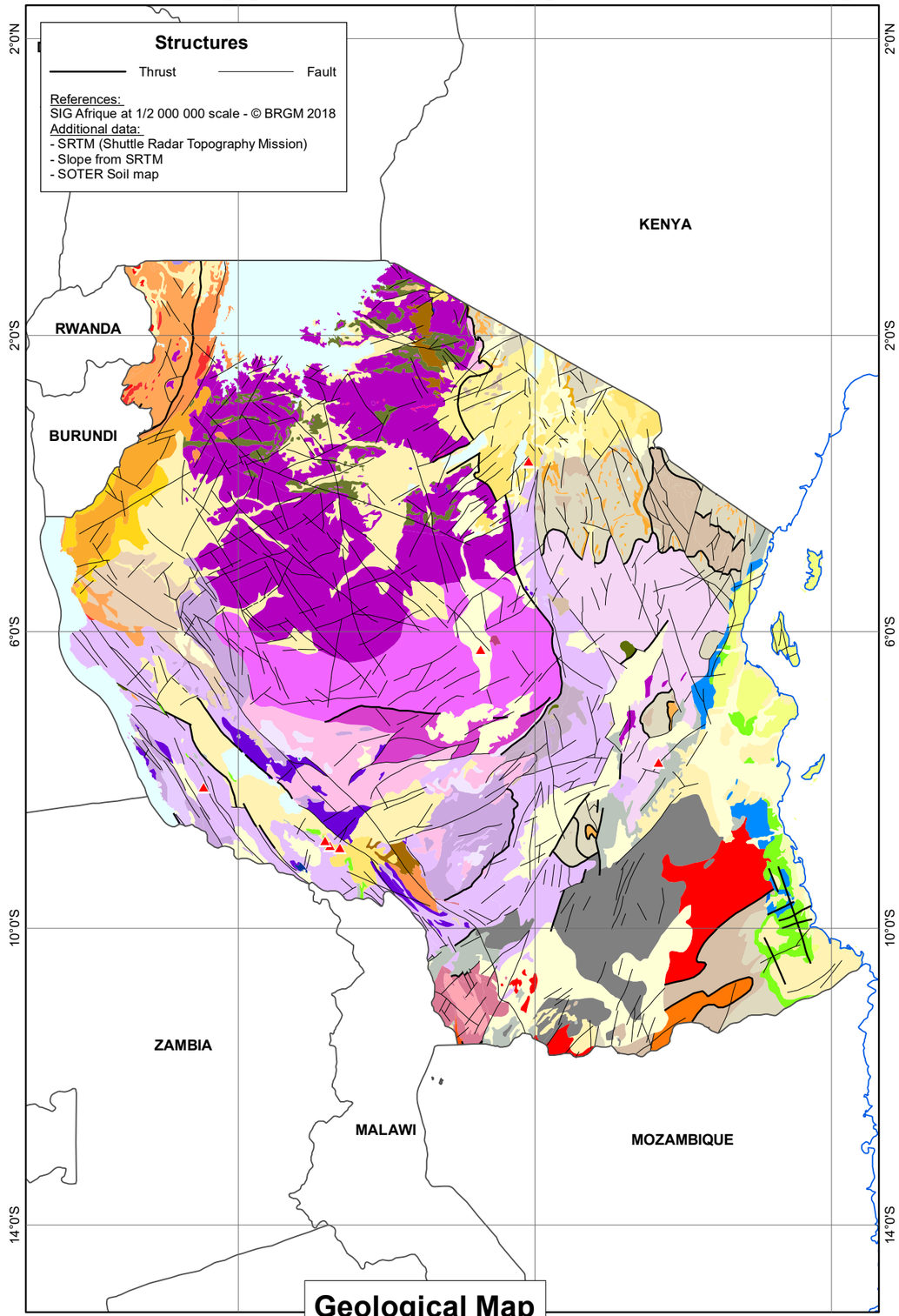
Country: TANZANIA

MINERAL POTENTIAL MAP - *PHOSPHATE (P)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

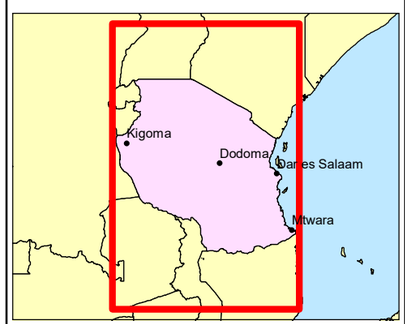
Known occurrences

▲ ▲ Phosphate (P)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 220846 99.95% Non-occurrence in database Non-occurrence predicted	False positive Cells: 92 0.04% Non-occurrence in database Occurrence predicted
False negative Cells: 1 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 31 0.01% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.64
Cell size: 2000 m



N 0 100 200 400 Km

Datum : WGS84 (World Geodetic System 1984)

January 2024

brgm Géosciences pour une Terre durable

Horizon Europe Framework Programme (HORIZON)

D9.3 – MOZAMBIQUE case study

WP9 - Task 9.4

Date [22/12/2023]

Patrícia Represas[1], Cátia Prazeres, Maria João Batista, Pedro Gonçalves, Carla Fortes

[1]LNEG

Funded by
the European Union

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Document information

Grant Agreement / Proposal ID	101057832
Project Title	EU-**Africa** Partnership on Raw **Ma**terial **Val**ue chains
Project Acronym	AfricaMaVal
Project Coordinator	Guillaneau Jean-Claude (jc.guillaneau@brgm.fr) - BRGM
Project starting date (duration)	1st June 2022 (42 months)
Related Work Package	WP9
Related Task(s)	Task 9.4
Lead Organisation	BRGM
Contributing Partner(s)	LNEG
Due Date	January 2024
Submission Date	January 2024
Dissemination level	

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Table of Contents

1. Extended Critical Raw Materials (ECRM) supply potential of Mozambique 9
1.1. Inventory of the ECRM 9
1.1.1. Geological setting 9
1.1.2. Known ore deposits and occurrences 10
1.2. Prospectivity and mineral high potential mapping 11
1.2.1. Selection of the ECRM for mineral prospectivity 11
1.2.2. Mineral high potential areas 12
1.3 Ore processing and refining capacities 15
2. Assessment of the ECRM value chain 17
2.1. Characterisation of the value chain for primary and secondary raw materials 17
2.1.1. List of the mining and recycling projects 17
2.1.2. Existing ESG indicators 18
2.1.3. Status of economic links between the formal and informal sectors 19
2.2. Identification of the bottlenecks along the value chain 19
3. Investment/financing prospects for ECRM projects in the Mozambique 22
3.1. Fiscal, legislative and regulatory context for in-country financings 22
3.2 Macroeconomic context for in-country financings 25
3.3 Political context for in-country financings 31
4. Assessment of social, environmental, and governance challenges 36
4.1. Country-level assessment and context 36
4.1.1. Context 36
4.1.2. Mineral and Mining Policies 37
4.1.3. Mining Regulations 37
4.1.4. Taxation and Royalties 39
4.1.5. Environment 39
4.1.6. Social 40

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4.2. Assessment of the Mozambican Mining Regime with Respect to ESG objectives . 41
5. Business network between the European Union and Mozambique 42
5.1. Assessment of the upstream and downstream business ecosystem 42
5.1.1. Context, formal and informal players 42
5.1.2. Relationships at local or regional levels 42
5.2. Building new B2B relations 44
5.3. Promoting local content and enabling mining cluster actors 44
5.3.1. Relevant institutions for the development of a Mozambique-focused critical minerals network 44
5.3.2. Academic institutions and other training establishments in the field of geosciences and mining 45
6. Energy and digital transition: develop a strategy for the EU and Africa Partnership 47
7. Opportunities for responsible investments 49
7.1. Identification of individual exploration, mining and refining projects 49
7.2. ASM sector country profiles 50
Country profiles on ASM sector developments and investment 50
Conclusion 51
References 52

List of Figures

Figure 1: Mineral occurrences in Mozambique overlaying simplified map of geological ages (source SIGAfrique) 11
Figure 2: Worldwide Governance Indicators (WGI) of Mozambique and Sub-Saharan Africa countries (data from World Bank) 20
Figure 3: Logistics Performance Index (LPI) score for Mozambique and Sub-Saharan Africa countries (data from World Bank) 20
Figure 4: Mozambique and Sub-Saharan Africa countries scores for the six key dimensions of LPI (data from World Bank) 21
Figure 5: Mozambique results from the 2022 Fraser Institute Annual Survey of Mining Companies 21

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Figure 6: Mozambique - Historical GDP per capita from 2011 to 2021 & projected estimations from 2022 to 2030 26
Figure 7: Mozambique - Historical and projected nominal GDP and real GDP (Sources: S&P) 26
Figure 8: Mozambique - Historical and projected real GDP growth (Sources: S&P) 26
Figure 9: Mozambique - Distribution of GDP across economic sectors from 2011 to 2021 [%] 27
Figure 10: Mozambique - Foreign direct investment net, net inflows, net outflows from 2013 to 2022 28
Figure 11: Mozambique - Historical official exchange rate (Metical per US$, period average) (Source: World Data Bank) 29
Figure 12: Mozambique - Historical and projected data on inflation indicators (S&P Global, 2022) 29
Figure 13: Mozambique - Historical and projected data public debt and debt/GDP (S&P Global, 2022) 30
Figure 14: Mozambique - Historical and projected data on public debt interest payment (S&P Global, 2022) 30

List of Tables

Table 1: Criteria allowing the assessment of DBA-RF modelling 12
Table 2: List of the main processing units 16
Table 3: A list of the major ECRM Mining projects in Mozambique 17
Table 4: The various license types available for the mining sector of Mozambique 38
Table 5: Projects selected to be presented as fact sheets in WP7 49

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Abbreviations and Acronyms

Acronym	Description
AfCFTA	African Continental Free Trade Area
ASM	Artisanal and Small-Scale Mining
AU	African Union
CACM	Centre for Arbitration, Conciliation and Mediation
CIT	corporate income tax
DBA	Disc-based association
DNGM	National Directorate of Geology and Mines
DTT	Double Tax Treaties
ECRM	Extended Critical Raw Materials
EPA	Economic Partnership Agreement
ESG	Environmental, social and governance
FDI	Foreign Direct Investment
GDP	Gross domestic product
ICSID	International Centre for Settlement of Investment Disputes ()
INAMI	Mozambican mining sector are: National Institute of Mines
INSS	Social Security Institute
IPM	Mining Production Tax Imposto sobre a Produção Mineira
IRRM	Resource Rent Tax
ISS	Surface Tax

LNG	Liquified Natural Gas
Ministry of Mineral Resources and Energy	MIREME
MPM	Mineral Prospectivity Mapping
MZN	Mozambican metical
OHADA	Organization for the Harmonization of Business Law in Africa
RF	Random Forest
SADC	Southern African Development Community
VAT	Value added tax
WHT	withholding tax
WP	Work Package

Wording

Mineral prospectivity: "Mineral potential mapping is concerned with quantifying and mapping the likelihood that mineral deposits are present in a study area. It is synonymous to mineral prospectivity mapping, which is concerned with quantifying and mapping the likelihood that mineral deposits may be found by exploration in a study area."

Keywords

ECRM, Mineral potential, Ore processing, Refining capacities, Recycling units, Value chain, Primary raw material, Secondary raw material, Bottlenecks, Finance, Investment, Sustainability, ESG, Land-use, Taxation, Mining regulation, Mining policies, Child labour, Responsible extraction, Mozambique, Pan-African

Executive Summary

This report provides an overview of the key aspects regarding mineral resources, supporting regulations and institutions, as well as any related provisions in the prospecting of Extended-Critical Raw Materials (ECRMs) in Mozambique. The report is an integral part of the larger AfricaMaVal programme project and, in that context, provides this country overview specifically aimed at European Union (EU) investors and decision-makers.

Mozambique is endowed in various raw materials, with an enormous number of small occurrences identified, including ECRM. The focus of this report is the most promising ECRMs, including beryllium, coking coal, copper, natural graphite, rare earth elements and titanium. Other raw materials as bauxite, lithium, niobium, tantalum and phosphate are also considered. This report gives an overview of the geological settings that favour the presence of the considered ECRM in Mozambique. The predictability mapping allows to visualize the major potential area or trends for each ERCM.

The potentialities of the value chains are shown, as well as insights into the regulations for financing, including taxation and royalties and give an overview about the macroeconomic context of Mozambique.

The assessment will also include value chain for these critical minerals therefore activities such as exploration, extraction, processing, and recycling will be evaluated. Fiscal regulation as well as the macroeconomic and political context will be scanned to give an overview of the country regime. ESG regulations and challenges will be depicted for the investors to better understand the background and questions to address when it comes to launch activities on the ground. A list of downstream to upstream actors related to the mining sector will assist deciders to build their Business-to-Business network. This country profile will try to address the needs of the EU green deal according to the country strategies and planification.

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1. Extended Critical Raw Materials (ECRM) supply potential of Mozambique

1.1. Inventory of the ECRM

1.1.1. Geological setting

Mozambique is characterized by main geological differences between north and south. The northern part of the country comprises the older, crystalline rocks, mainly proterozoic, whilst the southern part is entirely phanerozoic, with the central region hosting archaic, proterozoic and phanerozoic terrains.

The crystalline basement of Mozambique shows three major tectonic blocks, East, West and South Gondwana, that are the result of collision and amalgamation of the different Gondwana blocks, during the Pan-African orogeny. The East and West blocks are separated from the South block by the Lúrio Belt and by the Sanângoè Shear Zone, respectively. The crystalline basement comprises a heterogeneous assemblage of paragneisses, granulites, migmatites, orthogneisses and often metamorphic igneous rocks (Koistinen et al, 2008).

The Archaean terrane comprise the eastern and northeastern part of the Zimbabwe craton, occupying a zone a few tens of kilometers wide and c. 300 km long next to the state boundary between Zimbabwe and aging > 2500 Ma (Vasconcelos, 2014). In addition to dominant TTG gneiss lithology, the Archaean in Mozambique contains the eastern extensions of the Odzi-Mutare-Manica Greenstone Belt around Manica and the Cronley-Munhinga Greenstone Belt c. 50 km south of Manica (Koistinen et al, 2008).

Paleoproterozoic units are spread in three regions; Manica, along the border with Zimbabwe around archaic units; Tete region; and by the Lake Niassa. Mesoproterozoic intrusive and supracrustal units compose most of the northern region and a large extension of the central part of the country. A Mesoproterozoic gabbro-anorthosite body occupies an extensive area around and north of the city of Tete (Vasconcelos, 2014). As for Neoproterozoic units, they also occur in all the northern region, although not outcropping as much. They comprise supracrustal groups and the Ocua allochthonous complex of the Lúrio Belt.

The phanerozoic terrains correspond to the Karoo Supergroup and the East African Rift System. The Karoo Supergroup is divided into Lower Karoo (sedimentary) and Upper Karoo (Sedimentary and igneous) and goes from Upper Carboniferous to Jurassic. It deposited in deep intracratonic tectonic depressions (Vasconcelos, 2014). From the Jurassic it starts the opening of the Indian Ocean, together with the break-up of Gondwana lead to the opening of two major sedimentary basins, the Mozambique Basin and the Rovuma Basin.

The Lower Karoo Group consists of a thick sequence of sandstones and argillites with coal seams close to the base. Bimodal lava flows principally comprise the Upper Karoo Group. The Cretaceous volcano-sedimentary Lupata Group, terrestrial Sena Formation, carbonatites and associated alkaline rocks generally top the Karoo grabens. The East Africa Rift Sequence, initiated from Tertiary continental clastic

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formations and followed by Neogene volcanic events, forms the youngest cover together with colluvial and alluvial deposits of the Quaternary (Pekkala et al, 2008).

1.1.2. Known ore deposits and occurrences

Among the 34 raw materials assessed as ECRM by the EU in the new list of 2023, 22 ECRMs have been identified to varying degrees in Mozambique. Those will be briefly descried below, associated **with active mines:**

Coking Coal – Two active mines are described, while 38 deposits are identified.

Rare Earth Elements, Niobium, Beryllium, Lithium, Tantalum, Tin, Bismuth - REE, Nb, Be, Li, Ta, Sn, Bi, Sr – This group of elements are related to pegmatitic contexts in Mozambique. Some pegmatite fields are actively mined presently, with a special focus in the Alto Lingonha pegmatite field.

Rare Earth Elements - There is also an association to carbonatites and alkaline rocks, and, to a smaller degree, to alluvial placers deposits.

Copper (Cu) – Two active mines (Mundongwara and Cacanga), related to gold mineralization, and 85 occurrences are known.

Titanium (Ti) – A large amount of small alluvial Ti occurrences exist in Mozambique. There is a mine operating in Moma, and circa 124 mineralizations are identified hosting Ti as the main raw material of interest, but dozens of other deposits exist that contain Ti as possible coproducts, mostly associated with other heavy minerals in alluvial contexts, or in iron deposits.

Bauxite – Bauxite is mined from one deposit, although it is identified in 12 other occurrences in the country.

Natural Graphite – Graphite is mined in the Cabo Delgado Province. There are also 33 deposits, and 36 occurrences are identified in Mozambique, all in the northern part of the country.

Other ECRM occurrences with no evidence of past and current mining activities:

Phosphate Rock (P) – 17 deposits are described within different environments, however with little information associated. Additionally, 5 occurrences have been identified.

Fluorspar (Fl) – 11 deposits are known, mainly in veins or associated with carbonatitic rocks, and additionally 9 vein occurrences are identified in the country.

Silicon (Si) – Silicon deposits are identified in pegmatitic contexts. There are 8 such deposits recognized, having the above mentioned pegmatitic raw materials as secondary products. Nevertheless, there is one deposit related to gold deposits and one occurrence of unknown origin.

Cobalt (Co) – Cobalt occurs in 4 deposits from different contexts, mainly in association with other metals, and in 5 occurrences.

Vanadium (V) – Vanadium is a promising raw material in Mozambique. It occurs in 6 deposits, associated whether to iron/titanium or to graphite, and in 4 occurrences, associated to base metals.

Manganese (Mn) – 4 deposits are known in sedimentary contexts and 4 occurrences are identified without further information.

Magnesium – (Mg) -Magnesium is pointed in 3 deposits in mafic contexts.

Platinum (Pt) – Platinum was described in 2 deposits and 2 occurrences.

Baryte – There are 2 baryte deposits described in Proterozoic rocks in Mozambique.

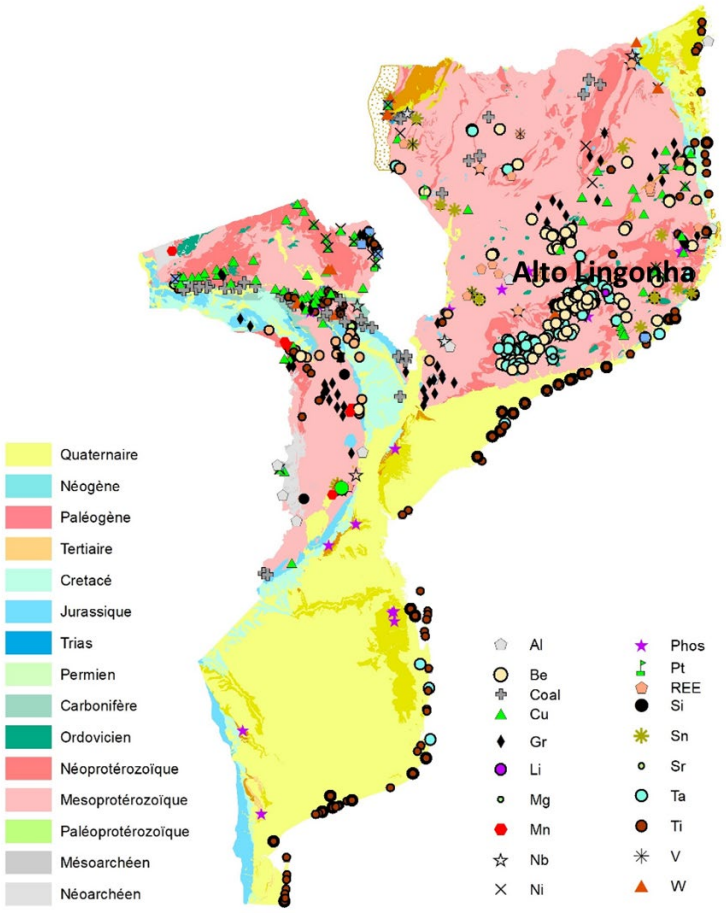

Figure 1: Mineral occurrences in Mozambique overlaying simplified map of geological ages (source SIGAfrique).

1.2. Prospectivity and mineral high potential mapping

1.2.1. Selection of the ECRM for mineral prospectivity

Among the ECRMs present in Mozambique, 6 **ECRMs** were selected for mineral prospectivity mapping (MPM): **beryllium**, **coking coal**, **copper**, **natural graphite**, **rare earth elements**, **titanium** and **5** others were chosen as optional elements: **bauxite**, **lithium**, **niobium**, **tantalum** and **phosphate**.

The choice of these commodities was constrained by the dataset used, as it needs at the very least more than 10 occurrences for a given ECRM to perform a correct prediction. The MPM was performed using the Disc-based association (DBA) grid method coupled to Random Forest (RF) method (see Vella, 2022). This method focusses on the local spatial associations of geological variables and features of various natures to describe the relationships between the predictors and the mineralization. This allows the identification of geological environments in the study area around each node of the DBA grid, and the integration of both quantitative and non-quantitative spatial data, such as geophysical anomaly maps and location of geological map units, respectively. Then, RF classification is used here to perform a generalization of complex geological environments and features and evaluate their likelihood to host potential mineralization occurrences by giving a score comprised between 0 (low potential) and 1 (high potential).

In Mozambique, the data used for MPM are:

- SIGAfrique Geological maps at 1:2,000,000 scale
- SIGAfrique mining database.

The DBA grid for predictive modelling is mainly defined by **five parameters**:

· Size of cell – d;
· Search radius for lithologies – R;
· R/d ratio,
· Search radius for mineral occurrences – R_1. It can be null, in this case the search radius will be restricted to the cell size (d)
· Search radius for faults – R_2. It can be null, in this case the search radius will be restricted to the cell size (d) or it can take into account the cumulative length of faults present in the cell size (d).

In order to maximize the grid resolution while minimizing overlaps and cells with only on lithology, the parameters of DBA grid for all the commodities used in this study are as follows: d = 5000 m, R = 10000 m, R/d = 2, R_1 = 5000 m, R_2 = 5000.

1.2.2. Mineral high potential areas

Mineral high potential areas were highlighted for the four studied ECRMs in Mozambique. The criteria allowing the assessment of DBA-RF modelling can be found in the table below. All the favorability maps can be found in the **Appendix_1.2_MPM_MOZAMBIQUE**.

Table 1: Criteria allowing the assessment of DBA-RF modelling

Mozambique	TN	FN	FP	TP	TPR	FPR	PPA (%)	Precision (%)	Accuracy (%)	J-score	Threshold
Natural graphite	30975	7	1429	190	0.964467	0.0440995	4.96611	11.7	95.6	0.92	0.433
REE	29922	16	2461	202	0.9266055	0.0759967	8.16846	7.6	92.4	0.855	0.399
Titanium	29869	9	2437	286	0.9694915	0.0754349	8.3525	10.5	92.5	0.894	0.425
Copper	30799	4	1545	253	0.9844358	0.0477677	5.51517	14.1	95.2	0.94	0.476
Coking coal	31376	1	1108	116	0.991453	0.0341091	3.75449	9.5	96.6	0.983	0.399
Beryllium	30915	5	1349	332	0.9851632	0.0418113	5.15628	19.8	95.8	0.946	0.444
Phosphate	32103	1	430	67	0.9852941	0.0132173	1.52449	13.5	98.7	0.987	0.502
Niobium	31678	4	747	175	0.9776536	0.0230378	2.82787	19	97.7	0.971	0.431

Lithium	31563	2	862	174	0.9886364	0.0265844	3.17782	16.8	97.3	0.968	0.399
Bauxite (Al)	32398	1	167	35	0.9722222	0.0051282	0.61961	17.3	99.5	0.967	0.532
Tantalum	31585	1	804	211	0.995283	0.0248232	3.1134	20.8	97.5	0.975	0.495

Notes: *True Positive (TP) and True Negative (TN) correspond to the number of grid cells which are correctly predicted by the RF model (i.e. mineralized and non-mineralized cells, respectively). Inversely, False Positive (FP) and False Negative (FN) correspond to the number of grid cells which are incorrectly predicted by the RF model (i.e. mineralized instead of non-mineralized cells and non-mineralized instead of mineralized cells, respectively).* ***FP could correspond to mineral high potential areas****. True positive rate (TPR), also called "Recall", correspond to TP/(TP+FN), False positive rate (FPR) correspond to FP/(FP+TN), Percentage of prospective area (PPA) correspond to (TP+FP)/All, Precision correspond to TP/(TP+FP), Accuracy correspond to (TP+TN)/All and J-score correspond to TPR – FPR.*

Natural Graphite

Graphite in Mozambique occurs exclusively in the northern part of the country. All the major graphite-bearing areas occur in high-grades metamorphic zone, metasedimentary contexts, or contact metamorphism zones, although epigenetic occurrences may occasionally be found (Lächelt, 2004). The main occurrences are the Angónia area (Angónia Group), that holds several occurrences, the Monapo Klippe structure, the Ancuabe deposit (Chiquita Group of the Chiúre Supergroup), the occurrences associated to the Lúrio Belt (in the Mirrote Group of the Lúrio Supergroup) and the Morrola structure (also in the Mirrote Group of the Lúrio Supergroup).

REE

Rare Earth Elements in Mozambique are predominantly associated with pegmatites and to a lesser degree to alkaline ring intrusions, carbonatites or placers (Lächelt, 2004). In the Alto Lingonha field, for example, although the REE-bearing pegmatites may coexist with the other types of pegmatites, they tend to follow characteristic trends and mineralogy associated with radioactive minerals. All rare-earth pegmatites belong to the group of unzoned pegmatites (Lächelt, 2004).

Nepheline syenites and carbonatites in Mozambique are known for hosting REE-bearing minerals and /or Nb/Ta-bearing minerals. It is the case of Chirua Alkaline Province and the Cone Negose, Mount Muambe and Xiluvo carbonatites. As for REE-bearing minerals found as placers, there is potential for monazite concentration along the coastline of the Zambezia and Nampula provinces (Lächelt, 2004).

In Metarica and Marrupa (NYF type – Nb, Y, F), some pegmatites have REE contents. The same happens in the Marirongoé pegmatite field, with both REE-bearing minerals and beryl (Marques, 2011). Other fields where it also occurs are the Inchope-Doerói aplite-pegmatite field and other in the Candica and Guro District.

Titanium

Titanium in Mozambique occurs mainly in association to Iron, in the mesoproterozoic anorthosites, in the archaic banded iron formations in Manica, or in costal deposits of heavy sands, as placer deposits, widespread in the Quaternary sands in the country. For the latter case, the most important deposits are Topuito in the north and Chibuto in the south (Vasconcelos, 2014). Enrichments of the heavy minerals, ilmenite, rutile and zircon are found all along the coast in both aeolian and beach sand, although more frequently in the vicinity of the major rivers. Sediments result from weathering and dismantling of Precambrian igneous and metamorphic rocks from the Mozambique Pan-African mobile belt.

Copper

In Mozambique, the main copper deposit is situated in Mundongwara mine, Manica. Hydrothermal, hydrothermal–metamorphic, hydrothermal–volcanic mineralization are associated with greenstones of the Manica Group. Other important occurrences are Fíngoè and Chíduè (paleo-mesoproterozoic) (Lächelt, 2004). Nevertheless, copper appears as a by-product in other occurrences namely iron occurrences.

Coal

Mozambique hosts coal deposits in the Moatize basin and in the Mucanha-Vúzi basin in the Tete region. This is one of the world's largest unexplored coal provinces. There is also potential in the areas of Sanangoe-Mefideze, Baixo Chire and Maniamba basins between Moatize and the Malawi border, as well as the Espungabera sub-basin, near the Zimbabwean border, along the M'Pote River (Lehto and Gonçalves, 2008).

The Moatize basin comprises sediments of the Ecca group within the Karoo Supergroup units. The coal-bearing Moatize Formation and the overlying Matinde Formation were deposited during Permian as part of the Lower Karoo sedimentary history. The productive series in the Moatize basin is thought to have six main coal layers. The deposit is overlayed by Quaternary alluvial deposits, gravel and sand, along the Zambeze and Rovuboe rivers, with a thickness that goes up to 50m.

The Karoo sedimentary sequence in the Espungabera sub-basin is superposed on the northern marginal zone of the Limpopo mobile belt. The productive series occurs near the surface, but block faulting is common, making the resource evaluation without geophysics and drilling quite unreliable. In addition, the location of the Espungabera coalfields is very remote, far from potential industrial users in Mozambique (Lehto and Gonçalves, 2008).

Beryllium

Beryllium is found as precious stone (beryl ?), in pegmatitic veins, and as so, it occurs in association to albite, columbo-tantalite, and Li-bearing minerals. It can be found in the various types of pegmatites.

Pegmatites in Mozambique occur mainly in the north and northeast of the country in the Zambézia and Nampula provinces, commonly intruded in Proterozoic rocks. Authors usually distinguish pegmatites between chemically and mineralogically homogeneous or zoned. The main deposit is the Alto Lingonha pegmatite field, that extends for 170 Km (Marques, 1989), in a wide range of widths. In Alto Lingonha, pegmatites are LCT type (Li, Cs, ta) with extensive hydrothermal substitution (Marques, 2017). The pegmatites occur as dispersed dykes that can present smaller apical extensions emanating from pegmatitic masses of large dimensions. Some pegmatites that occur in Mueda (Cabo Delgado).

Bauxite (secondary)

Four bauxite ore types are described in Mozambique: white saprolitic bauxite, light brown saprolitic bauxite, brown ferruginous, saprolitic bauxite and white kaolinitic clay with concretionary white bauxite.

In Mozambique bauxite occurs in the mount Snuta in the Serra de Moriangane, in Serra Vumba, in Chimanimani-Rotanda, Serra Suira (Zuira) and around Catandica in Manica Province (Lächelt, 2004). The Moriangane deposit is the most important in the country. The bauxite in this area overlies a hornblende syenite intrusion and is made up by a few lenticular bodies with limited lateral extent that are up to 20m thick (Callaghan 2002a).

In the Zambezi Corridor, bauxite occurs at Mount Salambidua in the Tete Province, and Mount Maúzo, Mount Derre and others in the Zambézia Province. The nepheline syenite intrusions here may be capped with bauxite and of these Mount Maúzo represents the best known deposit (Lächelt, 2004).

Lithium, Niobium, Tantalum (secondary)

As these substances commonly share the same enrichment context, they were investigated individually, but also grouped as a hole. They are hosted by pegmatites, which can also contain REE minerals, micas, tungsten, or beryllium, as stated before. Granitic pegmatites are found in several complexes in Mozambique, but are most common within the Marrupa, Lalamo and Nampula Complexes. Pegmatites in the two former complexes are located within felsic orthogneisses, whereas pegmatites in the easternmost part of the area are hosted in metasupracrustal rocks in the Nampula Complex (Bingen et al, 2007).

Tantalum and Niobium minerals are known to occur in the Alto Lingonha pegmatites. Columbite, tantalite and columbite-group minerals are described. Lithium ore is well studied in those pegmatites, some with economic studies.

Phosphate (secondary)

As for phosphate raw materials, only some guano was recovered from caves of Tertiary limestones in the Inhambane Province, or sedimentary occurences in Cretaceous and Tertiary sediments of the Mozambique and Rovuna Basins (Lächelt, 2004). However, several phosphate deposits and apatite occur, whether associated to metasomatic mineralizations, alkaline intrusions and carbonatites (eg. Cone Negose, Mont Muambe), or pegmatites (eg. Monte Fema) (Callaghan, 2002). Although phosphates are studied in some deposits because of their role as penalizing, they also show potential to be used directly or mildly processed locally for agricultural uses.

1.3 Ore processing and refining capacities

Regarding ore processing facilities, Mozambique has several facilities for substances on the ECRM list, specifically graphite, aluminum, and coal processing (Plaza-Toledo, 2018). Graphite, a major asset for Mozambique, is processed in Cabo Delgado province in the north. Additionally, there is another processing plant under construction in Niassa province. Aluminum is processed from bauxite in a facility located in Vila de Manica (Plaza-Toledo, 2018), and there is also a processing facility near Maputo. Coal processing takes place in Moatize, Tete province, where various types of coal are separated.

The mineral industry in Mozambique presents a diverse and substantial capacity across various critical raw materials, highlighting its crucial position in the global supply chain. The country's mineral landscape encompasses aluminum production powered by bauxite, significant coal mining operations, and the extraction of precious gemstones and graphite. This landscape showcases established operations alongside potential areas for growth.

Bauxite Extraction and Refinement

Bauxite production has exhibited noticeable fluctuations over recent years from 1451 mt in 2016 to 5000 mt in 2018. The major operating company, Mina Alumina Lda., which operates in Vila de Manica and possesses an annual capacity estimated as 12,000 metric tons, indicating potential for higher production. This vital resource is fundamental to aluminum production and export.

Aluminum Production

Mozambique Aluminum SARL, owned by South32 Ltd., Mitsubishi Corp., Industrial Development Corp. of South Africa Ltd., and the Mozambique Government, operates the Mozal smelter in Beluluane, boasting an annual capacity of 561,000 metric tons. This facility plays a pivotal role in aluminum production, utilizing bauxite as a key input.

Tantalum and Niobium

Tantalum production totals approximately 22 000 mt/y, while Niobium production stands at roughly 4 000 mt/year. Noventa Ltd. is the main contributor to production through its mine at Marropino, alongside several artisanal miners at Muiane.

Graphite

Graphite production in Mozambique has shown substantial growth, transitioning from no reported production in 2016 to a noteworthy figure of 106,773 mt in 2018. This significant increase illustrates the emerging presence and potential of the graphite mining industry within the country. The GK Ancuabe Graphite Mine SA and Syrah Resources Ltd. are notable contributors to this expanding sector, with GK Ancuabe Graphite Mine SA operating in Ancuabe and Syrah Resources Ltd. managing the Balama graphite operation in Cabo Delgado Province.

Coal Mining and Production:

Vale Moçambique, International Coal Ventures Private Ltd., Jindal Steel & Power Ltd., and Beacon Hill Resources plc are major players in coal mining across various locations, contributing to an annual capacity of millions of metric tons. The Moatize Mine in Tete Province, specifically, achieved an annual capacity of 22,000,000 metric tons, significantly bolstering the country's coal output.

Potential Challenges in ECRM Utilization

Despite its abundant reserves of ECRM minerals, Mozambique faces challenges in optimizing extraction, refining, and exportation. Infrastructural limitations, technological advancements, and sustainable mining practices remain focal areas for development.

Table 2: List of the main processing units

Name processing entity	Processing Facility	Status	ECRM	Owner	Operator	Products	Capacity
Balama Graphite Operation	Plant	Active	Natural graphite, Vanadium Lanthanides	Syrah Resources Ltd Mozambique	Syrah Resources Ltd.	Graphite concentrate	350 mt/y
Benga-Moatize Magnetite Processing Plant	Plant	Active	Coking coal	International Coal Ventures Private Ltd Tata Steel Ltd. (35%)	International Coal Ventures Private Ltd.	Metallurgical and thermal coal	75 mt/y
Chirodzi Coal Mine	Plant	Active	Coking coal	Jindal Steel & Power Ltd.	Jindal Steel & Power Ltd.	Metallurgical and thermal coal	2500 mt/y
Moatize Coal Mine	Plant	Active	Coking coal	Vulcan Minerals Inc. Mozambique	Vulcan Minerals Inc.	Metallurgical and thermal coal	22000 mt/y
Moma Mineral Sands Mine	Plant	Active	Lanthanides	Kenmare Resources plc	Kenmare Resources plc	Heavy Mineral Concentrate	1200 mt/y

Mozal Smelter	Smelter	Active	Bauxite	South32 Ltd The Industrial Development Corporation of South Africa Ltd Mitsubishi Corp. Mozambique	South32 Ltd.	Aluminum	585 mt/y
Muiane Mineral Sands Mine	Plant	Temporarily On Hold	Tantalum Lithium	Novak Holdings Ltd	Novak Holdings Ltd.	Concentrate	456 mt/y

2. Assessment of the ECRM value chain

2.1. Characterisation of the value chain for primary and secondary raw materials

Mozambique's industrial sector, led by Mozal's aluminum production, is relatively weak, while the extractive industries hold historical significance. These extractive sectors, including coal, base metals, petroleum, natural gas, and minerals, made up 68.3% of the country's industrial output in 2019. Despite contributing 6% to total tax revenue in 2019, the mining sector faces infrastructure challenges, a hurdle the government aims to address through initiatives like the Nacala Corridor Railway project to stimulate investment and enhance GDP growth.

2.1.1. List of the mining and recycling projects

MOZAL, an aluminium smelter in Mozambique, signifies the area's industrial revival, driven by substantial foreign investment and operated by South32. This pivotal venture, a partnership between the government and foreign investors, underscores the versatile applications of aluminium in construction, transportation, and electronics, portraying it as a pivotal component for future industries.

In parallel, the Monte Muambe Rare Earth Elements (REE) Project displays promising potential in critical minerals. Altona's commitment to exploration, aiming to secure 70% ownership, highlights its focus on high-grade zones for open-pit mining. The project emphasizes the significance of neodymium and praseodymium oxides for renewable energy technology. With plans for an 18-year operation involving advanced recovery methods, the project anticipates contributing to the global rare earth elements market, underscoring Mozambique's potential in this sector.

The following is a list of ECRM mining and processing projects of interest operating in Mozambique.

Table 3: A list of the major ECRM Mining projects in Mozambique

Project name	ECRM	Owner(s)	Operator	Development stage	Activity status	Reserves
Moma	Lanthanides Titanium	Kenmare Resources plc	Kenmare Resources plc	Operating	Active	8 806 Mt

Mutamba	Titanium	Rio Tinto Group	Rio Tinto Group	Prefeas/Scoping	Active	4 345 Mt
Corridor	Titanium	MRG Metals Ltd	MRG Metals Ltd	Prefeas/Scoping	Active	2 394 Mt
Balama	Natural graphite Vanadium	Triton Minerals Ltd	Triton Minerals Ltd	Feasibility Started	Active	1 563.1 Mt
Balama	Natural graphite Vanadium Copper Lanthanides	Syrah Resources Limited Mozambique	Syrah Resources Ltd	Operating	Active	1 035.7 Mt
Tete	Vanadium Manganese Titanium	Baobab Resources Plc International Finance Corporation	Baobab Resources Plc	Feasibility Started	Active	759 Mt
Moatize	Coking coal	Vulcan Minerals Inc. Mozambique	Vulcan Minerals Inc.	Operating	Active	716.5 Mt
Chirodzi	Coking coal	Jindal Steel & Power Ltd	Jindal Steel & Power Ltd	Operating	Active	700 Mt
Montepuez Central	Natural graphite Vanadium Copper	Tirupati Graphite plc	Tirupati Graphite plc	Construction Started	Active	158.2 Mt

2.1.2. Existing ESG indicators

ESG policies are incorporated in various scattered legal statutes. The Mining Law and the Mining Law Regulations enshrine certain industry-specific ESG principles, but there are no express ESG regulations for the mining sector.

The Environment-Mining activities are by nature subject to stringent environmental rules. In Mozambique, in addition to the general environmental laws and regulations, holders of mineral rights are also subject to industry-specific environmental regulations until mine closure and rehabilitation.

The government has approved the Regulation for Programs and Projects Inherent to the Reduction of Emissions from Deforestation and Forest Degradation Conservation and Increase of Carbon Reserves (REDD+), which aims to define sustainability rules in the reduction of greenhouse gas emissions.

The Sustainability: the general principle of worker protection, both in the sense of privacy and in the guarantees of protection required for specific works such as mining, is embodied in both general labor legislation and in the legislation governing mining labor relations. The scattered local content rules found in the Mining Law and the Mining Law Regulations also play a pivotal role in creating the best social practices for development of mining activities in the country to the benefit of local communities.

The Governance: companies operating in Mozambique are increasingly adopting anti-corruption measures within their organizations, through the implementation of procedures that aim to make employees aware of situations conducive to corruption and the associated risks. Investment from foreign investors subject to strict anti-bribery and anti-corruption laws (e.g., FCPA and UK Anti-Bribery Act) has also contributed to a marked increase in the implementation of high standards of control of corruption. It is also worth mentioning that Mozambique has recently made amendments to the country legislation on the prevention of money laundering and financing of terrorism.

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2.1.3. Status of economic links between the formal and informal sectors

Based on the recent government census (2021), the ASM sector majorly contributes to the production of gold, construction materials (sand, stones, clay) and gemstones. In Zambezia, one of the northern regions of Mozambique, 14 artisanal mine sites producing tantalum were identified. Extraction of tantalum is associated with rudimentary methods, posing limitation to further advancing the potential of tantalum production. In 2021 official data registered trade of about 19500 kg of tantalum. Existing information and interviews with stakeholders suggest that production and trade of tantalum remain largely informal. Although the mining law foresee designation of areas dedicated to ASM production, challenges persist in the access to mining permits for ASM organisations, including delayed permitting processes and overlapping requests with existing, but dormant exploration permits.

A comprehensive overview on the ore deposits and production parameters of ECRMS currently recovered by artisanal and small-scale mining in Africa is already available as part of the deliverable 1.4. While a more detailed analysis of the ASM sector role in the production of ECRMs in Mozambique, including major challenges and investment opportunities on production, social, governance and environmental impacts and value chain, will be available as part of deliverable 7.2.

2.2. Identification of the bottlenecks along the value chain

The business environment in Mozambique presents significant challenges, as noted by the International Trade Administration. Despite potential for long-term investment, the stability created by the Central Bank's efforts and political commitments to attract large investments conflicts with a bureaucratic system unresponsive to private sector needs, particularly for smaller businesses. Companies consistently highlight the business environment and the scarcity of skilled labor as major hurdles in Mozambique. Moreover, a hierarchical decision-making approach further hampers market efficiency in the country.

According to the World Bank, the Worldwide Governance Indicators (WGI) for Mozambique reflect a deterioration in the control of corruption, government effectiveness, political stability and absence of violence, regulatory quality, rule of law, and voice and accountability (figure 2). However, there seems to be a slight improvement in the last years, but still with a lower performance than the overall of Sub-Saharan Africa countries.

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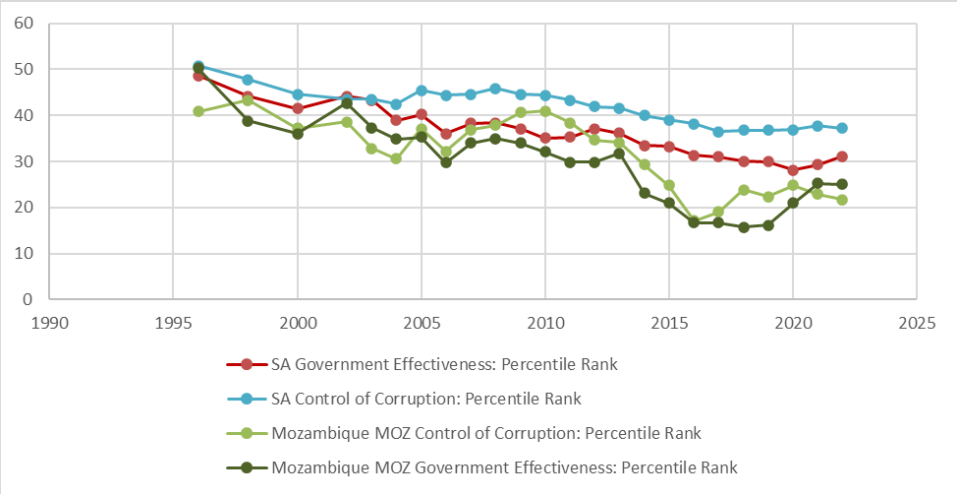

Figure 2: Worldwide Governance Indicators (WGI) of Mozambique and Sub-Saharan Africa countries (data from World Bank)

Overall Logistics Performance Index (LPI) score seems to have improved in the year 2016. However, there is no more recent information available. The increase in the global LPI score seems to be mainly due to an increase in the ease of arranging competitively priced shipments, which is even better than in the Sub-Saharan Africa countries group. The least favorable index refers to the quality of trade and transport infrastructure, which does not show any evolution over time.

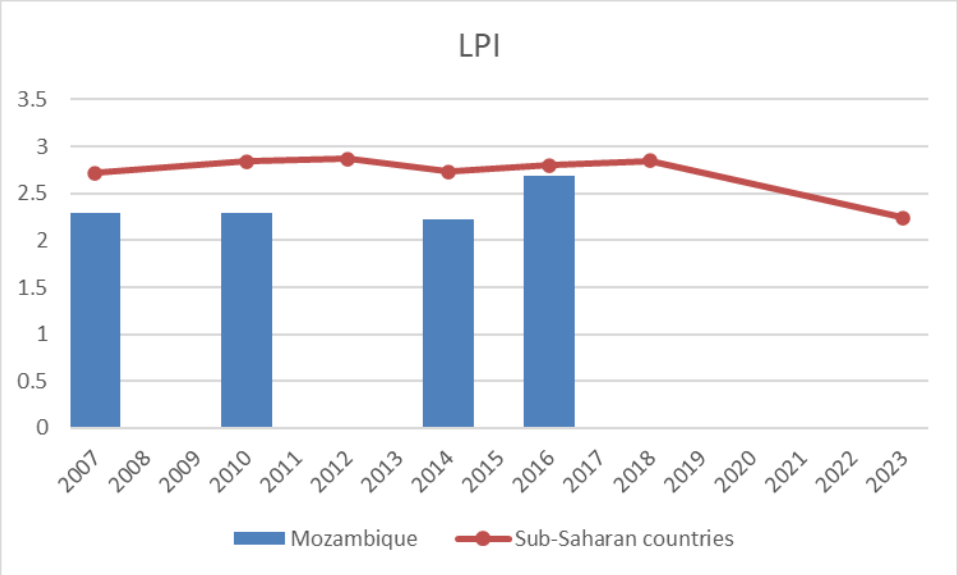

Figure 3: Logistics Performance Index (LPI) score for Mozambique and Sub-Saharan Africa countries (data from World Bank)

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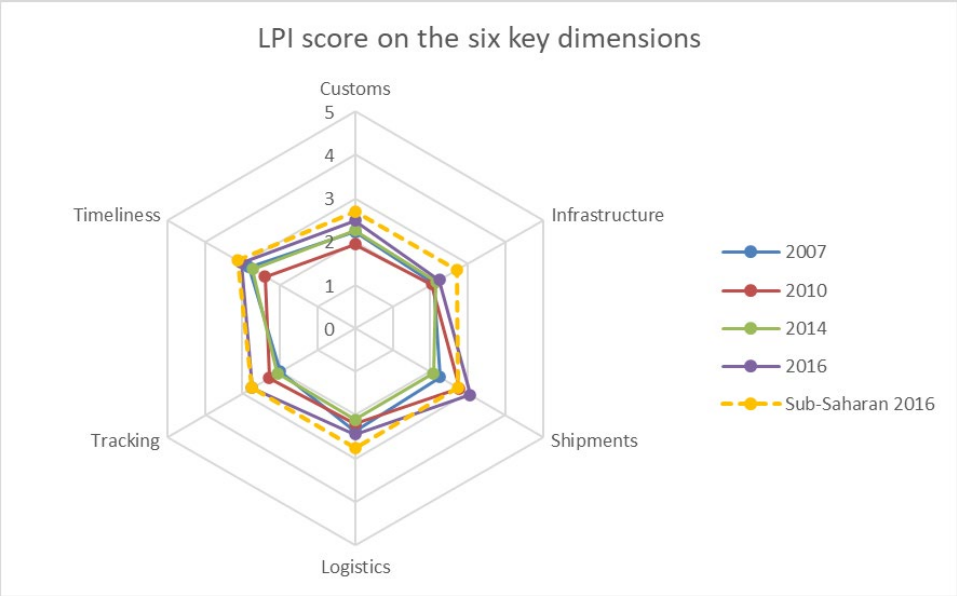

Figure 4: Mozambique and Sub-Saharan Africa countries scores for the six key dimensions of LPI (data from World Bank)

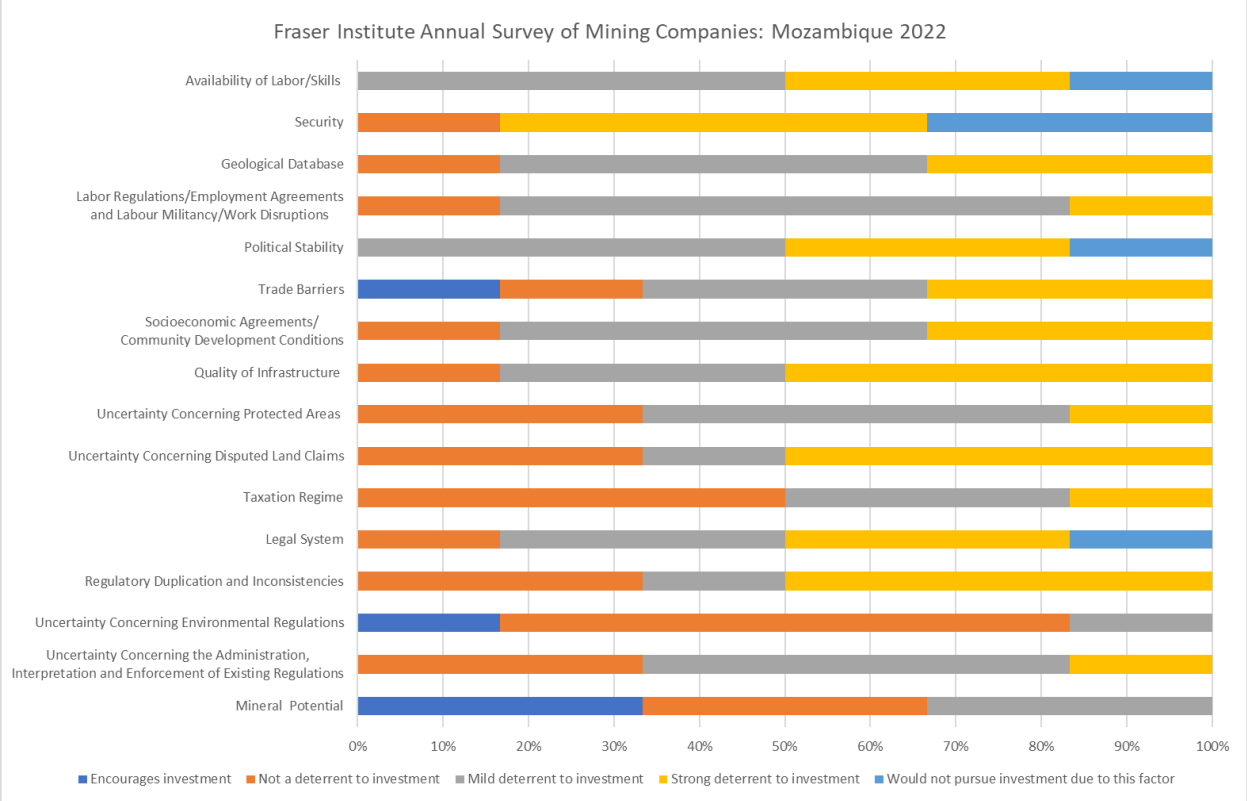

Figure 5: Mozambique results from the 2022 Fraser Institute Annual Survey of Mining Companies

The 2022 Fraser Institute Annual Survey of Mining Companies revealed Mozambique's limited capacity to attract investments. Among the 16 issues evaluated, only three—environmental regulations, mineral potential, and the taxation regime—garnered more than 50% in favor of investment. However, the

predominant concerns revolve around security, closely trailed by political instability and a scarcity of skilled labor. Labor regulations and infrastructure quality were also highlighted as significantly impeding investment, with more than 50% of respondents identifying these as deterrents.

The country's abundance of critical raw materials presents opportunities for industrialization and improving living standards. Partnerships with entities like the EU highlight the potential for clean energy production, utilizing Mozambique's graphite in the production of essential components for lithium-ion batteries. Despite having vast hydropower potential and plans for diverse energy sources, challenges like an underdeveloped power grid hinder rapid progress. The government aims for complete electrification by 2030 and has launched initiatives like PRONAI to modernize and boost competitiveness in various industries, emphasizing import substitution and public-private partnerships in industry-specific zones.

3. Investment/financing prospects for ECRM projects in the Mozambique

3.1. Fiscal, legislative and regulatory context for in-country financings

In Mozambique, the exercise of a commercial activity presupposes the incorporation of a company or the registration of a branch. As we will see later, in Mozambican law the consortium is not an autonomous entity, but only a contract.

The Commercial Code in Mozambique outlines specific business entity types, including limited liability general partnerships, private limited companies (Lda.), public limited companies (S.A.), and simplified joint stock companies. Moreover, Mozambique is not currently part of OHADA (Organization for the Harmonization of Business Law in Africa), which includes 17 member countries, and there is no indications suggesting Mozambique's imminent adherence to it.

Specific Tax on Mining Activity

In Mozambique, individuals and corporate entities involved in mining activities are subject to various specific taxes alongside the general taxes under the country's tax system. These specific taxes include the Mineral Production Tax (IPM), Surface Tax (ISS), and Mineral Resource Rent Tax (IRRM).

Mineral Production Tax (IPM): applies irrespective of legal authorization for mining operations. Triggered upon mineral extraction, this tax is exempt for minerals used in geological research. Its taxable base relies on the value of extracted minerals after treatment or, for untreated products, their initial value. Determining this value depends on recent sale prices or, in their absence, international market reference rates. Transport costs are deductible when calculating the taxable base. The IPM rates vary by mineral type, ranging from 1.5% for sand and stone to 8% for diamonds. Payment must be made by the 10th of the month following production or before export to gain export clearance.

Surface Tax (ISS): is an annual levy based on the area of mining activity. The rates differ according to the mining license type and duration. This tax exempts the mining area from other land usage and exploitation fees. Payment is due annually by January 31st or upon obtaining or renewing mining licenses, with specific deadlines based on license issuance.

Mineral Resource Rent Tax (IRRM): applies as an additional tax on companies when cash flows exceed 18%. This tax is based on positive net cash gains and is set at a fixed rate of 20% on annual gains above the threshold. Tax estimation is required by May 31st and must be paid in two equal instalments in August and November, each equivalent to 50% of the estimated tax amount.

These specific taxes shape the taxation framework for the mining sector in Mozambique, with distinct payment timelines, taxable bases, and rates tailored to different aspects of mining operations.

Transfer of Mining Rights

In Mozambique, the transfer of mining rights requires government approval, involving a formal request and various documents submitted for authorization. The process can take up to 180 days, and certain conditions must be met, including the transfer between resident entities and disclosure of company details. Additionally, changes in company ownership, such as mergers, demergers, or transfers of shares, demand authorization and follow similar formalities as mining title transfers.

These operations involving changes in ownership or shareholder structures require authorization; otherwise, they hold no legal effect in Mozambique. The authorization process typically involves scrutiny by tax authorities to determine potential taxable capital gains arising from the transaction.

Regarding tax implications, gains from the direct or indirect transfer of shares or participation rights involving assets in Mozambique are considered taxable, regardless of the entities being residents or non-residents. The gains are autonomously taxed at a 32% rate, applicable to both residents and non-residents. The tax is due within 30 days of the sale date and is calculated based on the difference between the transfer and acquisition prices of the shares.

The determination of the sales price lacks specific regulations, leaving room for potential disagreement between the taxpayer and tax authorities. Hence, having a comprehensive market study supporting the transaction price is crucial. Despite the liability for settling the tax falling on the non-resident entity without a permanent establishment in Mozambique as per law, joint and several liability is imposed on the acquiring entity or the mining rights holder.

Foreign Assignees Employment

In Mozambique, entities can employ foreign workers subject to specified limits based on the company's size, currently being revised for implementation in March 2024. The employment of foreign workers requires compliance with regulations concerning work permits, which are undergoing changes.

Work Permit

For entities hiring foreign employees within set quotas, the employment must be reported to the Labor Authorities within 15 days from admission.

Work permits can be granted for a maximum of 2 years and may require an academic equivalence certificate from the Ministry of Education. The process can be expedited in the mining and Oil & Gas sectors, although actual processing can take up to 15 working days. Work permits above the quota need

special approval by the Ministry of Labor and may take 3 to 6 months due to bureaucracy. Short-term permits (up to 120 or 180 days) don't necessitate a formal employment contract.

Immigration

Mozambique offers various visas like transit, student, tourist, business, and residence/work visas, obtainable from consular missions, border posts, or online.

Work visas for foreign citizens intending to work in Mozambique require documents such as a valid passport, work permit, medical certificate, and proof of accommodation and must be extended within 30 days. Visa extension entails submission of employer-related documents, work permit, and others for a maximum of one year, renewable based on the work permit's validity.

For workers in the extractive industries, additional approval from the Minister of Mineral Resources is required. Termination of work permits and visas must be formally communicated to labour authorities and the immigration department, respectively.

Import and export

In Mozambique, import and export processes involve strict customs controls and exchange formalities. Both importers and exporters need licenses, and customs clearance agents are currently mandatory. The system "Janela Única Electrónica" (JUE) manages import/export declarations and incurs processing fees based on the declared value.

A new requirement, the Conformity Assessment Programme (CAP), supervised by INNOQ, IP, ensures goods comply with standards. A Certificate of Conformity (CoC) is necessary for consignments, issued before shipment by a government-contracted agent.

Import procedures include obtaining licenses, submitting documents via the JUE, paying duties and fees, and confirming payments through a commercial bank. Exports require licenses, detailed invoices, certificates, and authorization, with similar steps to the import process. Mining products have additional requirements like the Kimberley Process Certificate and prepayment of mining production tax for rough diamonds, precious metals, and gems.

As a member of the Southern African Development Community (SADC), Mozambique adheres to protocols for trade, gradually reducing customs barriers among member states with proper documentation like the SADC Certificate of Origin, affirming adherence to specific Rules of Origin. The customs department requires various documents for approval, including the SADC Certificate of Origin, customs declarations, export invoices, costing for value added requirements, and any other necessary documents.

African Continental Free Trade Area (AfCFTA)

The African Continental Free Trade Area (AfCFTA), the world's largest free trade area, includes 55 African Union countries, including Mozambique, and eight Regional Economic Communities. It aims to create a unified and liberalized market for trade and services. Implementation occurs in phases, supported by

various initiatives targeting trade facilitation, investment, digital trade, inclusive trade, and environmentally sustainable practices.

Mozambique, although a signatory state, hasn't ratified the treaty yet, despite public support for ratification. There are concerns about the potential impact on public expenditure due to Mozambique's heavy reliance on imports and exports of raw materials, which might limit its ability to benefit from the market opportunities created by AfCFTA. The implementation of AfCFTA objectives will likely involve establishing rules of origin criteria, even though formal integration steps haven't been ratified within Mozambique's national jurisdiction. This necessity aligns with the objectives endorsed by the signatory countries.

3.2 Macroeconomic context for in-country financings

Gross domestic product (GDP) analysis

Mozambique's GDP showcases a promising trajectory, poised for growth despite recent challenges. With an estimated GDP growth of 3.8% in 2022 and projections indicating a potential rise to 4.8% in 2023 and 8.3% in 2024, the economy demonstrates resilience. Key drivers include the robust performance of extractive industries and agriculture. Anticipated faster GDP per capita growth, from 2.0% to 5.5% in 2023 and 2024 respectively, signifies a positive outlook, albeit contingent on managing risks like climate shocks and the insurgency in the North.

Historical GDP growth (The World Bank, 2022)

Mozambique's GDP trajectory has seen notable shifts in the past decades. Between 2003-2013, robust growth averaged 7.4%, fostering economic development. However, the subsequent decade showed a slowdown, averaging 3.9%, influenced by diverse challenges. In 2022, GDP rebounded to 3.8%, signifying a recovering economy.

Distinct sectors presented divergent performances. Agriculture, health, and transport surged with growth rates of 3.4%, 4.7%, and 3.5%, propelled by amplified inputs and public spending. Conversely, the tourism sector faced a setback, contracting by -1.7% due to pandemic and climate-related issues.

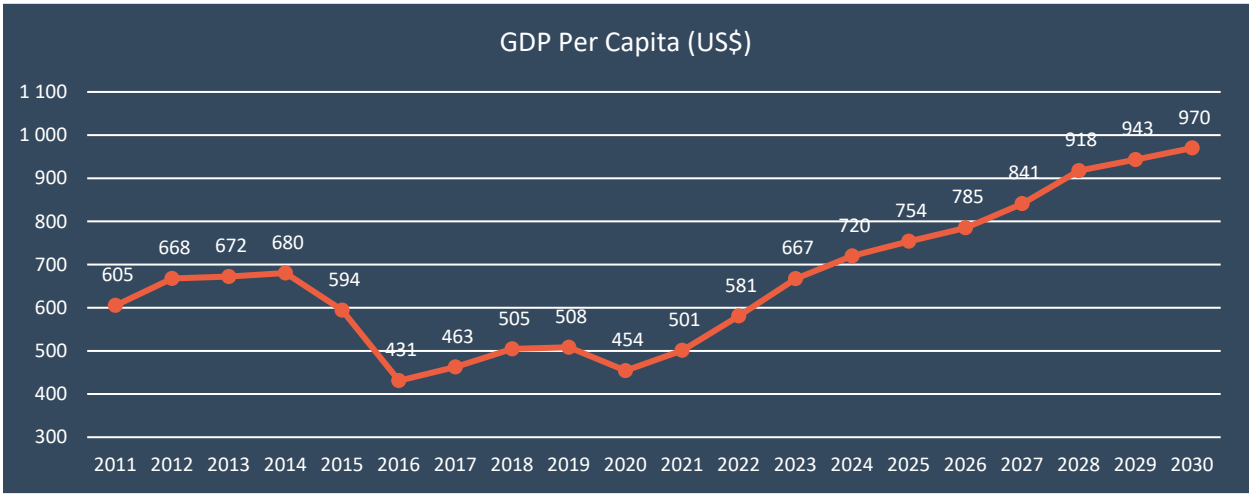

Figure 6: Mozambique - Historical GDP per capita from 2011 to 2021 & projected estimations from 2022 to 2030 (Sources: World Data Bank, S&P)

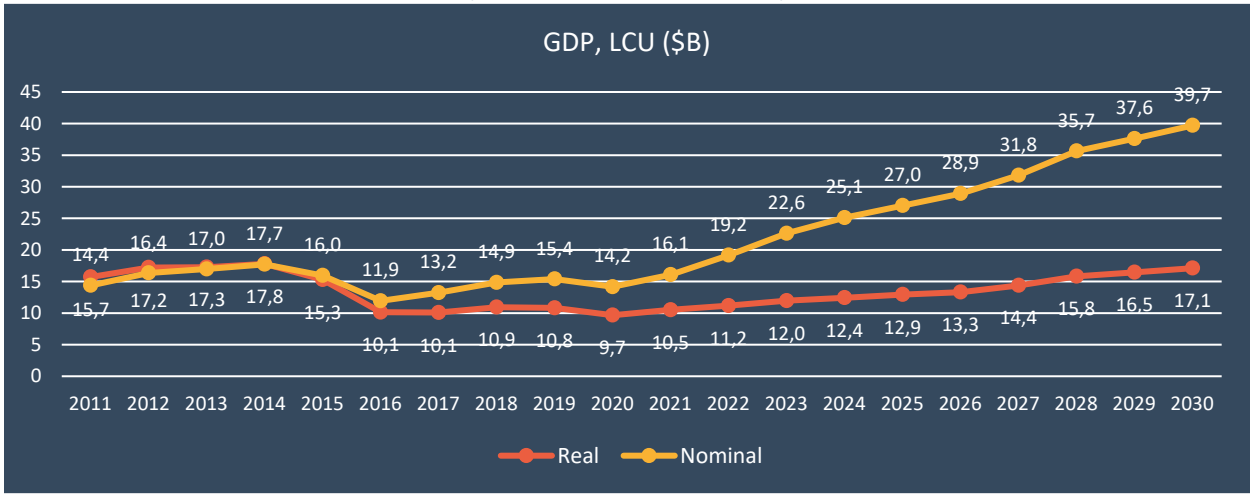

Figure 7: Mozambique - Historical and projected nominal GDP and real GDP (Sources: S&P)

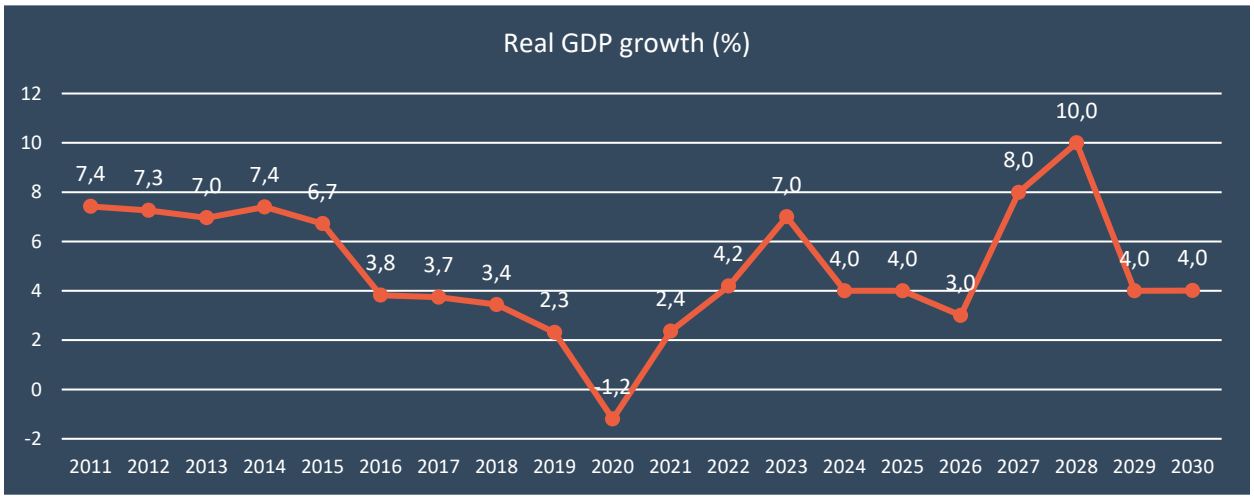

Figure 8: Mozambique - Historical and projected real GDP growth (Sources: S&P)

Private consumption, constituting 65% of GDP in 2021, remained pivotal, while gross capital formation rose to 58%, predominantly driven by extractive industries. However, negative net exports linked to mega-project imports countered this growth.

The country's GDP history illustrates a resilient economy adapting to challenges, showcasing potential for sustained growth. Despite hurdles, Mozambique displays resilience, fostering optimism for future economic stability and progress. Economic diversification and prudent fiscal measures remain crucial for navigating potential hurdles and sustaining growth momentum.

Economic drivers and sector breakdown (The World Bank, 2022)

Historically, Mozambique's GDP evolution has been shaped by diverse sectoral contributions. In the 1980s, agriculture was a primary economic pillar, constituting nearly 30% of the economy. However, the civil war disrupted agricultural activities and infrastructure, hindering growth. Post-war recovery

witnessed a surge in the services sector, expanding to around 50% of GDP by the early 2000s, signaling a shift in the economy's composition.

From 2010 onwards, the extractive sector, notably natural gas and coal, began gaining prominence, accounting for nearly 40% of the country's exports. This shift was pivotal, altering the economic landscape significantly. By 2022, services maintained a dominant position, representing 45% of GDP, while the burgeoning extractive industries drove industrial growth.

Agriculture, historically vital, now contributes around 23% of GDP, indicating a substantial transformation in sectoral contributions over time. This evolution highlights the transformative influence of extractive industries on Mozambique's economic structure. However, it underscores the imperative for strategic diversification and resilience across sectors to ensure sustainable and balanced growth, mitigating over-reliance on any single industry.

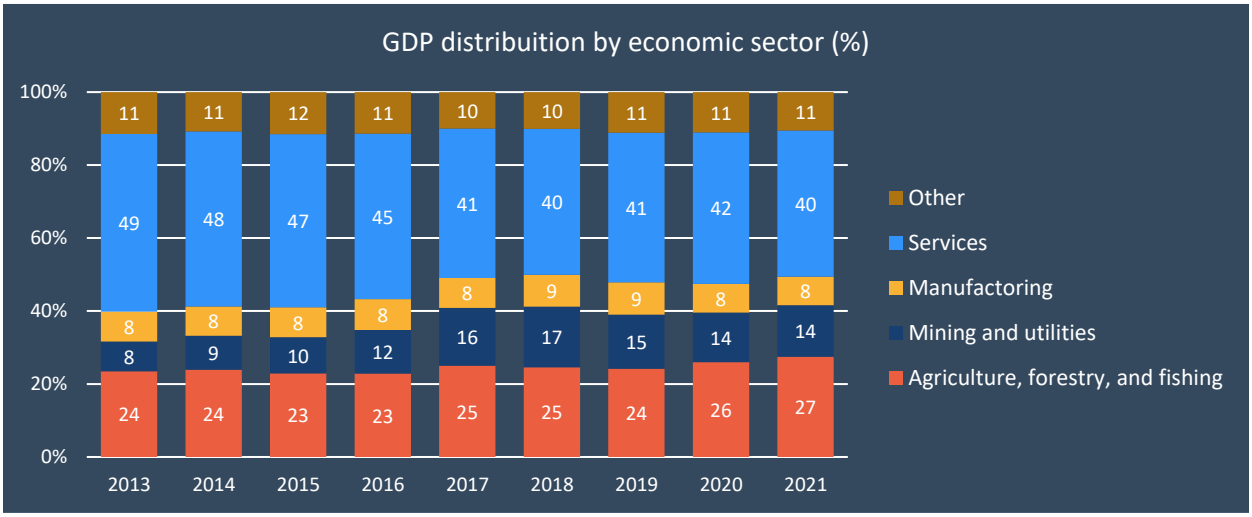

Figure 9: Mozambique - Distribution of GDP across economic sectors from 2011 to 2021 [%][1]

Foreign Direct Investment (FDI) Landscape

Mozambique's FDI inflows surged, reaching 7.2% of GDP in 2020, largely attributed to investments in natural resource projects. The country attracted $3 billion in FDI in 2020, showcasing resilience amid global economic turbulence. Initiatives under Mozambique's development plans have played a pivotal role in attracting foreign investments, especially in energy and infrastructure.

Foreign Direct Investment (FDI) Trends

Mozambique has witnessed a surge in foreign direct investment (FDI) in recent years, propelled by its natural resource endowments and strategic location. The country's vast reserves of natural gas and coal have attracted substantial FDI, particularly in the extractive industries. Additionally, renewable energy projects, such as solar and wind power, have garnered interest from international investors seeking to capitalize on Mozambique's renewable energy potential.

[1] Source: World Data Bank

The United Nations Conference on Trade and Development (UNCTAD) reported an increase in FDI inflows, indicating growing investor confidence in Mozambique's economic prospects. However, challenges related to regulatory frameworks, infrastructure limitations, and socio-political stability pose potential risks that investors carefully consider.

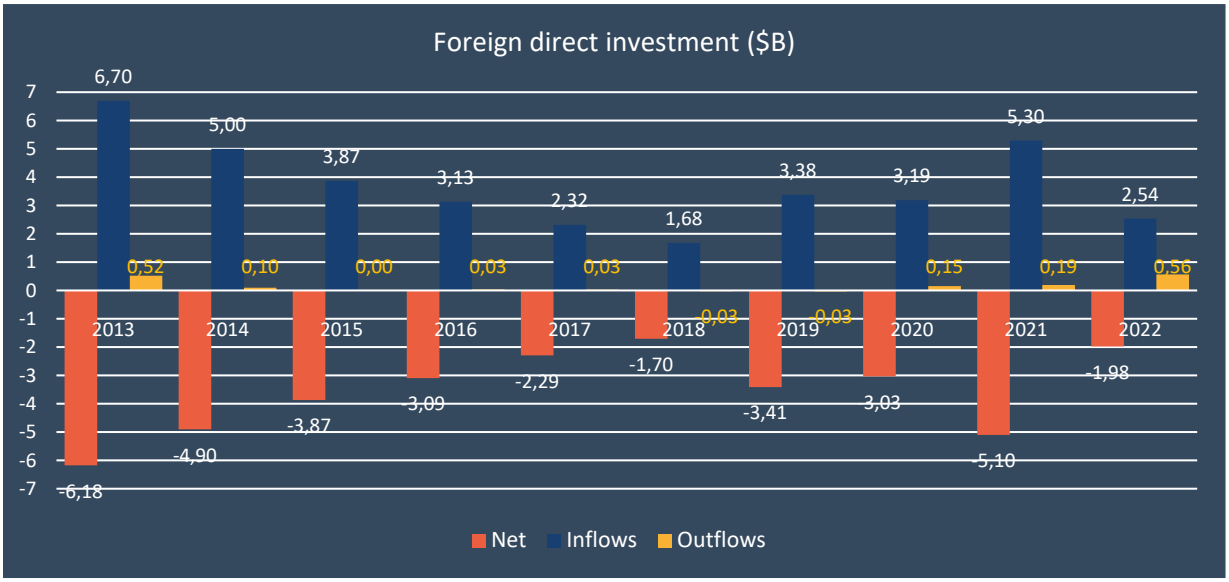

Figure 10: Mozambique - Foreign direct investment net, net inflows, net outflows from 2013 to 2022[2]

Currency and Inflation Dynamics

Mozambique's currency, the Mozambican Metical (MZN), operates within a framework of fixed parities, ensuring stability in exchange rates and free transferability. Influenced by its Southern African Development Community (SADC) membership, the Metical is subject to market forces, regulated by the central bank to stabilize its value.

Inflation trends in Mozambique have been subject to various internal and external factors. High inflation rates in recent years have been attributed to external shocks, including fluctuations in global commodity prices and climatic hazards affecting agricultural production. For instance, disruptions in global commodity markets and extreme weather events have contributed to the volatility observed.

Inflationary pressures have surged to 9.8% by August 2022, primarily attributed to rising food prices. These inflation trends, linked to global commodity price fluctuations and climatic hazards affecting agriculture, have significant repercussions, particularly for households reliant on imported goods and energy. This underlines the need for comprehensive measures to address inflationary pressures and enhance economic stability.

Looking ahead, stakeholders are closely monitoring inflationary trends, and the government, in collaboration with the central bank, is taking proactive measures to mitigate these pressures. Future policies and interventions are expected to play a crucial role in stabilizing prices and fostering a conducive economic environment for both businesses and households.

[2] Source: World Data Bank

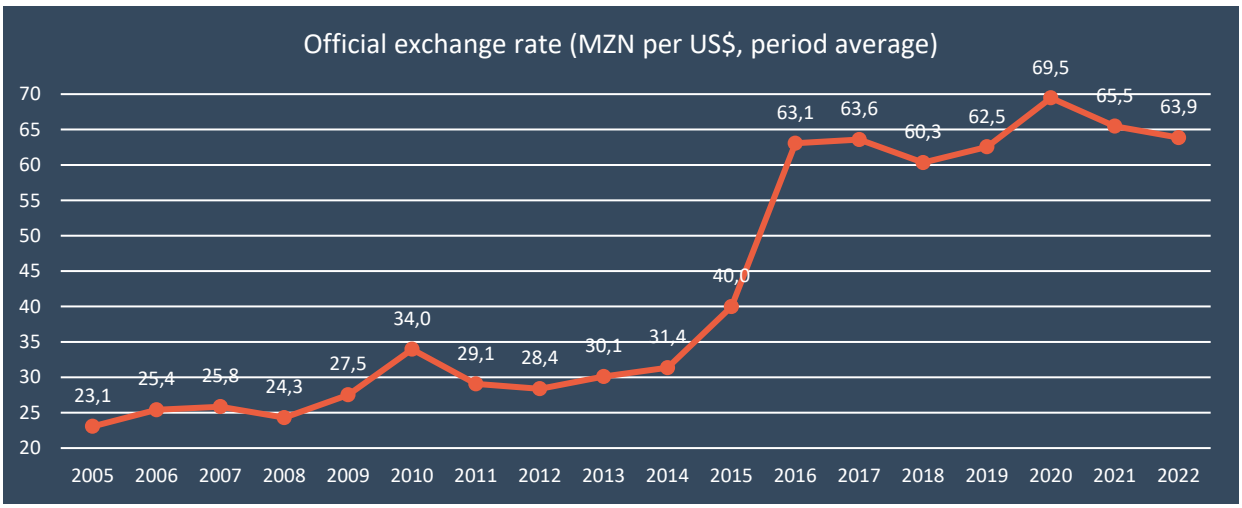

Figure 11: Mozambique - Historical official exchange rate (Metical per US$, period average) (Source: World Data Bank)

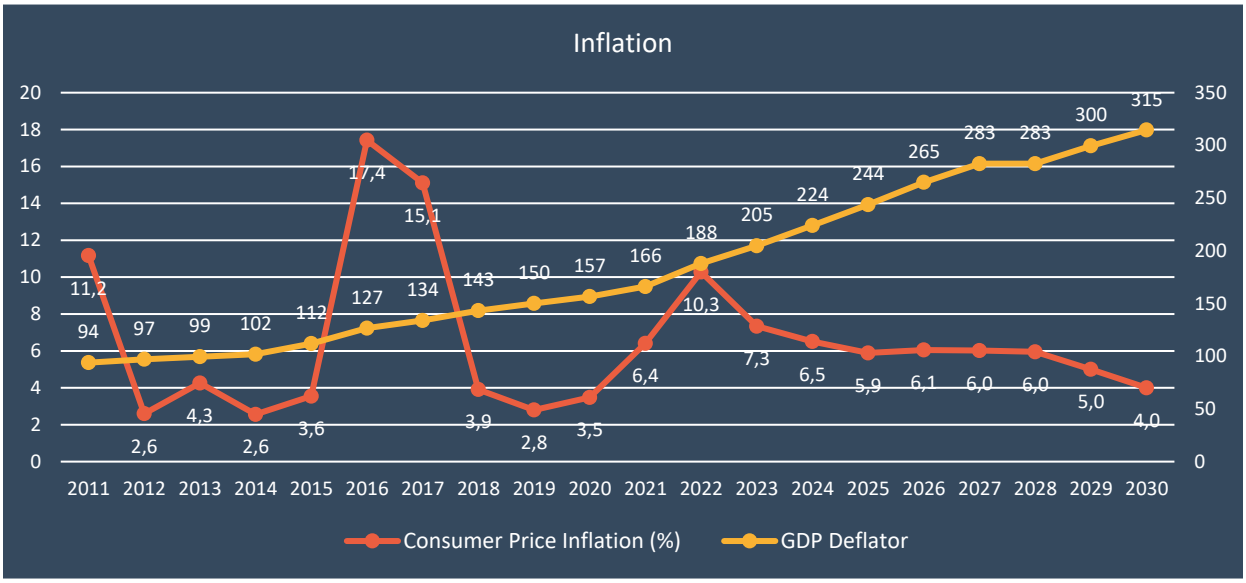

Figure 12: Mozambique - Historical and projected data on inflation indicators (S&P Global, 2022)

Sovereign Debt and Fiscal Sustainability

Mozambique's sovereign debt situation has undergone fluctuations due to economic challenges and external factors. The country has witnessed an increase in public debt in recent years, raising concerns about fiscal sustainability. This rise in debt levels, particularly in the wake of the COVID-19 pandemic and its economic repercussions, has prompted a need for prudent fiscal management and debt restructuring measures. Mozambique's public debt surged to $14.3 billion in 2021, representing 80% of the country's GDP. Despite the anticipated relief from natural resource exploitation, challenges persist due to external factors affecting key sectors such as energy and agriculture. The successful utilization of resources is crucial to mitigate the current deficit.

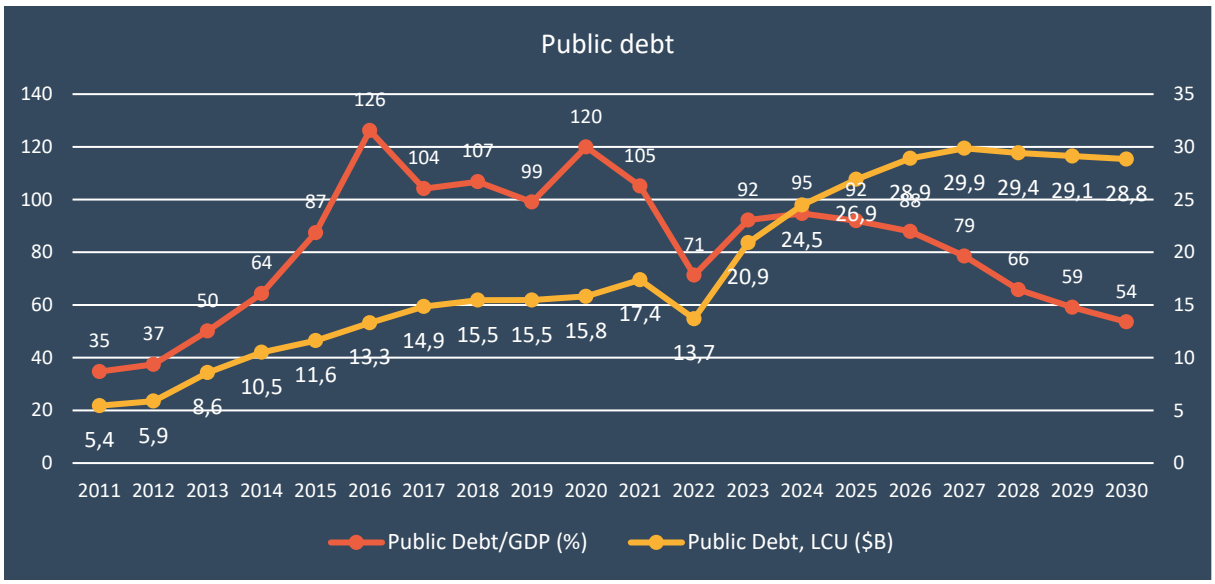

Figure 13: Mozambique - Historical and projected data public debt and debt/GDP (S&P Global, 2022)

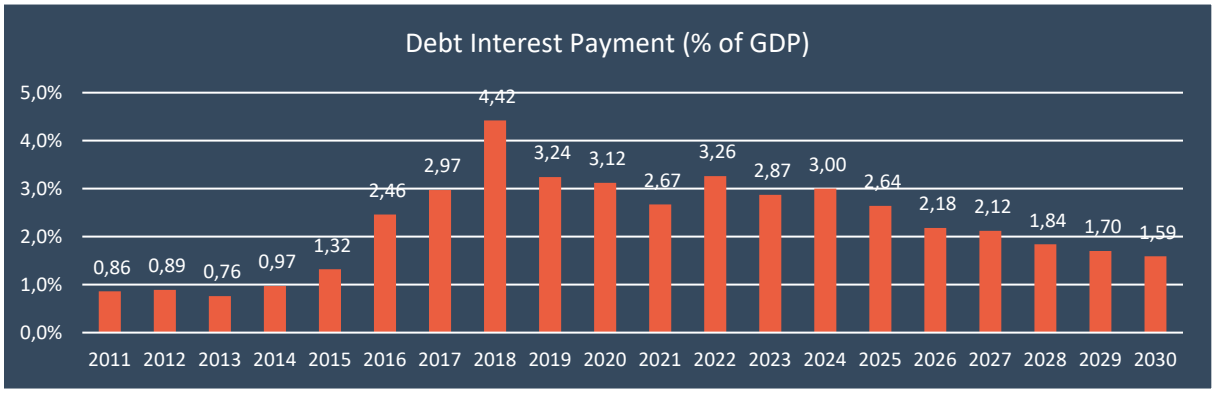

Figure 14: Mozambique - Historical and projected data on public debt interest payment (S&P Global, 2022)

The government is exploring strategies to manage public debt and enhance fiscal resilience. Efforts to diversify revenue sources, improve tax collection systems, and engage in responsible borrowing practices are underway to ensure long-term fiscal sustainability. The fiscal stimulus plan (Pacote de Aceleração Económica, PAE) implemented by the government over the period 2023-2024 will also support economic activity. This post-Covid economic support programme should improve the business environment by simplifying administrative procedures and improving the quality of infrastructure (roads, health and education, energy, access to water and telecommunications).

The country's tariff regime applies varying rates based on the nature of imported goods. Customs duties range from 0% to 20%, while additional charges like the Community solidarity levy and the Economic Community of West African States (ECOWAS) levy may also be applicable. Similarly, export duties, particularly on non-monetary gold, are fixed at 4% of the customs value and are payable upon exit from the national territory.

Regional Economic Alliances and Business Environment

Mozambique actively participates in regional and global economic alliances, significantly impacting its economic landscape. As a member of the Southern African Development Community (SADC) and the African Continental Free Trade Area (AfCFTA), Mozambique gains access to expansive markets. SADC, with 16 member states and a combined GDP exceeding $600 billion, offers a substantial regional market for trade and investment. AfCFTA, covering 1.3 billion people and a GDP surpassing $3.4 trillion, provides Mozambique with opportunities to expand market access and foster investments across Africa.

The country pursues bilateral and multilateral agreements, focusing on trade facilitation, investment protection, and technical cooperation. These agreements, particularly with key partners, have significantly boosted trade volumes, with exports reaching approximately $5 billion in recent years. Mozambique collaborates with global entities like the United Nations (UN), International Monetary Fund (IMF), and World Bank, securing substantial aid and investment for infrastructure development and economic growth.

Mozambique's commitment to regional integration and broader economic opportunities through these partnerships shapes its economic policies, attracts investments, and drives sustainable development. This active engagement has been instrumental in maintaining an average GDP growth of around 3-4% annually over the last decade."

3.3 Political context for in-country financings

President Filipe Nyusi, since taking office in 2015, has aimed to attract foreign investment, focusing on mining and energy sectors. Mozambique's National Development Strategy (2015-35) underscores plans to become a leading global mineral resource hub. However, political and operational challenges, particularly the insurgency by al-Sunnah militants in Cabo Delgado, pose significant obstacles to investment.

Total Energies halted its LNG project due to the insurgency, impacting the region's security and investment climate. Despite ongoing security threats, efforts by regional and international bodies like the Southern Africa Development Community Mission in Mozambique (SAMIM) aim to combat al-Sunnah. To address economic challenges, the Nyusi government removed legislative barriers and engaged the private sector in drafting new investment-friendly laws.

Political environment

Background: Mozambique has experienced relative stability as a multiparty democracy post its civil war (1977-92). The main opposition, Renamo, weakened due to internal conflicts post-2019 elections, signing a peace agreement in August 2019, officially ending their insurgency. The disarmament of Renamo fighters reduced the threat of further conflict. The closure of Renamo's last military base in June marked the end of the disarmament process and set focus on decentralization measures outlined in the peace agreement. Renamo gears up for future elections.

President Nyusi faces internal divisions within the ruling Frelimo party ahead of the 2024 elections, aiming to position himself or an ally for the presidency, while the constitution limits a president to two terms.

These divisions intensify due to legal proceedings linked to the "hidden loans scandal," involving misappropriation of $2bn during the tenure of former President Armando Guebuza (2005-15).

Current dynamics: President Nyusi has consolidated control over state institutions and within the Frelimo party ahead of Mozambique's 2024 general elections. The uncertainty surrounding a potential third term for Nyusi persists as he delays selecting a successor, solidifying his authority by positioning allies for key roles and potential successors. His focus remains on Frelimo's success in the upcoming municipal polls, considered crucial for the 2024 elections. Despite Nyusi's re-election as party president, internal disputes within Frelimo persist, particularly from factions supporting past presidents Chissano and Guebuza. Nyusi has minimized the influence of the Guebuza faction through strategic cabinet changes and addressing the "hidden loans scandal." However, his attempts to change the constitution for a third term are unlikely to succeed due to internal opposition. Nyusi aims to influence the succession process by supporting allies like Celso Correia, Adriano Maleiane, and Max Tonela for potential presidential candidates in 2024. Restarting LNG projects in Cabo Delgado remains a priority for Nyusi's economic recovery plans, crucial for both political and economic stability. His policies focus on reducing the state's role in the economy, attracting foreign investment, and continuing infrastructure development through public-private partnerships. While uncertainty remains about Nyusi's succession and potential third term, his influence over the process suggests continuity in policy direction, prioritizing economic recovery and reducing state involvement in the economy.

Civil unrest, stability and terrorism: The upcoming municipal elections in Mozambique are likely to favor Frelimo, positioning them well for the 2024 general elections due to their strong influence on social spending and patronage networks. This dominance might lead to sporadic protests, especially in urban areas, fueled by voter registration irregularities and preparation delays. However, internal divisions within the opposition may limit widespread protests, confining unrest to specific areas.

Civil unrest and climate disasters have significantly impacted Mozambique's economic stability. Ongoing armed conflicts and cyclones have disrupted economic activities, hampered infrastructure projects, and discouraged investments. The aftermath of such disasters diverts resources from developmental projects, impacting sectors like agriculture and tourism. To counter these challenges, Mozambique has initiated resilience measures focusing on disaster preparedness, early warning systems, and community programs. Investments in climate-resilient infrastructure, sustainable agriculture, and innovative technologies aim to mitigate climate change effects and bolster economic sustainability.

Terrorism threats persist in Cabo Delgado, with groups like Al-Sunnah disrupting economic activities like LNG and mining. Despite recent security operations weakening key leaders, the group still poses a significant threat, requiring ongoing vigilance in central and northern districts against terrorism.

Attitudes towards foreign investment and the mining sector: Nyusi's administration actively encourages foreign investment in the mining sector, prioritizing it within national development policies. This commitment to fostering foreign direct investment aligns with long-term development strategies and current government plans. Nyusi is expected to maintain a pro-business approach, aiming to expedite mining and natural gas activities by 2024. Despite uncertainties about succession, a probable Frelimo victory in the 2024 elections would likely sustain a business-friendly environment, considering ongoing

economic challenges. However, local concerns persist regarding perceived exclusion of communities by foreign investors and government officials in resource exploitation, potentially fueling demands for more local involvement policies and increased civil society activism against mining operators in the future.

Civil society activism: Civil society in Mozambique actively monitors foreign investments in mining and natural resources, highlighting concerns about human rights issues such as poor working conditions, wage law violations, excessive use of private security, and instances of forced and child labor. NGOs have criticized the state for inadequate regulation enforcement, particularly in large-scale mining projects leading to people's displacement. Reports by organizations like Human Rights Watch have documented forced evictions by coal-mining operations and monitor militant attacks in gem-rich areas of Cabo Delgado province. Recently, HRW urged Mozambican authorities to enhance security and provide support for those displaced by the ongoing insurgency. Under Nyusi's leadership, activists advocating transparency and anti-corruption have faced increased harassment, especially concerning reporting on the insurgency in Cabo Delgado. Amendments to the anti-terror law in May 2022 sparked criticism from civil society groups as potentially criminalizing insurgency reporting, despite the government's adoption of the law in June 2022. Additionally, the government's actions against critical journalists, like canceling public advertising contracts, have drawn international scrutiny from organizations like Freedom House.

Regulatory environment: The mining sector in Mozambique is regulated by multiple bodies, including the Council of Ministers, Ministry of Mineral Resources and Energy (MIREME), and the National Institute of Mines (INAMI). MIREME oversees mining licenses and supervises INAMI, responsible for regulating mining activities and public-private sector involvement in mining products. The National Directorate of Geology and Mines (DNGM) manages administrative procedures and mining information, while the Inspectorate-General of Mineral Resources and Energy monitors and inspects mining activities.

Carlos Zacarias, appointed as Minister of Mineral Resources and Energy in March 2022, brings substantial experience in the energy and mining sector, aiming to expedite LNG production restart and attract foreign investment. National laws, such as the Mining Law and Regulations, Taxation Law for Mining Operations, Mega-Projects Law, Health and Safety Regulations, and Environmental Regulations, provide the legal framework for mining activities. These laws detail licensing procedures, investment regimes, tax exemptions, safety measures, and environmental impact management in the mining sector.

Local content and ownership requirements: Regulatory risks in Mozambique's mining sector often revolve around issues concerning local content. The government aims to tackle public concerns that large mining projects primarily focused on exports don't adequately benefit the wider population. While the 2014 mining and petroleum codes outline local content requirements, some aspects lack implementing regulations. Stricter regulations on permits for foreign workers reflect the government's push for local employment. The 2014 Mining Law emphasizes local content, urging preference for Mozambican suppliers and services, even if they're pricier than imports. Mining operators must offer job opportunities and technical training to locals, prioritizing those residing near mining operations. Foreign ownership in mining adheres to the Mega-Projects Law, mandating a percentage of the project's capital to be reserved for local participants, ranging from 5% to 20%.

Implementation: Regulatory implementation in Mozambique faces challenges due to capacity limitations. Civil service constraints lead to officials not staying updated on regulations, sometimes requesting unnecessary documents. Local government structures, lacking resources, struggle to oversee companies' compliance with land use and community consultation obligations, causing issues in later project phases. State-owned companies' dual roles as commercial players and regulators create potential conflict of interest concerns. In the mining sector, decentralization laws introduced provincial governors in May 2019, causing confusion regarding license awards. Provincial governments can grant mining licenses without central government approval, but regulations remain unclear for operations spanning multiple provinces.

Contract risk and expropriation: Mozambique's government maintains a pro-investment stance to prevent expropriation and safeguard foreign investors' assets, particularly in mining and natural gas sectors, aiming to address socioeconomic challenges. Despite concerns regarding potential discriminatory actions by influential government figures, past incidents of asset seizures and license suspensions have occurred. While the judicial system, though imperfect, offers redress for affected companies, instances of government actions like unilateral license suspensions have been recorded in response to situations like the "coal rush" in Tete province.

External environment

International relations: The Mozambican government has made efforts to rebuild ties with traditional Western donors, aiming to attract more foreign investment and international funding. President Nyusi's diplomatic approach has focused on strengthening relations with Western partners and investors, especially after budgetary support was suspended due to a debt scandal implicating high-ranking officials in 2016. Despite this, the IMF adjusted its stance in March 2022 due to concerns about potential economic collapse and the government's anti-corruption efforts, approving a $470 million Extended Credit Facility (ECF) to aid fiscal improvement.

Western interests, notably in extractive industries and infrastructure, are increasingly active in the country. Maintaining strong ties with regional peers and the Southern African Development Community (SADC) remains a priority for Mozambique. The SADC's support in counterinsurgency operations in Cabo Delgado is crucial. President Nyusi aims to assure mining industry investors about the government's capability to handle security concerns in the northern regions, particularly in Cabo Delgado province, as they seek to resume LNG and mining operations.

International regulations: Mozambique's government is actively aligning with international standards and recommendations to enhance the appeal of its mining sector for foreign investors. Efforts include adopting regulations suggested by global institutions and complying with the Extractive Industries Transparency Initiative (EITI) standards. The EITI's recent validation report commended the government's engagement in addressing governance challenges in the extractive sector but highlighted the need for more transparency, particularly in beneficial ownership in mining to tackle corruption risks. However, challenges persist, as Mozambique was placed on the Financial Action Task Force (FATF) "grey list" due to deficiencies in anti-money laundering and counterterrorism financing regulations. To rectify this and improve international standing, the government established a committee to oversee measures

recommended by the FATF. While Mozambique has been an International Labour Organization (ILO) member since 1976 and ratified numerous human rights conventions, it's yet to ratify two fundamental ILO conventions related to occupational safety and health hazards, essential for ensuring safe workplace conditions.

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4. Assessment of social, environmental, and governance challenges[3]

Mozambique's mining industry plays a substantial role in the economy, contributing 7% to GDP and 6% to government revenues in 2019. Abundant reserves in coal, gold, graphite, tantalum, and other minerals offer significant potential. Coal mining, with vast deposits, and promising gold reserves stand out, alongside valuable minerals like graphite, precious stones, and heavy sands. The sector's potential is highlighted by TotalEnergies' 3.5 billion euros LNG project restart. Mozambique aims to attract investments, especially in graphite, leveraging incentives and profit repatriation. However, despite its importance, the sector's revitalization is slow due to inadequate supervision and regulation enforcement, particularly in smaller mines. The industry employs about 139,000 workers across large-scale and artisanal operations, constituting around 3% of formal employment. Mining drives growth in Mozambique's Special Economic Zones (SEZs) like Nacala and Maputo. Investments here create jobs, support infrastructure, and amplify trade prospects. The SEZs also foster value-added services for mining-related businesses, while the Nacala Logistics Platform facilitates global market access. Overall, this integrated approach is fuelling economic development and positively impacting Mozambique's population.

4.1. Country-level assessment and context

4.1.1. Context

The Ministry of Mineral Resources and Energy (MIREME) is in charge of enforcing the Mining Law, whilst events and incidents are simultaneously monitored by the Ministry of Lands, Environment and Rural Development (MTERD). The other key stakeholder in the Mozambican mining sector are: National Institute of Mines (INAMI), National Directorate of Geology and Mines (DNGM), Ministry of Land and Environment (MTA), Tax Authority of Mozambique, Bank of Mozambique and the High Authority of Extractive Industry (established by the Mining Law in 2014, this regulatory authority is not operational yet).

Mozambique is a member of the Extractive Industries Transparency Initiative (EITI) since 2009, a global standard for the good governance of oil, gas and mineral resources. The aim of the initiative is to promote better governance, transparency and accountability within resource-rich countries.

The EITI provides a platform to ensure that this potential for the extractive industry is ethically achieved, as a lack of transparency in the extractive sector can have serious implications for both the environment and local communities. The process is encouraging a range of organisations, such as companies, government and civil society, to work together to drive the necessary governance reforms and increase effective engagement with key stakeholders.

[3] Most of this section is from AfricaMaVal deliverable 4.1 by AWIMA

4.1.2. Mineral and Mining Policies

Mozambique's mining sector is governed mainly by nationwide laws and implementing regulations. Some of the specific laws and regulations governing the country's mining sector include:

- Mining Law (Law 18/2014, of 19 August 2014): This law provides for the definition, rights and duties of holders of mining titles, concession and licences, as well as the legal framework for the exploitation, production and transport of minerals in Mozambique.
- Environmental Law (Law 7/2018, of 22 August 2018): This law seeks to ensure the protection of the environment and the balanced and sustainable use of natural resources, as well as the safety and health of people.
- Customs Clearance Regulations (Decree 9/2017, of 6 April 2017): This law regulates the import and export of goods, provides for customs exemptions and establishes a preferential customs regime for the import of goods intended for use in the mining operations.
- Council of Ministers Decree 23/2018, of 3 May: This decree aims to support and promote green projects, programmes and activities in order to contribute to the control and reduction of greenhouse gas emissions.
- Regulations on the Hiring of Expatriates for the Petroleum and Mining Sectors (Decree 63/2011, of 7 December 2011): This decree regulates the employment of foreign personnel in Mozambique, as well as the procedures for the notification and authorisation of the hiring of foreigners.
- Regulations on Marketing of Mineral Products (Decree 22/2009, of 6 April 2009): This decree sets the ground-rules for the marketing of mineral products in Mozambique for entities that do not hold mineral titles.
- Regulations on Marketing of Diamonds, Precious Metals and Gems (Decree 39/2007, of 11 December 2007): This decree establishes the specific rules for the marketing of diamonds, precious metals and gems.
- Resettlement Regulations (Decree 31/2012, of 8 August 2012): This decree sets out the measures to be taken in order to ensure the protection of the rights of all persons affected by a project or an activity.
- Environmental Regulations for Mining Activities (Decree 11/2006, of 31 March 2006): This decree establishes the requirements to ensure the compliance with environmental regulations in the mining sector.
- Law on the Taxation and Fiscal Benefits of Mining Operations (Law 28/2014, of 23 September 2014): This law regulates the taxation system applied to mining operations.

4.1.3. Mining Regulations

Mozambique's mining regulations are governed by national laws, overseen by the Ministry of Mineral Resources and Energy (MIREME). Mining rights are awarded based on competence, technical, and financial capabilities, granted through mining titles by the State on a first-come, first-served basis to eligible legal entities registered in Mozambique. Recently, MIREME engaged Spatial Dimension, a Trimble Company, to upgrade the mining cadastre system, managed by the National Institute of Mines (INAMI). This upgrade aims to transition to an e-government-based system, streamlining licensing processes, enhancing efficiency, and improving revenue collection. The upgraded system facilitates online applications, license management, payments, reporting, and renewals, significantly enhancing revenue collection in Mozambique's mining sector. This digital transformation simplifies exploration and licensing

processes, making it more accessible for investors and positively impacting the industry's growth and the country's economic development.

The exploration and the mining concession are most usually mining titles and are summarised in Table 3.

Table 4: The various license types available for the mining sector of Mozambique

Licence Type	Description	Duration	Renewable	Restriction
Exploration Licence	This grants the rights to undertake exploration and prospecting to assess whether there are mineral resources; it may not exceed 19998 ha.	5 years	Renewable for an additional 3 year period.	
Mining Concession	This grants concessionaires the right to undertake mining operations and the right to dispose of minerals found;	25 years	Mining concessions are granted for 25 years and may be extended once, for another 25-year period. Extensions must be requested within 365 days prior to its due date.	The area of the concession must exceed that which is reasonably necessary for the mining operation.

For significant mining projects, the State and the concessionaire can establish a mining contract, though it is not mandatory unless the project's value surpasses USD 500 million. Such contracts serve as frameworks for additional rights, but their contents cannot conflict with Mozambican mining laws. Mining contracts cover various aspects, including the State's involvement, dispute resolution methods, and plans for benefiting local communities.

When finalizing the contract, considerations include the project's scale, invested capital, and the significance of minerals involved.

Requirements for Mining Rights Holders:

Mining rights holders in Mozambique bear several obligations related to environmental protection and community engagement. These obligations vary based on the scale and complexity of mining operations. Regardless of their specific title, they are required to furnish a financial guarantee aligning with their work programs or projected investments to ensure compliance. This performance bond can be withdrawn under specific conditions or invoked by the State for breaches leading to title revocation.

Mining concession holders must conduct impact assessments, prioritize local development, engage with communities, pay royalties, adhere to safety standards, and report activities regularly to the government. They must also operate within legal frameworks and maintain social and environmental standards mandated by law. Responsibilities encompass respecting local communities, preserving their cultural heritage, compensating landowners for damages, rehabilitating mined areas, reporting discoveries to the government before public announcements, and ensuring adequate insurance coverage for site-related risks.

Additionally, they're mandated to sell mineral products within Mozambique for industrial development and list their mining company on the Mozambique Stock Exchange.

Renewal and Transfer of Mining Titles

Under Mozambique's Mining Law, transferring mining titles or shares within the title-holding company requires government approval through MIREME. While leasing mining rights is prohibited, titleholders can delegate operational duties to a third party. Mining operators must register with MIREME for each specific mining title. For extensions of prospecting and exploration licenses, applicants must submit a request at least 60 days prior, accompanied by necessary documentation and fees. Approval depends on compliance with obligations and is subject to evaluation by the Ministry of Mineral Resources and Energy. Transfer of these licenses or shares requires prior government approval. A Mining Permit is necessary for various activities like extracting minerals for public works, geological research, or fossil removal.

Each mining title requires specific documentation:

- Processing and Mineral Treatment Licence necessitates land use rights, feasibility studies, and environmental impact assessments.
- Mining Certificate mandates applications, criminal records, and feasibility studies.
- Mining Pass requires applications, liability statements for employed workers.
- Trading Licence demands marketing plans, operator identification, and liability statements for employed operators.

4.1.4. Taxation and Royalties

Mozambique's Mining Law dictates that mineral processing must occur in-country when resource availability and viability permit it. Taxation and royalties for mining companies encompass a special value-added tax regime, production taxes, and surface taxes. Mining contracts may include exemptions and administrative adjustments. Foreign applicants should note that mining certificates, passes, and concessions are exclusively awarded to Mozambicans or Mozambican companies. Mineral rights are protected through an independent judicial system, allowing for international arbitration if needed. Environmental liabilities require financial bonds or insurance coverage.

Specific taxes applied to mining activities include royalties based on mineral types and varying rates, alongside surface taxes categorized by mining title. Mineral Resource Rent Tax is levied at 20% on net cash flow for projects achieving a minimum return rate. Additional general taxes, such as corporate income tax, value-added tax, customs duties, windfall profits tax, and capital gains tax on equity transfers, are also applicable. These regulations aim to attract both foreign and local investment while ensuring Mozambique's government actively participates in the country's economic growth.

4.1.5. Environment

Mozambique emphasizes environmental sustainability in mining, seeking a balance between economic gains and resource conservation. The Environmental Regulations for Mining Activity (2006) delineate requirements for assessments, permits, and audits, classifying mining operations into three levels based on scope and equipment sophistication. These levels determine the environmental guidelines and management plans.

Projects categorized as Level I must adhere to basic environmental rules, mitigating air, soil, and water pollution and preserving flora, fauna, and human health. Level II and III activities require specific plans and programs under the Environmental Regulations, mandating environmental management and risk control measures. To prevent over-mining, mining ventures with a pre-tax net return of 18% or more face windfall profits tax assessments. Financial bonds are compulsory for Level II and III operations, ensuring accountability for potential decommissioning costs and environmental damages.

Preserving Mozambique's **cultural heritage**, rich in tangible and intangible aspects, is crucial. Mining fosters economic growth and sustains traditions, necessitating a deeper understanding and respect for this heritage. Initiatives to safeguard culturally sensitive sites and support local cultural activities are vital in preserving this legacy.

The legal framework for **mine closure** and relinquishment, governed by the Mining Law of 2014, outlines procedures to protect the environment, compensate affected communities, and restore mined areas. Closure plans, environmental studies, and financial security declarations are required for legal compliance, ensuring post-operation land rehabilitation and environmental preservation.

Mozambique has implemented **water** resource management regulations within its mining framework. The Mining Law and its regulations oblige mining operators to protect water quality and quantity. Environmental impact studies and water resource management programs require approval from competent authorities before commencing mining activities. The National Legal Framework for Integrated Water Resources Management emphasizes sustainable water resource management, public access to safe water, and pollution prevention.

4.1.6. Social

Land-use and Mineral Rights: Governed by the Mining Law, land rates and mining rights are determined individually. Surface tax and corporate income tax apply alongside royalties, aiming to protect local communities and the environment. Holders of mining rights must create resettlement plans and compensate affected populations.

Artisanal and Small-Scale Mining (ASM): Mozambique boasts a robust ASM sector contributing significantly to the economy through gold production. The government formalizes ASM operations, creating designated areas and associations. Despite its importance, ASM faces challenges like environmental degradation. Mozambique addresses these issues by supporting initiatives like The Mining Development Fund and establishing the Gemmological Institute to promote value addition to ASM-origin gemstones.

Operational Health and Safety (OHS) and Labour Regulations: Mozambique prioritizes health and safety in mining operations. The Mining Law establishes guidelines for health and safety measures, requiring mining concession holders to submit comprehensive plans, conduct regular site inspections, and produce environmental management reports. The policy also emphasizes public health and safety regulations, covering various aspects, from worker authorization to compensation for long-term health impacts.

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Labour Practices: The Labour Constitution and Code affirm employees' rights to form trade unions and advocate for workers' interests. Trade unions have significant roles in protecting workers' rights, including engaging in collective bargaining and representing workers' interests.

Societal and Community Aspects: Mozambique's policies emphasize community rights and environmental protection. Regulations mandate public consultations before mining operations commence and focus on sustainable development. The government promotes foreign investment and local economic development by offering customs exemptions and competitive tax rates for the mining industry.

4.2. Assessment of the Mozambican Mining Regime with Respect to ESG objectives

Mozambique has integrated the ESG framework into its mining sector, emphasizing sustainability principles. Environmental regulations categorize operations into three levels based on potential impact, requiring assessments or management plans. Socially, resettlement plans aim to restore affected communities' conditions, and there's encouragement for agreements addressing environmental, social, and cultural aspects. Despite challenges, Artisanal Small-scale Mining (ASM) remains vital, contributing to employment and rural income, yet needing better policy support for sustainable growth.

Governance-wise, the legal framework is strong, but practical implementation needs improvement. Licensing procedures are stringent, aided by a robust cadastre system and transparent practices. The government plans to review stock market registration for mining firms and revise laws governing mining projects. These efforts indicate a structured ESG policy in Mozambique's mining sector, though implementation and revisions are pending in certain areas.

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5. Business network between the European Union and Mozambique

5.1. Assessment of the upstream and downstream business ecosystem

The relationship between the EU and Mozambique is characterized by multifaceted partnerships spanning bilateral, regional, and global domains. The EU assumes an active role in advocating peace, security, trade, investment, development cooperation, and humanitarian aid, thriving across political, trade, economic, and cooperative sectors. The EU plays a pivotal role in fostering dialogue for peace between Mozambique's Government and its primary opposition party, Renamo. This diplomatic engagement culminated in the signing of the Peace Agreement in August 2019. Additionally, the EU commits substantial support, amounting to €60 million, towards the implementation of this important agreement.

An Economic Partnership Agreement (EPA) sealed between the EU and Mozambique seeks to alleviate poverty, stimulate economic diversification, and foster employment opportunities. This pact aims at encouraging intra-regional integration while cautiously embracing global economic openness.

Moreover, the extensive links between the EU and Mozambique align with key priorities outlined in the EU Strategy for Africa. These priorities encompass trade facilitation, initiatives for a sustainable green transition, advancements in digital transformation, fostering sustainable growth, and generating employment opportunities.

5.1.1. Context, formal and informal players

The mining industry in Mozambique is regulated by the Ministry of Mineral Resources and Energy and the National Institute of Mines. The Ministry of Mineral Resources and Energy is responsible for awarding mining rights, while the National Institute of Mines oversees mining activities.

5.1.2. Relationships at local or regional levels

Overall, the EU-Mozambique relationship at local or regional levels involves tailored interventions and partnerships aimed at addressing specific challenges, fostering development, and enhancing the well-being of communities within Mozambique.

Southern African Development Community (SADC): Mozambique has been a member of SADC since its creation. In 1993, through Resolution 3/93, dated 1st June, the country ratified the SADC community treaty. Since then, Mozambique has ratified several other agreements and treaties of SADC, most notably the Resolution no. 44/99, dated 28th December, related to the protocol on trade in the SADC region. One of the main objectives of this protocol is the gradual reduction/elimination of customs barriers in trade between member states, provided that the rules of origin are observed. Thus, to apply such exemption/reduction of duties, a Certificate of Origin is required.

African Continental Free Trade Area (AfCFTA): The AfCFTA is the world's largest free trade area (signed in 2018 and officially launched in 2021) in which the 55 countries (being Mozambique part of it) of the African Union (AU) and eight Regional Economic Communities (RECs) have form part of it. The AfCFTA is

to be implemented in phases as illustrated below, with the main goal of the creation of a single and liberalised market for trade and services.

Phase	Supporting initiatives[4]
Facilitating trade in goods	The Global Alliance for Trade Facilitation: a public-private partnership led by the World Economic Forum, International Chamber of Commerce (ICC), Center for International Private Enterprise (CIPE) and the German Agency for International Cooperation (GIZ) to implement trade-facilitation projects. These projects cover aspects such as trade facilitation such as digitalizing border processes, digitizing phytosanitary and rules of origin certificates, modernizing customs broker arrangements etc
Facilitating services and investment	Enabling Action on Sustainable Investment (EASI) initiative: EASI projects will bring a public-private approach to implementing investment measures that will facilitate the flow of sustainable investment and grow a larger continental market, thereby attracting greater FDI from outside Africa. EASI projects can also help support the implementation of the WTO Investment Facilitation for Development Agreement.
Facilitating digital trade	TradeTech: a concept that reflects different Fourth Industrial Revolution technologies in the trade space. - Digital Economy Agreements Leadership Group: this provides an impartial space for information exchanges and debate concerning digital economy agreements. - Trade Finance Frontiers: a multistakeholder group to explore and analyze where public-private cooperation can help the growing trade finance gap. - Digital Economy Agreements Leadership Group: this provides an impartial space for information exchanges and debate concerning digital economy agreements
Facilitating inclusive trade	Labour Programme and Trade and Indigenous Peoples Programme aim to identify how trade tools and mechanisms can better serve workers and increase access to trade benefits for Indigenous businesses and communities.
Facilitation environmentally sustainable trade	A guidebook of investment facilitation measures for developing countries to attract FDI aligned with climate action.

Although Mozambique is a signatory state, it has not ratified the treaty to date. Public pronouncements have been made in favour of ratification, but there are no indications that this will happen any time soon.

Development Cooperation**:** The EU engages in localized development projects aimed at specific regions within Mozambique. These projects often focus on areas such as infrastructure development, education, healthcare, agriculture, and community empowerment. They aim to address local challenges and improve living conditions.

Humanitarian Aid**:** At the regional level, the EU often provides humanitarian aid in response to natural disasters, conflicts, or other emergencies affecting specific areas within Mozambique. This aid includes assistance in the form of food, shelter, healthcare, and other essential services to affected communities.

Trade and Economic Partnerships**:** Regional trade and economic partnerships between the EU and Mozambique can have localized impacts, especially in areas where specific industries or sectors thrive. For instance, certain regions might specialize in agricultural production or mining, and EU trade agreements may influence the dynamics and development of these sectors at a local level.

[4] Source: Adapted from World Economic Forum. (n.d.). (rep.). AfCFTA: A New Era for Global Business and Investment in Africa. Retrieved from https://www3.weforum.org/docs/WEF_Friends_of_the_Africa_Continental_Free_Trade_Area_2023.pdf

Cultural and Educational Exchanges**:** The EU might engage in cultural and educational exchanges at regional levels within Mozambique. This could involve initiatives promoting cultural understanding, student exchanges, or support for local educational institutions to enhance skills and knowledge.

Local Governance and Capacity Building: The EU often collaborates with local governments and institutions to strengthen governance structures, promote good governance practices, and build the capacity of local authorities. This support aims to empower local leadership and improve service delivery to communities.

Environmental and Sustainability Initiatives: The EU supports localized environmental and sustainability initiatives in Mozambique, focusing on regions dealing with environmental challenges such as deforestation, climate change impacts, or biodiversity conservation. These efforts aim to promote sustainable development practices at the regional level.

5.2. Building new B2B relations

The EU and Mozambique have signed an Economic Partnership Agreement (EPA), which aims to reduce poverty, diversify economies, and create employment through enhanced intra-regional integration and a carefully managed opening towards the world economy.

The EU-Mozambique Global Gateway Investment Forum was held on November 2023, in Maputo. The forum aims to enhance and mobilize European private sector investments and partnerships in Mozambique, with a focus on digital transition, renewable energy, agriculture, blue economy, transport, and tourism. The forum will bring together public and private sector stakeholders to explore new business horizons.

5.3. Promoting local content and enabling mining cluster actors

5.3.1. Relevant institutions for the development of a Mozambique-focused critical minerals network

State institutions:

Ministry of Mineral Resources and Energy: ensures the implementation of the Government's policy in geological research, exploitation of mineral and energy resources, as well as in the development and expansion of infrastructure for supplying electricity, natural gas, and petroleum products."

National Institute of Mines: is the regulatory entity for mining activities in Mozambique

Private or consular institutions:

Chamber of Mines of Mozambique (CMM): a formal private sector organization that aims to represent the entire mining sector in Mozambique

Associação Geológico-Mineira de Moçambique (AGMM): a private association that aims to reinforce the interventionism of the associative, subsidizing the emergence of sustainable solutions for the challenges and opportunities in the geological and mining sector of the country.

5.3.2. Academic institutions and other training establishments in the field of geosciences and mining

Mozambique's mining industry is rapidly expanding, demanding a skilled workforce. Educational institutions like Eduardo Mondlane University are adapting, offering specialized courses in geosciences and mining engineering. Collaborations with international partners enhance knowledge exchange. Government support for vocational programs aims to equip individuals with practical skills. Mozambique education system struggles to meet industry demands due to resource constraints. Despite a variety of courses, alignment with the evolving needs of the mining sector remains a challenge.

Courses available in public institutions

Institution	Faculty	Course	Contact
Universidade Eduardo Mondlane	Faculdade de Ciências	Degree in Applied Geology	Av. Julius Nyerere - Campus Universitário 3453; Maputo Tel. +258 21 493 376 www.ciencias.uem.mz/
		Masters in Mineral Resources Management	
Universidade de Licungo	Faculdade de Ciências	Degree in Geology	Estrada Regional nº 642, Campus de Murrópuè, Quelimane Tel. +258 84 340 3960 www.unilicungo.ac.mz
Universidade Púnguè	Faculdade de Geociências e Ambiente	Degree in Geology	Bairro Heróis Moçambicanos, Cidade Chimoio, Provincia de Manica Tel. +258 25 125 700 www.unipungue.ac.mz
		Masters in Mining and Sustainability	
	Faculdade de Engenharia	Degree in Mining Engineering	
		Degree in Mineral Processing Engineering	
Universidade de Rovuma	Faculdade de Geociências	Degree in Geology	Av. Josina Machel nº 256 Tel. +258 84 073 1777 www.unirovuma.ac.mz
Universidade Lúrio	Faculdade de Engenharias	Degree in Geological Engineering	Bairro de Marrere, R. nr. 4250, Km 2,3 - Nampula Tel. +258 26 218 250
Universidade Wutivi		Degree in Mining Engineering	Av. Da Namaacha, nº118, Belo-Horizonte, Boane, Maputo Tel. (+258) 85 777 1613 www.unitiva.ac.mz
		Degree in Applied Geology	
Instituto Superior Politécnico de Tete		Degree in Mining Engineering	Estrada Nacional nº 7, Km 1, Bairro Matundo, Cidade Tete Tel. (+258) 252 20454 www.ispt.ac.mz
Instituto Superior de Ciências e Tecnologia de Moçambique		Degree in Geological and Mining Engineering	Rua 1,194 n ° 332, Bairro Central, Maputo, Maputo 1100 Tel. +258 84 093 1000 www.isctem.ac.mz

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Courses available in private institutions

Institution	Faculty	Course	Contact
Universidade Católica de Moçambique	Faculdade de Gestão de Recursos Naturais e Mineralogia	Degree in Mining Engenering	Av. da Liberdade, Bairro Josina Machel, Tete Phone: (+258) 25 224 066 www.ucm.ac.mz
		Degree in Mineral Processing Engeneering	
Universidade Jean Piaget de Moçambique		Degree in Geological and Mining Engenering	Campus Universitário de Inhamizua, Beira, Moçambique Telefone: +258 23 346 6200 www.unipiaget.ac.mz

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the European Union

6. Energy and digital transition: develop a strategy for the EU and Africa Partnership

Existing partnerships/projects dealing with responsible sourcing, CRM, with synergies to the AfricaMaVal objectives

i. Strategy for responsible sourcing:

The concept of responsibility remains undefined. However, the 2014 mining code delineates several actions that must be incorporated into each mining contract, forming a segment of negotiations between the company and the government. These include, among others:

Minimum local content: The law requires that mining companies operating in Mozambique must have a minimum percentage of local content in their operations.

Local employment and training requirements: The law requires that mining companies must employ Mozambican citizens and provide them with adequate training.

Incentives in relation to increasing the value of the minerals to be extracted (downstream processing): The law provides incentives for mining companies to increase the value of the minerals extracted through downstream processing.

Corporate social responsibility requirements: The law requires mining companies to undertake corporate social responsibility activities to benefit the communities in which they operate.

Memorandum of understanding between the firm, the State and the community establishing dialogue with local communities: The law requires mining companies to establish a memorandum of understanding with the state and local communities to ensure that the communities are involved in and benefit from the mining activity.

Disputes resolution mechanisms, including provisions relating to the settlement of disputes by way of arbitration: The law provides for dispute resolution mechanisms, including arbitration, to settle disputes between mining companies and the state or local communities.

The way that the communities in the area will be involved in and benefit from the mining activity: The law requires mining companies to ensure that the communities in the area are involved in and benefit from the mining activity.

ii. Mining sector development policies, targets and goals

Based on the Mineral Resources Policy and Strategy from 2013, but also on the 2014 mining law. The policy provides guidance towards turning the mineral resources into drivers of industrialization, diversification and broader economic transformation. Local content is at the center of this policy, improving and promoting the participation of local stakeholders and to maximize benefits for the local

economy. Several priority areas have been identified where mining firms are required to make special efforts to increase local participation.

According to the mining law, a prominent mechanism through which LC is to be promoted is through public tender processes, which are mandatory above a certain threshold. In these tenders, priority is to be given to local offers. This 'priority' however is not closer defined. Closely related to this is the requirement of foreign firms that provide services to mining operations to "associate with" Mozambican entities. Here too, this association is not closer defined.

Similar, the GoM tries to promote local employment, at least when competencies are available. The companies also have to provide professional training of national workers.

7. Opportunities for responsible investments

7.1. Identification of individual exploration, mining and refining projects

The projects presented on Table 4 were identified as fulfilling the following requisites:

- Credible ECRM resource estimate available.
- Sufficient availability of credible project-specific information on economics and ESG features.
- The project operator is seeking investment or financing.
- Part of the project's current or anticipated future ECRM production is potentially available to the EU industry.

Four projects were selected within the framework of this study. Balama Central started production in November 2021 and is expected to produce up to 50,000 tpa of graphite concentrate over an estimated mine life of 27 years.

Monte Muambe Rare Earths Project is a world-class carbonatite-hosted rare earth element (REE) exploration and development project located in Tete Province. Altona Rare Earths Plc. is strongly focused on the high-grade parts of the deposit to rapidly move towards development.

Triton Minerals Ltd.'s Balama North Project is the world's largest known combined graphite-vanadium resource, located in northern Mozambique. The project consists of two significant areas of interest that are currently being evaluated: Nicanda Hill and Cobra Plains. The Nicanda Hill Resource of 1.4 billion tn at 11.1% TGC is the world's largest graphite-vanadium deposit. Triton is actively seeking a JV Partner and Finance to complete Feasibility Studies and advance development.

Inhambane Mineral Sands Project is a key opportunity for Heavy Minerals Ltd and is considered a large, commercially viable mineral sands deposit. The project is located in the Southern part of the Inhambane Province, Mozambique. Heavy Minerals intends to continue exploring for ilmenite, zircon and rutile while awaiting the granting of its Mining Licence applicatio. The project has an installed processing capacity of 120 tons per hour, valued at ten million. The heavy sands processing plant, operated by Mutamba Mineral Sands, will have the capacity to process 120 tons per hour and has an investment of ten million US dollars.

Table 5: Projects selected to be presented as fact sheets in WP7

Project	Owners	Commodities	Total in situ Value	Possible benefits from EU partnership
Balama	Triton Minerals Ltd.	Graphite Vanadium	183,224.8	Complete feasibility studies and advance development
Monte Muambe	Altona Rare Earths Plc Unnamed Owner	Lanthanides Cerium Praseodymium Neodymium Terbium Dysprosium Niobium	16,718.9	Drive exploration

Balama Central	Tirupati Graphite plc	Graphite Vanadium	3,692.7	Consolidate production
Inhambane	Heavy Minerals Ltd., Private Interest	Ilmenite Rutile Zircon Leucoxene Heavy Mineral Sands	1,375.0	Drive exploration

7.2. ASM sector country profiles

Country profiles on ASM sector developments and investment

One of the core objectives of the AfricaMaVal is to identify investment opportunities in a number of commodities considered critical by the European Union, and there is a clear interest to include the ASM sector in the identification of such opportunities. The emphasis should be on identifying responsible investment opportunities that strengthen the artisanal sector's supply potential and address ESG impacts while also contributing to higher value addition and economic development.

To ease identification of opportunities, the following categories should be considered.

1. Governance: focusing on the needs of the sector to strengthen its governance to ensure it contributes to socio-economic development. This could include support to government, knowledge sharing programmes, extension services to the ASM sector, etc.

2. Support to existing initiatives: existing initiatives which focus on supporting the ASM sector to improve its social and economic impacts, and that could benefit from stronger / continued financing.

3. Value chain projects (processing, trading, etc.): opportunities to support value addition projects which directly support and benefit the ASM sector.

4. Small-scale mining projects: specific small-scale mining projects which might benefit from financing opportunities and investment (e.g., to improve mining techniques, production, environmental and social impact management.).

Conclusion

Mozambique serves as a compelling example for mining investments, presenting a complex interplay of both opportunities and challenges. Abounding in rich and varied mineral resources, including critical raw materials (CRMs), Mozambique captivates mining investors seeking promising ventures. This wealth of valuable resources, combined with the proactive governmental approach, enhances the country's attractiveness in the eyes of potential investors.

From a positive perspective, Mozambique's mineral abundance acts as a magnet, attracting global mining investors. The extensive reserves of valuable minerals, especially CRMs, offer an attractive prospect for individuals seeking profitable ventures within a highly competitive global market. This inherent potential elevates Mozambique's profile, garnering interest and focus from mining stakeholders on an international scale.

Moreover, the collective endeavours of the Mozambican government highlight its commitment to fostering an inviting investment climate. Through strategic policies and initiatives, the government acts to create an environment conducive to foreign capital inflow into the mining sector. These policies are thoughtfully designed to attract and facilitate foreign investments, positioning mining as a corner stone for driving economic growth and fostering comprehensive national development.

However, within these encouraging opportunities, Mozambique faces inherent complexities that present challenges for potential investors. The country struggles with significant difficulties such as infrastructural limitations, civil unrest, and regulatory intricacies, demanding thorough assessment and strategic navigation. Successfully overcoming these challenges mandates a meticulous approach, calling for potential investors to navigate the elaborate operational landscape through comprehensive due diligence and planning.

Investors assessing Mozambique's mining sector must prioritize thorough risk management and forward-thinking strategies. Successfully crossing the interplay between promising prospects and intricate challenges requires careful assessment and comprehensive planning. Collaborative alliances with the government and local stakeholders emerge as crucial elements in harnessing Mozambique's vast mining potential, fostering mutual growth, and nurturing sustainable development.

Essentially, Mozambique emerges as a compelling yet multifaceted scene for mining investments. Balancing the pull of abundant opportunities with the complexities of operational details calls for astute engagement, diligent planning, and collaborative alliances. As Mozambique strides forward, investors equipped with a comprehensive understanding of these dynamics hold the potential to leverage the country's vast mining resources while contributing to its socio-economic growth trajectory.

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References

AWIMA (2023). AfricaMaVal Deliverable 4.1 Report on mining regimes with respect to ESG objectives

Bingen, B., Bjerkgård, T., Boyd, R., Dehls, J., Engvik, A., T. Grenne, T. I. Henderson, I.O. Lutro, V. Melezhik, G. Motuza, Ø. Nordgulen, M. Often, J.S. Sandstad, M. Smelror, A. Solli, H. Stein, O.M. Sæther, T. Thorsnes, E. Tveten, G. Viola (Geological Survey of Norway), W. Bauer, P. Dunkley, E. Gonzalez, L. Hollick, J. Jacobs, R. M. Key, R. Smith, R.J. Thomas (British Geological Survey), D. Jamal (University Eduardo Mondlane), F. Catuane, S. de Azavedo, P. Feitio, P. Fumo, V. Manhica, S. Manuel, A. Moniz, F. Njange, D. Rossi, I. de S. Saranga, H. de S. Soares, D. Tembe, B. Uachave e/and E. Zandamela (National Directorate of Geology) (2007) Mineral resources management capacity of Mozambique. Component 2: Geological Infrastructure Development Project. Direcção Nacional de Geologia

Callaghan, C. (compiler) 2002 Mineral scan of the Zambezi River and Beira Corridor Spatial Development Initiatives. 247p

Lächelt, S., (2004) Geology and mineral resources of Mozambique Mineral Resources Management Capacity Building Project. Direcção Nacional de Geologia. ISBN 1-919908-52-8

Lehto, T., Gonçalves, R. (2008) Mineral Resources Potencial in Mozambique in GTK Consortium Geological Surveys in Mozambique 2002–2007, edited by Yrjö Pekkala, Tapio Lehto & Hannu Mäkitie Geological Survey of Finland, Special Paper 48, 307–321

Marques, J.M., (1989) O Campo Pegmatítico do Alto Ligonha: Estado actual e sua importância a curto prazo. Tese de Licenciatura, Departamento de Geologia, Faculdade de Ciências, Universidade de Lisboa, Lisboa, Portugal, pp. 291.

Marques, J.M., Ferrara, M. & Mäkitie, H., (2011) O Novo Campo Pegmatítico da Região de Marirongoè, Província de Tete, Moçambique, 6o. Congresso Luso-Moçambicano de Engenharia/3o. Congresso de Engenharia de Moçambique, Maputo, Moçambique, 769- 770.

Marques, J. M., (2017) Distribuição dos campos pegmatíticos em Moçambique: sua localização, caracterização e mineralizações. Proceedings CLME2017/VCEM 8º Congresso Luso- Moçambicano de Engenharia / V Congresso de Engenharia de Moçambique. Maputo, 4-8 Setembro 2017; Ed: J.F. Silva Gomes *et al*.; Publ: INEGI/FEUP

Plaza-Toledo, M. (2018) The Mineral Industry of Mozambique. USGS 2017-2018 Minerals Yearbook, Vol. III, Mozambique Country Chapter

Vasconcelos, L. (2014) Breve apresentação sobre os recursos geológicos de Moçambique. Comunicações Geológicas (2014) 101, Especial II, 869-874. ISSN: 0873-948X; e-ISSN: 1647-581X

Vella, A. (2022) Highlighting mineralized geological environments through a new data-driven predictive mapping approach. PhD Thesis, Institut des Sciences de la Terre d'Orléans, Université d'Orléans

Koistinen, T., Lehtonen, M., Fernando, S., Matola, R. (2008) Contribution to the structure at the eastern margin of the Archaean Zimbabwe craton, Mozambique in GTK Consortium Geological Surveys in Mozambique 2002–2007, edited by Yrjö Pekkala, Tapio Lehto & Hannu Mäkitie Geological Survey of Finland, Special Paper 48, 121–144

Pekkala, Y., Lehto, T., Lehtonen, M. (2008) Introduction to GTK projects in Mozambique 2002–2007 in Geological Survey of Finland, Special Paper 48 Yrjö Pekkala, Tapio Lehto & Matti I. Lehtonen

APPENDICES

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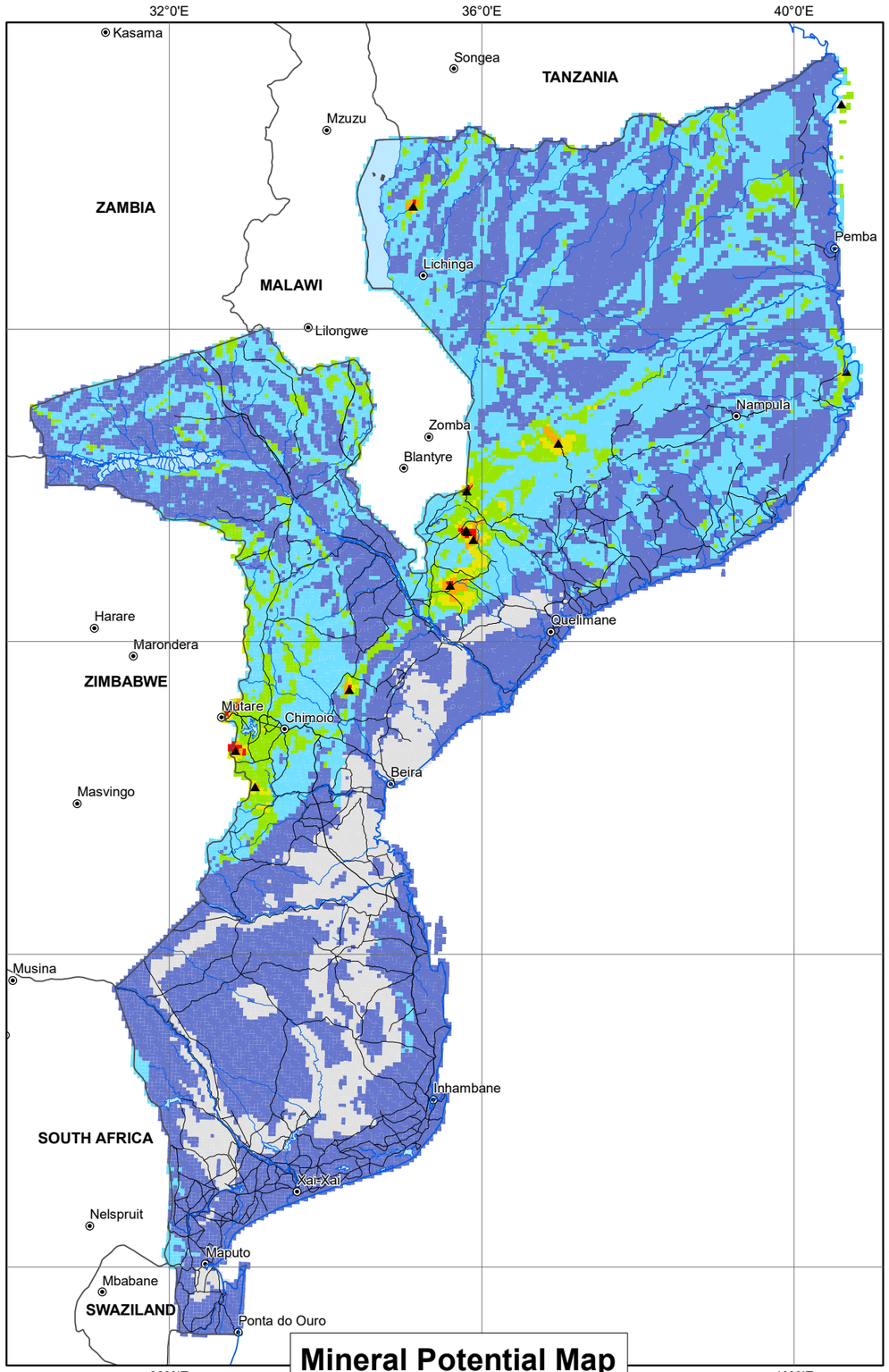
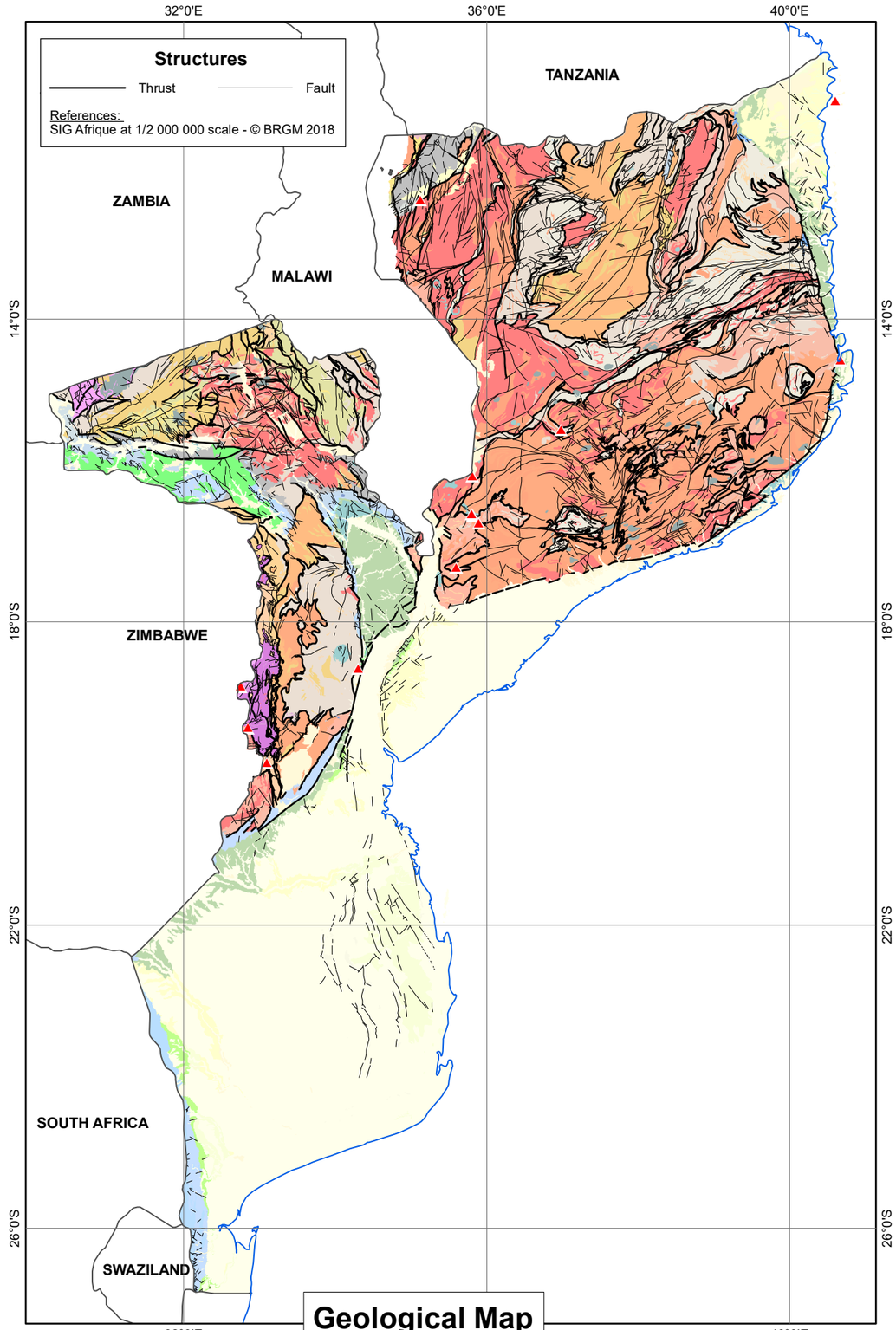
Country: MOZAMBIQUE

MINERAL POTENTIAL MAP - *BAUXITE (Al)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

	< 0.05
	0.05 - 0.125
	0.125 - 0.25
	0.25 - 0.45
	0.45 - 0.60
	0.60 - 0.80
	0.80 - 1

Known occurrences

▲ ▲ Bauxite (Al)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 32398 99.38% Non-occurrence in database Non-occurrence predicted	False positive Cells: 167 0.51% Non-occurrence in database Occurrence predicted
False negative Cells: 1 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 35 0.11% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.53
Cell size: 5000 m

N

0 75 150 300 Km

Datum : WGS84 (World Geodetic System 1984)

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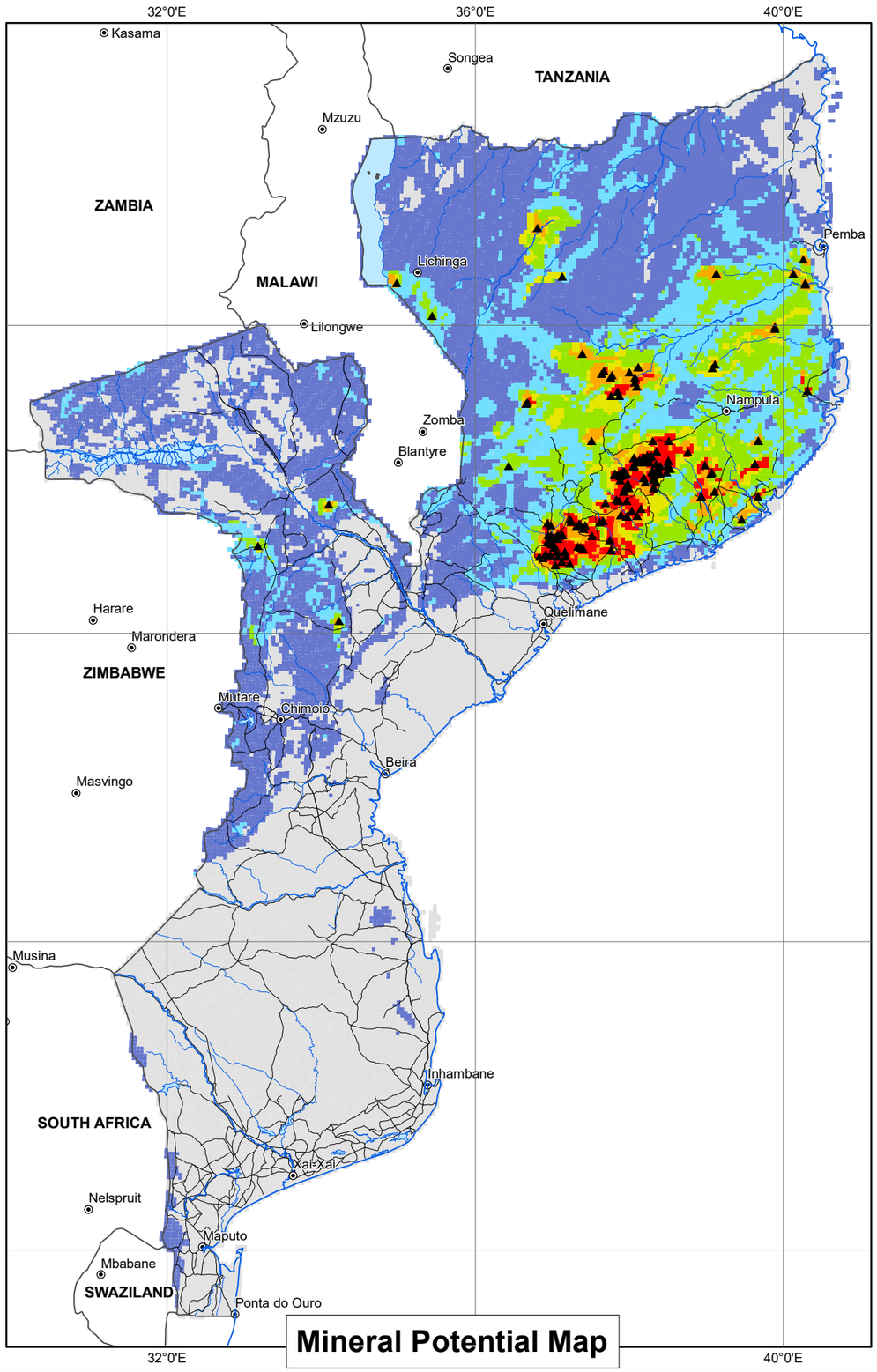
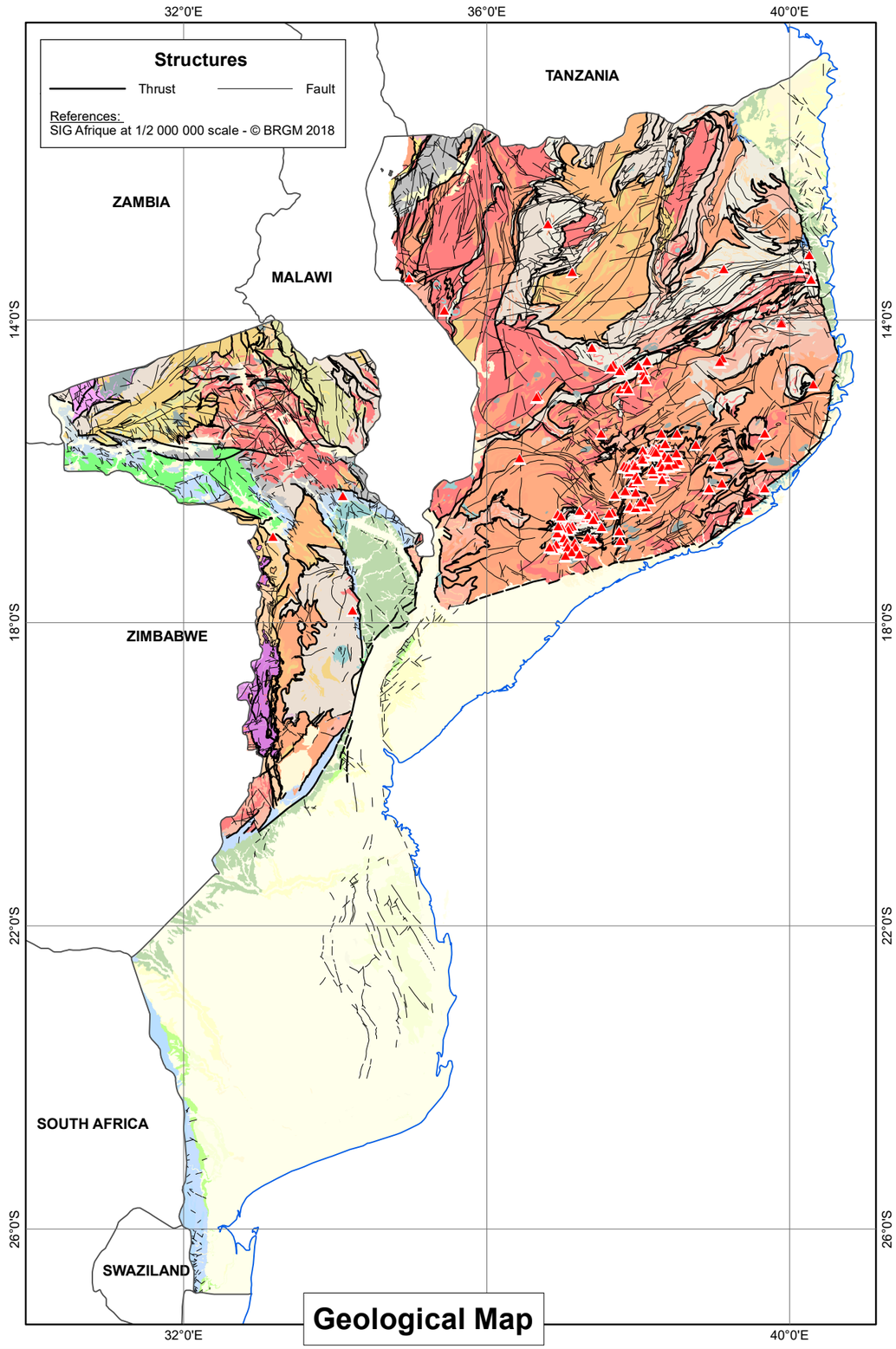
Country: MOZAMBIQUE

MINERAL POTENTIAL MAP - *BERYLLIUM (Be)*



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

Known occurrences

Berryllium (Be)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 30915 94.82% Non-occurrence in database Non-occurrence predicted	False positive Cells: 1349 4.14% Non-occurrence in database Occurrence predicted
False negative Cells: 5 0.02% Occurrence in database Non-occurrence predicted	True positive Cells: 332 1.02% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.44
Cell size: 5000 m

0 75 150 300 Km

Datum : WGS84 (World Geodetic System 1984)

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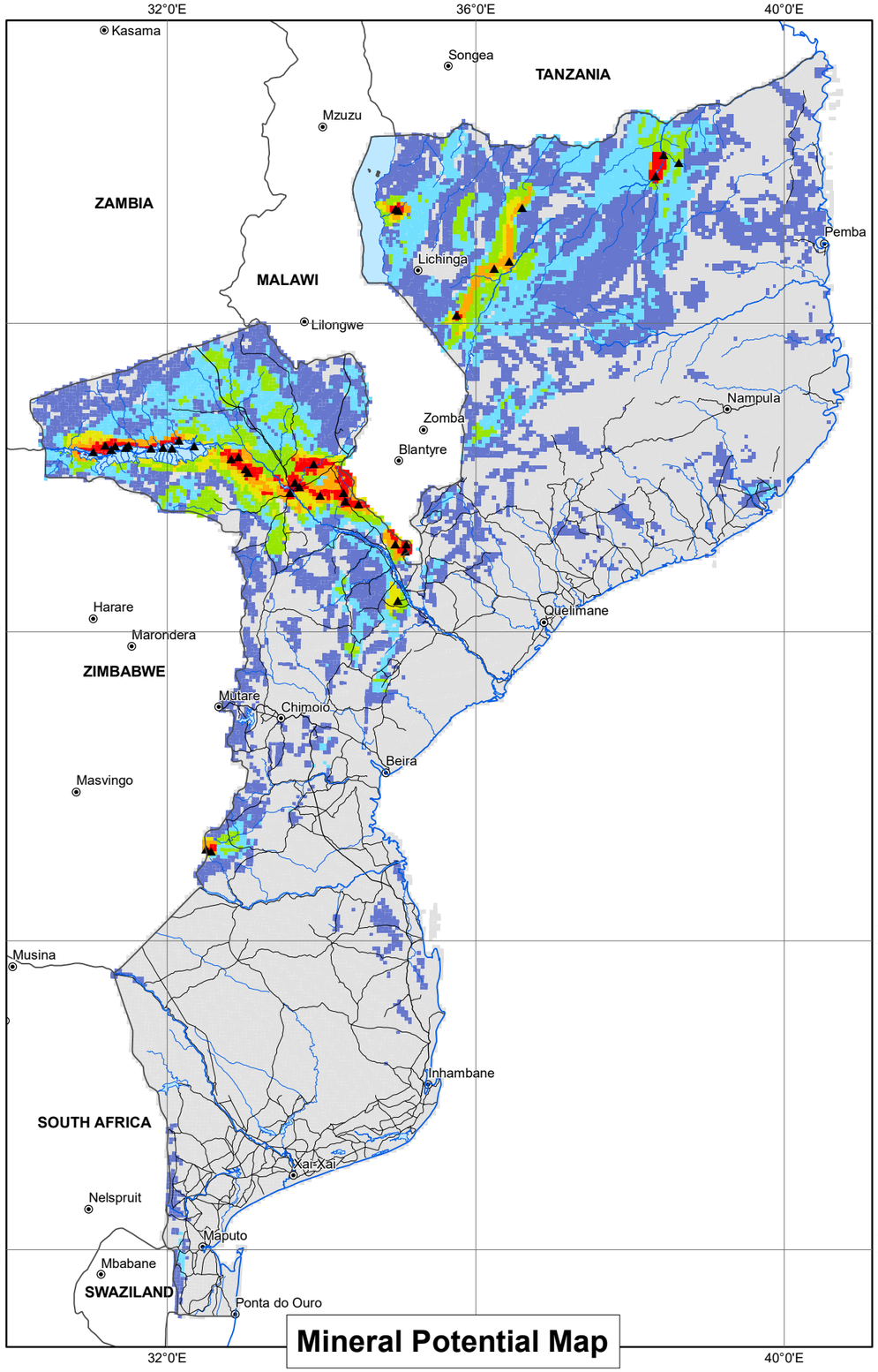
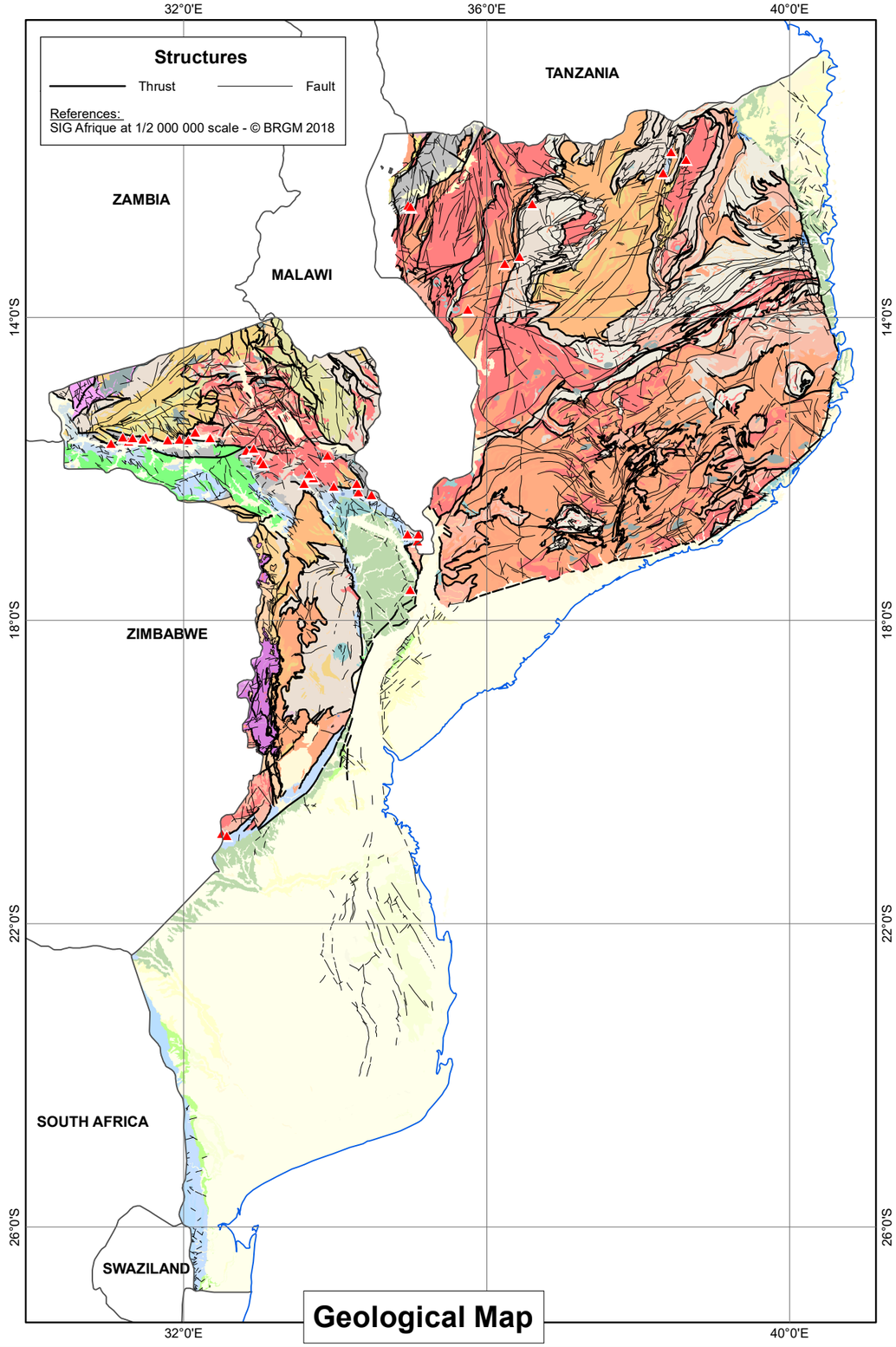
Country: MOZAMBIQUE

MINERAL POTENTIAL MAP - *COKING COAL (Coal)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

Known occurrences

Coking coal (Coal)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 31376 96.24% Non-occurrence in database Non-occurrence predicted	False positive Cells: 1108 3.40% Non-occurrence in database Occurrence predicted
False negative Cells: 1 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 116 0.36% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.40
Cell size: 5000 m

N

0 75 150 300 Km

Datum : WGS84 (World Geodetic System 1984)

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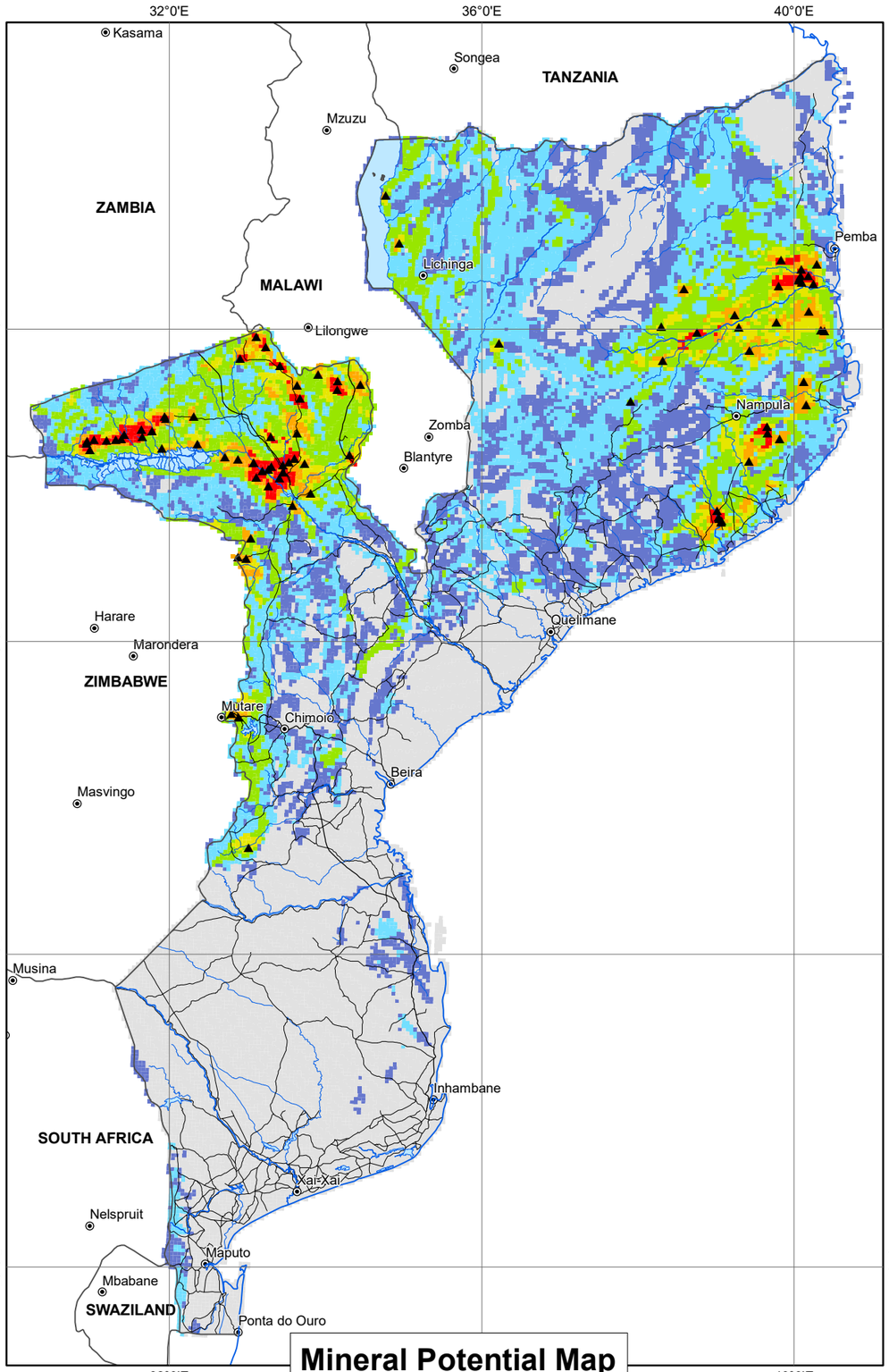
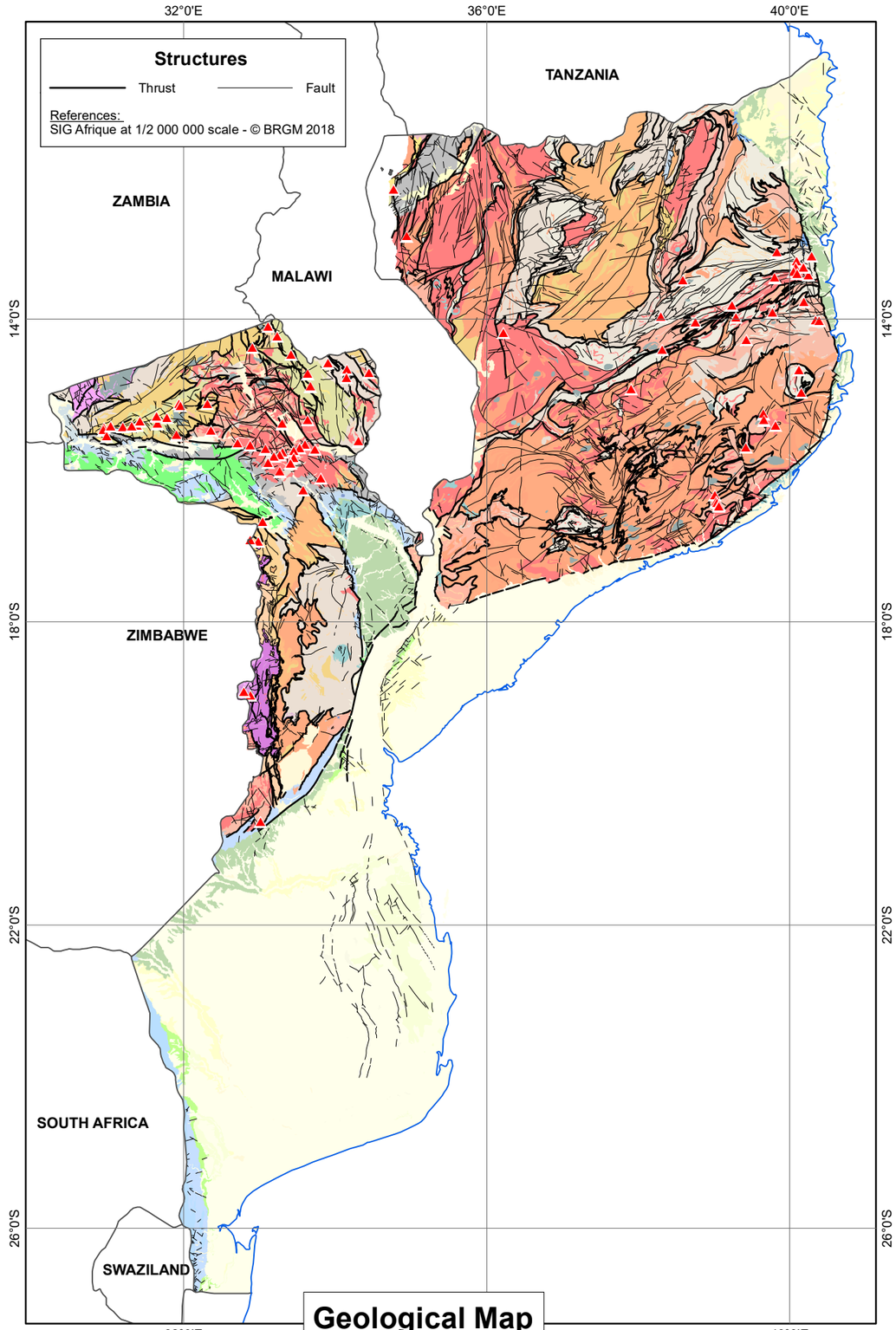
Country: MOZAMBIQUE

MINERAL POTENTIAL MAP - *COPPER (Cu)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

Known occurrences

Copper (Cu)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 30799 94.47% Non-occurrence in database Non-occurrence predicted	False positive Cells: 1545 4.74% Non-occurrence in database Occurrence predicted
False negative Cells: 4 0.01% Occurrence in database Non-occurrence predicted	True positive Cells: 253 0.78% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.48
Cell size: 5000 m

N

0 75 150 300 Km

Datum : WGS84 (World Geodetic System 1984)

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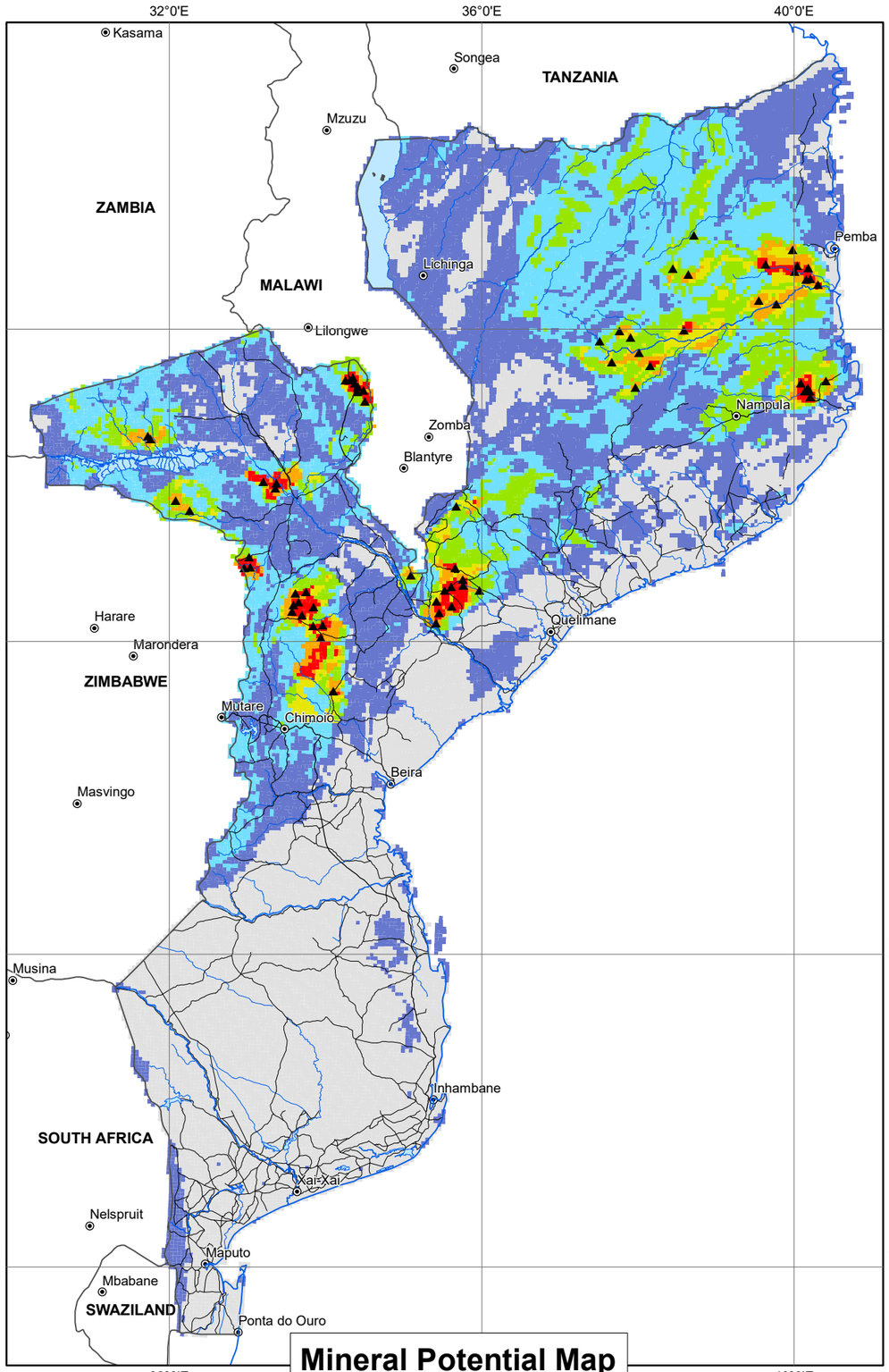
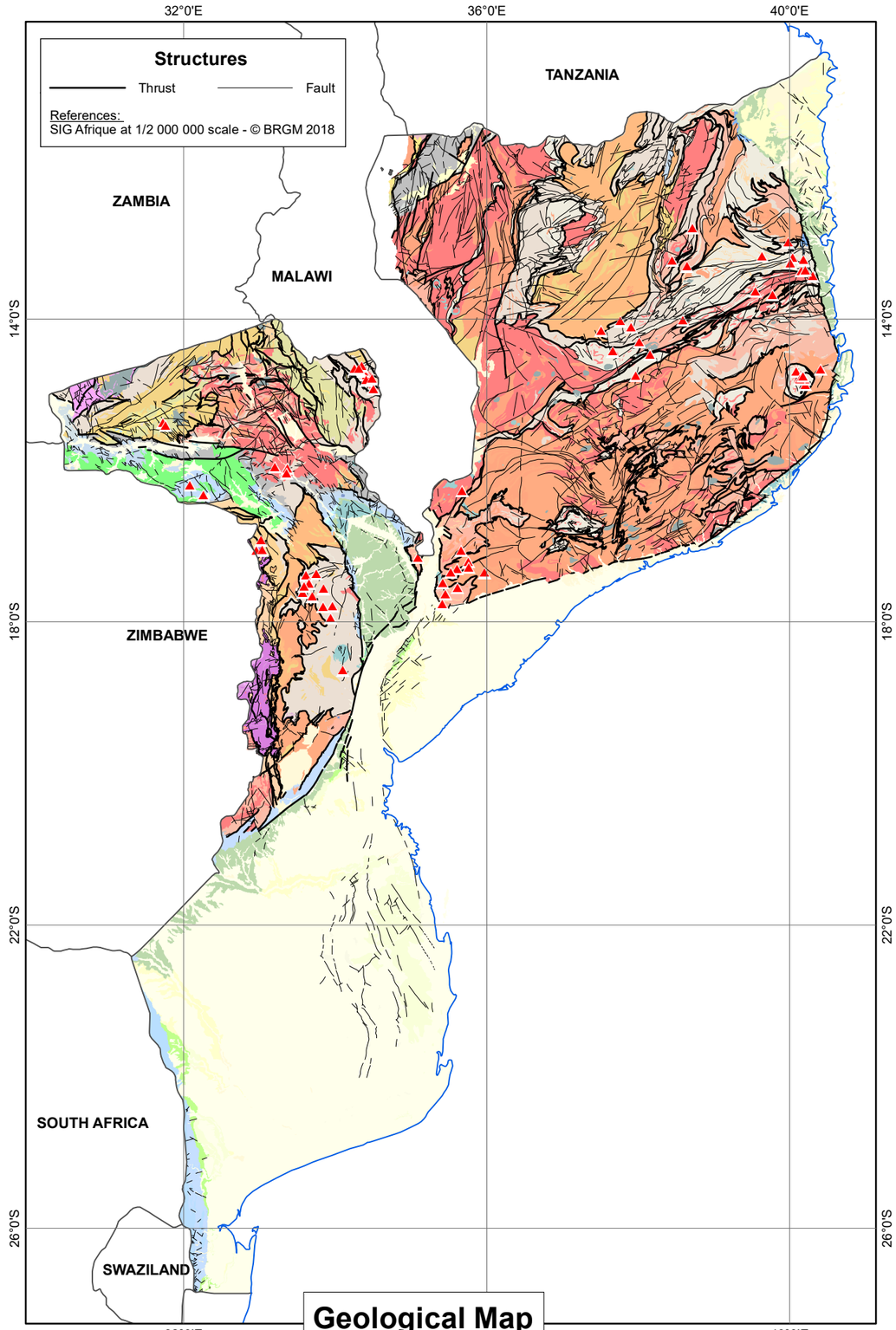
Country: MOZAMBIQUE

MINERAL POTENTIAL MAP - *NATURAL GRAPHITE (Gr)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

Known occurrences

▲ ▲ Natural Graphite (Gr)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 30975 95.02% Non-occurrence in database Non-occurrence predicted	False positive Cells: 1429 4.38% Non-occurrence in database Occurrence predicted
False negative Cells: 7 0.02% Occurrence in database Non-occurrence predicted	True positive Cells: 190 0.58% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.43
Cell size: 5000 m

N

0 75 150 300 Km

Datum : WGS84 (World Geodetic System 1984)

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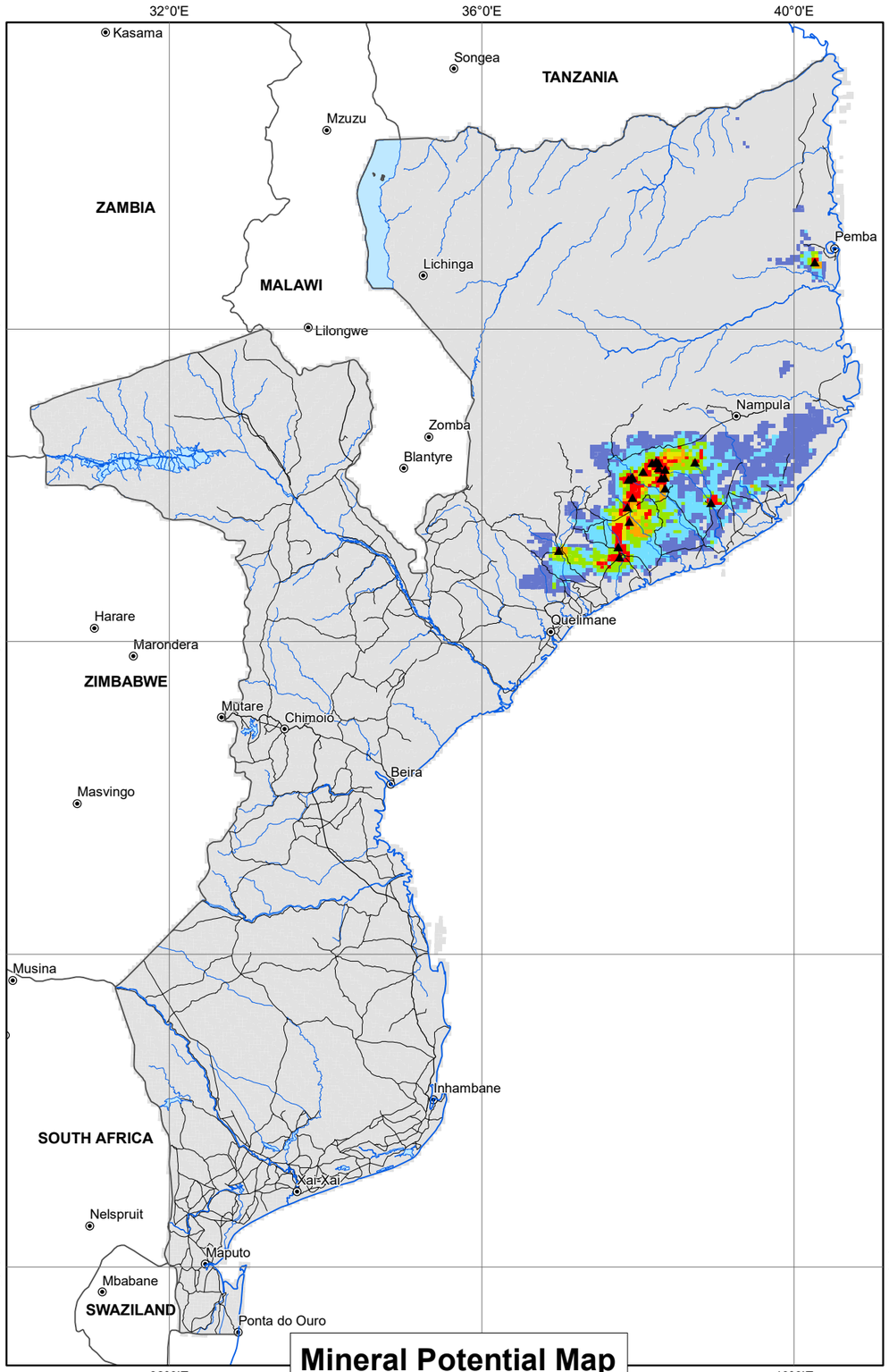
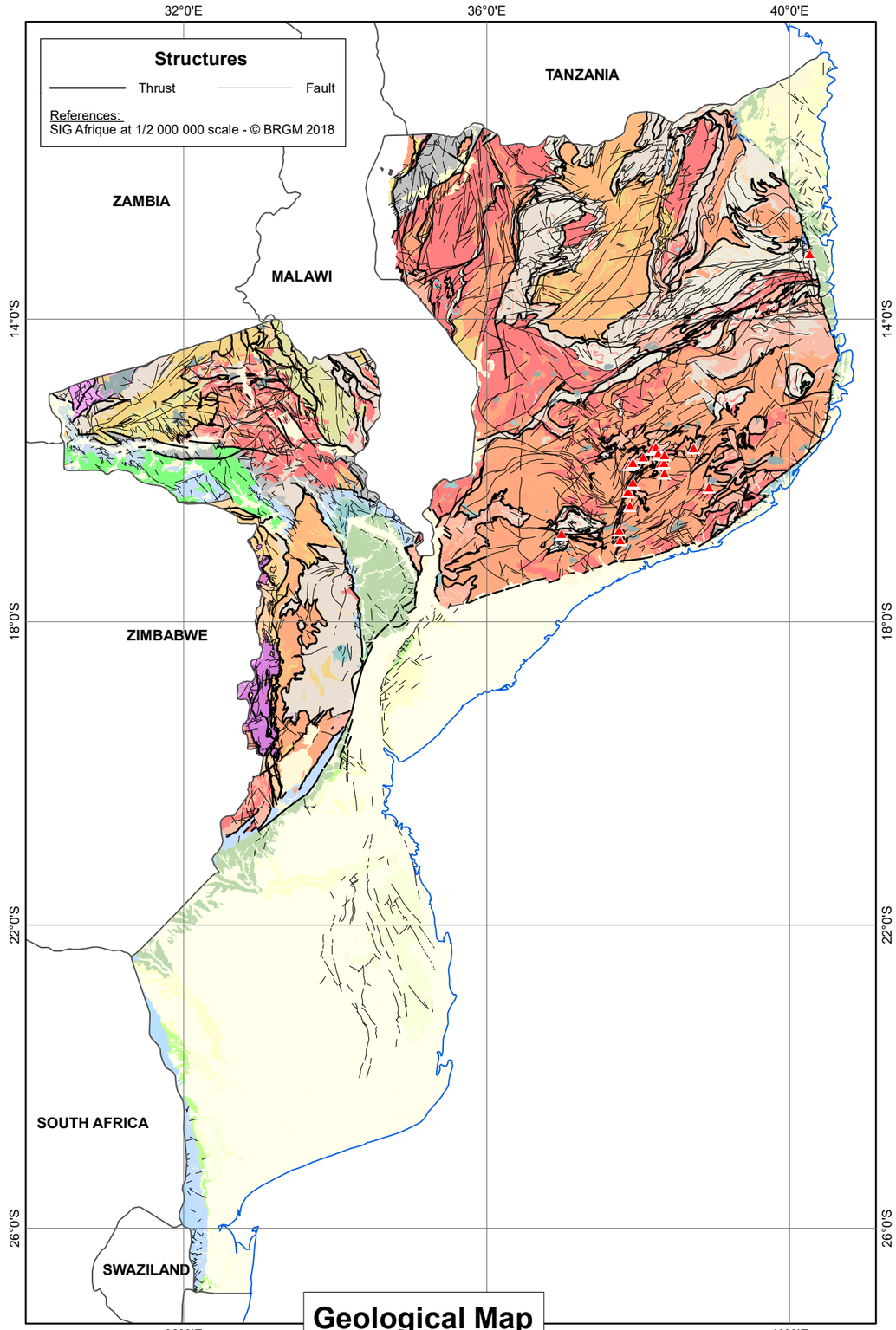
Country: MOZAMBIQUE

MINERAL POTENTIAL MAP - *LITHIUM (Li)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

Known occurrences

Lithium (Li)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 32403 99.39% Non-occurrence in database Non-occurrence predicted	False positive Cells: 140 0.43% Non-occurrence in database Occurrence predicted
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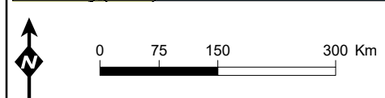
Cell size: 5000 m



Datum : WGS84 (World Geodetic System 1984)

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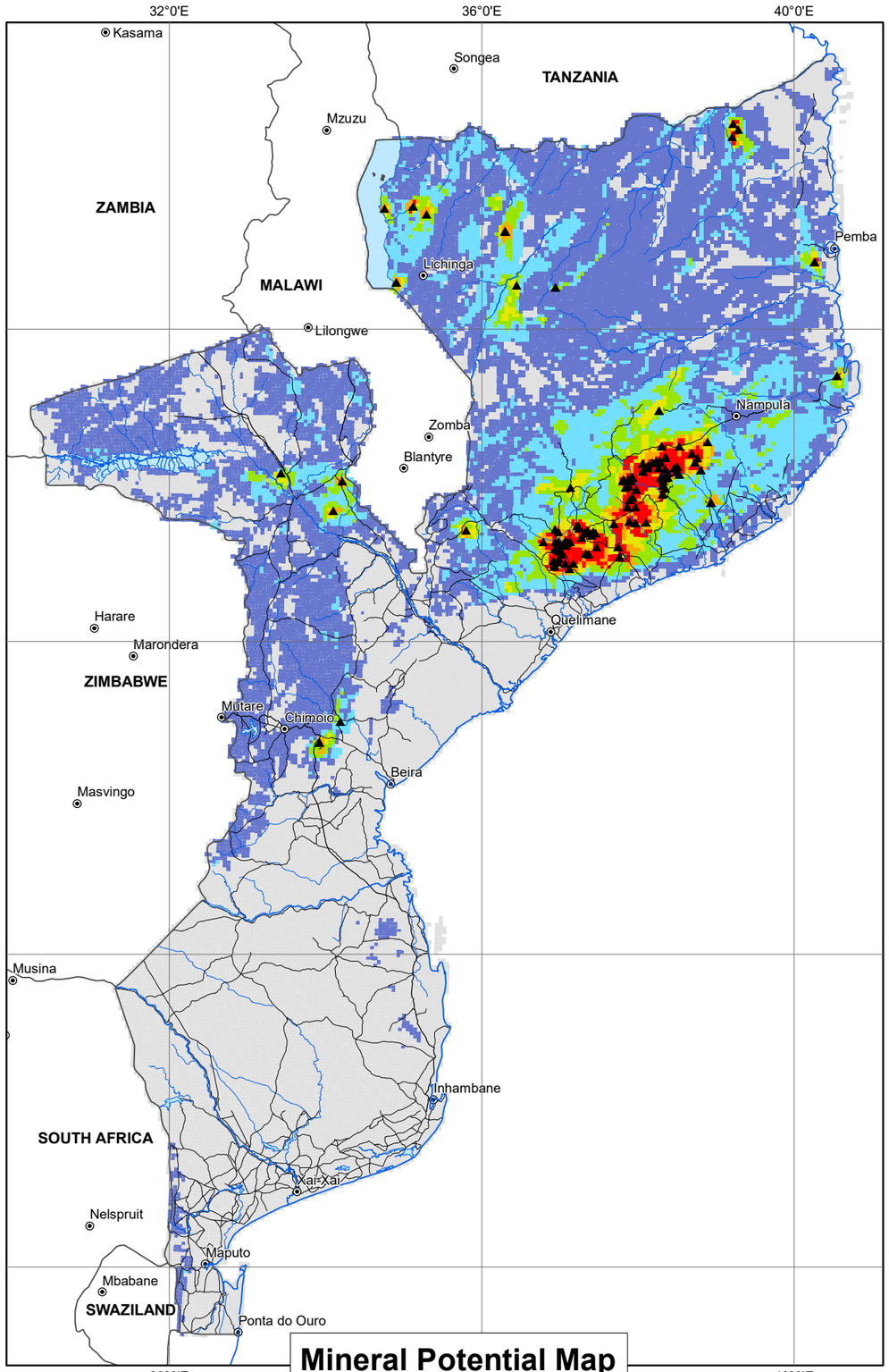
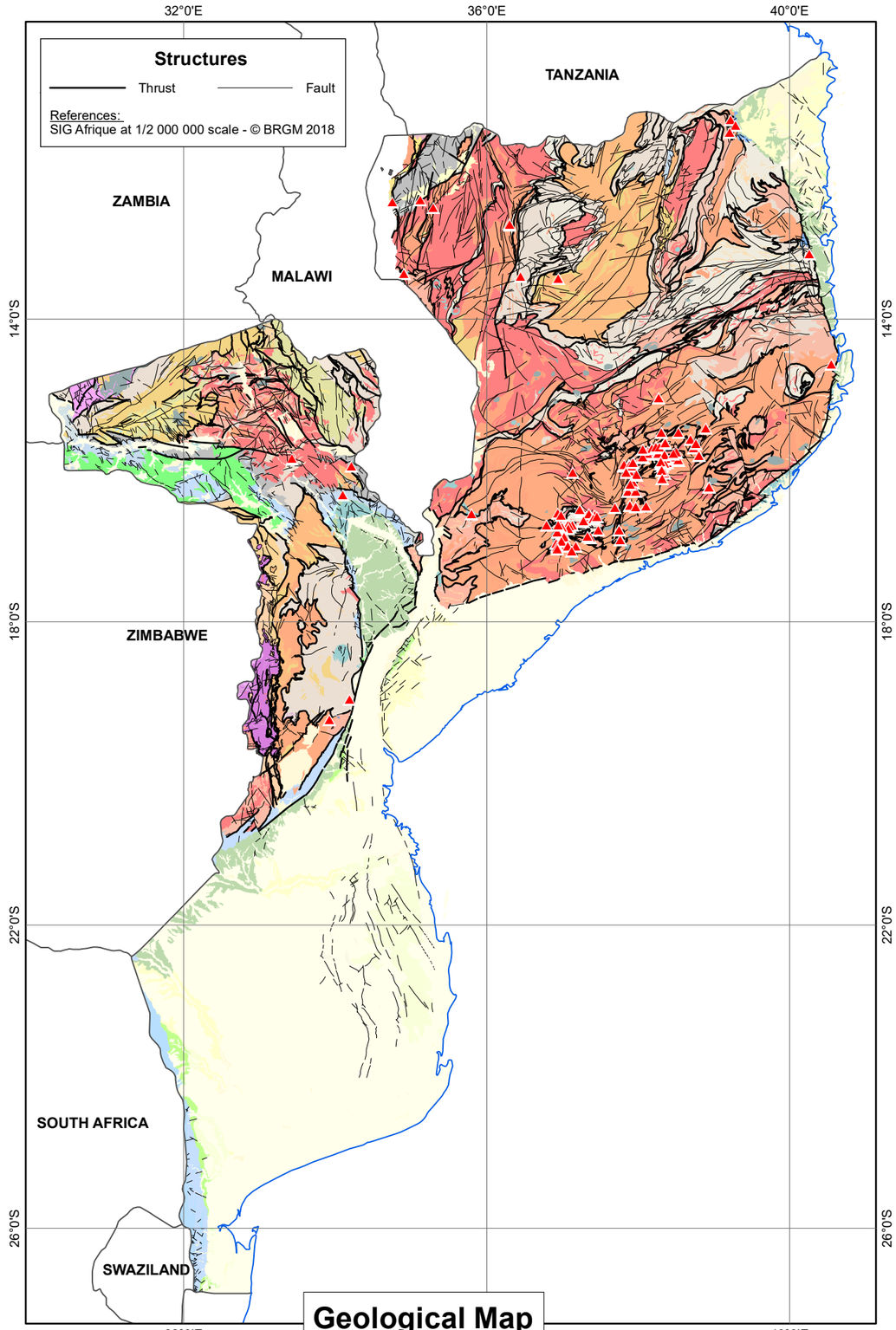
Country: MOZAMBIQUE

MINERAL POTENTIAL MAP - *LITHIUM-NIOBIUM-TANTALUM (Li-Nb-Ta)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

Known occurrences

Lithium-Niobium-Tantalum (Li-Nb-Ta)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 31338 96.12% Non-occurrence in database Non-occurrence predicted	False positive Cells: 1006 3.09% Non-occurrence in database Occurrence predicted
False negative Cells: 2 0.01% Occurrence in database Non-occurrence predicted	True positive Cells: 255 0.78% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.38
Cell size: 5000 m

N

0 75 150 300 Km

Datum : WGS84 (World Geodetic System 1984)

January 2024

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Horizon Europe Framework Programme (HORIZON)

D9.3 – Namibia case study

WP9 - Task 9.4

Date [19/12/2023]

M. Drobe[1]

[1]*BGR*

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Grant Agreement / Proposal ID	101057832
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Project Acronym	AfricaMaVal
Project Coordinator	Guillaneau Jean-Claude (jc.guillaneau@brgm.fr) - BRGM
Project starting date (duration)	1st June 2022 (42 months)
Related Work Package	WP9
Related Task(s)	Task 9.4
Lead Organisation	BRGM
Contributing Partner(s)	BGR
Due Date	January 2024
Submission Date	January 2024
Dissemination level	

History

Date	Version	Submitted by	Reviewed by	Comments
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14/12/2023	V1	BGR – M. Drobe	BRGM – C. Zammit	Main processing units table + content
19/12/2023	V2	BGR – M. Drobe	BRGM – C. Zammit	Final Introduction and Conclusion
08/01/2024	FINAL	BRGM – C. Zammit	BRGM. J. Melleton	

Table of Contents

1. Extended Critical Raw Materials (ECRM) supply potential of Namibia 9
1.1. Inventory of the ECRM 9
1.1.1 Geological setting 9
1.1.2 Known Ore deposits and occurrences 12
1.2. Prospectivity and mineral high potential mapping 14
1.2.1 Selection of the ECRM for mineral prospectivity 14
1.2.2 Mineral potential maps of the ECRM's Cu, Li, F 16
1.2.3 Further mineral high potential areas 19
1.3. Ore processing and refining capacities 21
2. Assessment of the ECRM value chain 24
2.1. Characterization of the value chain for primary and secondary raw materials 24
2.1.1 List of the mining and recycling projects 24
2.1.2 Status of economic links between the formal and informal sectors 25
2.2. Identification of the bottlenecks along the value chain 26
2.2.1 List of the main bottlenecks and the links between them 27
3. Investment/financing prospects for ECRM projects in Namibia 28
3.1. Fiscal, legislative and regulatory context for in-country financings 28
3.2. Macroeconomic context for in-country financings 32
3.3. Political context for in-country financings 40
4. Assessment of social, environmental, and governance challenges 43
4.1. Country-level assessment and context 43
4.1.1 Context 43
4.1.2. Mineral/mining policies, industry policies 44
4.1.3. Mining regulations 44
4.1.4. Taxation and royalties 46
4.1.5. Land-use and mineral rights 47

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4.1.6. Environment 48
4.1.7. Societal and community aspects, cultural heritage 49
4.1.8. Public health and safety 49
4.2. Mining practices *vs.* Environmental, Social and Governance (ESG) goals 50
4.2.1 Environmental challenges 50
4.2.2 Socio-economic issues 51
4.2.3 What would be the best practices for a responsible mining? 52
5. Business network between the European Union and Namibia 54
5.1. Assessment of the upstream and downstream business ecosystem 54
5.1.1 Context, formal and informal players 54
5.1.2 Relationships at local or regional levels 55
5.2. Building new B2B relations 57
5.2.1 Promoting local content and enabling mining cluster actors 57
6. Energy and digital transition: develop a strategy for the EU and Africa Partnership 59
7. Opportunities for responsible investments 63
7.1. Identification of individual exploration, mining and refining projects 63
7.2. ASM sector country profiles 65

List of Figures

Figure 1: Geological map of Namibia (GSN 2002) 11
Figure 2: Regional geology of Namibia and the ECRM occurrences used for this study recorded in the SIG-Afrique of BRGM 13
Figure 3: Mineral Potential Map of Namibia for copper (Cu). The known occurrences (762) are indicated as black stars. 16
Figure 4: Mineral Potential Map of Namibia for fluorine (F). The known occurrences (35) are indicated as black stars. 18
Figure 5: Mineral Potential Map of Namibia for lithium (Li). The known occurrences (17) are indicated as black stars. 19
Figure 6: Location and operational status of processing facilities and refineries in Namibia. 22
Figure 7: Gross Domestic Product Growth Rates, in percentage 33
Figure 8: Gross domestic product by activity 2022 34
Figure 9: Gross Domestic Expenditure as a percentage of GDP 34
Figure 10: Foreign Direct Investment inflows into Namibia 35
Figure 11: Annual Average Inflation Rate 2017-2022 37
Figure 12: Namibian Exports in Percentage Shares by Value - N$ million (2023) 39

List of Tables

Table 1. Overview of known mineral occurrences in Namibia and their geological environment (based on SIG-Afrique of BRGM) 15
Table 2. Duration of licence and Renewal Periods 29
Table 3. Licence Application Fees 29
Table 4. Annual Licence Fees 30
Table 5: The various licence and claims types available for the mining sector of Namibia 45
Table 6: Royalty rates per mineral category 46

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Abbreviations and Acronyms

Acronym	Description
ASM	Artisanal and Small-Scale Mining
BGR	German Federal Institute for Geosciences and Natural Resources
BRGM	Bureau de Recherche Géologique et Minière/ French Geological Survey
CUI	Common User Infrastructure
DBA	Disc-Based Association
DEA	Department of Environmental Affairs
ECC	Environmental Clearance Certificates
ECRM	Extended Critical Raw Materials
EIA	Environmental Impact Assessments
EMA	Environmental Management Act
EPA	Economic Partnership Agreements
ESG	Environmental, social and governance
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GSN	Geological Survey of Namibia
HPP	Harambee Prosperity Plan
LNEG	Laboratório Nacional de Energia e Geologia
MARC	Minerals Ancillary Rights Commission
MET	Ministry of Environment and Tourism

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MME	Ministry of Mines and Energy
MPM	Mineral Potential Mapping
MSFI	Mining Sector Specialized Institutions (
RF	Random Forest
ROE	Return-on-equity
SACU	Southern African Customs Union
SSM	Small-Scale Mining
SEZ	Special Economic Zone
WP	Work package

Wording

Mineral prospectivity: "Mineral potential mapping is concerned with quantifying and mapping the likelihood that mineral deposits are present in a study area. It is synonymous to mineral prospectivity mapping, which is concerned with quantifying and mapping the likelihood that mineral deposits may be found by exploration in a study area."

Keywords

ECRM, Mineral potential, Ore processing, Refining capacities, Recycling units, Value chain, Primary raw material, Secondary raw material, Bottlenecks, Finance, Investment, Sustainability, ESG, Land-use, Taxation, Mining regulation, Mining policies, Child labour, Responsible extraction, Namibia, Pan-African

Executive Summary

This Namibia country case study represents a collaboration by the German Federal Institute for Geosciences and Natural Resources (BGR) and the Namibian consulting office Odikwa Geoservices. The Republic of Namibia is a country with a very long mining tradition. In the past especially Diamonds and Uranium played the major role in the commodities sector. Besides these two raw materials, there is a high number of prospects and mines of so called critical raw materials (CRM) or, as used within AfricaMaVal, extended critical raw materials (ECRM). The most prospective ECRM as main or by-product are tin, lithium, tantalum and rare earth elements, but there are also interesting occurrences and deposits for graphite, copper, cobalt, manganese, nickel as well as gallium, germanium and barite. The majority of deposits is of small to medium size and in the exploration or (pre)feasibility stage.

This report gives an overview of the geological setting and ECRM endowment in Namibia. It shows the value chain and potential investment opportunities in this value chain, as at present the majority of raw materials is only mined, concentrated and exported afterwards. We will also present insights into the regulations for financing, including taxation and royalties and give an overview about the macroeconomic context of Namibia. Besides these financial issues we will also present an assessment of the social, environmental and governance challenges of Namibia, which includes Mining practices vs. Environmental, Social and Governance (ESG) goals. This also relates to the lack of coordination among some oversight institutions and the issue that e.g. there is no provision for land access to environmental assessment studies. On the other hand Namibia does have a robust legal framework that aligns with international laws, agreements, conventions, and standards in several key areas. These include the Environmental Management Act (EMA), the Environmental Policies and Regulations, the Mineral Act (Prospecting and Mining), Mineral Policies and Regulations, the Corporate Governance Act, and the NamCode (2014).

Artisanal and small scale mining also plays an important role, especially for coloured gemstones and semi-precious stones, and informal artisanal production of lithium ore can be observed in 2022. The Namibian law distinguishes between artisanal small-scale mining (rudimentary equipment) and small-scale mining (mining in a small scale). A few industrial mining operators have implemented structured purchasing systems to facilitate the acquisition of ECRM commodities from small-scale miners. These systems ensure that the miners can sell their products and receive regular payments, providing them with a stable income to support their mining activities. The involvement of industrial mining operators in purchasing ore from small-scale miners not only contributes to the local economy but also helps formalize and regulate mining operations in specific areas.

Namibia is a well-known mining jurisdiction with (according to international stakeholders in the mining sector) a good geological database, clear environmental regulations and a high certainty concerning the enforcement of regulations. On the other side labour regulations, the taxation regime, trade barriers and an uncertainty about protected areas are criticized by the same stakeholders.

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1. Extended Critical Raw Materials (ECRM) supply potential of Namibia

1.1. Inventory of the ECRM

Apart from the 74 deposits, occurrences and prospects, delivered by BRGM and LNEG as part of AfricaMaVal work package 1, the national Namibian Consultant (Odikwa Geoservices) subcontracted by the BGR delivered a list of further 625 occurrences, prospects and deposits, of which 588 are holding a valid mining or prospecting license. 39 of these additional 588 areas with a certain geopotential do have defined non-historical resources. Almost 200 deposits/occurrences yield information about historical resources or recent drill core intersections. It is clearly visible that Namibia has numerous prospective areas with known occurrences, but at the moment, only very few deposits, which are mined for ECRM or where ECRM are about to be produced.

1.1.1 Geological setting

Namibia's varied geology encompasses rocks of Archaean to Phanerozoic age, thus covering more than 2600 million years of Earth history. About half of the country's surface area is bedrock exposure, while the remainder is covered by Cenozoic deposits of the Kalahari and Namib Deserts (Figure 1).

Highly deformed gneisses, amphibolites, diverse metasediments and associated intrusive rocks are exposed within several metamorphic inliers in the central and northern parts of the country, and represent the oldest rocks of Archaean to Palaeoproterozoic age (ca. 2600 to 1600 Ma) in Namibia. These include the volcanic Haib Subgroup and Vioolsdrif Granite Suite along the Orange River, the volcano-sedimentary Khoabendus and Rehoboth Groups, as well as the Kunene and Grootfontein Igneous Complexes in the north.

The Mesoproterozioc (1600 to 1000 Ma) is represented by the Namaqua Metamorphic Complex in the south, which comprises granitic gneisses, metasediments and felsic to mafic instrusions, and by the volcano- sedimentary Sinclair Supergroup of central Namibia, with its associated granites (e.g. Gamsberg Suite).

The coastal and intracontinental arms of the late Proterozoic Damara Orogen (ca. 800 to 500 Ma) underlie much of northwestern and central Namibia, with stable platform carbonates in the north, and diverse metasedimentary rocks pointing to more variable depositional conditions further south. The volcano-sedimentary Gariep Belt along the southwestern coast represents the southern extension of the Damara Orogen. Shallow-marine clastic sediments of the Nama Group, which covers parts of southern Namibia, are derived from orogenic uplift of the Damara and Gariep Belts.

Sedimentary and volcanic rocks of the Carboniferous to Jurassic Karoo Supergroup occur in the Aranos, Huab and Waterberg Basins, in the southeastern and northwestern parts of the country. They are extensively intruded by dolerite sills and dykes which, in collusion with predominantly basaltic volcanism (Etendeka Plateau) and a number of subvolcanic complexes (e.g. Spitzkoppe, Erongo), herald the break-up of the Gondwana Supercontinent, and the formation of the South Atlantic during the Cretaceous (ca.

130 Ma). The currently last chapter of Namibia's geological history is told by the widespread Palaeogene to Recent (< 50 Ma) sediments of the Namib and Kalahari Groups.

A great variety of mineral deposits has been identified throughout the stratigraphic column. Metamorphic complexes host several base and precious metal occurrences, such as copper-molybdenum porphyry, volcano-exhalative copper-lead-zinc and gold, volcanogenic copper, sedimentary-exhalative lead-zinc, shear-zone gold and beryllium-niobium-tantalum pegmatites. Meso- to Neoproterozioc rocks locally contain extensive red-bed copper, while calc-alkaline granitoid intrusives of that age have potential for porphyry and hydrothermal copper, as well as for vein-type gold mineralisation.

In the Neoproterozoic Damara Orogen and Gariep Belt, mineralisation is associated with successive phases of intracontinental rifting (copper, graphite), spreading and the formation of passive continental margins (volcano- exhalative base metals, e.g. Rosh Pinah (1), Skorpion (2); sedimentary-exhalative lead-zinc, e.g. Tsongoari (3); glaciomarine iron-mangenese, e.g. Otjosondu (4); sediment-hosted copper, e.g. Klein Aub (5). Besshi-type copper-pyrite (e.g. Otjihase (6)) is related to mid-ocean ridge development, whereas subsequent subduction led to the localised enrichment of carbonate-hosted base metals (e.g. Tsumeb (7)), Kombat (8)), uraniferous granites (Rössing (9)), rare metal and tin pegmatites (Uis (10), Rubicon (11), as well as skarn tungsten and gold (Navachab (12), Otjikoto (13)).

Coal measures are hosted in Palaeozoic rocks of the Karoo Supergroup, while Cretaceous anorogenic complexes, contain a variety of semi-precious stones, fluorite (Okorusu (14)), apatite, rare earth elements, iron and other base metals. Following the discovery of the offshore Kudu gas field of Cretaceous age (15), hydrocarbon exploration also intersected oil-prone source rocks in boreholes. Cenozoic epigenetic uranium mineralisation occurs in calcretes above basement rocks in the Namib Desert (e.g. Langer Heinrich (16)), and salt is produced by solar seawater evaporation (e.g. Walvis Bay and Swakopmund Salt Works (17)).

The most important mineral resources of the country, however, are the Cenozoic diamondiferous beach and river gravels, which are exploited along the Orange River (e.g. Daberas (18)) as well as the southwestern coast, both offshore and onshore (19). With mining techniques being developed to suit the unique conditions of these deposits, Namibia has become one of the world's top five producers of diamonds.

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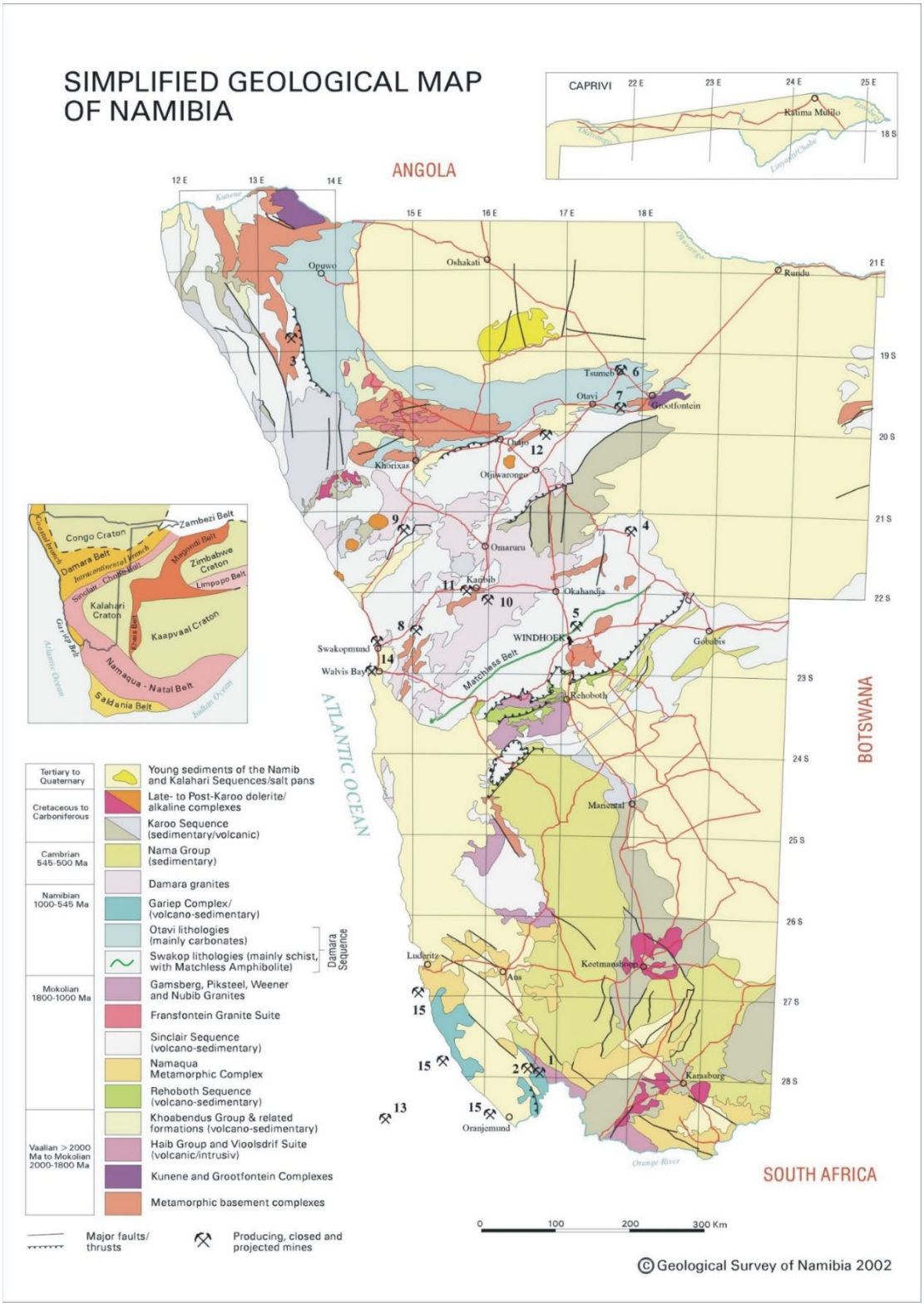

Figure 1: Geological map of Namibia (GSN 2002)

1.1.2 Known Ore deposits and occurrences

For the estimation of mineral potential zones in this chapter, a total number of 1649 ECRM occurrences (Figure 2, Table 1) was used, which is quite high within the African context but relatively low in comparison to countries with a mature exploration history such as South Africa where about 12,000 occurrences are referenced by the Council of Geoscience (CGS).

Namibia remains to date underexplored despite the geology being favourable for a number of deposit styles (sediment-hosted, igneous, and structurally controlled), easy access to a wealth of high quality geoscientific data at the Geological Survey, as well as modern infrastructure, mining laws and active mining community. Namibia's ECRM commodities include a large range of elements (34) of widely varying age and origin. The most abundant commodity by far is copper (762 occurrences), followed by tin (153), beryllium (107), zinc (103), tungsten (100), lithium (64), and tantalum (58; Figure 2: Regional geology of Namibia and the ECRM occurrences used for this study recorded in the SIG-Afrique of BRGM). The most favourable environments in terms of ECRM abundance are to date the Central Zone of the Damara Belt (score = 16), followed by the Namaqua Belt (11.5), the Northern Zone of the DO (9), the Richtersveld Province (7) and the Rehoboth Group (4).

From the national consultant Odikwa Geoservices we received information about 679 deposits and occurrences. There is a huge difference in information that is available for these areas. Sometimes there is only a short description of geological features and observations, sometimes first drill results are published and for the deposits, there usually is a certain resource defined. Of these areas, 362 are categorized as occurrences, 122 are greenfield exploration projects, 93 are brownfield exploration projects, 3 have started a feasibility study, 13 are dormant mines, and 53 are abandoned mines and 22 are mines. For the missing occurrences, there is no such information available. The majority of these occurrences has copper as the primary commodity (379), followed by tin (49) and lithium (38), although the pure number is not of value, as there might be listed only 2 occurrences of one raw material, which are big mines and thus have a far bigger importance, compared to 50 very small occurrences, which will most probably never be mined.

The prospectivity of some areas of Namibia will be discussed in more detail in chapter 1.2.

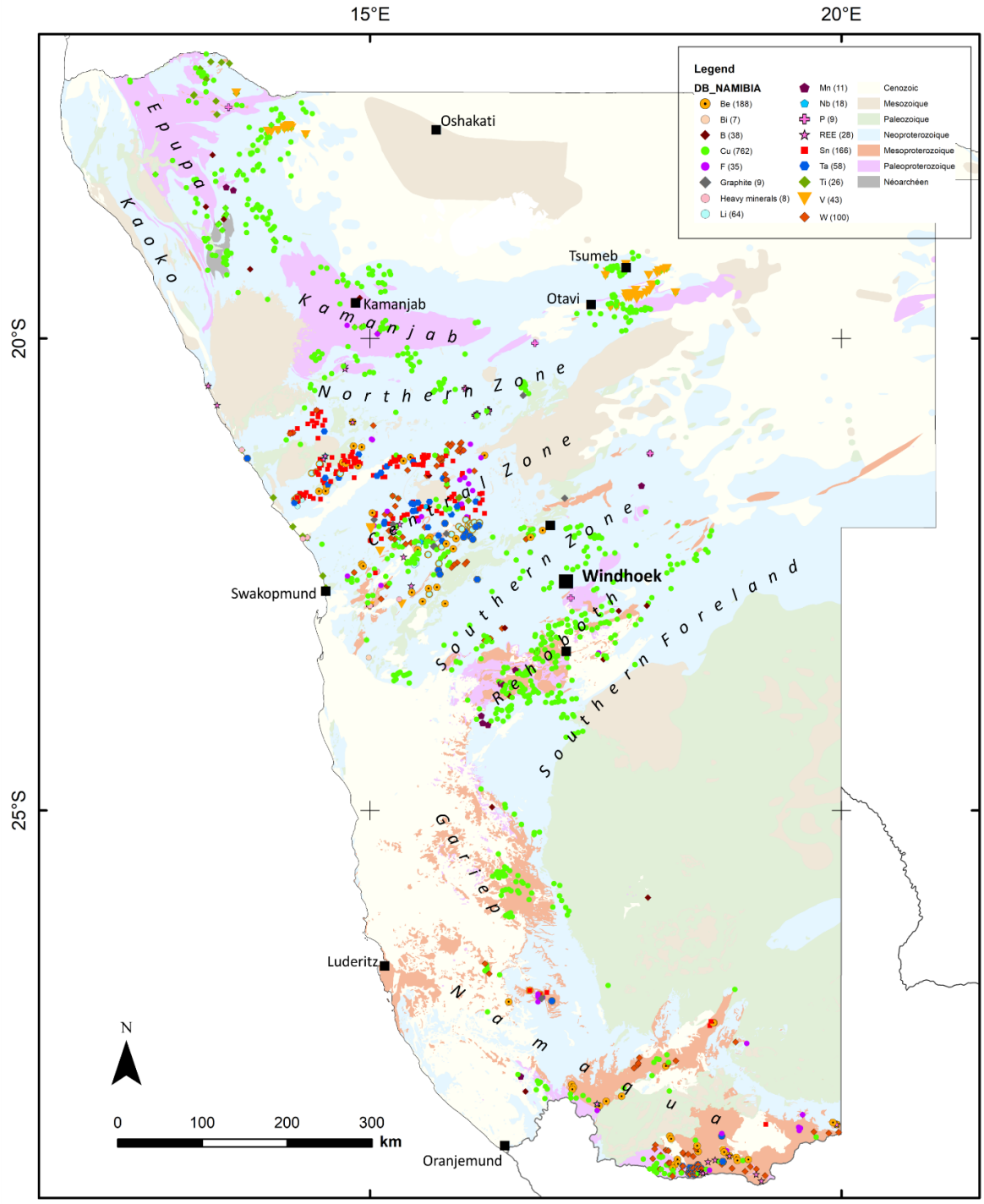

Figure 2: Regional geology of Namibia and the ECRM occurrences used for this study recorded in the SIG-Afrique of BRGM

1.2. Prospectivity and mineral high potential mapping

1.2.1 Selection of the ECRM for mineral prospectivity

Among the 34 ECRMs present in Namibia, only **three** were selected for mineral potential mapping (MPM) in order to demonstrate the principle of the method (**Cu, F** and **Li**).

The lack of geoscientific data (e.g. aerial and ground geophysics, satellite data, soil and stream geochemistry) and the low resolution of the geological maps used for this study (1:2 Million scale) imply only limited information value of the weakly constrained mineral potential maps for exploration. Therefore, it seems not of great interest to illustrate this for the whole range of Critical Raw Materials (CRM's).

The MPM was performed using the disc-based association (DBA) grid method coupled with Random Forest (RF) method (*Vella, 2022*). The software analyses the local spatial associations of geological variables and features of various natures to describe the relationships between the predictors and the mineralization. This allows the identification of geological environments in the study area around each node of the DBA grid, and the integration of both quantitative and non-quantitative spatial data, such as geophysical anomaly maps and location of geological map units, respectively. In a second step, RF classification is used to perform a generalization of complex geological environments and features and evaluate their likelihood to host potential mineralization occurrences by giving a score between 0 (low potential) and 1 (high potential).

The data base for the MPM of Namibia comprised the following:

- SIG-Afrique mineral resources database - BRGM
- SIG-Afrique 1:2,000,000 geological map - BRGM
- SIG-Afrique 1:2000,000 structural data (faults, thrusts) - BRGM
- SRTM (Shuttle Radar Topography Mission)
- Slope

The DBA grid for predictive modelling is mainly defined by five parameters:

- Size of cell – d;
- Search radius for lithologies – R;
- R/d ratio,
- Search radius for mineral occurrences – R1. It can be null, in this case the search radius will be restricted to the cell size (d)
- Search radius for faults – R2. It can be null, in this case the search radius will be restricted to the cell size or it can take into account the distance of the cell to the neighboring faults

In order to maximize the grid resolution while minimizing overlaps and cells with only one lithology, the parameters of DBA grid for Cu, F, and Li commodities used in this study are as follows: d = 2500 m, R = 10,000 m, R/d = 4, R1 = 2500 m, R2 = distance.

Namibia (1649 occurrences)			Archean	Paleoproterozoic				Mesoproterozoic			Neoproterozoic						Paleo-Mesozoic	Meso-Cenozoic	
Substance AfricaMaVal	**Element (oxide)**	**No occ.**	NN	Epupa Complex	Kamanjab Inlier	Rehoboth Group	Richtersveld Province	Kunene Complex	Sinclair SG	Namaqua Belt	Kaoko Belt	Northern Zone	Central Zone	Southern Zone	Southern Foreland	Gariep	Karoo	Cretaceous - Tertiary Rift	**Score element**
Bauxite	Al	1																	0
Beryllium	Be	107					1			2			2						5
Bismuth	Bi	7					*						0.5						0.5
Borate	B	38																	0
Baryte	Ba	32			0.5				*	*		0.5							1
Cobalt	Co	2																	0
Coking coal	C	4																	0
Copper	Cu	762	1	1	1	2	2		2	1		2	1	1	2				16
Fluorspar	F	35			0.5					1			2						3.5
Gallium	Ga (Al, Zn)	2																	0
Germanium	Ge (Zn)																		0
Natural graphite	C	9								*			1						1
Hafnium	Hf (Zr, HM)																		0
Heavy Minerals	HM	3																*	
Indium	In (Zn)											*							0
Lithium	Li	64					1			1			1					*	3
Magnesium	Mg	1													*				0
Manganese	Mn	11				0.5						*							0.5
Niobium	Nb	15								0.5			1						1.5
Nickel	Ni	22				1	*												1
Phosphate	P	9																	0
Platinum Group Metals	Pt, Pd, Rd							*											0
REE non-diff	REE	28						*		1			1					1	3
HREE	HREE	1										2							2
Antinomy	Sb	2																	0
Scandium	Sc																		0
Silicon metal	SiO2	9																	0
Tin	Sn	153								2			2						4
Strontium	Sr	2																	0
Tantalum	Ta	58					1			1			2						4
Titanium	Ti	26		1				0.5				0.5	1						3
Vanadium	V	43						0.5				2	*						2.5
Tungsten	W	100					2		*	1			1						4
Etain	Zn	103			0.5	0.5	*		*	1		2	0.5	0.5		2			7
score domain			1	2	2.5	4	7	1	2	11.5	0	9	16	1.5	2	2	0	1	

0.5	Minor presence
1	Presence
2	Major presence
*	Potential

Table 1. Overview of known mineral occurrences in Namibia and their geological environment (based on SIG-Afrique of BRGM)

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1.2.2 Mineral potential maps of the ECRM's Cu, Li, F[1]

Copper:

With 762 entries in the SIG Afrique of BRGM, copper is by far the most abundant mineral commodity in Namibia. The mineralisations occur all over the country and are hosted mainly by lithologies of Palaeoproterozoic to Neoproterozoic age. The Handbook of Mineral Resources of Namibia (1992) illustrates the large variation in mineralization style with a predominance of structural-controlled deposits (Rehoboth area (Klein Aub), Otavi Bergland (Tsumeb)), and minor magmatic massive sulfide (Matchless belt,) porphyry (Haib), and metamorphic (Abenab) deposits amongst others. Sediment-hosted, copper belt style deposits are assumed below the sediments of the eastern Kalahari but only few occurrences have been identified so far in the Nauchas-Klein Aub area where the Neoproterozoic rocks outcrop.

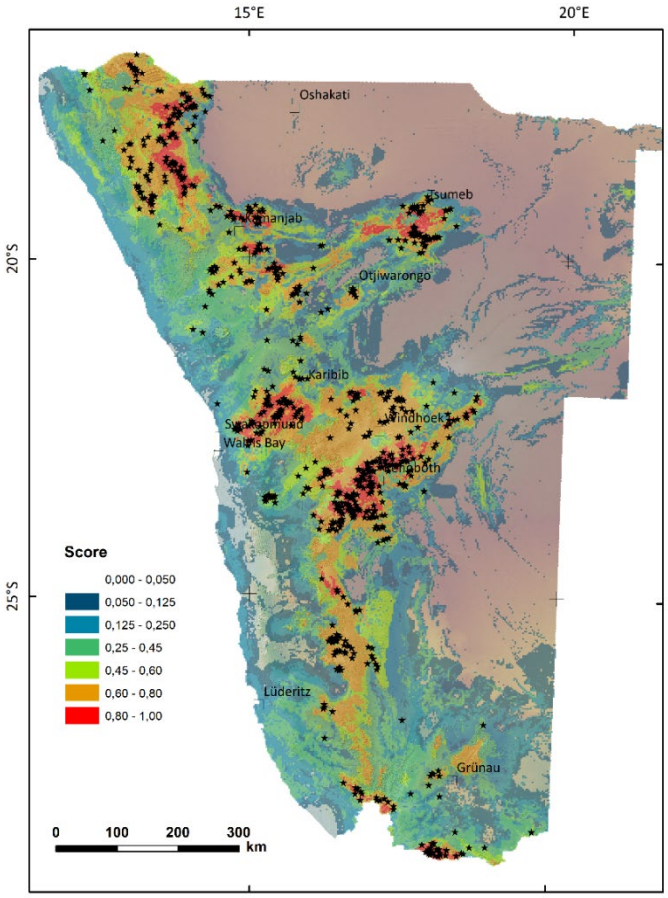

Figure 3: Mineral Potential Map of Namibia for copper (Cu). The known occurrences (762) are indicated as black stars.

The mineral potential map (Figure 3) shows accordingly increased potential for copper in most of the areas where bedrocks are cropping out. Areas with high potential have been identified, from north to south, (1) in the Epupa Complex, (2) the Otavi Mountainland of the northern Damara platform, (3) in the Central

[1] See appendix APPENDIX_1.2_MPM_NAMIBIA.pdf for further details

Zone of the Damara orogeny, (4) in the Rehoboth Inlier and overlying late Meso- to early Neoproterozoic sediments, (5) the Mesoproterozoic Sinclair area, and (6) the Mesoproterozoic Namaqua Belt with Palaeoproterozoic Inliers (Richtersveld). The DBA-RF model has an accuracy of ~87 % and indicates that about 14 % of Namibia are prospective for discovering new Cu deposits. This percentage represents a minimum value since areas in eastern Namibia, which are covered by sediments of the Kalahari Desert, were given low scores.

The statistically most favourable factors are, in decreasing order, **slope**, **fault**, **srtm**, and lithologies **73** (Neoproterozoic (820-650 Ma) sedimentary rocks (Damara SG; Auas, Khomas, Nosib Fms.), **79**, Neoproterozoic (730-600 Ma) sedimentary rocks (Damara SG; Abenab, Otavi Fms), **60** (Neoproterozoic (700-650 Ma) sedimentary and volcanic rocks (Damara SG; Karibib, Khomas, Swakop Fms.), **82** (Neoproterozoic (730-600 Ma) sedimentary rocks (Damara SG; Huab, Tsumeb, Otavi Fms), **1** (Quaternary sand sea, Namib Desert). It is interesting that Palaeoproterozoic and Mesoproterozoic rocks are not considered as favourable factors from a statistical point of view, even though they are prospective in the reality. This is probably due to a bias in the occurrences, most of which are situated in Neoproterozoic rocks.

Fluorite:

Although fluorite is widely distributed in various types of deposits throughout Namibia, only a few have so far been exploited. These include replacement ore bodies in carbonate rock associated with the Okorusu Alkaline Complex, veins hosted deposits by igneous, metamorphic and sedimentary rocks and the in-filling deposits of a volcanic breccia pipe. 16 occurrences are indicated in the Central Zone of the Damara orogeny within the triangle Swakopmund-Omaruru-Karibib, 13 in the Namaqua Belt of southern Namibia and the remaining 6 in different areas.

The mineral potential map (Figure 4) shows high potential for Fluorite in central Namibia, not only restricted to the known occurrences but also in larger distances, in strike with the regional Damara trend. No relationship is indicated in this area between the recorded tectonic structures and areas of increased mineral potential nor is there any clear association with specific geological units. In the Namaqua Belt, areas with increased mineral potential are influenced by the presence/absence of tectonic structures and partly by different rock types. The same holds true for the areas around mineral occurrences in northern and central Namibia.

The DBA-RF model has an accuracy of ~97 % and indicates that about 3.5 % of Namibia is prospective for fluorite deposits. The statistically most favourable factors are, in decreasing order, **89** (Neoproterozoic to Cambrian syn- to post-tectonic plutonic suites (Naauwpoort, Salem suites), **83** (Neoproterozoic (730-650 Ma) sedimentary rocks (Damara SG; Kuiseb, Khomas, Swakop Fms.), **slope**, **fault**, **srtm**, **154** (Mesoproterozoic pre- to syntectonic biotite-rich augen gneiss of the Namaqua Belt, **158** (Mesoproterozoic gneiss, amphibolite and metasediments of the Namaqua Belt), and **4** (Cenozoic sand, calcrete, and gravel; Kalahari Formation),

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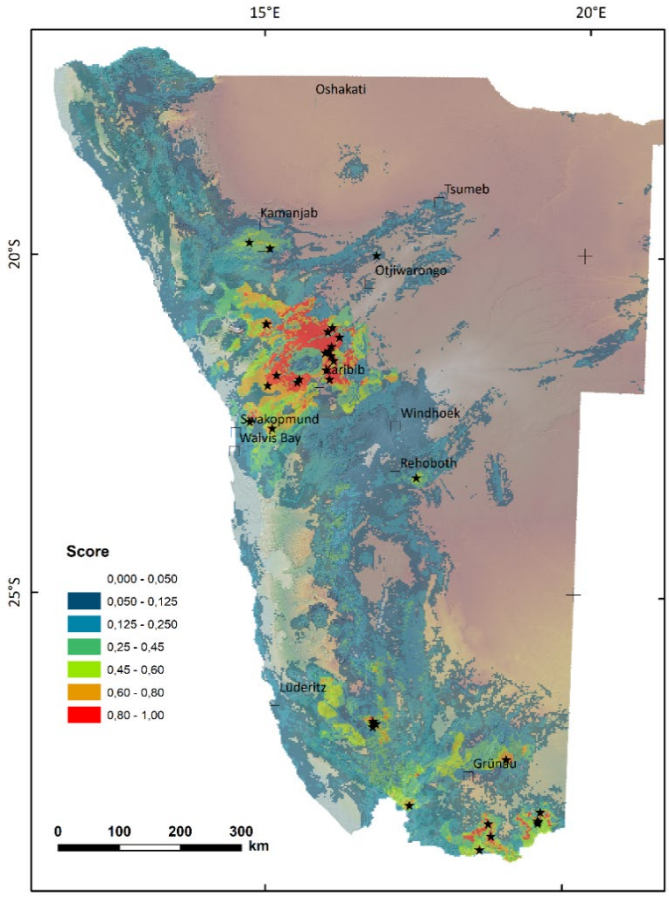

Figure 4: Mineral Potential Map of Namibia for fluorine (F). The known occurrences (35) are indicated as black stars.

Lithium:

Lithium occurrences associated with pegmatites are mainly recognised in the Karibib-Usakos district in central Namibia. A total of 35 occurrences are variously associated with beryl, tantalum, niobium and tungsten. Two other pegmatite groups are located in the extreme south of the country in the Namaqua metamorphic complex (17 occurrences) and in the area SW of Uis (i.e. the so-called Uis pegmatite swarm, 12 occurrences).

The mineral potential map (Figure 5) displays high potential for lithium around the known occurrences in these areas. In the Namaqua belt the linear arrangement of the zones with increased lithium potential suggests the influence of the tectonic structures on the mineral potential extending the prone zones into a NW direction beyond the known occurrences of the Warmbad area to the Aus-and Lüderitz areas. In the central Damara area are additional zones, which suggest Li potential: (1) between the known Usakos and Uis pegmatite fields, (2) SE of Karibib, (3) NW of the Uis pegmatite field, and (4) of low Li potential in a NW-SE strip west of Sesrien in the Kaoko Belt.

The DBA-RF model has an accuracy of ~99.5% and indicates that about 0.7% of Namibia is prospective for lithium. The statistically most favourable factors are, in decreasing order, **Be** and **Ta** occurrences, **89**

(Cambrian syn- to post-tectonic plutonic; Naauwpoort, Salem suites), **slope**, **srtm**, **83** (Neoproterozoic (730-650 Ma) sedimentary rocks (Damara SG; Kuiseb, Khomas, Swakop Fms),), **170** (Richtersveld Provonce; Palaeoproterozoic Vioolsdrif Suite), **73** (Neoproterozoic (<820-650 Ma) sedimentary rocks (Damara SG; Auas, Khomas, Nosib Fms).

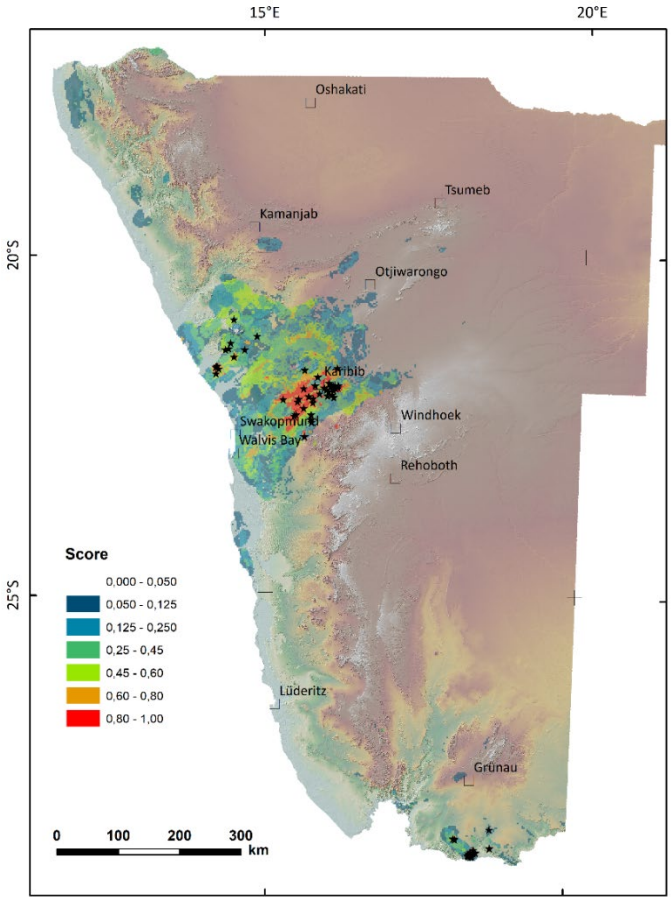

Figure 5: Mineral Potential Map of Namibia for lithium (Li). The known occurrences (17) are indicated as black stars.

1.2.3 Further mineral high potential areas

Mineral high potential areas can be anticipated by the geographical location of known deposits and occurrences. We additionally provide an overview of national priority areas compiled by Odikwa Geoservices CC (national consultant):

Kunene Region: A Mining Hotspot

Namibia's Kunene Region has emerged as a significant mining hub with promising ventures. Gecko Cobalt Mining is planning to extract copper and cobalt, with estimated resources to sustain operations for two decades. The Lofdal Project, a joint venture between Namibia Critical Metals and JOGMEC, focuses on rare earth metals, with production expected to commence in 2026. Namibia East China Non-Ferrous Investment's discovery of 2.37 billion tons of iron ore promises a century-long lifespan for their mining operations in the same region, if it should be brought to production.

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Collaborative efforts between Southern African Universities, Anglo-American, the NRF, and RISA have yielded research on the Kunene Complex. This research helps identify areas with prospective Ni-Cu-(Co-PGE) mineralization, while simultaneously training Southern African geoscientists and fostering valuable research and expertise. African Nickel's exploration on the Kunene Complex has shown promising intersections, hinting at substantial discoveries. The region's potential extends beyond nickel, encompassing Cu, Co, Pt, Pd, and Au.

The GSN launched the Kunene Mineral Prospectivity project with the aim of enhancing the utility of geophysical data and encouraging mineral investments within the region. This initiative has yielded five maps, now accessible for geophysical analysis, for Swaartbooisdrift, Opuwo, Kamanjab, Fransfontein, and Sesfontein areas. The GSN has also provided "The Geophysics Pilot Project,'' an online platform designed to provide prospective mining investors with complimentary access to airborne magnetic and radiometric data, with the objective of encouraging mineral exploration in an underexplored region characterized by a substantial Kalahari cover.

A new substation called the "Kunene" substation is planned, along with a 400kV transmission line, to significantly boost power supply capacity and resolve energy constraints. Road network upgrades, including the B1 national highway and coastal MR44 and MR76 highways, are underway to enhance accessibility to new developments. In Addition, national plans exist to construct a deepwater seaport at Cape Fria.

Lithium in central Namibia

Namibia's lithium industry holds immense promise, potentially contributing up to N$13.9 billion or 6.7% of the country's GDP annually. It could inject N$4.6 billion into government coffers through taxes and royalties (Simonis Storm, 2023). The Erongo region is witnessing a surge in government and private sector projects and exploration activities for Rare-Earth-Elements. Projects like Soris and the Karibib Lepidolite Project in the Erongo region show substantial lithium extraction potential. Andrada Mining, a tech metals producer, specializes in lithium, tin, and tantalum in the Brandberg West mining asset, offering untapped potential with a history of two decades of concentrate production and valuable mineralization.

To support the water needs of the mining industry in the Erongo region, the Namibian government is collaborating with NamWater to build a scalable, modular desalination plant. This plant will provide desalinated water to central regions, addressing water supply needs for Botswana in the future.

Southern Namibia Mapping Program

The Southern Namibia Mapping Program (SNMP) represents a collaborative effort between the Council for Geoscience (CGS) in South Africa and the Geological Survey of Namibia (GSN) since March 2013. This initiative focuses on regional-scale geological mapping and capacity building. Its primary objective is to establish a comprehensive lithostratigraphy and tectonostratigraphy spanning the South Africa-Namibia border. The program also seeks to provide deeper insights into the geological formations and structural features that influence mineral deposits within the region, specifically targeting resources such as copper (Cu), lead (Pb), zinc (Zn), uranium (U), tantalum (Ta), niobium (Nb), rare-earth elements (REE), lithium (Li), and tungsten (W).

To date, the SNMP has successfully generated 59 new geological maps at a scale of 1:50,000, covering approximately 28,000 square kilometers. The geological mapping efforts are complemented by a range of scientific techniques, including U-Pb geochronology, Sm-Nd and Rb-Sr isotope geochemistry, comprehensive analysis of major, trace, and rare-earth elements in whole-rock samples, as well as investigations into structural geology.

The overarching goal of the SNMP aligns with the broader vision of achieving comprehensive geological map coverage at a 1:50,000 scale for the entire country by the year 2030. This objective is in accordance with the strategic goals outlined in Vision 2030, the Millennium Development Goals, the National Development Plan (NDP4-5), and the Harambe Prosperity Plan (HPP), all of which are vital components of the Namibian government's agenda. Additionally, the SNMP places significant emphasis on elevating research capabilities and enhancing expertise in geological mapping within the Geological Survey of Namibia.

1.3. Ore processing and refining capacities

Processing/Comminution

Over 90% of the operational or previously active large-scale mining sites in Namibia, as well as those currently under care and maintenance, have their own on-site facilities for early-stage processing or comminution (Figure 6: Location and operational status of processing facilities and refineries in Namibia.). These facilities are responsible for several essential processing activities, including ore crushing, screening, grinding, size classification, and concentration.

Centralized processing facilities are also widespread in Namibia's small-scale mining sector, particularly for copper, where they serve as key hubs for receiving bulk ore from multiple small-scale mining sites. Centralized processing facilities in the small-scale mining sector play a crucial role in enabling small-scale miners to access processing capabilities that would otherwise be economically unfeasible for individual operations. By consolidating ore from multiple mining sites, these facilities increase efficiency and reduce costs for small-scale miners. Figure 6 shows the location and operational status of processing facilities and refineries in Namibia. In certain instances, large-scale mining operators have established purchasing systems to facilitate the acquisition of ECRM commodities from small-scale miners. These systems are designed to procure the necessary raw materials from small-scale miners to supply their own processing plants.

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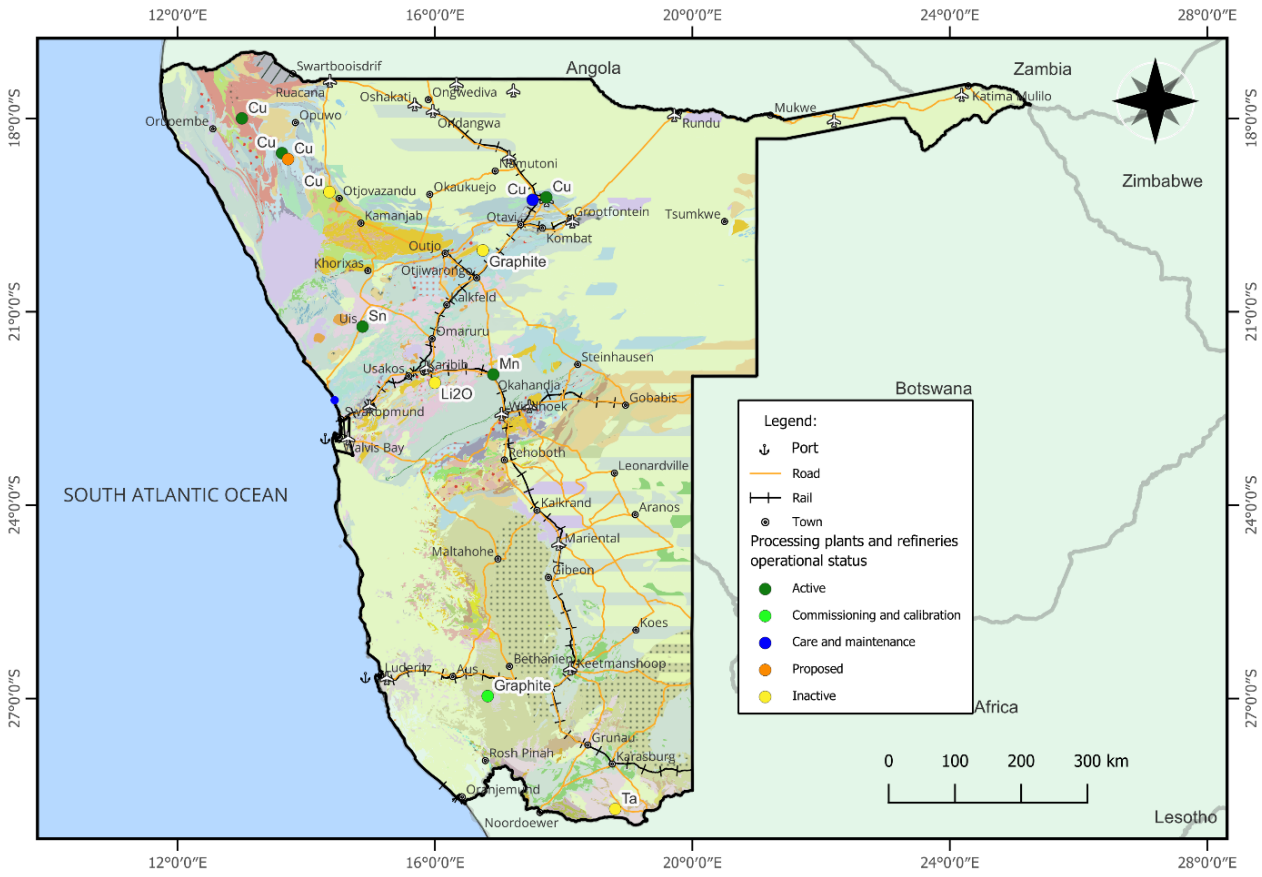

Figure 6: Location and operational status of processing facilities and refineries in Namibia.

Refining

The majority of the local mining industry in Namibia focuses solely on extraction without significant value addition occurring within the country, resulting in limited capture of the upstream value chain. However, there is a potential for this situation to change following a recent Cabinet decision on June 7, 2023. The decision, issued by the Namibian Minister of Information, approved a ban on exporting specific critical minerals in their unprocessed form. These minerals include crushed lithium ore, cobalt, manganese, graphite, and rare earth elements. The aim of this ban is to encourage value addition and promote the establishment of processing facilities within the country.

By implementing this prohibition, the Namibian government intends to stimulate local industrial development and enhance the economic benefits derived from the mining sector. Mining companies will be required to process these minerals locally before export, fostering the growth of downstream industries and creating more employment opportunities.

Furthermore, the Cabinet decision grants the Minister of Mines and Energy discretionary authority to permit limited quantities of the aforementioned minerals for export, subject to endorsement by the Cabinet. This provision allows for flexibility in cases where restricted export of these minerals may still be necessary or beneficial.

In Namibia, the refining of ECRM is primarily focused on copper. The country has facilities for producing copper cathodes and blister copper through refining processes.

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2. Assessment of the ECRM value chain

2.1. Characterization of the value chain for primary and secondary raw materials

Namibia's ECRM deposits are primarily at the exploration phase and include copper, graphite, lithium, tin, tantalum and REE. In terms of ECRM production, Namibia primarily produces tin and manganese at present. Titanium, tantalum, vanadium, and other minerals are predominantly by-products, while copper, lithium and fluorite are produced through small-scale mining. The Namibian ECRM value extraction is focussed on mining with limited value addition, resulting in less capture of the upstream value chain. However, a recent Cabinet decision aims to change this by banning the export of specific critical minerals in unprocessed form, encouraging local value addition. There is no manufacturing of end-use products in Namibia. The Annex Value Chain and Economic Framework Evaluation **(Appendix_2.1.1_RECYCLING)** lists ECRM related recycling organisations.

2.1.1 List of the mining and recycling projects

Mining and production

As of June 2023, large-scale mining licenses accounted for 3 percent (188) of the total active and pending mineral rights in Namibia. Among these licenses, 24 percent have been granted specifically for extracting ECRM such as copper, tin, manganese, graphite, fluorite, rare earth elements, lithium, and marine phosphate. However, it is worth noting that a significant number of licensed properties are currently not operational or in production.

Regarding ECRM production, Namibia primarily focuses on tin (855 tonnes of tin concentrate for 2022) and manganese (30 thousand tonnes of ore in 2022). Titanium, tantalum and vanadium are predominantly obtained as by-products, and the country also produces copper and fluorite, primarily through the small-scale mining sector. Since around 2020, there has been an increased interest in lithium by small-scale miners.

Recycling

Recycling plays a crucial role in establishing a circular economy within the mining sector, aiming to minimize waste and environmental contamination by extracting value from discarded mining materials. In Namibia, mining-associated waste materials encompass tailings, slag, mining machinery, and infrastructure like plants and structures.

Namibia has a documented 167 historical abandoned mine sites (GSN, 2011), out of which a hundred had previously produced ECRM including copper, tin, graphite, vanadium, and lithium. The resource potential of most of these sites is currently being investigated either in the historical tailings or in the remaining insitu ore. Tailings with potential to recover ECRM through reprocessing include graphite at the Aukam mine and lithium from the Uis Tin Mine. Slag from the Tsumeb mine has been documented to contain significant Gallium and Germanium.

In addition to tailings reprocessing, Namibia's mining waste recycling landscape is mainly made up of locally owned enterprises, with a primary focus on utilizing mine tailings for purposes such as aggregates, collection of scrap metal during demolition of mine infrastructure, and scrap metal reclamation. The Uis Tin Mine's slag and fine tailings, for instance, are currently employed in brick production. Various companies like Rent-a-Drum offer services encompassing a wide array of waste management tasks, including the dismantling of mine infrastructure and collection of scrap metals. Others, like Scrap Salvage and SA Metals Namibia, specialize in specific waste categories, primarily scrap metal. Notably, NamiGreen stands as the sole Namibian enterprise engaged in electronic waste collection.

At least 80 percent of all waste generated in Namibia is sent to South Africa and Asia for recycling. In 2011, the Recycle Namibia Forum (RNF) was established as a non-profit membership organisation with the purpose of coordinating projects to promote recycling, and the reduction and reuse of so-called waste in Namibia. The recycling industry has been steadily growing in Namibia with new entrants supported by loans through the Development Bank of Namibia for acquiring trucks for waste transport to South Africa.

For more information, see the list of companies and projects in the Namibian recycling sector related to ECRM **(Appendix_2.1.1_RECYCLING).**

2.1.2 Status of economic links between the formal and informal sectors

The small-scale mining sector plays a crucial role in Namibia's Minerals Policy of 2002 and is governed by the Minerals Act 33 of 1992 ("Minerals Act"). The Minerals Act regulates the prospecting, exploration, and exploitation of solid minerals throughout Namibia. It encompasses various licenses, approvals, and restrictions that are applicable to the mining sector as a whole, with specific relevance to the Artisanal and Small-Scale Mining (ASM). The Ministry of Mines and Energy (MME) serves as the regulatory authority for mining activities and has a dedicated division to support SSM operators in all aspects of the mining process. This includes assisting with license acquisition, conducting sample testing, and facilitating mineral export procedures. To address any disputes that may arise, the MME has established the Minerals Ancillary Rights Commission (MARC) as a mechanism for conflict resolution within the SSM sector. MARC focuses on mediating conflicts related to land access between SSM miners and private landowners, particularly when a mineral license area overlaps with privately owned properties. MARC's primary objective is to facilitate agreements that ensure both access to land for SSM miners and appropriate compensation for landowners.

A few large-scale mining operators have implemented structured purchasing systems to facilitate the acquisition of ECRM commodities from small-scale miners. These systems ensure that the miners can sell their products and receive regular payments, providing them with a stable income to support their mining activities. The involvement of large-scale mining operators in purchasing ore from small-scale miners not only contributes to the local economy but also helps formalize and regulate mining operations in specific areas.

Centralized processing facilities are also widespread in Namibia's small-scale mining sector, particularly for copper, where they serve as key hubs for receiving bulk ore from multiple small-scale mining sites. Centralized processing facilities in the small-scale mining sector play a crucial role in enabling small-scale

miners to access processing capabilities that would otherwise be economically unfeasible for individual operations.

The Kaokoveld mining district in the Kunene region is a hub for small-scale miners, housing multiple mining operations, and it is supported by at least two processing facilities that receive the miners' products. These processing facilities, in turn, sell their copper concentrate to the Dundee Precious Metals Smelter located in northern Namibia. By consolidating ore from multiple mining sites, these facilities increase efficiency and reduce costs for small-scale miners. The processing facilities include:

1. Dundee Precious Metal Tsumeb with a capacity of 180,000tpa
2. Tschudi Copper mine with a capacity of 17,000tpa
3. Otjozondu Mining Project with a manganese processing capacity of 38, 000tpm
4. Kunene Crushers Copper Concentrate with a capacity of 62tpm concentrate
5. Uis Tin with a capacity of 1,200tpm concentrate
6. Okandjande Graphite with a capacity of 31,877tpa graphite concentrate.
7. Omao Copper Processing with a capacity of 200tpm.

In certain instances, large-scale mining operators have established purchasing systems to facilitate the acquisition of ECRM commodities from small-scale miners. These systems are designed to procure the necessary raw materials from small-scale miners to supply their own processing plants.

For Lithium, small-scale miners in the Erongo region have started mining lithium and stockpiling in order to sell the stockpiles to mostly Chinese buyers, who export the ore for further processing to China.

Between 1990 and 2019, Namibia's tin production is attributed to small scale miners who exploit cassiterite rich pegmatites in central Namibia. In 2019, the Uis Tin Mine was re-opened and the first tin concentrate since 1990 was produced. The mine has a resource of 81 million tonnes at a grade of 0.15% Sn and 86ppm Ta supporting a 14-year life of mine.

Tin is currently not mined by small-scale miners, but the Namibian government possesses a 15% interest in the Uis Tin Mine (Andrada Mining) through the Uis Tin Small Miners Association.

2.2. Identification of the bottlenecks along the value chain

Bottlenecks in Namibia's ECRM mineral value chain includes skill scarcity, small-sized deposits and limited water and power supply. The industry faces a scarcity of critical skills essential for both the upstream and downstream segments of the mineral value chains including geoscientists, mining engineers, minerals processing experts and digitally and technically experienced workers. This skills gap is exacerbated by insufficient graduates entering the sector, limited exposure to specialized training, and a nascent downstream industry. Namibia's ECRM deposits tend to be of low to medium tonnage and insufficient infrastructure, often difficult to sustain complete value chains independently. Varying project advancement within the upstream sector, from early exploration to development phases, underscores the need to expedite projects for economies of scale, ensuring adequate feedstock for downstream

activities. Processing complex ores for ECRM minerals demands substantial water and energy. Namibia's aridity, persistent drought, and limited water supply pose challenges. Only a third of the country's power needs are met by domestic production, with Namibia heavily reliant on South Africa's state-owned power company, ESKOM. The reliance on external power and the high costs of energy and fuel hinders the full development of the ECRM mineral value chains in Namibia.

2.2.1 List of the main bottlenecks and the links between them

Namibia has a combined "Worldwide Governance Indicators (WGI)" (World Bank 2023) of +0.35. This is lower compared to Botswana (+0.75), but higher compared to other countries in the region like South Africa (-0.13), Angola (-0.94), Zambia (-0.44) and Zimbabwe (-1.43). In the Logistics Performance Index (LPI) Namibia is ranked 66th (score of 2.9), from 139 countries. Clearly below South Africa (19th, 3.7) but within a range of Botswana (57th, 3.1). Zimbabwe for comparison is ranked 97th with a score of 2.5 Angola is ranked 134th (2.1). In the Investment Attractiveness Index from Fraser Institute (2023) Namibia gets a score of around 60 (out of 100) and is ranked 38th of 62 investigated mining legislations. It is ranked 26th for the Policy Perception Index (69 of 100). In the Investment Attractiveness Index it is 6th out of 16 evaluated African countries. 'Sheimin.Abdul@BCI.CO.MZ'

The national consultant in Namibia (Odikwa Geoservices) found the following issues the main bottlenecks:

- Skill scarcity leads to reduced ability to increase the value chain
- Small-sized deposits leading to high investment for infrastructure in relation to the size of the deposit
- Water and power scarcity lead to high costs for ore processing and further processing of concentrated minerals. Combined with skill scarcity this discourages investment into prolonged value chain.

Namibia has adopted the "Growth at Home" strategy, initiated in 2015, along with the mineral beneficiation strategy introduced in 2021. These strategies collectively lay out a comprehensive roadmap for the country's Industrial Policy. Key policies within these strategies encompass the enhancement of manufacturing incentive schemes, the facilitation of skills development and knowledge transfer, the promotion of local engagement in research and development, and the safeguarding of infant industries. Nevertheless, the overall progress in implementing these strategies could be speeded up. Issues have been the resistance from industry stakeholders, lack of support for infant industries and a lack of political will, as noted by Hope in 2019. As an illustrative case, in 2015, a local drum manufacturing company was forced to shut down its operations as a result of local mines choosing to import drums for transporting their mining products and inputs. It is important to highlight that, at present, Namibia does not offer any incentives for the mining industry or for beneficiation.

3. Investment/financing prospects for ECRM projects in Namibia

3.1. Fiscal, legislative and regulatory context for in-country financings

Legal form of different types of activities to the exploitation of mineral raw materials

The Legal Position of Natural Resources in Namibia

Article 100 of the Namibian Constitution states that "Land, water and natural resources below and above the surface of the land and in the continental shelf and within the territorial waters and the exclusive economic zone of Namibia shall belong to the State". The mineral law system in Namibia rests on the idea that all minerals belong to the State and the State grants rights to certain parties to exploit such minerals. The only exception to the aforementioned rule is where a natural resource is lawfully owned by a party, which has registered such ownership against the title deed of a property – which was only possible prior to the commencement of the Namibian Constitution in 1990.

The Minerals (Prospecting and Mining) Act 33 of 1992 ("Minerals Act") (as amended by Minerals (Prospecting and Mining) Amendment Act 8 of 2008) comprehensively governs the prospecting, exploration, and exploitation of solid minerals in Namibia. The Ministry of Mines and Energy (MME) serves as the regulatory authority overseeing these activities on behalf of the government. Part II of the Minerals Act outlines the rights and restrictions related to minerals, specifically:

Rights in relation to minerals: The rights to explore, prospect, mine, sell or dispose of, and exercise control over any mineral in Namibia are vested in the State, regardless of any ownership rights to the land where the minerals are found unless otherwise provided for in the Act or other laws.

Prohibition on certain operations without a license, and transfer of licenses or interests: No person is allowed to carry out reconnaissance operations, prospecting operations, or mining operations in Namibia without a valid non-exclusive prospecting license, mining claim, exclusive prospecting licences, reconnaissance licences, exclusive reconnaissance licences, mining licences or mineral deposit retention licences, as applicable. Additionally, the transfer, grant, cession, or assignment of the aforementioned licences and claims or the joining of persons as joint holders of such licenses or interests, must be done in writing and with the written approval of the Minister of Mines and Energy.

The different types of licences, including application fees and annual fees can be found in the following tables. There are six types of licences that can be applied for and obtained under the Minerals Act. These licences fall into two main categories of licences relating to minerals in terms of the Minerals Act, namely category 1, which are licences available only to Namibian entities for the development of small-scale mining and category 2, which are licences available to Namibian and Foreign entities.

Mineral Licence Holders have different rights, depending on their license, which are all described in the Minerals Act.

Mineral licences have a limited period of validity and an application for renewal must be lodged to the Minister to extend the period of validity. An application to renew a mining claim, exclusive prospecting licence and mineral deposit retention licence must me made no later than 90 days before the expiry of such licence or claim. An application for the renewal of a mining licence must be made no later than 12 months before the expiry of such mining licence. Section 38, section 72, section 84 and section 96 regulate the renewal of licences in the Minerals Act. Table 2 below illustrates, for each mineral licence, the duration for which licences remain valid upon issue and the periods for which the licences can remain valid after renewal.

Table 2. Duration of licence and Renewal Periods

Type of Licence	Duration	Renewal	Section in the Minerals Act
Mining Claim	3 years	2 years	Section 37
Non-Exclusive Prospecting Licence	12 months	May not be renewed	Section 22
Reconnaissance Licences	6 months	May not be renewed, however, can be extended once for a period of 6 months	Section 63
Exclusive Prospecting Licences	3 years	May be renewed for a period of 2 years per renewal (multiple renewals allowed at Ministers' discretion)	Section 71
Mineral Deposit Retention Licences	5 years	1 year	Section 82
Mining Licences	25 years	15 years	Section 94

Fees (Tables 3 and 4) are payable to the MME upon application for, and maintenance of, various types of licences and permits. In terms of section 47 (1) of the Minerals Act, an application for a mineral licence or mineral licence renewal shall be accompanied by a fee. There are also fees payable for the amendment of a mineral licence, the approval for the transfer interest in a mineral licence.

Table 3. Licence Application Fees

Nature Of Application	Once-Off Fee
Application for reconnaissance licence per quarter degree square	N$ 1 200
Application for exclusive reconnaissance licence per quarter degree square	N$ 2 500
Application for a mining claim registration	N$ 250
Application for a mining claim transfer	N$ 150

Application for a mineral licence amendment	N$ 1 200
Application for mineral deposit retention licence	N$ 25 000
Application for a mining licence for a project with below N$ 10 million projected gross revenue	N$ 5 000
Application for a mining licence for a project with above N$ 10 million projected gross revenue	N$ 25 000
Application for a mineral licence transfer	N$ 1 200
Application in respect of an exclusive prospecting licence for 0– 20 000 hectares	N$ 10 000
Application in respect of an exclusive prospecting licence for 20 001–30 000 hectares	N$ 15 000
Application in respect of an exclusive prospecting licence for 30 001–40 000 hectares	N$ 20 000
Application in respect of an exclusive prospecting licence for 40 001–50 000 hectares	N$ 25 000
Application in respect of an exclusive prospecting licence for 50 001–60 000 hectares	N$ 30 000
Application in respect of an exclusive prospecting licence for 60 001–70 000 hectares	N$ 35 000
Application in respect of an exclusive prospecting licence for 70 001–80 000 hectares	N$ 40 000
Application in respect of an exclusive prospecting licence for 80 001–90 000 hectares	N$ 45 000
Application in respect of exclusive prospecting licence for 90 001–100 000 hectares	N$ 50 000

Table 4. Annual Licence Fees

Nature of Licence	Annual Fee
Licence fee in respect of non-exclusive prospecting licence	N$ 250
Reconnaissance licence fee per quarter degree square	N$ 0
Exclusive Reconnaissance licence fee per quarter degree square	N$ 0
Licence fee in respect of an exclusive prospecting licence for 0– 20 000 hectares	N$ 10 000

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Licence fee in respect of an exclusive prospecting licence for 20 001– 30 000 hectares	N$ 15 000
Licence fee in respect of an exclusive prospecting licence for 30 001– 40 000 hectares	N$ 20 000
Licence fee in respect of an exclusive prospecting licence for 40 001– 50 000 hectares	N$ 25 000
Licence fee in respect of an exclusive prospecting licence for 50 001– 60 000 hectares	N$ 30 000
Licence fee in respect of an exclusive prospecting licence for 60 001– 70 000 hectares	N$ 35 000
Licence fee in respect of an exclusive prospecting licence for 70 001– 80 000 hectares	N$ 40 000
Licence fee in respect of an exclusive prospecting licence for 80 001– 90 000 hectares	N$ 45 000
Licence fee in respect of exclusive prospecting licence for 90 001– 100 000 hectares	N$ 50 000
Mining claim fee	N$ 250
Licence fee in respect of mineral deposit retention licence	N$ 25 000
Licence fee in respect of a mining licence for a project with below N$ 10 million projected gross revenue	N$ 5 000
Licence fee in respect of a mining licence for a project with above N$ 10 million projected gross revenue	N$ 25 000

Namibia was once considered one of the top investment-friendly destinations. For instance, in 2015, the Fraser Institute ranked Namibia as the second-most attractive African country for investment. However, in recent years, a combination of external and internal factors has led to Namibia losing its favourable position. According to the 2022 Fraser Institute Survey of Mining Companies, Namibia now ranks sixth out of sixteen African jurisdictions in terms of overall investment appeal. On a global scale, it stands at the thirty-eighth position out of sixty-two jurisdictions surveyed, a notable shift from fifty-ninth out of eighty-four in 2021. These rankings signify a decrease in Namibia's attractiveness to investors. Within this survey, there are subchapters, as e.g. the Policy Perception Index, in which Namibia is ranked 26th out of 62 (26/62). According to the Fraser Index the Policy Perception Index provides a comprehensive assessment of the attractiveness of mining policies in a jurisdiction, and can serve as a report card to governments on how attractive their policies are from the point of view of an exploration manager. When it comes to attracting exploration, Namibia only scores 43/47. In this subchapter it is measured weather a country encourages exploration investment or is at least not a deterrent to investment.

Comments from consulting and exploration companies in the annual survey of mining companies compiled by the Fraser Institute vary between “There are good foreign investment policies for mining”, to “There is a lack of mineral rights security” and “Unilateral powers to the Minister of Mines to make various determinations, like royalty levels, hurts Namibia’s competitiveness”. Other topics like “Uncertainty Concerning Environmental Regulations”, “Uncertainty Concerning the Administration, Interpretation and Enforcement of Existing Regulations” and “Geological Database” are ranked relatively good (11/62 to 21/62). The majority of topics is evaluated as average (26/62 to 35/62). These include “Uncertainty Concerning Disputed Land Claims”, “Legal System”, “Availability of Labor/Skills”, “Political Stability”, “Regulatory Duplication and Inconsistencies”, “Quality of Infrastructure”, “Security” and “Socioeconomic Agreements/Community Development Conditions”. In four sectors (“Labour Regulations/Employment Agreements and Labour Militancy/Work Disruptions”, “Taxation Regime”, “Trade Barriers” and “Uncertainty Concerning Protected Areas”) Namibia only scores below the average of the 62 investigated mining jurisdictions between 41/62 and 46/62.

3.2. Macroeconomic context for in-country financings

Gross Domestic Product (GDP)

Namibia's economy, which is classed as a developing, middle-income country with a mixed economy, has grown significantly during the last 30 years. During the first few years of Independence from 1990 to 1994, around 60% of Namibia’s GDP was generated by: agriculture, mining, manufacturing and government. After 1995, the contribution of those four sectors (agriculture, mining, manufacturing and government) dropped to roughly 50% of Namibia’s GDP as the country started to diversify into other sectors. The mining sector’s share was between 8 and 10 % from 2016 – 2021 and around 12 % in 2022.

The GDP of Namibia has fluctuated significantly over the years (Figure 7), sometimes being characterised by fast expansion and other times by economic stagnation. Namibia has made considerable strides in improving its economy since obtaining independence in 1990, diversifying away from dependency on mining and agriculture.

According to World Bank data, Namibia's GDP grew from $2.5 billion in 1990 to $13.4 billion in 2019, representing an average annual growth rate of 4.7%. The country's highest GDP growth rate was recorded in 2015, at 5.2%, while the lowest was in 2009, at -0.9%. However, the COVID-19 pandemic had a significant impact on the Namibian economy, resulting in a contraction of -7.3% in 2020.

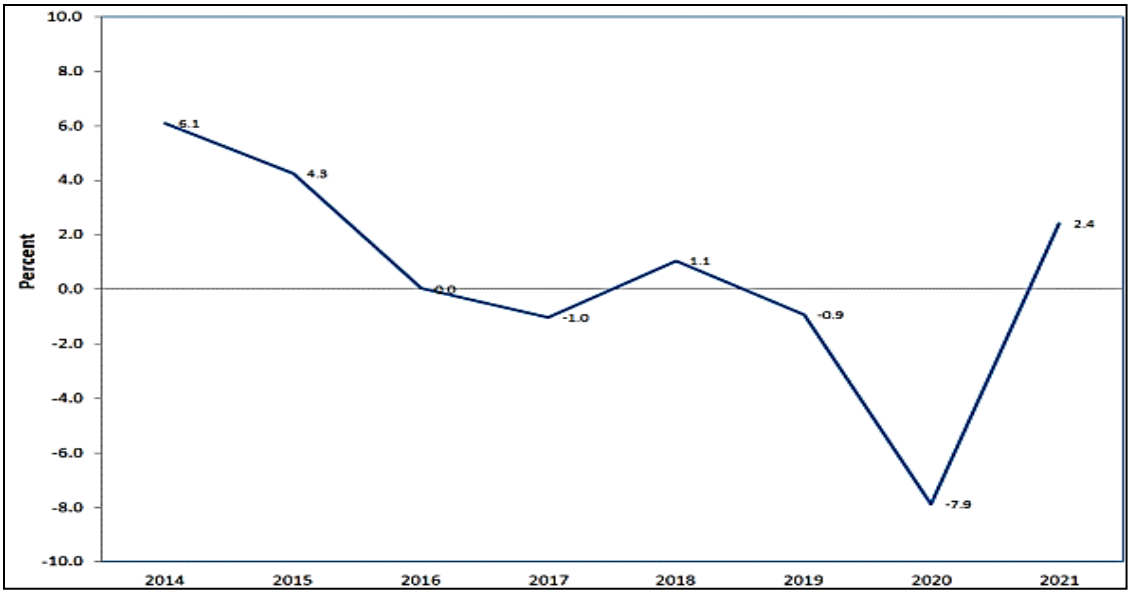

Figure 7: Gross Domestic Product Growth Rates, in percentage[2]

The mining sector plays a vital role in the economic development of many countries. In Namibia, mining contributed the highest in activity for the year 2022 as illustrated in Figure 7, Mining has been the backbone of the economy having a positive impact measured through job creation and income generation, among others (Figure 8). Total job creation in the sector has been volatile due to fluctuations in commodity prices and technological advancement.

Today, worldwide real GDP growth has slowed in the fourth quarter of 2022, and Namibia has experienced the same, owing to soaring inflation, higher interest rates, less investment, and disruptions caused by Russia's invasion of Ukraine. Global economic activity continued to slow in the last quarter of 2022 compared to the previous quarter. On a full-year basis, the global GDP growth rate dwindled as the Russia-Ukraine war disrupted the global supply chains, exacerbating the increases in food and oil prices and feeding into high inflation rates globally. Inflation remained high and broad-based, although recent declines in commodity prices and easing supply challenges have started to moderate the pace of price increases.

[2] Source: Namibia Statistics Agency

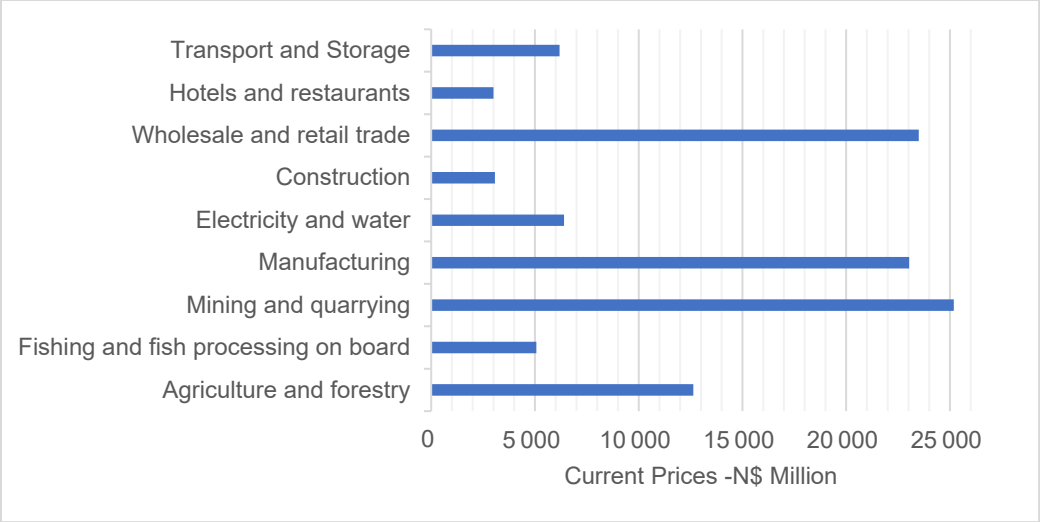

Figure 8: Gross domestic product by activity 2022[3]

Level of Expenditure vs GDP Levels

Over the years, Namibia has consistently maintained a relatively stable level of expenditure as a percentage of GDP, with a peak of 126.5% being recorded in 2015 (Figure 9). However, due to the outbreak of the Covid-19 pandemic in 2020/2021, the level of expenditure has experienced a significant increase, resulting in a departure from the previous trend. The pandemic has caused unprecedented disruptions to the country's economic activities, necessitating a significant increase in government spending to mitigate its impact on the population and the economy. The government has implemented various measures, including fiscal stimulus packages, social welfare programs, and healthcare interventions, to address the multifaceted challenges posed by the pandemic. This therefore resulted in increased spending of 7.6% from the year 2020 to 2021. As a result, the level of expenditure as a percentage of GDP in Namibia has risen sharply, reflecting the government's commitment to protecting its citizens and supporting the country's economy during these challenging times.

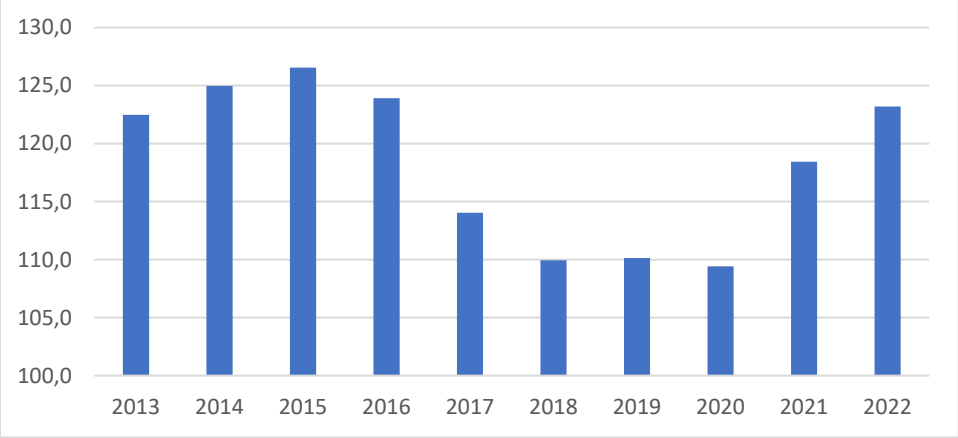

Figure 9: Gross Domestic Expenditure as a percentage of GDP[4]

[3] Source: Namibia Statistics Agency
[4] Source: Namibia Statistics Agency

Fitch Rating Agency Rating and World Bank Economic Classification

The World Bank classification is a system used by the World Bank to classify countries depending on their level of income. According to the bank, Namibia is classified as an upper-middle-income country. Namibia has been able to achieve upper-middle-income status by reducing poverty with the aid of political stability and prudent economic management. However, the COVID-19 pandemic aggravated already high levels of socioeconomic inequality, which are a legacy of previous governments' use of apartheid.

Despite being categorised in the BB- with a stable economic outlook by the Fitch rating agency, Namibia faces significant challenges due to its elevated fiscal deficits, high-rising debt, and weak growth prospects, which could potentially lead to further economic instability if not addressed in a timely and effective manner. These factors could also harm the country's ability to attract foreign investment and maintain a competitive position in the global market, making it essential for the government to implement appropriate policies and strategies to mitigate these risks and foster sustainable economic growth.

Foreign Direct Investment (FDI): FDI Profitability and Factors Contributing to FDI Profitability

From the year 1998 to 2008 FDI inflows into Namibia constituted about 25.6% of the Gross Fixed Capital, mainly flowing into the manufacturing sector; into companies such as the Scorpion Zinc Refinery, Ramatex Textiles and Namdeb Diamonds (Figure 10). Reinvestments of earnings into the domestic economy increased as a result of the sector's continuing upward trajectory in Namibia. However, over the past ten years, there has been a movement in big investments from the manufacturing sector to the mining industry, which has resulted in a sustained inflow of FDI.

Since its independence in 1990, Namibia has done well in setting up an environment favourable to attracting foreign direct investment. At the outset, the country adopted the Foreign Investment Act 27 of 1990 intending to attract foreign investments through a favourable investment climate and various tax incentives. The favourable investment climate and the sophisticated financial system allowed foreign direct investment enterprises (FDIEs) to easily remit capital and profits abroad. The main sources of FDI being mainly intercompany borrowings and reinvested earnings equity capital as illustrated below.

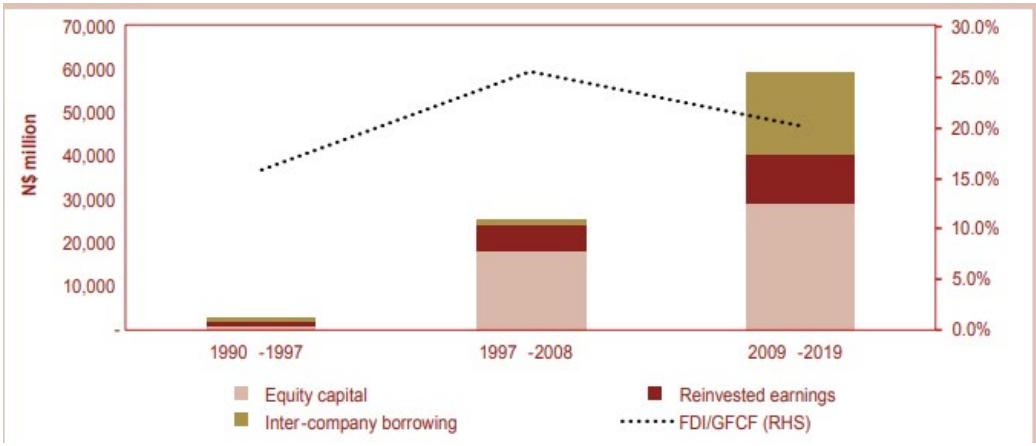

Figure 10: Foreign Direct Investment inflows into Namibia[5]

[5] Source: Bank of Namibia Note on FDI

As defined by the Bank of Namibia, FDI profitability is commonly proxied by the return on equity (ROE) of foreign direct investment affiliates. Foreign direct investment in the mining sector remained nearly stable between 2015 and 2019, ranging between N$53 million and N$50 million per year. The mining sector's profitability was primarily influenced by changes in international commodity prices. The high reliance on commodity prices is attributable to Namibia's huge number of marginal mines with poor ore concentrations. Between 2009 and 2019, the mining sector had an average Return-on-equity (ROE) of 1.0 percent per year. The poor ROE was caused by high net losses on occasion, as the industry faced several obstacles throughout the years. These obstacles include the worldwide recession of 2009, which harmed the sector, as both the diamond and copper industries suffered significant losses in 2009. Copper prices fell to their lowest levels in 2009, forcing Namibia's' largest copper mine to go into care and maintenance. Over the review period, the uranium business faced headwinds for the last decade as uranium prices never returned to pre-2007 levels following the 2011 Fukushima Daiichi nuclear disaster and so stayed chronically low. As a result, various uranium mines have been care and maintenance over the years. The high operating costs continued to have an impact on the industry's profitability. According to the available literature on the financial life cycle of FDI, the recent massive investments in the uranium business were accompanied by large initial losses. The main investors in the mining sector in Namibia are South Africa, the United Kingdom, the United States and Germany.

Historical Inflation Levels

The Namibian dollar is pegged to the South African Rand, thus the Namibian Central Bank's monetary policy decisions are highly influenced by the inflation changes in South Africa. As such, the Namibian Central Bank closely monitors inflation trends in South Africa and considers them when making monetary policy decisions to ensure a stable and predictable inflationary environment in Namibia (discussed further below).

As illustrated in Figure 11, in 2020, Namibia's inflation rate reached its lowest point, with an annual average of 2.9%, which can be attributed to the economic impact of the COVID-19 pandemic. However, in 2022, the inflation rate reached its peak, with an annual average of 8.3%, due to various factors, including rising fuel and food prices, as well as external economic conditions.

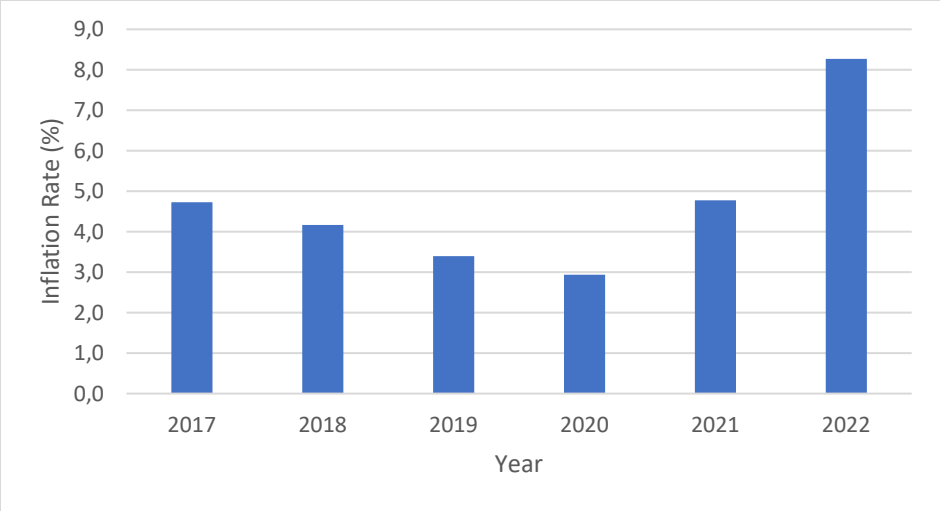

Figure 11: Annual Average Inflation Rate 2017-2022[6]

Impact of Inflation on Namibia's Economy and Mining Sector

The Namibian mining industry is primarily affected by variations in the prices of the commodities extracted, which have been volatile; however, inflation has little impact on the sector.

The sector contracted by 4.7% on average between 2014 and 2016 mainly due to a decreased demand for mining products and low commodity prices for minerals that Namibia exports. However, the growth rate for 2018 was positive at 22% from 13.3% in 2017.

In 2018, Namibia was ranked as the fifth biggest Uranium producer in the world by the World Nuclear Association (WNA). However, growth in the Uranium sector has been very slow due to weak international uranium prices and weak global demand, which has led to slow production and the closure of some mines. According to the Chamber of Mines South Africa (2018). Consequently, the mining sector suffered 822 retrenchments comprising permanent, temporary and contract workers attributable to volatile mineral commodity markets in the second half of 2018 and a stagnantly low uranium price in the last nine years.

Some of Namibia's peers within the Southern African Development Community (SADC) region have been experiencing similar mining sector growth and contribution to GDP declines. For example, in Botswana, the mining sector growth contracted by 9.6 and 3.7% in 2015 and 2016, respectively. According to StatsBots (2017), the decline in 2016 was due to the closure of the copper/nickel mines during the fourth quarter of 2016 and therefore the sector contributed 20% to Gross National Output in 2016 up from 17.7% in 2015.

Namibian Dollar and South African Rand Dynamics

In 1990, Namibia became a formal member of the Southern African Customs Union. Namibia later implemented the Namibian dollar currency and remained pegged to the South African Rand on a 1 to 1 basis to maintain its membership status with the Common Monetary Area (CMA).

[6] Source: Namibia Statistics Agency

This means that the exchange rate between the two currencies is fixed, and changes in the value of the South African rand will affect the value of the Namibian dollar as well. While the peg has provided stability to Namibia's economy, it also means that the country is vulnerable to economic shocks in South Africa.

Overall, the dynamics between the Namibian dollar and the South African rand are closely linked due to the peg, and any fluctuations on the South African Rand will have a direct impact on the Namibian Dollar.

Historic Debt Levels of the Country and Factors Contributing to the Country's Debt Levels

Until 2011, Namibia had very little public debt. At just 16% of GDP, the country had one of the lowest debt-to-GDP ratios in the world. However, in 2017, the country was downgraded by both of the international rating agencies that cover it, to a sub-investment or "junk" rating, citing amongst others, the rapid rise in public debt.

Over the first five years of this period, the country went through one of its longest and largest boom periods, with the strongest and most sustained growth levels seen since 1990. However, much of this growth was driven by debt, both public and private. As a result, between early 2011 and the end of 2017, Government debt levels rose from N$13.8 billion (16.4% of GDP) to N$72.8 billion (40.6% of GDP).

To repay debt, the Ministry of Finance started a Debt Redemption Strategy, which aims to ensure prudent credit risk management to avoid default events. Namibia has so far never defaulted on any public debt.

Current Status of Its External and Domestic Debt and the Impact of Debt on the Country's Economy and Society

The current debt levels in Namibia have been mainly attributed to several factors, including the depreciation of the Namibian Dollar, external loans obtained to support the country's economic recovery from the COVID-19 pandemic and high levels of government spending. The depreciation of the Namibian Dollar has increased the cost of servicing foreign debt, while the external loans taken to mitigate the impact of the pandemic have added to the country's overall debt burden. In addition, high levels of government spending on infrastructure development, social programs, and defence have contributed to the rising debt levels. These factors have combined to create a challenging debt situation for Namibia, which will require careful management and strategic policy decisions to address in the coming years.

The stock of external debt rose over the year to the end of December 2022, mainly owing to exchange rate depreciation, coupled with the disbursement of the Africa Development Bank ("AfDB") loan. According to the Bank of Namibia (2023), the central government's external debt stock rose, year-on-year, by 4.9 percent to N$34.1 billion in the third quarter of FY2022/23. The yearly rise was due to the disbursement of a N$2.3 billion AfDB loan during December 2022, coupled with the depreciation of the Namibia Dollar against other major trading currencies. Quarterly, the external debt stock declined by 0.2 percent, from N$34.2 billion, owing to the significant appreciation of the Namibia Dollar against the US Dollar every quarter. As a ratio of GDP, external debt declined by 0.8 percentage points to 16.4 percent at the end of December 2022. This was owing to a higher fiscal GDP for the FY2022/23, compared to the previous year.

These increases in debt levels, coupled with a challenging economic climate, have brought about notable changes in the Namibian fixed-interest (corporate, government and quasi-government debt) space. The growth of this sector has had a noticeable impact on the economy, as seen in the changes in capital availability and pricing for households and businesses since 2016.

Balance of Payments Levels

Namibia's persistent trade deficit can be examined more closely by looking at the external transactions section of its national accounts. The balance of payments, which summarizes and categorizes Namibia's transactions with the rest of the world, is divided into the current and the capital account.

Namibia has run an overall negative balance of trade almost every year since 1990 with exceptions only in 2005 and 2006. While the balance of trade in services was mainly negative throughout the 1990s, it has fluctuated from positive to negative since 2000, a possible reflection of the growing importance of Namibia's tourism industry, Namibia's major service export. However, because trade in goods dwarfs trade in services, the overall balance of trade has been determined primarily by the huge deficits in goods, which have taken place over the past decade and more.

According to the Namibia Statistics Agency's database on export percentage, it is evident that the manufacturing sector in Namibia is a significant contributor to the country's overall export earnings, accounting for 56.8% of the total export value (Figure 12). In comparison, the mining and quarrying sector makes up 36.5% of the export value. This suggests that the manufacturing sector is a vital component of the Namibian economy, and its performance has a significant impact on the country's economic growth and development. The manufacturing sector also comprises outputs from copper smelting. Adding this to the mining and quarrying sector, the minerals sector has a contribution of 57 % to the exports of Namibia.

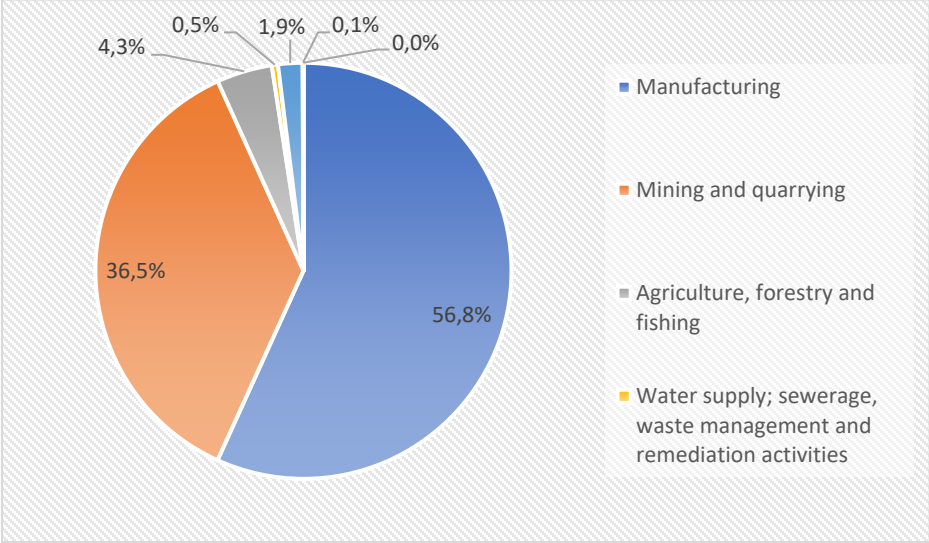

Figure 12: Namibian Exports in Percentage Shares by Value - N$ million (2023)[7]

[7] Source: Namibia Trade Statistics

3.3. Political context for in-country financings

Companies investing in Namibia are focused on developing the supply side of the value chain to supply mineral concentrates mostly to China and the Western world. Copper is the only commodity, whose value chain has developed into metal production in the form blister copper. No commodity in Namibia has a full value chain set up. Although Namibia has a variety of critical mineral deposits and commodities, individual deposits might be too small for localized value chains to be established. Opportunities exist to develop in-country scale, regional scale and continent scale value chains for commodities such as copper, lithium and rare earths. In general, developing Namibia's value chains will require large capital to build infrastructure such as processing facilities, roads, water pipelines and power generation.

Traditionally, mining companies have followed an enclave approach for infrastructure development, often constructing infrastructure exclusively for their operations. At a local level, shared and common infrastructure corridors both among mining industry players and with other sectors such as green hydrogen, green energy and roads authorities to increase the economy of scale. Because many ECRM mining projects are still at the early to intermediate exploration phase, Namibia is in a favourable position to evaluate, strategize and plan the utilization and locations of shared-use infrastructure. Namibia's Public Private Partnership (PPP) Act 2017 provides a framework under which private companies can partner with the government to establish shared infrastructure.

Existing policies and agreements to facilitate collaborative efforts to development value chains in Africa and Southern Africa in particular include the Africa Mining Vision, African Continental Free Trade Agreement (AfCFTA) and SADC Regional Mining Vision.

No expropriation of Property without just compensation

In terms of section 11 of the *Foreign Investment Act, 1990*, no enterprise or part of an undertaking carried on by an enterprise, or interest in or right over any property forming part of such undertaking shall be expropriated, save in accordance with provisions of Article 16 (2) of the Constitution. Furthermore, where an enterprise is so expropriated, the Government shall pay to the holder of the Certificate of Status Investment just compensation for such expropriation without undue delay and in freely convertible currency.

Furthermore, in terms of section 13 of the *Foreign Investment Act, 1990*, if a person to whom a Certificate of Status Investment has been issued so elects, such Certificate of Status Investment shall provide that any dispute between the holder and the Government in relation to any issue relating to the amount of compensation payable for an expropriation or the validity of the Certificate of Status Investment shall be referred for settlement by international arbitration under the Arbitration Rules of the United Nations Commission on International Trade Law.

However, section 13 does not prohibit the right of the holder to seek remedies in a competent court in Namibia if the Certificate does not provide for arbitration, nor does it prevent the holder and the Minister from agreeing to resolve a dispute through a competent court in Namibia if the Certificate provides for arbitration.

Developments regarding ECRM investment incentives

There are no policy developments in regard to ECRM investment incentives that can be reported on presently. However, as discussed above, the Namibia Investment Promotion Act, 2016 ("NIPA"), presents a legal development that is yet to come into force.

NIPA would repeal the Foreign Investment Act, 1990 and present additional criteria for the Minister of Trade and Investment to consider before awarding a Certificate of Status Investment. When considering an investment proposal to the Minister of Trade and Investment, the Minister must satisfy himself that the value addition to the natural resources and manufacturing sector and procurement of local goods and services is likely to occur as a result of the investment. NIPA further sets out that investment proposals must consider the development of managerial skills and the transfer of technological skills. NIPA further sets out those investors are mandated to absorb all available skills in Namibia and invest in human capacity development to ensure a national transfer of skills.

Many of the protections awarded to investors under the Foreign Investment Act remain unchanged under NIPA i.e. equal treatment between foreign and local entities, compensation for expropriation, ability to employ foreign personnel, assistance for visa and residence processes, and the ability to transfer funds into and out of Namibia in a freely convertible currency without undue delay.

Despite the development and drafting of NIPA, it is not promulgated yet and does not have the force of law. It is unclear when it may come into force.

Local Content: Requirements, Reporting and License conditions

Namibia does not have explicit local content legislation nor is local content defined within the Minerals Act. However, there are general licence conditions housed in section 50 of the Minerals Act which outline local content requirements (and which are applicable to all mineral licences). Section 50 of the Minerals Act states that:

- in the employment of employees, give preference to Namibian citizens who possess appropriate qualifications, expertise and experience for purposes of the operations to be carried on in terms of such mineral licence;
- carry out training programmes in order to encourage and promote the development of Namibian citizens employed by such holder;
- with due regard to the need to ensure technical and economic efficiency, make use of products or equipment manufactured or produced, and services available, within Namibia;
- co-operate with other persons involved in the mining industry in order to enable such citizens to develop skills and technology to render services in the interest of that industry in Namibia"

The above conditions together with the additional conditions that may be imposed by the Minister on licences in terms of section 48 (4) of the Minerals Act form the legal basis of Local Content Policies in Namibia.

Namibia's local content policies are characterised as more qualitative as opposed to quantitative. For example in terms of section 50 of the Minerals Act, it states that "*in the employment of employees, give preference to Namibian citizens.*" It does not state how many Namibians must be employed. Another example in terms of section 50 of the Minerals Act, is that "*make use of products or equipment manufactured or produced, and services available, within Namibia".* Again, it does not state what goods and services or the quantities of goods and services that must be procured locally. There is a lack of quantitative local content requirements, which contain more prescriptive local content targets in terms of volume or value, i.e. the number of local employees to be employed and the number of local suppliers to procure from. Due to this lack of quantitative and explicit targets, local content requirements are relatively easy to satisfy.

The one exception to the above circumstance is that the Minister does, on occasion, impose quantitative restrictions regarding control of a mineral licence. For example, some licences contain conditions stating that "*20% of the management structure (including the board) […] and 5% of the voting shares must be held by historically disadvantaged Namibians*" or the Minister may prohibit the Namibian ownership in a majority Namibian-owned licence to drop below 15%. These conditions or prohibitions mandate the involvement of Namibian parties, however, they do not specify particular individuals and thus a foreign company has sole discretion in selecting who to involve in their operations – which makes these condition easily satisfied.

Some licences may also contain conditions stating that "*all funds raised in relation to the mineral licence be banked with a Namibian financial institution*", which mandates the use of local banks for transacting on Namibian mining projects. This condition is also easily satisfied and further details on moving such funds into Namibia are discussed in Chapter 4 on 'Foreign Investment Related Issues'.

With regard to reporting on local content requirements, Namibia ascribes to (1) a geographical component and an (2) ownership component to local content reporting:

The geographical component means that the use of a company registered in Namibian proves to be sufficient in satisfying the general licence condition relating to the use of products, or equipment manufactured in, or services available within Namibia – even if that company supplies goods from a foreign country or uses foreign inputs. The ownership component means that any requirement to provide equity or voting rights to a Namibian citizen is limited to such equity or voting right – other conditions such as the terms upon which the equity is acquired and whether or not such equity pays dividends etc. is up to the company.

Namibia has not joined the Extractive Industries Transparency Initiative (EITI) to improve transparency in the mineral industry. However, the country is in the process of establishing a position on joining it.

4. Assessment of social, environmental, and governance challenges

The major input in this chapter is taken from AWIMA's deliverable 4.1: "Report on mining regimes with respect to the ESG objectives". One exception is chapter 4.2 of this country case study. The information concerning "what would be best practices for a responsible mining?" and "environmental challenges" were compiled by Odikwa Geoservices as part of their contract as a national consultant for this country case study.

4.1. Country-level assessment and context

4.1.1 Context

Best Practice in governance in Namibia has been identified as a priority by the Namibian government. The Harambee Prosperity Plan (HPP) is a targeted Action Plan to accelerate development in clearly defined priority areas, which lay the basis for attaining prosperity in Namibia. The Harambee Prosperity Plan II (2021-2025), aims at implementing policy programmes that enhance service delivery and economic recovery to strengthen Namibia in terms of socioeconomic challenges and preparing it for global opportunities in relation with the Covid-19 pandemic. The HPP2 is based on 4 pillars and the first pillar, Effective Governance, focusses on continuously improving accountability and transparency in order to strengthen the national anti-corruption mechanisms.

The **Corporate Governance Code for Namibia (NamCode,** Namibian Stock Exchange, 2023) is a corporate governance manifesto for companies incorporated under the Companies Act 28 (Legal Assistance Centre of Namibia 2004) as well as entities incorporated by statute (i.e., so called incorporation by act of parliament. The code was prepared and drafted by the Namibian Stock Exchange with support from FNB Namibia Holdings Limited. The principles of this NamCode apply to Namibian entities (large private and listed companies across all industries) on a 'apply or explain' basis and that the best practice recommendations are provided as guidance for the application of the principles of this NamCode.

Namibia has the **Anticorruption Act 8 of 2003** (Legal Assistance Centre of Namibia 2003) to lead the fight against corruption through effective law enforcement and preventative measures. In addition to this, the Anti-Corruption Commission has set out the National Anti-Corruption Strategy and Action Plan (NACSAP) that serves as a tool for fostering cooperation and continued synergy across all sectors and spheres of society in Namibia in attaining the national vision for a corruption-free Namibia.

The following sections in the **Mineral (Prospecting and Mining) Act of 1992** make specific regulatory provisions for transparency in the mining industry of Namibia: 45, 66, 76, 89 and 101. According to these sections, the following disclosures are mandatory: production records, productions plans, records and financial statements and reports. These disclosures are to be submitted to the MME by the holders of mining claims, reconnaissance licences, exclusive prospecting licences, mineral deposit retention licences and mining licences. Although Mineral (Prospecting and Mining) Act of 1992 make provision for transparency, there is no monitoring body to monitor the implementation of this legislation.

Namibia has not joined the Extractive Industries Transparency Initiative (EITI) to improve transparency in the mineral industry. However, the country is in the process of establishing a position on joining it.

4.1.2. Mineral/mining policies, industry policies

The **Minerals (Prospecting and Mining) Act 33 of 1992** is the main legal mechanism controlling the allocation of mineral rights in Namibia. The act outlines the mineral rights in the country, describes how the industry will be administered, and lays out the processes, procedures, rights, and obligations relating to the various mining claims and licences available in Namibia. It also includes information on royalty rates and penalties for any infractions, sets mine closure requirements, and establishes a Minerals Ancillary Rights Commission to help those licence holders who cannot exercise their rights due to land disputes. Minerals (Prospecting and Mining) Act, 1992 provides for the reconnaissance, prospecting, and mining for, and disposal of, and exercising control over, minerals.

The **Minerals Policy of Namibia (2003)** sets out guiding principles and directions while communicating the values of the Namibian people in pursuit of the development of the mining sector. The Minerals Policy of Namibia (2003) was developed to achieve a high level of responsible development of national resources in which Namibia becomes a significant producer of mineral products while ensuring maximum sustainable contribution to the country's socio-economic development.

Both, the Minerals (Prospecting and Mining) Act and Mining Policy are currently under review to incorporate changing knowledge and best practice.

The **Mineral Beneficiation Strategy for Namibia (2021)** was developed as an inclusive long-term modernisation and economic transformation programme that enables substantive and sustained raising of living standards, intensifying structural change and accelerating Namibia's industrialisation. The strategy seeks to complement key national development initiatives by creating a conducive environment for investment and value-addition through the provision of mineral-based feedstock for a competitive manufacturing sector in an environmentally sustainable way. It aims to address critical intervention areas in order to direct Namibia's mineral endowment and outputs towards enhanced economic development and social progression. The mineral beneficiation strategy provides a blueprint for Namibia to improve competitiveness as an investment destination. This competitiveness, coupled with considerable natural endowment in mineral resources, provides a platform for increased beneficiation, leading to the realisation of more economic value from the various mineral commodities in the country. The Namibian government has unquestionable commitment to working with the role players in the minerals industry to create the investment in infrastructure that is necessary for beneficiation to reach its full potential and contribute to the industrialisation of the country as outlined in Vision 2030 and the National Development Plans (NDP5 and beyond, (Ministry of Industrialization and Trade, 2021).

4.1.3. Mining regulations

The Minerals (Prospecting and Mining) Act stipulates a fair and transparent process for licencing. The Act clarifies data and reporting requirements for permits and mining claim applicants. According to the Minerals (Prospecting and Mining) Act, 1992, section 47, with the approval of the minister, mineral licence can be amended or transferred upon cession or assignment of any interest in any mineral licence or to be joined as a joint holder of a mineral licence and if the applicants are not satisfied with the outcome, they can appeal to Mining Minister and up to the level of the High Court of Namibia. The Chief Inspector is

responsible for compliance audits and mine visits. If the companies are in non-compliance with the mineral act, the Mining Commissioner has the right to issue a notice of intention to cancel the licence.

The Mining Commissioner, through the Division of Mineral Rights and Resource Development at the MEM is responsible for issuing licences. The application forms are located on the MEM's website (MME 2023) and contains all the information needed for the application. The following information about the application is available on the website for the Mining Cadastre Portal (2023):

- Licence type
- Name of the applicant
- Date of application
- Date of issuance
- Date of Expiry
- Commodities
- Size of the license area

The information is typically updated on each business day. The various licence and claims types for the mining sector of Namibia are listed and summarised in Table 5.

Table 5: The various licence and claims types available for the mining sector of Namibia

Licence type	Description	Duration	Renewable	Restrictions
Non-exclusive prospecting licence (NEPL)	Gives the right to prospect on any land for any mineral or group of minerals.	12 months	No	Anyone over the age of 18 can apply; non-transferable.
Mining claims	For Namibians, mining on a small scale.	3 years	2-year extension, unlimited (Providing the claim is being worked on)	A maximum of 10 claims can be held at any one time. Available to Namibian citizens only.
Reconnaissance licence	Regional, mainly remote sensing exploration for identification of exploration targets.	6 months	No	Not transferable.
Exclusive prospecting licence (EPL)	For an area of up to 1,000 km^2 (100,000 ha). Granted for a specific mineral or group of minerals.	3 years	Twice for 2-year periods, with the area decreasing by 25 percent with each renewal	Exclusive exploration rights to the land. (Renewals beyond seven years require special approval by the Minister).
Mineral deposit retention licence	Allows exploration company to retain tenure on exclusive prospecting licence, mining licence or mining claim without any mining obligations.	5 years	2-year periods	Must meet work and expenditure obligations and submit regular project reviews.
Mining licence (ML)	Exclusive rights to the mining area.	25 years or life of Mine	15-year periods	Must demonstrate financial and technical ability to develop and operate a mine.

Key pieces of legislation and Policy, including the Minerals (Prospecting and Mining) Act, the Minerals Policy, and the Water Act, require revision or are in the process of revision that is often seen as too lengthy and opaque (IGF, 2018).

It is a requirement for foreign investors in mining that the company has at least 5% of Namibian ownership and 20% of the management structure consists of Namibians. Foreign investors cannot own mining claims; however, they can enter into a joint venture with Namibians.

4.1.4. Taxation and royalties

Namibia operates a modern system of taxation that is reasonably competitive by international standards and is modified and updated on a regular basis usually, but not always, following announcements in the national budget speech. The basic system has remained fairly simple and satisfies a vital governance aspect in that the policies and regulations are stable, predictable, and transparently implemented. Tax administration is carried out primarily by the Directorates of Inland Revenue and Customs and Excise within the Ministry of Finance, which administer the Income Tax Act, Value Added Tax Act, Stamp Duty Act, Transfer Duty Act, as well as parts of the Petroleum Taxation Act. Some mining taxes, however, are the responsibility of the Ministry of Mines and Energy. Taxation for mining and quarrying, as well as that for oil and gas companies is different to other companies.

The mining sector generates significant revenue for Namibia through various mechanisms (including taxes, royalties, equity, fees, and levies). The rates are generally fair, regionally competitive, and equitably applied across the sector (Table 6). The Ministry of Finance has divisions investigating large taxpayers and combatting transfer pricing. Policies on taxation and royalties can be decisive elements to attract or deter foreign investment but are also essential instruments to ensure that a fair share of the wealth generated by extraction remains in the source country. Mining companies pay royalties to the government. That said, local communities do not directly get a share of the royalties paid by the mining companies. Royalty rates differ according to metal or mineral type as shown in Table 6.

Table 6: Royalty rates per mineral category

Mineral	Royalty rate (%)
Semi-precious stones	2
Dimension stones	5
Base and rare metals	3
Precious metals	3
Diamonds	10
Industrial minerals	2
Non-nuclear fuels	2
Nuclear fuels	2

Taxation for the income from exploration and mining companies is done according to the **Income Tax Act, 1981 (Act 24 of 1981)**. There is no restriction on repatriating profits for foreign investors. Namibia Revenue Agency (NamRA) is the nation's tax-collecting authority, while MME is the Royalty collecting authority.

The **Export Levy Act 2 of 2016** to provide for the imposition of an export levy on certain goods to improve Namibia's value share in its resource base, to encourage further processing or beneficiation of or value addition to such goods, to support national or regional industrial development, to promote the

development of regional value chains and to meet revenue needs; and to provide for incidental matters. The export levy is higher for raw minerals than for processed or finished goods.

There are laws in place that allow for adequate protection of the rights of investors. The state may lawfully expropriate property owned by foreign national in the public interest, provided that it is done in accordance with the law. Findings show that value addition plays a huge role even in cases of expropriation, as people who add value to their property are well compensated.

Namibia's **National Special Economic Zone Policy (SEZ)** expands and subsumes the existing **Export Processing Regime (EPZ)** by strengthening key provisions, such as expanded sectoral focus and a transparent monitoring and evaluation framework. The SEZ policy was finalised and adopted in August 2022 but the SEZ Act will only be enacted in 2023. The expected outcome of the National Special Economic Zone Policy is to bring about successful industrialisation. The Ministry of Industrialization and Trade (MIT) will review the SEZ policy every five years to incorporate new market dynamics and developments. The SEZ expects to yield the following outcomes: A regulatory framework that optimises the development and attainment of an inclusive SEZ regime in Namibia; a regionally balanced operation of SEZ across Namibia; attraction of both, qualitative and quantitative investments into the SEZ across industrial and services sectors; fostering key cross-border regional and bilateral value chains development through SEZ; creation of industrial hubs and technical skills development, and enhanced developmental impact of the SEZ regime. The SEZ policy has made a provision for both fiscal and non-fiscal investment incentives for various investment categories among others, exporters and manufacturers. Some of the identified, but not limited to, incentives are: lower Corporate Income Tax rates; reduced import duties/customs tariffs; Capital Deductions Allowance; Research and Development Allowance; establishment of One-Stop Shop to support the facilitation of incentives for investors in the SEZ; Competitive Utility Tariffs; and supportive and directed approach to provision of visa for non-resident foreign investors.

The Income Tax Amendment Act, 2020 repealed the provisions relating to **tax incentives** for manufacturers. These special income tax incentives granted to registered manufacturers by the time of the amendment in 2020, in relation to the above will continue to apply until the end of the 2025 tax year in respect of each registered manufacturer. The Ministry of Industrialisation and Trade, the Ministry of Finance and Namibia Investment Promotion and Development Board (NIPDB) are in the process of developing new incentives schemes for various investments outside the Special Economic Zones. The new incentives scheme is expected to be in place together with the **Special Economic Zones Incentives Scheme** by mid-year 2023.

4.1.5. Land-use and mineral rights

There are four main categories of land in Namibia, namely:

- State land (land owned by the State and used for nature conservation or military bases;
- Urban land (this land can be owned by the State, by a local authority or by private individuals inside the boundaries of local and regional authorities;
- Commercial farmland (this is agricultural land held under a freehold title) and
- Communal land (land held in trust by the State for the benefit of the communities living on it).

Mineral explorers have to negotiate a contract with landowners to gain access for exploration or mining purposes. Communities have also expressed a desire to have a share of the fees paid to the Government regarding communal land used for mining purposes.

If disputes arise, the **Minerals Ancillary Rights Commission (MARC**) offers an opportunity to implement a cooperative and consultative process between mineral explorers and landowners (MME 2023). The MARC is regulated by the Minerals (Prospecting and Mining) Act and makes provisions for agreement between landowners and mineral explorers. To further empower the MARC, there is a need to develop guidelines to assist in settlement of land disputes.

Public protests against extractive operations are allowed in Namibia, but relatively scarce. In cases where these protests have occurred, it was mostly due to water use conflicts (e.g., impacts on water availability and quality) or labour disputes (e.g., strikes, wages, health and safety).

4.1.6. Environment

Namibia is one of the few countries incorporating environmental sustainability in her constitution. The government institution responsible for the protection and management of Namibia's natural environment is the **Ministry of Environment and Tourism (MET)**. The **Department of Environmental Affairs (DEA)** is responsible for granting Environmental Clearance Certificates (ECC), the administration of Environmental Impact Assessments (EIA), and enforcement of regulations such as on pollution control and waste management). A valid ECC is required for the application for various mining licences and licence renewals. The DEA is also responsible for ensuring that mining companies comply with the EIA-related obligations that allow them to maintain their exploration or mining licence, through regular monitoring and inspection.

The environmental aspects of the mining life-cycle are governed by the **Environmental Management Act No 7, 2007 (EMA)** and the **Environmental Impact Assessment Regulations: Environmental Management Act, 2007 (EIA)**. This includes exploration, construction, production, closure and post-closure.

In addition to the EMA and EIA Regulations, the following key laws and policies play an important role in the environmental aspects of the mining cycle:

- Environmental Assessment Policy, 1995
- The National Drought Policy and Strategy, 1997
- Namibia's Climate Change Policy, 2011
- Nature Conservation Ordinance, 1975

The EMA and its regulations are vital to the environmental management of Namibia's natural resources and the MET proactively continues to try to improve upon it. These regulations include the requirements around the development of Environmental Impact Assessments (EIAs) and Environmental Management Plans (EMPs), as well as The Environmental Clearance Certificate (ECC) process. Special and stringent conditions are placed on ECCs for projects with high or significant social or environmental risks. The EMP should include measures to be taken to eliminate, offset, or reduce to acceptable levels adverse environmental impacts of mining across the mine life-cycle (EMA, 2007).

Through the EIA process, the EMA requires that mining companies identify and minimise their operations' local and transboundary impacts. Continued pressure from the public and interested and affected parties

helps reinforce the importance of companies consistently working to prevent adverse environmental impacts beyond their mines' boundaries. The effluent permitting process for mining entities is inconsistently applied; some companies have the permits required to ensure that the quality and quantity of mine effluent discharged into the environment is managed and treated to meet established effluent discharge guideline values. In contrast, others can operate without these permits.

Depending on the size of the operation, the following mining activities require an EIA: mineral exploration, mine development and exploitation, landfilling and mine closure/reclamation. The EMA empowers the Environmental Commissioner to monitor compliance with the act and conditions stipulated in ECCs. An EMP must be developed and submitted as part of the ECC application and reviewed and resubmitted every three years for the renewal of the ECC. The monitoring of the environmental performance and the enforcement of environmental provisions is fairly good. However, this is not the case in the case of ASM. The legislation dealing with environmental issues in terms of ASM is fragmented (Leonard et al, 2011).

There are a number of no-go areas for mining in Namibia. Namibia's mineral endowment implies that mining and the environment will continue to interact and hence the need to work together to achieve prosperity in a sustainable manner. The legislation does not offer adequate protections for biodiversity in the face of mine construction and operation. The **Forestry Act No. 12, 2001** provides provisions for removing vegetation and protected trees. At the same time, the draft **Parks and Wildlife Bill** would address biodiversity holistically but has yet to be adopted.

4.1.7. Societal and community aspects, cultural heritage

The Environmental Management Act, through the EIA regulations, caters to what to do should archaeological or fossil remains be encountered during mining activities. Extraction projects may affect tangible or intangible cultural heritage sites, such as archaeological sites or sites of spiritual value. The EIA addresses the protection of cultural heritage and national monuments in the permit application process. The **National Heritage Act No. 27, 2004,** is the law dealing with protecting such cultural heritage.

The **National Policy on Prospecting and Mining in Protected Areas (2018)** aims to ensure that exploration and mining within protected areas are undertaken within the environmental and economic regulatory framework that exists and that mineral development only commences in these protected areas once the impacts have been assessed. This policy also aims to develop integrated and sustainable prospecting and mining in Namibia to support economic growth, whilst maintaining the integrity of ecosystems and natural resources, and avoiding degradation of areas highly sensitive for their ecological, social and/or cultural heritage value. Based on the best available information, the Policy also establishes "no-go areas" where exploration and mining will not be permitted due to high conservation and/or aesthetic land tourism value. Mining activities are only allowed in these areas under conditions of strict environmental management and after the completion of a full EIA.

4.1.8. Public health and safety

Extractive operations can have significant off-site effects and impacts. To a great extent, these are covered by the relevant environmental legislation. Still, other bodies of legislation, such as the Labour Act for Namibia's case, may cover certain aspects. There is no legislation governing noise and dust pollution in

Namibia. The country relies on the South African National Standard (SANS) and South African guidelines without these laws.

Mining-related traffic on public roads is regulated under the Road Traffic and Transport Act 22 of 1999. Potentially affected stakeholders are consulted and involved in developing and maintaining emergency preparedness planning. There are set requirements for public disclosure and access to information, at least for the immediate communities, of the possible dangers or health impact in place (should there be, e.g., dam failure or a release of contaminated dust or water into the environment, etc.). Currently, community members are not monitored for potential long-term health impacts, but compensation schemes for road and workplace injuries or accidents are in place.

4.2. Mining practices *vs.* Environmental, Social and Governance (ESG) goals

4.2.1 Environmental challenges

On the strength side, Namibia boasts a robust legal framework that aligns with international laws, agreements, conventions, and standards in several key areas. These include the Environmental Management Act (EMA) No. 7 of 2007, Environmental Policies and Regulations of 2012, the Mineral Act (Prospecting and Mining) 33 of 1992, Mineral Policies and Regulations, the Corporate Governance Act (the Companies Act of 2004), and the NamCode (2014). Notably, Namibia's recent acceptance into the United Nations Water Convention marks a historic milestone as it becomes the first Southern African country to join. However, despite the commendable legal framework, there are significant challenges stemming from issues such as institutional capacity and coordination that pose obstacles to effective implementation. Regarding environmental management and protection, Namibia's comprehensive legal framework includes the Environmental Management Act (EMA) No. 7 of 2007 and its associated Environmental Impact Assessment (EIA) regulations, which are essential for safeguarding the environment.

Nonetheless, this study has identified various challenges and gaps within the mineral sector, particularly concerning ESG reporting and performance metrics. The most notable among these challenges, although not limited to, include the following:

Lack of Coordination among Oversight Institutions

In May 2023, the Namibian Parliamentary Committee on Natural Resources conducted an assessment and concluded that there is a notable lack of coordination between the Ministry of Environment, Forestry, and Tourism (MEFT) and the Ministry of Mines and Energy (MME) in fulfilling their respective duties and responsibilities. Furthermore, the monitoring of performance and compliance by companies with existing regulations and policies by state competent agencies and authorities is a rare occurrence and largely contingent upon the budgetary or financial constraints faced by the relevant institutions and authorities. This includes bodies such as the Environmental Commissioner and Environmental Inspectors, as well as the Mining Commissioner and Mine Inspector(s).

No Provision for Land Access to Environmental Assessment Studies

A critical component of the Environmental Impact Assessment (EIA) process involves independent environmental assessment practitioners who conduct EIA studies on behalf of project proponents. However, both the Environmental Management Act (EMA) and EIA Regulations do not include provisions that guarantee unrestricted land access for these independent assessment practitioners conducting assessments for project proponents, particularly mineral companies. Consequently, some environmental assessment firms or practitioners may face challenges in executing comprehensive EIA processes as mandated by the law.

These challenges primarily revolve around difficulties in gaining access to entire areas that need to be assessed and contacting all relevant interested and affected parties for proposed projects. Issues related to personal information (privacy) and the limitations posed by connectivity issues can hinder the full execution of these assessments. Consequently, such challenges can lead to conflicts and delays in project implementation, ultimately deterring investment, limiting job opportunities, and impeding economic growth.

4.2.2 Socio-economic issues

Communities are affected by extractive operations in a wide variety of ways. There can be both positive and negative impacts. Local communities are sometimes supported by mining companies once mining activities have ceased in their area.

The Environmental Impact Assessment regulations outline the processes for public participation. There are no requirements in the Minerals Policy for building the capacities of communities to understand the potential environmental and socio-economic impacts presented during the EIA process. Some stakeholders are generally well-informed, but while the main socio-economic focus of the mining sector tends to be job creation, there is often limited information on other socio-economic factors, such as gender inclusivity or the promotion of local content.

There are no specific regulations related to the involvement of local communities in perceiving economic benefits or incentives for mining activities. The Minister can impose special conditions before granting a mining licence or EPL, including provisions to improve Namibia's socio-economic context. Socio-economic planning is integrated into the EIA process but it is not reported regularly. Mining permits and licence applicants must also identify their mining project's socio-economic benefits and include them in their submissions.

Child labour is not prevalent in the ASM sector in Namibia. Before the start of the any mining activities on a specific land, local communities are often supported by specific measures or programmes. This however not the case in the case of ASM.

Namibia is a signatory to the following international regulations: Universal Declaration of Human Rights (1990), United Nations (UN) Convention on the Elimination of All Forms of Discrimination Against Women (ratified 1992), UN Convention on the Rights of the Child (ratified 1990), Freedom of Association and Protection of the Right to Organise Convention (1995), The Right to Organise and Collective Bargaining Convention (1995), The Forced Labour Convention (2000), The Abolition of Forced Labour Convention (2000), The Worst Forms of Child Labour Convention (2000), The Minimum Age Convention (2000), The

Discrimination (Employment and Occupation) Convention (2001), The Equal Remuneration Convention (2010).

Mining companies are also encouraged to engage in Corporate Social Responsibility/Investment (CSR/I) initiatives and programs on voluntary basis. CSR/I is also encouraged in the Minerals Policy of Namibia. According to the Chamber of Mines, between 2017 & 2022 mining, development and exploration companies contributed N$837.9 million worth in the form of CSR activities (Chamber of Mines, Annual Reviews 2017-2021). Figure 2 shows the annual corporate social responsibility contribution by mining, development and exploration companies in Namibia.

The data on CSR is not available for the overall mining industry nor for ECRM alone but only for members of the Chamber of Mines. There are a number of companies such as Dundee Precious Metals Tsumeb (DPMT) and AfriTin Mining (Namibia) - Andrada Mining (Pty) Ltd that are part of the ECRM and whose CSR activities are documented.

4.2.3 What would be the best practices for a responsible mining?

The requirements for ESG in the mining sector of Namibia were formulated in accordance and in alignment with international standards and best practices of ESG. This was also done in line with Article 144 of the Constitution of Namibia, which provided for enabling mechanism to ensure that all international treaties and protocols are ratified.

Accordingly, Namibia signed and ratified numerous international agreements, protocols, conventions and commitments relevant to ESG principles and requirements with regards to its mining sector. These international laws, protocols and conventions include but are not limited to:

- The Southern Africa Development Community (SADC) Protocol on Mining, and Southern Africa Development Community (SADC) Protocol on Energy.
- The UN Framework Convention on Climate Change (ratified 1995).
- The Paris Accord (2016).
- The Convention on Biological Diversity (1997).
- The Ramsar Convention on Wetlands (1995),
- The UN Convention to Combat Desertification (1997).
- The Convention on the Illegal Trade in Endangered Species of Wild Fauna and Flora (1990, accession).
- The World Heritage Convention, 1972.
- The Vienna Convention for the Protection of the Ozone Layer, 1985.
- The Montreal Protocol on Substances that Deplete the Ozone Layer, 1987.
- The Kyoto Protocol on the Framework Convention on Climate Change, 1998.
- The International Convention for the Prevention of Pollution from Ships, 1973 (MARPOL) and its subsequent regulations relating to preventing pollution.
- The Minamata Convention on Mercury in 2017.

Namibia also supports several international Human Rights conventions and declarations. These include but are not limited to:

- The Universal Declaration of Human Rights (1990).
- United Nations (UN) Convention on the Elimination of All Forms of Discrimination against Women (ratified 1992).
- UN Convention on the Rights of the Child (ratified 1990).

Namibia is also committed to several international conventions, which include but are not limited to:

- The Basel Convention for Controlling Transboundary Movements of Hazardous Wastes and their Disposal (1995, accession).
- The Stockholm Convention on Protecting Human Health and the Environment from Persistent Organic Pollutants (2005, accession), and,
  The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (2005, ratification).

Furthermore, Namibia is a member of the International Labour Organization (ILO) and it has ratified all the eight (8) ILO fundamental conventions: These include:

- The Freedom of Association and Protection of the Right to Organise Convention (1995).
- The Right to Organise and Collective Bargaining Convention (1995).
- The Forced Labour Convention (2000).
- The Abolition of Forced Labour Convention (2000).
- The Worst Forms of Child Labour Convention (2000).
- The Minimum Age Convention (2000).
- the Discrimination (Employment and Occupation) Convention (2001), and,
- The Equal Remuneration Convention (2010).

The Namibian Chamber of mines states, that it will be implementing an ESG strategy that seeks to achieve a common understanding of ESG principles and its objectives across industry. The Chamber believes that a central approach has become necessary to ensure that ESG strategies have the maximum beneficial impact on the socio, economic, and environmental spheres in which mining companies operate. An additional goal of pursuing a unified approach to ESG matters is to promote and rebuild the international brand of Namibian minerals, which seeks to represent sustainable and responsible mining practices." - Veston Malango, CEO of the Chamber of Mines.

5. Business network between the European Union and Namibia

5.1. Assessment of the upstream and downstream business ecosystem

Since becoming a sovereign state, Namibia has had preferential access to the European market. Today all Namibian exports to the European Union enter the market duty-free and quota-free.

According to the European Union, Namibia's trade balance with the EU is positive. In 2013, Namibian exports to the EU had a value above 12 Billion Namibia Dollars and the value of imports from the EU was less than 10 Billion Namibia Dollars resulting in a surplus of export earnings of more than 2 Billion Namibia Dollars.

5.1.1 Context, formal and informal players

The Namibian mining sector is dominated by industrial mining. ASM is mostly carried out on coloured gemstones, but also on some lithium minerals, especially during the phase of extremely high lithium prices, starting in 2021-2022. As described in chapter 1.3, centralized processing facilities are also widespread in Namibia's small-scale mining sector, particularly for copper, where they serve as key hubs for receiving bulk ore from multiple small-scale mining sites. Centralized processing facilities in the small-scale mining sector play a crucial role in enabling small-scale miners to access processing capabilities that would otherwise be economically unfeasible for individual operations. By consolidating ore from multiple mining sites, these facilities increase efficiency and reduce costs for small-scale miners. Figure 2 shows the location and operational status of processing facilities and refineries in Namibia. In certain instances, large-scale mining operators have established purchasing systems to facilitate the acquisition of ECRM commodities from small-scale miners. These systems are designed to procure the necessary raw materials from small-scale miners to supply their own processing plants. In certain instances, large-scale mining operators have established purchasing systems to facilitate the acquisition of ECRM commodities from small-scale miners. These systems are designed to procure the necessary raw materials from small-scale miners to supply their own processing plants.

The key institution governing the mining sector of Namibia is the Ministry of Mines and Energy (MME). MME is responsible for:

- Attracting private investment in resource exploration and development through the provision of geological and geochemical information on minerals and energy resources, as well as through the management of an equitable and secure system of licences for the mining, energy and geothermal industries.
- Regulating the industries and ensuring that health, safety and environmental standards are in place and consistent with other Namibian legislation, policies and regulations
- The collection of royalties from the mining and energy sectors; upon collection, the royalties are transferred to the national treasury.

In addition to the MME, the following key government stakeholders in the management of the mining sector are: The Ministry of Environment and Tourism (MET), Ministry of Finance (MoF), Ministry of Industrialisation, Trade and Small and Medium Sized Enterprise Development (MITSMED), Ministry of Agriculture, Water and Forestry (MAWF), the Ministry of Fisheries and Marine Resources (MFMR), the Ministry of Gender Equality and Child Welfare, the Ministry of Health and Social Services, the Ministry of Labour and Social Welfare, and the Ministry of Justice and the National Planning Commission.

5.1.2 Relationships at local or regional levels

Since the early 2000 years, the EU has been promoting a new type of regional, multilateral trade arrangement, known as the Economic Partnership Agreements (EPAs). EPAs are comprehensive trade and development agreements and their objectives are to reduce poverty, diversify economies and create employment through enhanced intra-regional integration and a carefully managed opening towards the world economy. EPAs are compatible with the requirements of the World Trade Organization. They provide benefits for the EU's partner countries that are not matched by any other trade agreements worldwide.

Namibia has participated in EPA negotiations with the EU and other Members of the SADC- EPA Group, namely Lesotho, Mozambique, Botswana, South Africa and Swaziland. On July 6, 2016, the National Assembly of Namibia ratified the Economic Partnership Agreement. Within the framework of this Agreement Namibia will maintain its duty-free and quota-free access to the EU market, along with enhanced regulations on accumulation, protection for emerging industries, safeguards, and other measures that take into account Namibia's development stage and its goal of strengthening its economic integration within SADC and Africa. At the same time, the EU will benefit from improved access to the Namibian market, for the benefit of consumers and investors.

According to the European Commission (2023), Namibia and the EU signed a Memorandum of Understanding establishing a strategic partnership on Sustainable Raw Materials Value Chains and Renewable Hydrogen. The operational roadmap, launched and endorsed today and for the upcoming period 2023–2025, details the concrete actions in which the partnership will advance its goals, in close cooperation with EU and Namibia financial and private sector stakeholders.

Namibia's Economic Regional Organizations

Namibia’s regional integration and bilateral trade agreements have aided in achieving the country’s trade missions and economic goals. The following are some of the groups and organizations that are integrated with Namibia:

Southern African Customs Union (SACU)

The Southern African Customs Union is the world’s oldest existing customs union with a history stretching back to 1910. When Namibia joined in 1990, SACU consisted of four members: Botswana, Lesotho, Switzerland, and South Africa.

The defining feature of the customs union is that all member countries apply the same customs tariff on all goods entering from outside the SACU region. This means that there are no variations in tariffs among

member countries and that any goods entering from outside the region are subject to the same tariffs regardless of which SACU country they enter first. Hence why most of Namibia's commodity exports are exported to South Africa.

In addition to the common external tariff, SACU member countries also impose no customs tariffs on goods entering from other SACU members. This means that goods produced within the SACU region can move freely between member countries without any additional taxes or fees imposed at the border. The customs union also includes provisions for the coordination of trade policies and the sharing of revenue generated from the common external tariff.

As a result of these policies, the regional market becomes more integrated, allowing enterprises to benefit from economies of scale, lower transaction costs, and better access to a wider consumer base. It also contributes to the promotion of economic cooperation and coordination among SACU member nations, as well as ensuring that the benefits of regional integration are shared by all member countries.

Southern African Development Community (SADC)

The Southern African Development Community (SADC) was formed out of the Southern African Development Coordination Conference (SADCC). Each country has export restrictions on specific commodities that benefit local communities, economies, and the environment. Namibia restricts certain mineral exports under its strategic mineral policy, aiming to promote sustainable exploitation, value addition, and protect strategic resources.

Many African countries depend on mining for economic growth and livelihood. In 1997, SADC launched the 'Protocol on Mining' whose aim was to develop the region's mineral resources through international collaboration, in turn improving the living standards of the people engaged with the mining industry. Likewise, the Protocol on Mining prompted several Member States to sign bilateral agreements with countries outside SADC, which has boosted investment. It is against this backdrop that Heads of State and Government of SADC countries decided to develop and harmonize the legislation in the mineral sector for the region as a whole, hence the development of the Protocol on Mining.

The Southern African Development Community Protocol on Mining was signed on September 8, 1997 and entered into force February 10, 2000. The protocol in terms of mining is to grow the mineral industry in Southern Africa, encourage private sector developments, including small-scale projects that promote economic empowerment of those who have been historically disadvantaged in the mining sector. The organization was established in an attempt to reduce the economic stranglehold of apartheid South Africa and one of the early goals achieved was creating infrastructure in all member countries – ports, roads and railways.

The Member States acknowledge that mining can lead to economic development, poverty alleviation and improvement of living standards. They agree to harmonize national and regional policies related to mining and bear their own costs of participation in the implementation of the Protocol. All decisions related to the Protocol will be made by consensus. The Member States will cooperate to develop human and technological capacity, encourage private sector participation in mining, and promote economic

empowerment of disadvantaged groups. They will also improve public information availability and observe international standards for health, safety, and environmental protection.

African Growth and Opportunity Act (AGOA) and the United States of America (U.S.)

The African Growth and Opportunity Act (AGOA) is a U.S. initiative to assist the economies of Sub-Saharan Africa and improve their trade relations with the U.S. AGOA builds on existing US trade programs by expanding the duty-free benefits previously available only under the Generalized System of Preference (GSP).

The Namibian sectors that are involved currently in exports to the U.S under the AGOA arrangement are the following: 'forest products', 'chemicals and related products', energy-related products, fisheries, textiles and apparel, minerals and metals, machinery, transportation equipment, electronic products, miscellaneous manufactures and special provisions. Namibia's exports were further enhanced by AGOA II, which allows Namibia to benefit from the 'lesser developed beneficiary Sub-Saharan African country' provision.

Overall, these trade restrictions aim to balance the benefits of the mining sector with the needs of the local population and the environment. While they may create some challenges for mining companies, they also provide opportunities for local businesses and job creation.

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5.2. Building new B2B relations

5.2.1 Promoting local content and enabling mining cluster actors

Relevant institutions for the development of a Namibia-focused critical minerals network

The most relevant "institutions" would be large/industrial scale exploration and mining companies, as they bring in, foster and demand well trained professionals in various fields of the mining industry.

These companies are usually members in the Chamber of mines, which has a committee dedicated identifying critical areas for skills development and training in the mining sector. This network can also carry the needs of mining and exploration companies to the state institutions and the public to show the needs of the mining industry, to demonstrate the importance and the potential of the mining industry to Namibia and also to build a network of companies and employees, to support each other and to learn from each other. Although there already is a relatively good network of Namibian professionals in the mining sector due to the size of Namibia and the limited number of institutions for higher education.

The mining industry is also an important factor for capacity building. In 2022, the Namibian mining industry spent N$196 million on training and skills development. This included expenditure on:

- Internships
- Bursaries and scholarships
- Health and safety training
- Leadership, Management and Supervisory Development

- Machine operation competency
- Supply chain
- Compliance training
- Water resource management training
- First aid training

Academic institutions and other training establishments in the field of geosciences and mining

The key Higher Education Institutions and vocational centres are:

- **Namibia University of Science and Technology** (NUST): NUST offers undergraduate and postgraduate programs in mining-related disciplines, including mining engineering, metallurgy, geomatics (NUST, 2023).

- **University of Namibia** (UNAM): The University of Namibia's school of science offers various science, technology, engineering and math (STEM) programs relevant to the mining industry. The programs offered include mining engineering, geology, environmental management science and geo-information science (UNAM, 2023).

- **International University of Management** (IUM): IUM offers undergraduate and postgraduate programs in Environmental management-related disciplines, including environment management and sustainable development (IUM, 2023).

- **Vocational training Centres**: Vocational training centres in Namibia provide an opportunity for individuals to gain skills for employment in the formal market. The programmes offered include boiler making, electrical engineering, welding and metal fabrication. Namibia has seven vocational training centres in different regions under the NTA (Public) offering fulltime, distance, part time and special training. In addition, Namibia has 56 private vocational training institutes. The Namibia Institute for Mining and Technology (NIMT) is a vocational training institution offering courses and programs in mining-related disciplines, including autotronics, boiler maker, diesel mechanic electrical & fitting and tuner. Its key object is to provide skilled manpower for the mining industry (NIMT, 2023). NMT offers both fulltime and special training courses.

6. Energy and digital transition: develop a strategy for the EU and Africa Partnership

In November 2022, Namibia launched the "Green Hydrogen and Derivatives Strategy" which sets out Namibia's action plan in establishing itself as a major global hydrogen producer. The strategy foresees the creation of three hydrogen valleys in the southern region of ||Karas, the central region (which includes the port of Walvis Bay and the capital Windhoek), and the northern region of Kunene. These regions and locations coincide with the regions of high ECRM mining activity. Namibia's potential to produce green hydrogen and derivates is estimated at 10-15 million tonnes per annum by 2050. The strategy also envisions the creation of common user infrastructure (CUI) which includes overland transmission lines, water infrastructure, hydrogen pipelines, ancillary infrastructure and an industrial port complex. Consequently, an opportunity exists for the ECRM mining sector to utilize the CUI to its advantage. Furthermore, green hydrogen presents a substitute for fossil fuels by enabling the transition to hydrogen-powered mining fleets. Hyphen (a German – British consortium) won a government-hosted competitive tender to build the project, but will not officially be given the rights until it concludes a feasibility study and signs a construction contract with the government. The first phase, which is expected to enter production in 2026, will see the creation of 2GW of renewable electricity generation capacity to produce green hydrogen for conversion into green ammonia, at an estimated capital cost of US$4.4bn (Hyphen 2023). Further expansion phases in the late 2020s will expand combined renewable generation capacity to 5GW and 3GW of electrolyser capacity, increasing the combined total investment to US$9.4bn.

EU-Namibia strategy on green hydrogen

For the EU, raw materials and renewable hydrogen value chains are critical to the green and digital transitions. They are essential for the deployment of critical technologies like wind turbines (with rare earth magnets) and semiconductors (polysilicon). Similarly, renewable hydrogen technology supports the decarbonisation of hard to abate sectors and energy intensive industries.

The EU needs to secure a sustainable supply of raw materials, especially critical raw materials, as an essential prerequisite for delivering on green and clean energy objectives. As part of the Action Plan on Critical Raw Materials, the Commission has already started working to build partnerships with resource-rich third countries, making use of all external policy instruments and respecting its international obligations. In the margins of the EU-Africa Summit in February 2022, President von der Leyen and Mr Hage Geingob, President of Namibia, discussed the establishment of a partnership on sustainable raw materials value chains and renewable hydrogen, as one of the key flagships of the Global Gateway strategy. The partnership aims to ensure the development of a secure and sustainable supply of raw materials, refined materials and renewable hydrogen to support the green and digital transformation of the partners' economies. It deepens the cooperation in areas with mutual benefits for both parties. The partnership will promote local value addition in Namibia by supporting the development of the mining and renewable hydrogen value chains. It will support sustainable raw materials value chains and facilitate investment and funding opportunities to modernise the Namibian industries and drive economic and social development.

The partnership contains six main pillars:

- Integration, where feasible, of raw materials and renewable hydrogen value chains, including networking, new business models and promotion and facilitation of trade and investment linkages;
- Cooperation to leverage Environmental, Social, and Governance (ESG) Criteria and align with international standards;
- Mobilisation of funding for the development of soft and hard infrastructure required for projects development and for leveraging private sector funding through cooperation to address trade matters, including inclusiveness, and improving investments on climate action;
- Capacity building, training and skills development along raw materials and renewable hydrogen value chains;
- Co-operation on research and innovation along the raw materials value chain, including on mineral knowledge and circularity, hydrogen technologies and skills;
- Regulatory alignment, standards and certification.

Risks

A main risk may be to hire the estimated 3000 people, who will work in the facility, due to the limited workforce in Namibia with its below 3 million inhabitants. Another risk in terms of hydrogen production is the capital expenditure and operating costs. Industrial production in such a scale, as envisaged has never been done before and although the process should be scaleable, it is not clear, weather the production of wind energy during the nights is sufficient to compensate the solar energy, which cannot be produced during the night. This could probably lead to higher than expected costs and lower than expected production.

National strategy

Namibia uses a Modified Single Buyer model which allows transmission electricity consumers to directly procure up to 30% of their energy requirements from Independent Power Producers (IPPs). Mining companies have an opportunity to reduce their carbon footprint by shifting to renewable energy either through purchase agreements with green energy producers or by setting up their own green energy schemes. In Namibia, non-ECRM mining companies such as B2Gold and Rosh Pinah Zinc Corporation have initiated solar parks to meet their power needs.

The rising use of renewable energy sources is one significant development in Namibia's mining industry. Solar and wind energy are gaining prominence as viable alternatives to reduce dependence on fossil fuels and mitigate greenhouse gas emissions, leveraging Namibia's abundant sunshine and strong winds. Namibia uses a Modified Single Buyer model, which allows transmission electricity consumers to directly procure up to 30% of their energy requirements from Independent Power Producers (IPPs). A few mining companies in Namibia have already embarked on renewable energy initiatives. In addition, the government of Namibia also intends on expanding its power generation capacity with renewables. All

these initiatives involve the installation of solar panels and wind turbines to power their operations. Some of the operations with existing or planned green energy plants include:

- Tshudi Copper Mine: The Tschudi copper mine owned by Weatherly international corporation, has constructed a 1.5MW solar power plant to supply electricity to the mine.
- Lofdal Heavy Rare Earth Project: The project is being undertaken by Namibia Critical Metals and aims to integrate both solar and wind energy sources to supply the envisioned mine with electricity.
- Rosh Pinah Zinc Mine: The Rosh Pinah Zinc Mine has constructed a solar power facility with a capacity of 1.2 MW.
- Otjikoto Gold: The Otjikoto gold mine, owned by B2Gold has constructed 2.5 MW wind farm for electricity supply.
- Southern Coastal Mines: Namibia's biggest land diamond operator, Namdeb, intends on establishing a 34MW wind energy facility to replace up to 50% of its current high-carbon electricity footprint.
- Rossing Uranium Mine: The company plans to construct a 15MW Solar power plant.
- Namibian government: Namibia plans on expanding its power plant capacities to 1,677 MW by 2035. 42% (708.5 MW) of these planned capacities will be derived from renewables with a mix of wind, photo-voltaic, biomas and concentrated solar power. To date a total of 199MW renewable energy plants have been built.

Mining Sector Specialized Institutions (MSFI) can be specialized in raising green and sustainability bonds that are specifically focused on the mining sector. These bonds can attract environmentally conscious investors and fund projects with a strong sustainability focus. The green revolution and the shift toward a low-carbon economy necessitate the use of metals and minerals. However, to ensure the success of this transition, it is crucial that these resources are extracted, processed, and recycled in an environmentally sustainable manner.

Investors and financiers are increasingly interested in green and sustainable investments. The pressing issues of climate change and environmental concerns like air and water pollution are now seen as systemic risks. Governments, regulatory bodies, central banks, and insurers are acknowledging these risks, which may lead to higher financing costs for unsustainable ventures.

The green bond market, though still a relatively small segment of global bond markets, is experiencing rapid growth. In the first half of 2019, more than $100 billion worth of green bonds were issued. However, there's a growing recognition that for this sector to continue expanding and, more importantly, to support and facilitate the transition to a greener economy, traditionally "brown" industries like mining must be able to access green and sustainability-linked financing.

Mining investors and financiers now demand adherence to global standards like the Equator Principles and IFC Performance Standards, irrespective of local regulations. Rather than viewing enhanced transparency and reporting as a hindrance, increased ESG (Environmental, Social, and Governance) reporting can open doors to "sustainability-linked" financing. This can involve loan facilities where the interest rate is tied to the achievement of specific ESG key performance indicators (KPIs), verified by an independent third party.

Instances of this approach being employed in the mining sector include Rusal's recent $1 billion sustainability-linked syndicated pre-export finance facility and Polymetal's sustainability-linked loans signed in partnership with ING in 2018 and Société Générale in 2019. To engage in such financing, third-party evaluators and sustainability ratings agencies require transparency and disclosure to effectively assess performance against ESG criteria. Sustainability-linked lending is recognized as one of the fastest-growing debt asset classes in 2019, according to Bloomberg. This presents an opportunity for Namibian mining companies to access such top-tier financing through the establishment of a dedicated Namibian MSFI.

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7. Opportunities for responsible investments

The biggest investment opportunities in the ECRM value chain might be given in the further processing of concentrates of ECRMs, which should be focussed on lithium (close to production start at Andrada Mining's operation) to lithium carbonate and to produce mixed rare earth oxides from concentrates from the planned rare earth mine of Namibia Critical Metals (Lofdal Project). Tin from the Uis Mine could also be smelted in the country, but this process step consumes relatively much electrical energy. There is no single investment opportunity in Namibia like a planned smelter or processing facility for ECRMs with direct investment need, except the mining and processing project of the Lofdal rare earth project, which is financed by the Japanese state owned company JOGMEC, which would also take off the produced rare earth mixed oxides – meaning that it already got founding. In general the biggest value addition in mining is coming from the mining and concentration at the mine itself. The net smelter return (NSR) for base metals – the percentage of money a mining company receives from a smelter minus transport and fees – is usually above 60 %, reaching values of up to 80-90 % (for copper and nickel concentrates with a short or cheap transport route). This does not mean that a country should concentrate on mining only, although this is the single biggest value addition in the value chain. Further processing usually includes higher educated workers and more employment. Additionally, it is opening the doors for a downstream industry.

7.1. Identification of individual exploration, mining and refining projects

At the level of individual exploration, mining or refining projects, the BGR will prepare the following fact sheets for Namibia as potential investment opportunities. These fact sheets are presented in Task 7.2 (Work Package 7):

1. Uis (Li, Sn, Ta)
2. Eureka (REE)
3. Karibib (Li, Sn, Ta)
4. Tsumeb (Ge recovery from copper slag)

In addition, Odikwa Geoservices has prepared fact sheets for the following projects as a contribution to this country case study:

Opuwo Co-Cu-Zn Project. The Opuwo Cobalt Project is the first significant cobalt discovery in Namibia. Rio Tinto (RTZ) worked in the area around 1992/1993 and identified the "SD copper-zinc target". RTZ drilled five boreholes into the unit of which four boreholes were assayed for copper, zinc, and lead only. The economic potential of cobalt mineralisation was first recognized by Kunene Resources (Rainer Ellmies) during reconnaissance in 2012.

Tsongoari Pb-Zn-Cu-Ag-Ba Deposit. The Tsongoari SEDEX deposit was discovered in 1973 by Sarusas Development Corporation, who, together with General Mining and Finance Corporation Limited, conducted the initial mineral exploration in the area until mid-1975. Work in the area has since been undertaken by different companies including Rand Mines Limited and Rio Tinto Namibia Limited from the 1980's to early 1990's. The most recent article on the deposit is by Professor Christoph Gauert (2005), which is focused on the geology, versus additional resource work.

Eureka LREE Deposit. The Eureka Light Rare Earth Elements (LREE) deposit occurs in several medium to coarse-grained dolomitic (beforsite) carbonatite dykes with an average thickness of 1-2 m (maximum 7m). The dykes intrude feldspathic quartzites of the Etusis Formation, interfingering with calc-silicate layers of the Khan Formation and are intersected by a tourmaline-bearing pegmatite. In 1960, the carbonatites were interpreted to have been skarn deposits, but later studies by Verwoerd (1967) and Dunai (1989) confirmed the magmatic origin of the Eureka carbonatite dykes. The Eureka carbonatite dykes are located close to the intersection of the Omaruru Lineament with the Welwitschia Lineament Zone, and have an age of 450-500 Ma, separating them from earlier carbonatite and alkaline complexes of the NE-trending Damara Belt.

Aukam Graphite Project. The Aukum Graphite Deposit was discovered by J. Eloff in 1928. The deposit was mined in two stages between 1940 to 1956 and 1964 to 1974. The operations halted in 1956 when the workings were destroyed by fire and ceased in 1974 when the reserves were exhausted. In that period (1940-1974), all the crude ore was sent by rail to South Africa where it was treated and refined.

The Steilrand Manganese and Barite Deposits (SSM). Outcrops of stratiform manganese layers in the Orurio/Olulilwa (company vernacular) area were discovered by Kunene Resources (Rainer Ellmies and Kaarina Ndalulilwa) on 15th June 2013 on a reconnaissance excursion on the western part of EPL4347 (relinquished). The geological literature did not note manganese occurrences in the area. A comprehensive exploration program on the prospect comprising of detailed surface mapping and diamond drilling was undertaken in 2016.

Bitterwasser Lithium Clays and Brines. Arcadia's Bitterwasser lithium in clays and lithium in brines deposits are in central Namibia, east of the town of Kalkrand. The deposits are comprised of lithium, potassium, and boron enriched sulphate-, chlorite- and carbonate- saltpan, within Kalahari Group sediments. The pan sediments are dominated by massive clays, silty-clays, and sandy-clays, within the unconsolidated red-coloured aeolian sands. Coarse sediment increases towards the margins of the pan, while finer sediments dominate the central section, suggesting persistent terrestrial sediment input throughout the pan's development processes of deflation and sedimentation.

Kum-Kum Nickel-PGE (Pd) Project. The Kum-Kum Project is at an early stage of mineral exploration. EPL 7295 covers the Kum-Kum Igneous Complex. The Kum-Kum Igneous Complex consists of rocks with a gabbronorite composition, which are metamorphosed and altered, with significant proportions of green amphibole. Small doleritic dykes crosscut the complex. Gabbros, gabbronorites, and their metamorphic equivalents make up the bulk of the Kum Kum rock library.

Swanson Tantalum-Niobium-Lithium Project. Tantalum mineralisation has been known in the area since the 1940s. There is abundant evidence of historical extraction of economic minerals such as tantalite, beryl, spodumene, and tungsten, from pegmatites on EPL 5047. The remains of permanent structures such as personnel accommodation and a processing plant is still evident. The primary mining was for tantalum which it took place on the shallow dipping pegmatites in the north-western strain shadow of the Tantalite Valley Complex.

Omitiomire Copper Project. The Omitiomire Copper (Cu) Deposit was discovered in the mid-1970s by General Mining and Finance Corporation (GenMin), following on the discovery of malachite occurrences associated with sporadic outcrops of metabasite. Drilling between 1976 and 1978 targeted copper in soil geochemical anomalies but due to the disappointing copper assay results and failure to understand the geology due to the relatively wide spacing of drill holes, it resulted in no work on the project for more than a decade until the rise in copper prices in 1989.

Otjozondu (Otjosondu) Manganese Field. The Otjozondu Manganese Field is the largest known manganese occurrence in Namibia. It is located about 150 km NE of the town Okahandja and covers an area of over 240 km2. The area is relatively flat lying, with limited outcrops, and mostly covered by extensive Kalahari sands. Production has been ongoing since the 1950's at small-scale mining, and ores are un-depleted. Upside potential lies in off-take opportunities, mineral exploration in the underexplored areas and the areas under cover, including possible extensions of current open pit operations.

7.2. ASM sector country profiles

In Namibia, the term "small-scale mining" (SSM) is used as opposed to artisanal and small-scale miners (ASM). SSM refers to mining with minimal machinery and/or simple technology with very low capital requirements (Linus, 2023). Throughout its history, Namibia has been renowned for its diverse range of high-quality semi-precious stones. SSM and prospectors are primarily responsible for extracting these stones, with most mining activities concentrated in three regions: ||Kharas, Erongo, and Kunene (Figure 24). Due to the limited economic feasibility of large-scale mining operations, small-scale miners rely on basic equipment and simple technology to exploit small mineral deposits. Compared to other nations, Namibia's SSM community remains relatively small, largely due to the country's modest population. Approximately 5000 – 8000 Namibians derive their livelihoods from the small-scale mining sector, a notable figure considering the country's population of only about 2.6 million people.

The small-scale mining sector plays a crucial role in Namibia's Minerals Policy of 2002 and is governed by the Minerals Act 33 of 1992 ("Minerals Act"). The Minerals Act regulates the prospecting, exploration, and exploitation of solid minerals throughout Namibia. It encompasses various licenses, approvals, and restrictions that are applicable to the mining sector as a whole, with specific relevance to the SSM sector. The Ministry of Mines and Energy (MME) serves as the regulatory authority for mining activities and has a dedicated division to support SSM operators in all aspects of the mining process. This includes assisting with license acquisition, conducting sample testing, and facilitating mineral export procedures. To address any disputes that may arise, the MME has established the Minerals Ancillary Rights Commission (MARC) as a mechanism for conflict resolution within the SSM sector. MARC focuses on mediating conflicts related to land access between SSM miners and private landowners, particularly when a mineral license area overlaps with privately owned properties. MARC's primary objective is to facilitate agreements that ensure both access to land for SSM miners and appropriate compensation for landowners.

The Minerals Act stipulates that all prospecting, exploration, and mining activities are prohibited without the appropriate license. In the small-scale mining sector, there are two primary licenses:

- Non-exclusive Prospecting License: This license allows the holder to conduct prospecting activities, extract specified minerals listed on the license, and sell them with the approval of the mining commissioner. It does not grant exclusive rights to the designated area, meaning multiple parties can hold non-exclusive prospecting licenses for the same geographic area. As a result, the application fees for non-exclusive prospecting licenses are cheaper than those for exclusive prospecting licenses.
- Mining Claims: This license enables the holder to engage in both prospecting and mining activities, extract specified minerals mentioned in the license, and sell them with the approval of the mining commissioner. Additionally, the holder is permitted to construct supporting infrastructure within the claim area.

SSM licenses are exclusively reserved for Namibian citizens or corporate entities in which only Namibian citizens have ownership. This restriction aims to promote local participation in the mining sector. Compared to licenses for large-scale mining, SSM licenses have lower acquisition costs, quicker feedback on applications, and less stringent technical or financial requirements for applicants. The issuance of SSM licenses is overseen by the Mining Commissioner, who governs the SSM sector, in contrast to licenses for the large-scale mining sector, which are issued by the Minister of Mines and Energy. However, despite the reduced administrative requirements, many SSM operators face challenges in formally registering their sites due to the distant location of the license administrative centre from the mining sites.

Similar to large-scale mining, obtaining an Environmental Clearance Certificate (ECC) is a prerequisite for SSM licenses. The ECC application requires applicants to provide details of the proposed mining activity and assess potential environmental impacts. The ECC requirements have been identified as a barrier to formalizing SSM operations. Acquiring an ECC typically involves significant capital investment, which is often inaccessible to SSM operators. To address this issue, organizations such as the United Nations Development Program have provided funding for district-scale Environmental Scoping Studies in SSM hotspots, facilitating the acquisition of ECCs.

Small-scale mining in Namibia coexists with established large-scale mines. At present, small-scale miners have taken steps to form associations based on regions or mining districts, aiming to advocate for their interests and address their specific needs. As of now, associations have been established in three regions: Erongo, Kunene, and //Kharas. However, in most other regions of the country, small-scale miners continue to operate without formal recognition or association representation. The formation of these regional associations demonstrates the proactive approach taken by small-scale miners to organize themselves and have a collective voice in the industry. It allows them to collaborate, share information, and work towards addressing the challenges they face. The goal is to further expand the formation of associations across the country, ensuring that small-scale miners in all regions have a platform to represent their interests and contribute to the development of the sector. The Ministry of Mines and Energy (MME), in collaboration with Regional and Town Councils, is actively engaged in the ongoing endeavour to formalize a larger portion of these miners. However, it is important to note that the process of formalization is progressing slowly. Efforts are being made to streamline and expedite this process to ensure that small-scale miners across the country receive the necessary recognition and support in their operations.

Conclusion

There are several 100 ECRM prospects in Namibia, covering 16 ECRMs as a primary commodity, but the majority of them will not fit into so called world-class deposits with a major share in the production of a certain commodity. Nevertheless, there are various investment opportunities in several commodities like lithium, tin, rare earths elements, graphite and tantalum in a small to medium scale. Due to the small number of only 3 million inhabitants and thus a small workforce, combined with restrictive working permits for foreign specialists, investing into small to medium size projects can be very attractive in Namibia.

The most interesting mining areas in Namibia are the Kunene Region, which has emerged as a significant mining hub with promising ventures in cobalt, copper, rare earth metals, iron ore, Ni-Cu-(Co-PGE) mineralizations.

The Erongo region in central Namibia is promising to lithium, rare earth elements, tin, and tantalum, offering untapped potentials in a former mining area.

Other investments from the Namibian government like the Southern Namibia Mapping Program (SNMP) shows the commitment of the government to increase the geological database and to attract mining investment. This program seeks to provide deeper insights into the geological formations and structural features that influence mineral deposits within the region, specifically targeting resources such as copper, lead, zinc, uranium, tantalum, niobium, rare earth elements, lithium and tungsten.

Due to its long mining history, Namibia offers a robust legal and fiscal framework for mining and exploration companies. Mining has a huge share in the Namibian GDP of around 10 % in the last years. Compared with the smelting operation in Tsumeb the share of mineral and metal production will be even higher. Mining and mineral products also dominate the exports of Namibia, where their share is 57 %. Although there is such a big contribution of the minerals sector to the economy, there is only one major further processing project in Namibia, the Tsumeb smelter. The government wants to increase further processing in the country, not only for ECRMs, but in general for mineral products and defined the Growth at Home strategy.

This reports also gives an extensive overview about the relatively high taxation environment, but also fair royalty regime and stability in Namibia. There is of course room for improvement in workers' rights and other ESG topics, but besides the access to water, there is not much opposition to mining in Namibia at present. Although Namibia has not yet joined the Extractive Industries Transparency Initiative (EITI), but the country is in the process of establishing a position on joining it. Mining investors appreciate a clear interpretation of regulations and a solid geological database. But they also demand improvement in the sectors of labour regulations, taxation, trade barriers and more predictability about protected areas.

The EU and Namibia want to extend their cooperation and signed a Memorandum of Understanding establishing a strategic partnership on Sustainable Raw Materials Value Chains and Renewable Hydrogen. This planned investment demonstrates the stability and general investment regime in Namibia, which make it possible to attract multi-billion dollar investments.

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References

Blengini, G.A., Latunussa, C.E.L., Eynard, U., Torres de Matos, C., Wittmer, D., Georgitzikis, K., Pavel, C., Carrara, S., Mancini, L., Unguru, M., Blagoeva, D., Mathieux, F., Pennington, D., 2020. Study on the EU's list of Critical Raw Materials (2020). Final report. European Commission, ISBN 978-92-76-21049-8, doi: 10.2873/11619, 158 p.

Kaufmann D., Kraay A., Mastruzzi M., 2010. The Worldwide Governance Indicators: Methodology and Analytical Issues. World Bank Policy Research Working Paper 5430.

Arvis et al., 2018. Connecting to Compete 2018. Trade Logistics in the Global Economy. The Logistics Performance Index and Its Indicators. The International Bank for Reconstruction and Development/The World Bank, 82 p.

Carranza E. J. M., 2017. Natural resources research publications on geochemical anomaly and mineral potential mapping, and introduction to the special issue of papers in these fields. Natural Resources Research 26(4), 379-410.

Hyphen 2023: https://hyphenafrica.com/projects/

World Bank 2023 https://www.worldbank.org/en/country/namibia/overview#:~:text=The%20lingering%20impacts%20of%20the,the%20continued%20recovery%20of%20services., accessed on 24 May 2023

Chamber of Mines, 2022 Annual Reviewhttps://chamberofmines.org.na/wp-content/uploads/2023/04/2022-Chamber-of-Mines-Annual-Review.pdf, Accessed on 6 March 2023.

Geological Survey of Namibia. 1992. Mineral Resources of Namibia. Special Publications of the Geological Survey of Namibia, Windhoek, 598 pp.

International Trade Administration 2023. Namibia Country Commercial Guide, Mining and Minerals, available on https://www.trade.gov/country-commercial-guides/namibia-mining-and-minerals, accessed on 31 May 2023.

Hope.C. 2019. Growth at Home four years on: the need for better industrial policy implementation. Democracy report. Special briefing report 27

KPMG Report 2014. KPMG Global Mining Institute, Namibia Country Mining Guide. Retrieved April 4, 2023

Namibian Stock Exchange 2023. The Namcode, available on http://nsx.com.na/images/reports/Namcode-Inside.pdf, accessed on 20 March 2023

Legal Assistance Centre of Namibia (2004). Companies Act 28 of 2004, available on http://www.lac.org.na/laws/annoSTAT/Companies%20Act%2028%20of%202004.pdf, accessed on 24 May 2023.

Legal Assistance Centre of Namibia, Anti-Corruption Act 8 of 2003, available on https://www.lac.org.na/laws/annoSTAT/Anti-Corruption%20Act%208%20of%202003.pdf, accessed on 24 May 2023.

1 Ministry of Industrialization and Trade, 2021, Mineral Beneficiation Strategy for Namibia, available on https://mit.gov.na/documents/41692/88507/Mineral+Beneficiation+Strategy+for+Namibia+2021.pdf/df535451-9bb1-3bf6-20b9-f36f0aecbb75?version=1.0&t=1617718580899&download=true, accessed on 20 March 2023

MME (2023). https://www.mme.gov.na/mines/mrrd/

Mining Cadastre (2023). https://maps.landfolio.com/Namibia/

IGF (2018). The IGF Mining Policy Framework Assessment, Namibia, 2018, available on https://www.iisd.org/system/files/publications/namibia-mining-policy-framework-assessment-en.pdf, accessed on 24 May 2023.

MME (2023). The Ministry of Mines and Energy, Minerals Ancillary Rights Commission (MARC), available on https://www.mme.gov.na/mines/marc/#:~:text=MARC%20is%20regulated%20by%20the,provide%20for%20matter%20incidental%20thereto

Leonard, Rosina Ndahafa, Hauptfleish, Morgan, Ellmies, Rainer (2011). An Artisanal Mining Environmental Code of Practice for Namibia, Czech Geologgical Survey, ISBN 978-807075119-0, available on http://the-eis.com/elibrary/sites/default/files/downloads/literature/An%20Artisanal%20Mining%20Environmental%20Code%20of%20Practice%20for%20Namibia_2011.pdf, accessed on 24 May 2023.

Fraser Institute (2023). Fraser Institute Annual Survey of Mining Institutes 2022. https://www.fraserinstitute.org/sites/default/files/annual-survey-of-mining-companies-2022.pdf

Vella, A. 2023. Highlighting mineralized geological environments through a new Data-driven predictive mapping approach. PhD thesis University Orléans, France.

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APPENDICES

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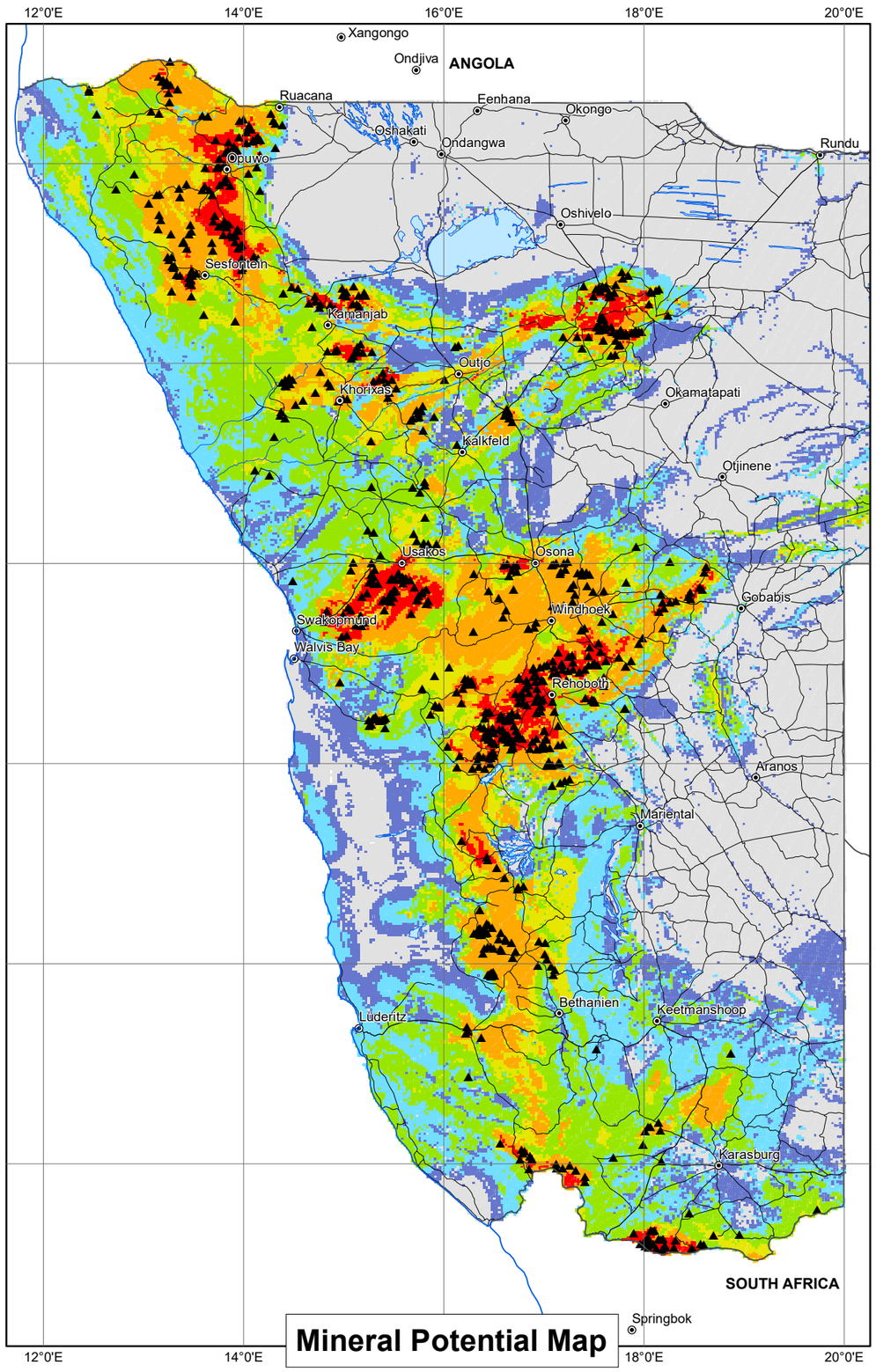
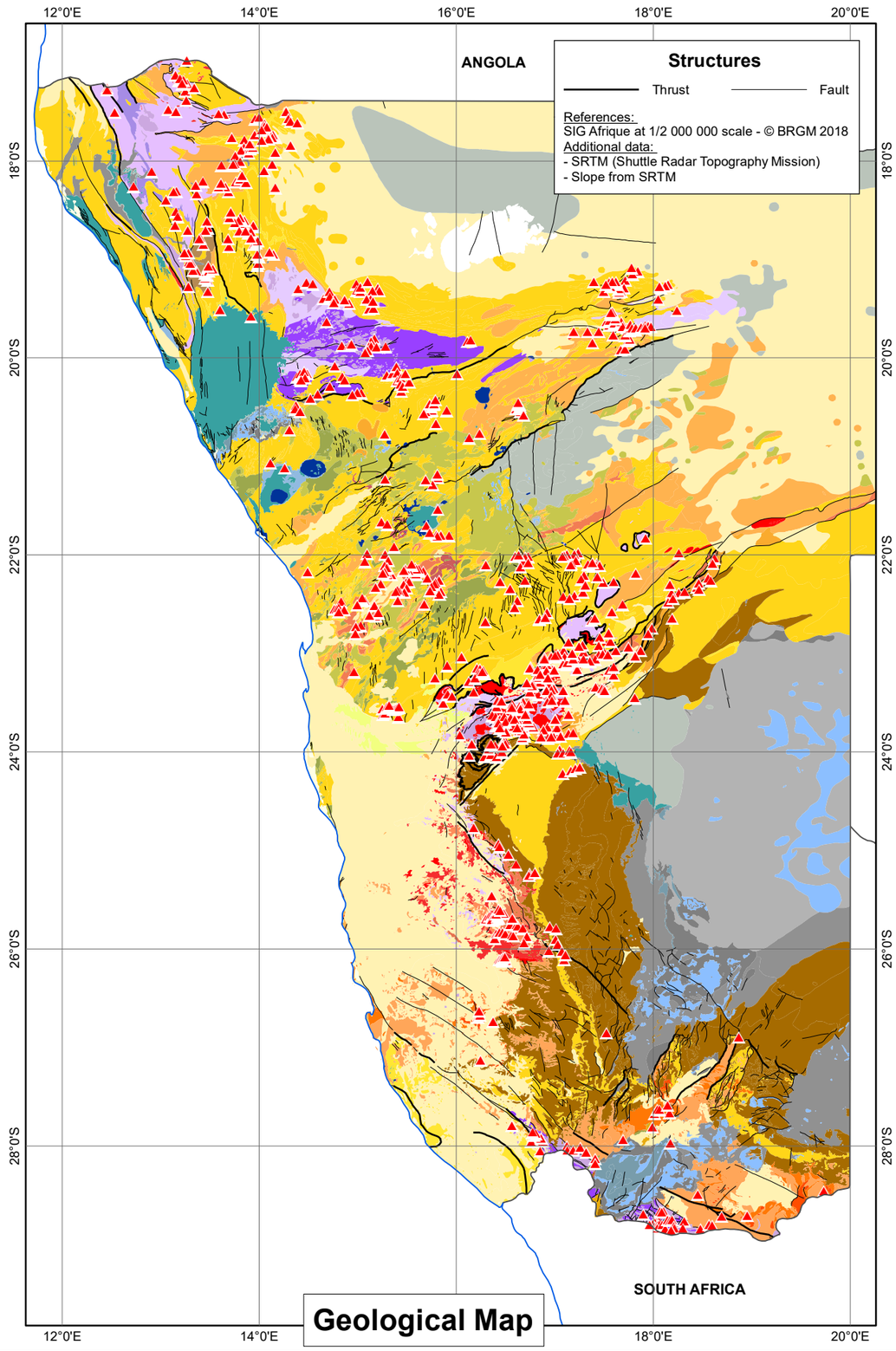
Country: NAMIBIA

MINERAL POTENTIAL MAP - *COPPER (Cu)*

Africa MaVal





Structures

Thrust — Fault

References:
SIG Afrique at 1/2 000 000 scale - © BRGM 2018
Additional data:
- SRTM (Shuttle Radar Topography Mission)
- Slope from SRTM

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

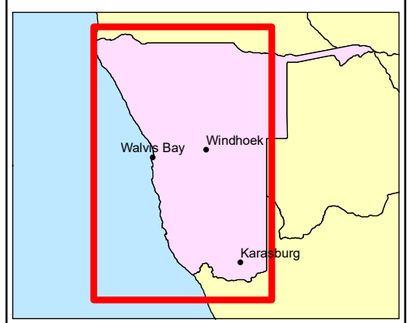
Known occurrences

Copper (Cu)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 114262 85.87% Non-occurrence in database Non-occurrence predicted	False positive Cells: 16824 12.64% Non-occurrence in database Occurrence predicted
False negative Cells: 185 0.14% Occurrence in database Non-occurrence predicted	True positive Cells: 1796 1.35% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.57
Cell size: 2500 m



N

0 50 100 200 Km

Datum : WGS84 (World Geodetic System 1984)

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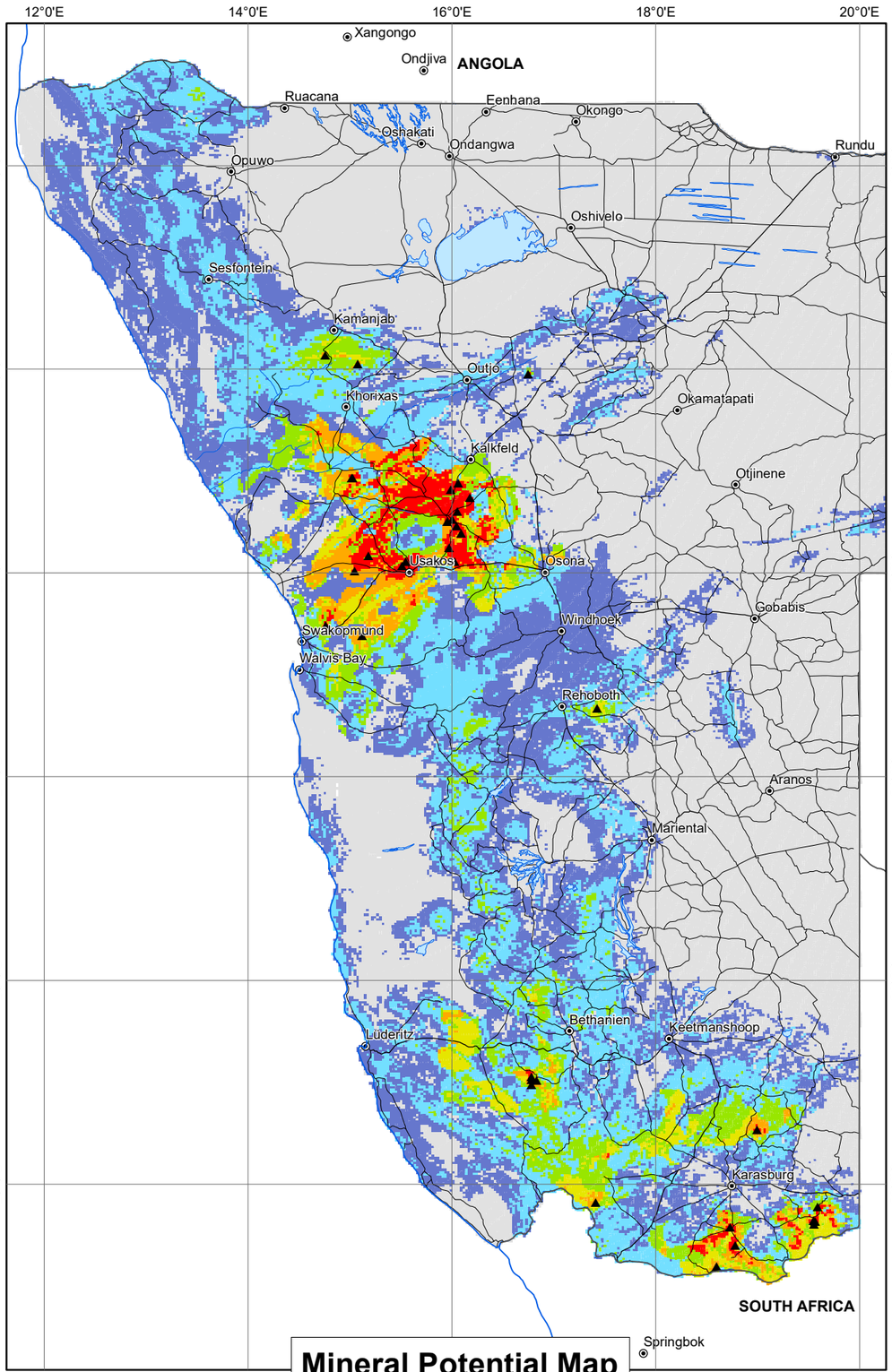
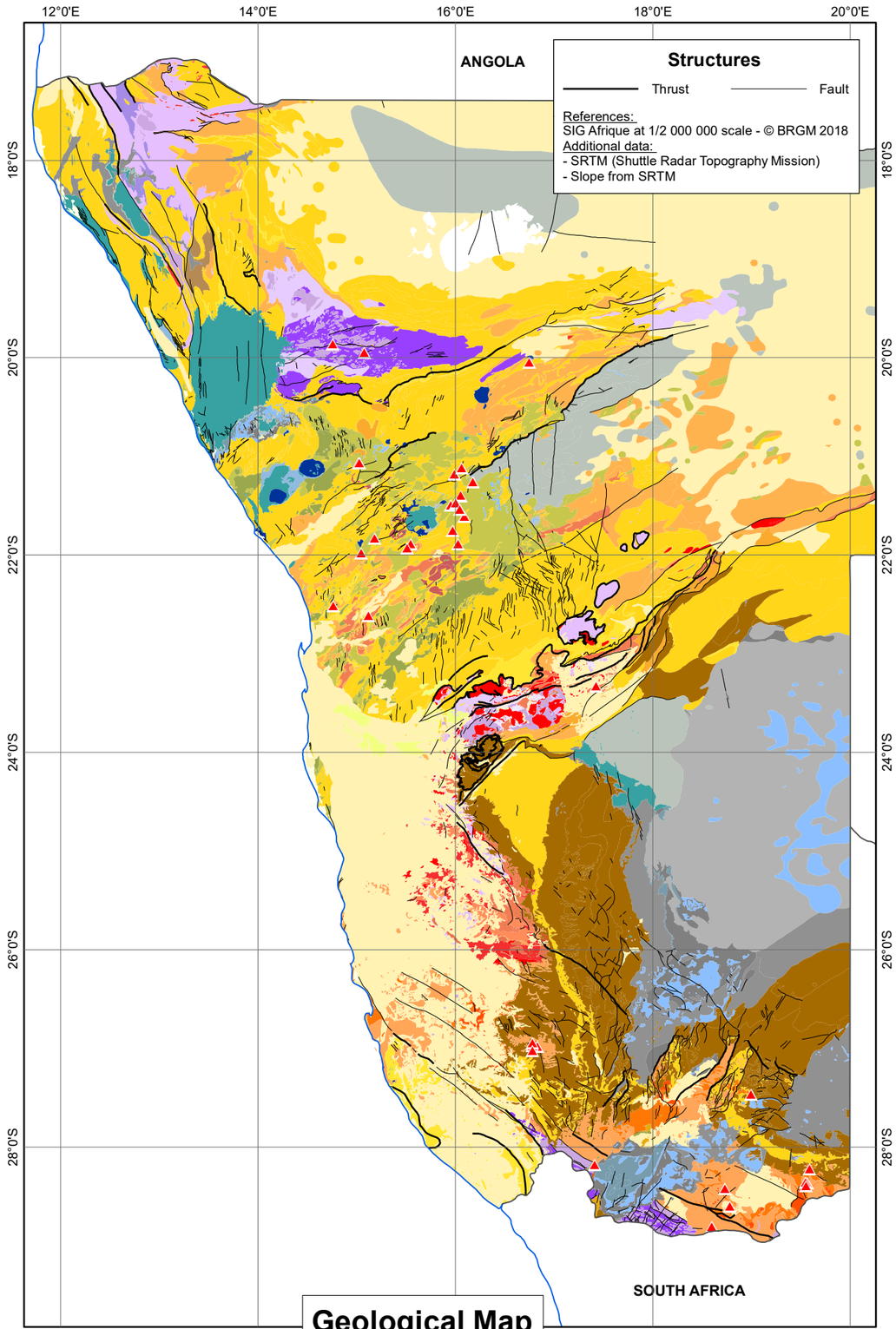
Country: NAMIBIA

MINERAL POTENTIAL MAP - *FLUORINE (FI)*

Africa MaVal



Mineral Potential Map



Geological Map

Structures

Thrust — Fault

References:
SIG Afrique at 1/2 000 000 scale - © BRGM 2018
Additional data:
- SRTM (Shuttle Radar Topography Mission)
- Slope from SRTM

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

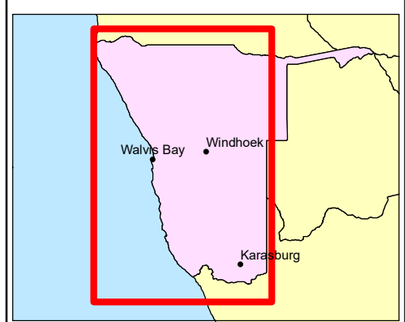
Known occurrences

▲ ▲ Fluorine (FI)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 128382 96.48% Non-occurrence in database Non-occurrence predicted	False positive Cells: 4541 3.41% Non-occurrence in database Occurrence predicted
False negative Cells: 1 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 143 0.11% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.52
Cell size: 2500 m



N

0 50 100 200 Km

Datum : WGS84 (World Geodetic System 1984)

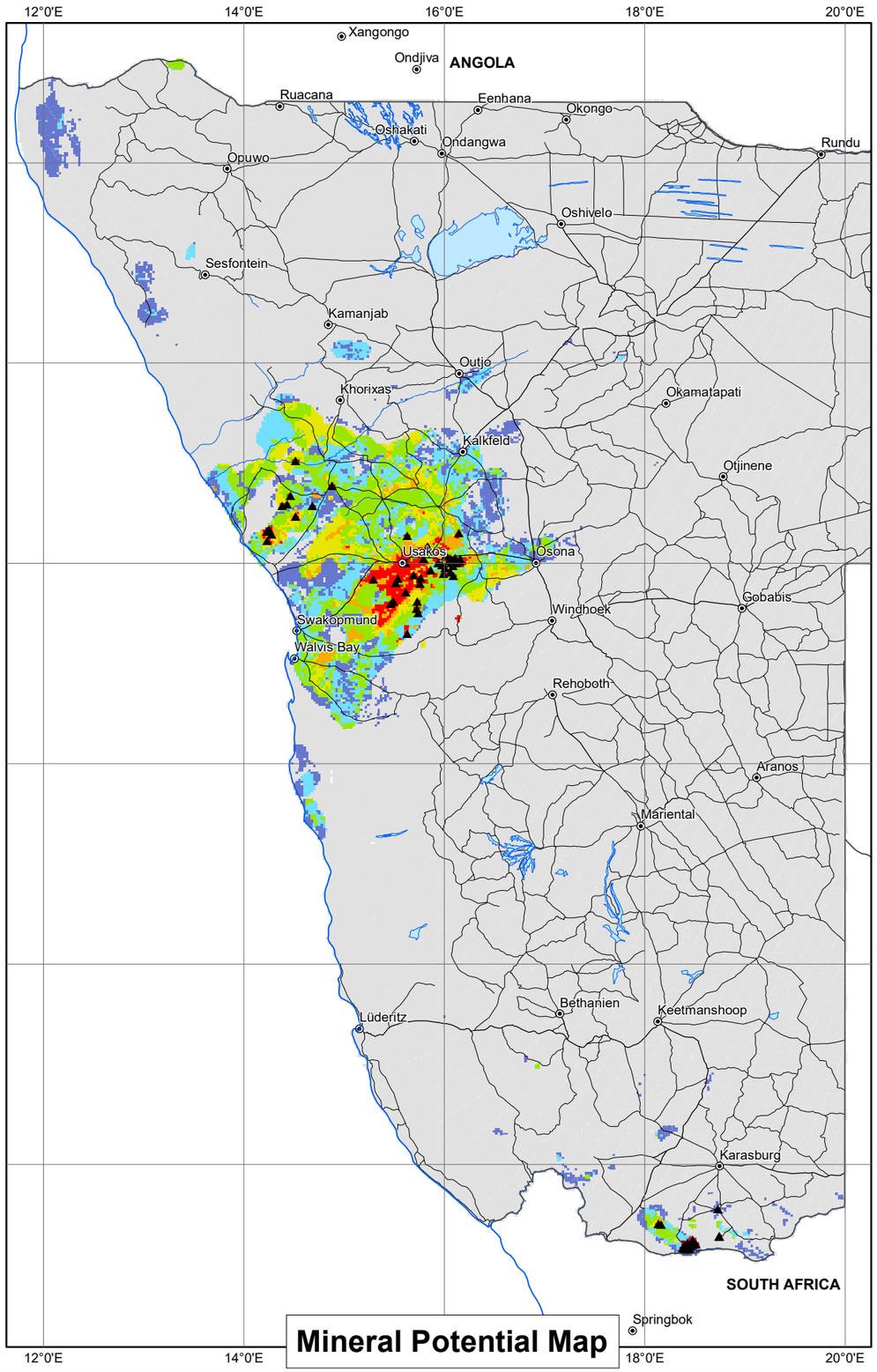
January 2024

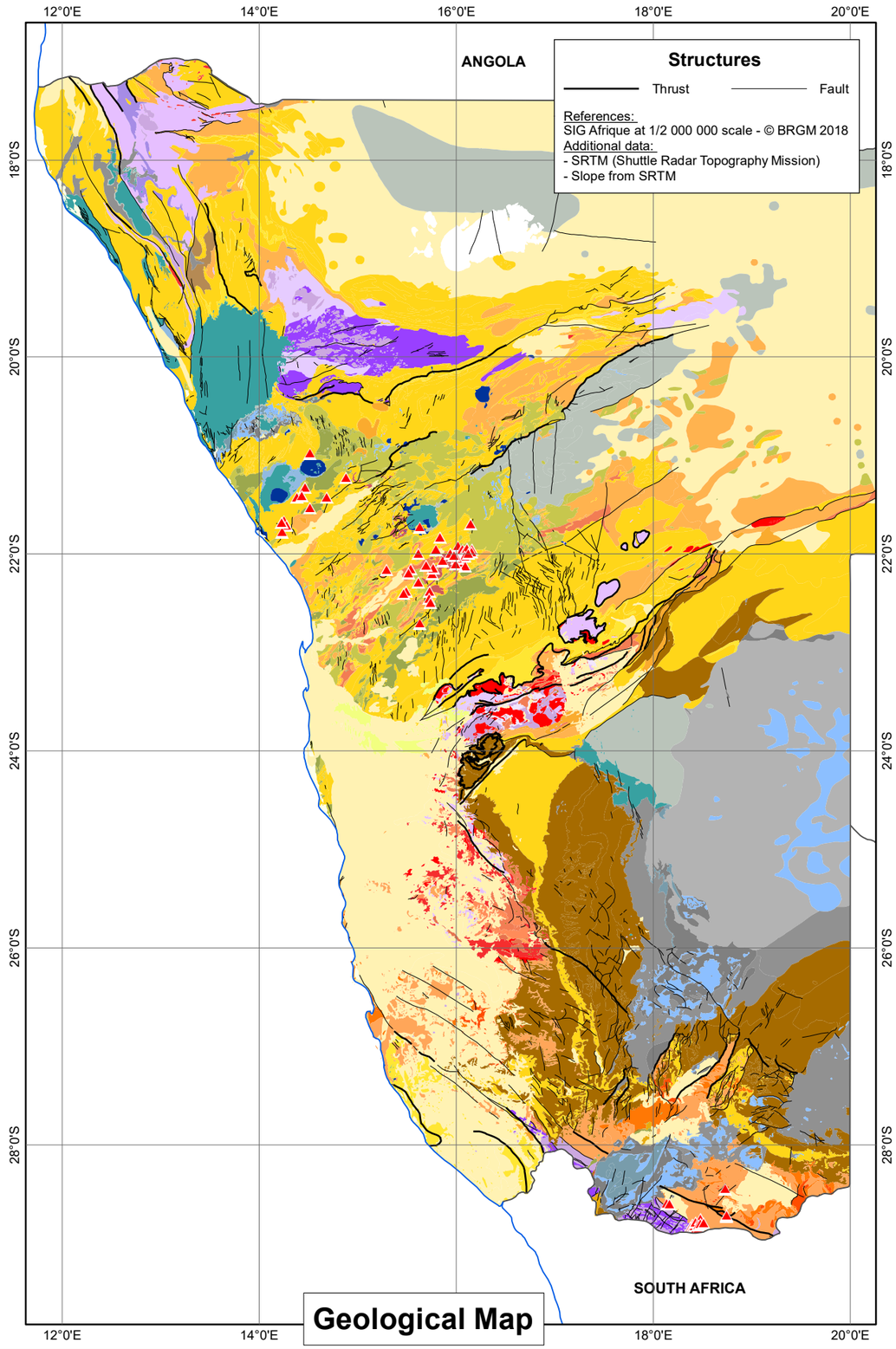
Géosciences pour une Terre durable
brgm

Country: NAMIBIA

MINERAL POTENTIAL MAP - *LITHIUM (Li)*

Africa MaVal





Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

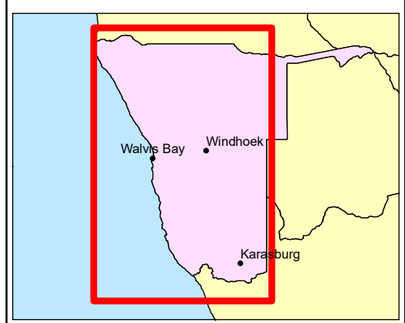
Known occurrences

Lithium (Li)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 132148 99.31% Non-occurrence in database Non-occurrence predicted	False positive Cells: 682 0.51% Non-occurrence in database Occurrence predicted
False negative Cells: 0 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 237 0.18% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.65
Cell size: 2500 m



N

0 50 100 200 Km

Datum : WGS84 (World Geodetic System 1984)

January 2024

Géosciences pour une Terre durable
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Appendix 2.1.1 RECYCLING : List of ECRM related recycling organizations

Organisation/company	Target waste	Commodity	Description	website
Collect-a-Can	Metal cans, tinplate	Tin	All recovered scrap and used metal cans are either processed to add value (de-tinning and briquetting) or prepared and sold for recycling	
Gratomic	Historical tailings dump at Aukam graphite Mine	graphite	Investigating the reprocessing of historical tailings from Aukam Mine	https://www.gratomic.ca/aukam/
Mr. Morne Du Plessis	Historical tailings dump at Sinclair Copper Mine	copper	Small scale re-processing of the existing surface stockpiles from historical	
NAMCLAY Bricks and Pavers	Historical slimes from Uis Tin Mine	clay	productin of high strength quality bricks	https://www.namclay.com/
Namib Base Minerals CC and Namibia Silica CC	Historical tailings dump at Uis Tin Mine	lithium, tin, silica sand	Investigating the reprocessing of historical tailings from Uis Tin Mine	
NamiGreen	Electronic waste	e-waste	The company collects and sorts e-waste from companies, individuals and organisations. The company has drop-off points where citizens can drop-	https://www.namigreen.com/
Q Global Commodities	Historical tailings dump at Klein Aub Mine	copper	Klein Aub was known for copper mining from 1964 to 1987. QGC is exploring the viability of re-working the tailing storage facility of the old	https://qgc.co.za/metals-2/
RENT-A-DRUM	Scrap metal	copper	organization involved in waste management and recycling including	https://www.rent-a-drum.com.na/
Scrap Metal Sales cc	Scrap metal	copper	Collection and recycling of scrap metals	https://scrapmetalsalesnam.com/
Scrap Salvage	Ferrouse and non ferrous scrap	copper	Offers a total recyclng facility for any type of waste.	https://www.scrapsalvagenam.com/
Tsumeb (Ongopolo) Mine	Historical tailings dump at Tsumeb Mine	Germanium, Gallium	Investigating the reprocessing of historical tailings from Tsumeb Mine	
Vision Sales and Marketing (VARTA)	Household batteries	zinc/manganese/potassium/graphite	and at Namibia's coastal towns.	https://visionsalesnamibia.com/

Horizon Europe Framework Programme (HORIZON)

D9.3 – South Africa Case Study

WP9 - Task 9.4

Date [31/01/2024]

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Table of Contents

1. Extended Critical Raw Materials (ECRM) supply potential of South Africa .. 10

1.1. Inventory of the ECRM 10

1.1.1 Geological setting 10

1.1.2 Known Ore deposits and occurrences 13

1.2. Prospectivity and mineral high potential mapping 19

1.2.1 Selection of the ECRM for mineral prospectivity 19

1.2.2 Mineral high potential areas 20

2. Assessment of the ECRM value chain 31

2.1. Characterisation of the value chain for primary and secondary raw materials 31

2.1.1 List of the mining and recycling projects 31

2.1.2 Existing ESG indicators 35

2.1.3 Economic links between the formal and informal sectors 36

2.2. Identification of the bottlenecks along the value chain 38

2.2.1 List of the main bottlenecks and the links between them 38

3. Investment/financing prospects for ECRM projects in South Africa 42

3.1. Legal and regulatory context for in-country financings 42

Context 42

Review of liquidity pockets 45

Mapping of Financing and Investment Instruments 47

3.2. Macroeconomic context for in-country financings 50

3.3. Political context for in-country financings 54

4. Assessment of social, environmental, and governance challenges 60

4.1. Country-level assessment and context 60

4.1.1. Mineral/mining policies, industry policies 60

4.1.2 Mining regulations 63

4.1.4 Land-use and mineral rights 65

4.1.5. Environment 66

4.1.6. Societal and community aspects, cultural heritage 68

4.1.7. Public health and safety 69

4.2. Mining practices vs. Environmental, Social and Governance (ESG) goals 70
4.2.1 Environmental challenges 70
4.2.2 Social and societal issues 71
4.2.3 What would be the best practices for a responsible mining? 75
5. Business network between the European Union and the Republic of South Africa 77
5.1. Assessment of the upstream and downstream business ecosystem 77
5.1.1 Context, formal and informal players 77
5.1.2 Relationships at local or regional levels 80
5.1.3 Overview of the local or regional clusters 82
5.2. Building new B2B relations 87
5.2.1 Promoting local content and enabling mining cluster actors 87
5.2.2 Potential partner institutions for an Africa-focused critical minerals network 88
5.2.3 Strengthening African mining clusters 92
6. Energy and digital transition: develop a strategy for the EU and Africa Partnership 93
6.1 Assessment of local EU funded activities 93
6.1.1 Context and partnerships 93
6.1.2 Assessment of the existing platforms and networks 97
6.2 What are the key challenges to cope with the twin transition needs? 98
6.2.1 The twin transition needs 98
6.2.2 Proposal of a strategy outline 99
6.2.3 Mining Sector Strategy South Africa and potential alignment with the EU partnership 99
6.2.3 Risk assessment 102
7. Opportunities for responsible investments 105
7.1. Proposal of projects to be presented as fact sheets in WP7 105
7.1.1 Identification of individual exploration, mining and refining projects 105

List of Figures

Figure 1. Cratons and orogenic belts in South Africa (Source: Eglington & Armstrong, 2003)11
Figure 2. A geological map that shows overlying lithostratigraphic features of South Africa and their associated ages. 12
Figure 3. Mineral Potential Map of bauxite (Al). The investigated AOI is outlined in red; known occurrences are indicated as black dots. 21
Figure 4. Mineral Potential Map of barite (Ba). The investigated AOI's are outlined in red; known occurrences are indicated as black dots. 22
Figure 5. Mineral Potential Map of fluorite (F). The investigated AOI's are outlined in red; known occurrences are indicated as black dots. 23
Figure 6. Mineral Potential Map of manganese oxides (Mn). The investigated AOI's are outlined in red; known occurrences are indicated as black dots. 25
Figure 7 Map of the Main CRM deposits of South Africa 26
Figure 8 Composition of net fixed investment (LHS constant 2015 Rand) compared to commodity price movement (RHS % change) 1993 to 2021 33
Figure 9: Map of CRM occurrences in SA, with major road, rail and port infrastructure. 41
Figure 10 Commodity shares of mining production 51
Figure 11 Physical volume of mining production: seasonally adjusted (Base: 2019=100) 53
Figure 12 Physical volume basic iron & steel and non-ferrous production: seasonally adjusted 54
Figure 13: JET IP governance framework 96

List of Tables

Table 1: Known ore deposits and occurrences in South Africa 13
Table 2 The applied parameters for production of the MPM of South Africa 20
Table 3 Results of data driven mineral potential mapping in South Africa applying the FAMME 20
Table 4 Statistically most favourable factors for exploration of each commodity 20
Table 5: List of major ECRM's mined in South Africa and description of processing activity 27
Table 6 Major mining companies by commodity group 31
Table 7: Recycling operations in South Africa 34
Table 8 Tailings retreatment projects in SA 34
Table 9: CRM constraints and opportunities for engagement (per DAI Global, 2022) 38
Table 12 EU member business councils in South Africa 80
Table 13: Just Transition Risk Assessment and mitigation measures 102

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Abbreviations and Acronyms

Acronym	Description
AfCFTA	African Continental Free Trade Agreement
AfDB	African Development Bank
AMCU	Association of Mineworkers and Construction Union
ANC	African National Congress
AOI	Areas Of Interest
ASM	Artisanal and Small-scale Mining
BEE	Black Economic Empowerment
B-BBEE	Broad-Based Black Economic Empowerment
BIT	Bilateral Investment Treaties
BRIC	Brazil, Russia, India and China
BRICS	Brazil, Russia, India, China and South Africa
CIPC	Companies and Intellectual Property Commission
COMESA	Common Market for Eastern and Southern Africa
CRMs	Critical Raw Minerals
DAI	Development Alternatives Incorporated
DBA	Disc-Based Association
DMRE	Department of Mineral Resources and Energy
EAC	East African Community
ECRMs	Extended Critical Raw Materials
EITI	Extractive Industries Transparency Initiative
EIU	Economist Intelligence Unit

ESG	Environmental, Social and Governance
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
HDI	Historically Disadvantaged Individuals
IEC	Independent Electoral Commission
ILO	International Labour Organisation
IMF	International Monetary Fund
IPG	International Partners Group
JET IP	Just Energy Transition Investment Plan
JETP	Just Energy Transition Partnership
JSE	Johannesburg Stock Exchange
MCSA	Minerals Council South Africa (formerly the Chamber of Mines)
MPM	Mineral Potential Mapping
MPRDA	Minerals and Petroleum Resources Development Act, 2002
NECOM	National Electricity Crisis Committee
NLCC	National Logistics Crisis Committee
NUM	National Union of Mineworkers
OECD	Organisation of Economic Cooperation and Development
PGM	Platinum Group Metals
PRECCA	Prevention and Combating of Corrupt Activities Act, 2004
PRI	Principles for Responsible Investment
RF	Random Forest
RSA	Republic of South Africa

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SADC	Southern African Development Community
SAHRC	South African Human Rights Commission
SAIMM	South African Institute of Mining and Metallurgy
SAMCODE	South African Minerals Reporting Code
SAMESG	South African guideline for the reporting of ESG
SAMRAD	South African Mineral Resources Administration System
SAMREC	South African Minerals Reporting Code
SLP	Social and Labour Plan
SOE	State Owned Enterprise
TDCA	Trade and Development Cooperation Agreement
US$	United States Dollar
WEF	World Economic Forum
WP	Work Package
WTO	World Trade Organisation

Wording

Mineral prospectivity: "Mineral potential mapping is concerned with quantifying and mapping the likelihood that mineral deposits are present in a study area. It is synonymous to mineral prospectivity mapping, which is concerned with quantifying and mapping the likelihood that mineral deposits may be found by exploration in a study area."

Keywords

ECRM, Mineral potential, Ore processing, Refining capacities, Recycling units, Value chain, Primary raw material, Secondary raw material, Bottlenecks, Finance, Investment, Sustainability, ESG, Land-use, Taxation, Mining regulation, Mining policies, Child labour, Responsible extraction, South-Africa, Pan-African

Executive Summary

South Africa is a country that is vastly rich in mineral resources. The scope of report precludes an in-depth treatment of all aspects of the country; rich geology, and the ecosystem of supports systems, institutes of learning, legislation and industry that has developed over more than a century in support of this mineral wealth.

The structure of this report has been adapted to facilitate a rapid overview, with significant amounts of additional information provided in appendixes to reduce the bulk of the main report.

The objective of the report is to provide the reader with an overview of the country as a producer of Critical Raw Minerals (CRMs) and to present a balanced view of the structure of the economy, the institutions and legislation that guide mineral exploitation, and the support industries available for these industries. This overview starts with a brief look at the geology and mineral prospectivity maps of the country, focussing on CRM's.

The chapters that follow, then turn the reader's attention to a look at economic parameters, international cooperation, and legislation. An important aspect of mineral investments in the mining sector for both large-scale and small-scale activities, is the consideration of Environmental, Social and Governance aspects, and these are addressed.

The closing chapters of the report address indicators for the Twin Transition in the country, and the final chapter provides an assessment of the country as an investment destination, giving more specific details of projects that may interest readers and potential investors.

South Africa's mining and mineral industry is vast and complex. Despite the decline of mining's relative importance in terms of absolute contribution to Gross domestic product (GDP), it has shaped the landscape of the country, its infrastructure development and labour relations in ways that remain evident to the present day. The new global demand of CRM's has seen South Africa ready to engage with buyers and investors from all over the world and, given the persistent decline of the traditional mineral commodities since the 2008 global financial crisis, this interest is met with eager anticipation from a variety of stakeholders within well-organised sectors in the country.

This report provides the reader with an overview of the current scenario and key aspects of CRM prospectivity, institutions and potential in South Africa.

The report is an integral part of the larger AfricaMaVal project and, in that context, provides this country overview specifically aimed at European Union (EU) investors and decision-makers. The report demonstrates South Africa's suitability as a destination of choice for stable future CRM supply to the EU.

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1. Extended Critical Raw Materials (ECRM) supply potential of South Africa

NOTE: *In consideration of size limitations in this report and the availability of ample alternative sources, the geology of South Africa in this chapter is restricted to only these brief statements. Interested readers are referred to APPENDIX_1.1_GEOLOGY for more information about the main geological features and economically significant ore deposits. APPENDIX_2.1_MINING_LIST presents List of Major CRM operations in South Africa. Table 1. Presents a list of the known CRM deposits in the country.*

1.1. Inventory of the ECRM

1.1.1 Geological setting

The geology of South Africa records large parts of the Earth's history from Mesoarchean to recent time. This implies a high diversity of geological environments and associated mineral resources that evolved during the geologic evolution of the country (**Fig. 1**). The oldest rocks constitute the Kaapvaal Craton in NE South Africa, which are comprised of Mesoarchean consist of grey, banded gneisses, various granitoids, and rather well-preserved volcanic rocks that show evidence of submarine extrusion and constitute the so-called greenstone belt. In the NE corner of the country, the Kaapvaal Craton is separated from the Zimbabwe Craton of similar age and composition by the Limpopo Belt which is an east-northeast trending zone of granulite facies tectonites with large scale ductile shear zones that evolved in the Palaeoproterozoic era and are interpreted as uplift structures of the overthickened crust. In the west the Kaapvaal Craton is bound by the Palaeoproterozoic Kheis Belt, whereas in the centre it is overlain by the Witwatersrand Basin Neoarchaean (2700 Ma) and the Early Palaeoproterozoic (2500 Ma) Transvaal Supergroup. The latter comprises predominantly clastic sedimentary rocks at the base, carbonate rocks and banded iron formations in the central part and a thick pile of sediments and volcanic rocks at the top; it is hosts to the world's largest manganese resources. The Transvaal Supergroup is intruded by the Bushveld Complex at 2050 Ma, which is home to world-class metallic deposits of PGE, nickel, and chrome.

The Precambrian geology west of the Kheis Belt is covered by sedimentary rocks of the Neoproterozoic Nama Group and Cenozoic sands of the Kalahari savannah. However, geophysical data indicate the presence of another underlying Archaean core, referred to as the Kalahari craton, the main part of which is located in southern Namibia. To the south, the Kalahari Craton is bound by the Namaqua Belt, which represents a Mesoproterozoic orogen and comprises Mesoproterozoic and Paleoproterozoic components that accreted at the older cratons and mobile belts. The Namaqua Belt probably underlies large parts of central and southern South-Africa which are, however, covered by Palaeozoic to Mesozoic rocks of the Karoo Supergroup. The continuation of the Namaqua Belt below the Karoo Basin into the Natal Belt of eastern South Africa is likely.

Neoproterozoic sedimentation, volcanism and Pan-African tectonics is recorded in the Gariep Belt along the Atlantic coast at the western boundary of the country. The deformation partly affected the Namaqua rocks, too.

Deposition of the Cape Supergroup upon the folded Meso and Neoproterozoic rocks during Cambrian times was followed by a new phase of deformation resulting in the Cape Fold belt, which follows roughly the coastlines of the Atlantic and Indian Ocean in the southwestern part of South Africa.
The Karoo Supergroup was deposited after a hiatus on these and older rocks from Carboniferous to Jurassic periods and covers most of central and southern South Africa (**Fig. 1**). The early phase in the

break-up of Gondwana is recorded in the lower Jurassic (182-180 Ma) Drakensberg lavas of eastern Natal which form part of the upper Karoo SG.
Cretaceous rifting at about 70 Ma is represented by the alkaline Sutherland Suite in the Northern Cape. Cenozoic sands of the Kalahari Group cover the north-central part of South Africa.

South Africa has a wide-ranging geology comprising cratons, orogenic belts, greenstone belts, and large impact craters. Furthermore, the country is mainly covered by the basal Kaapvaal craton, encompassed by the Namaqua-Natal Belt and the Cape Fold Belt (**Fig. 1)**. The cratons, a relatively stable continental crust, have sustained a continuous accumulation of younger cover rocks (Hunter et al., 2006), further classified into stratigraphic units (**Fig. 2**). These stratigraphic units are divided into three categories, i.e., lithostratigraphic, biostratigraphic, and chronostratigraphic. Chronostratigraphic units are categorized based on the geological time scale, while biostratigraphy is focused on fossil content; lastly, lithostratigraphic characterization is where different units are grouped into complexes, supergroups, groups, and formations.

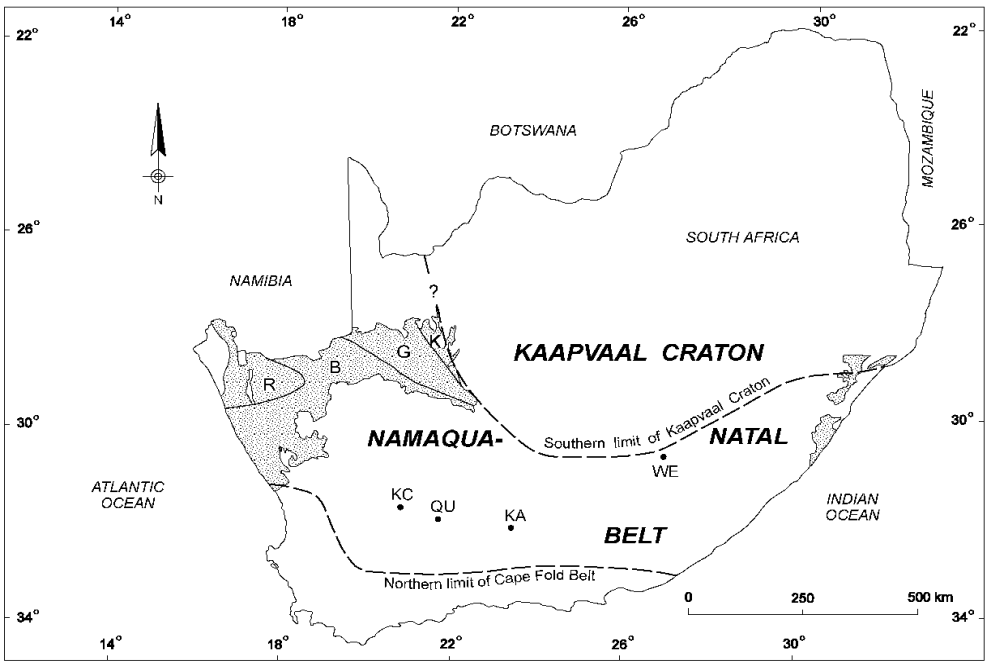

Figure 1. Cratons and orogenic belts in South Africa (Source: Eglington & Armstrong, 2003)

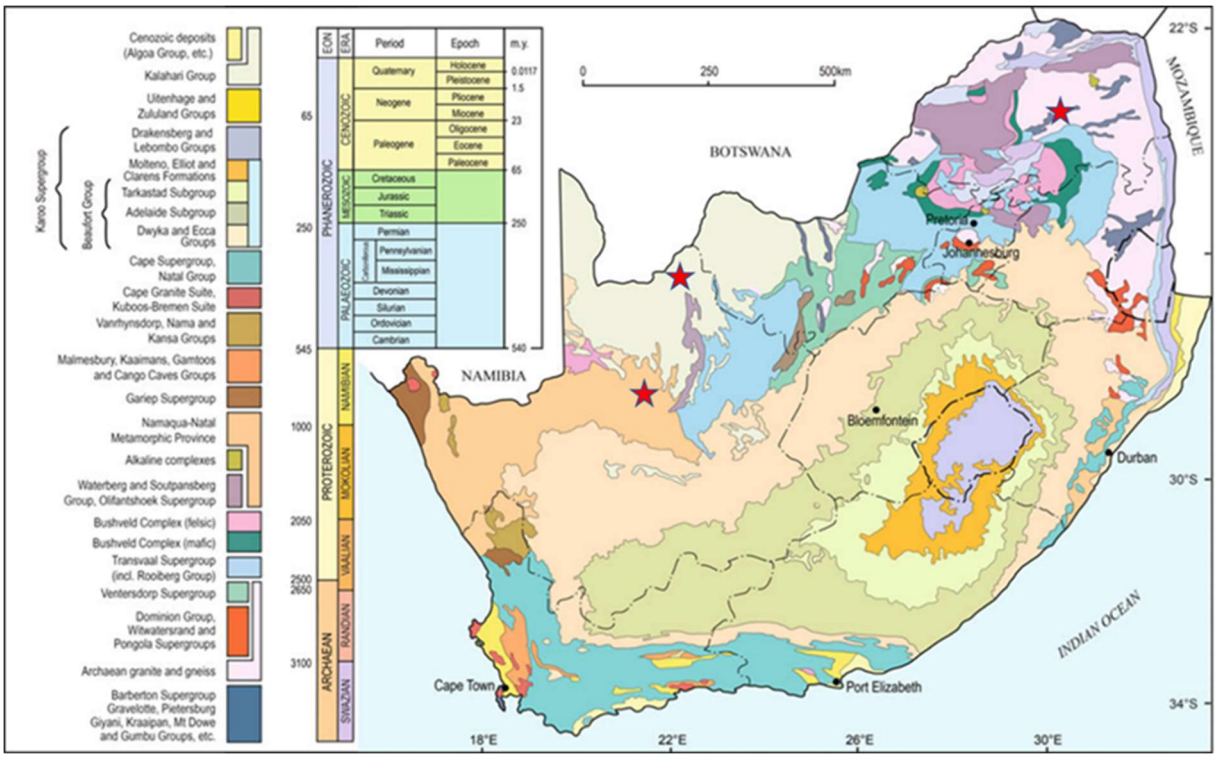

Figure 2. A geological map that shows overlying lithostratigraphic features of South Africa and their associated ages. The red stars represent the national provinces (Limpopo, Northern Cape and Northwest provinces) where most ECRM producing projects are located[1]

Cratons and Orogenic Belts

South Africa's geology is extremely diverse and includes orogenic bands, massive impact craters, greenstone belts, and cratons. A sizable mining industry that produces gold, diamonds, iron, and coal, amongst others, by leading mining houses is supported by the geology of South Africa. The Great Escarpment, which borders South Africa's high plateau to the west, south, and southeast, and the rocky mountains of the Cape Fold Belt make up its geomorphology, with Kaapvaal forming the base and bordered by the Namaqua Natal belt.

Stratigraphy of South Africa

For this report, Lithostratigraphic characterization is applied to define different units of rocks and group into Supergroups, groups, and formations to describe the geology of South Africa. South Africa comprises of three geological supergroups, namely: Karoo Supergroup, Transvaal Supergroup and Cape supergroup, which are described under the Cape Fold Belt. Details of these are contained in the Annexures.

[1] . Source: Grab & Knight, 2015

1.1.2 Known Ore deposits and occurrences

The known ore deposits of South Africa have been studied and developed for well over a century. A significant amount of geological information is available for the country, most of which is created and hosted by the Council for Geoscience, a state-owned enterprise dedicated to this purpose. The list presented in Table 1 below is extracted from public information sources and contains only the CRM's as defined in the EU list. Interpretation of the location of the CRM deposits in South Africa is best achieved by matching this list with the maps provided as Figures 2 and 7.

Table 1: Known ore deposits and occurrences in South Africa

Main commodity	Other commodity(ies) (co- or by-product)	Deposit geology	Industrial factors	Development stage
Antimony (Sb)	Associated with Au, Beryl-Emerald	• Stibnite is the main source of antimony. • It is found on epithermal vein deposits and precipitated by hydrothermal processes.		Murchison Range, Limpopo: Brownfield Willows silver mine Pretoria: Brownfield
Barite	Associated with Pb, Cu, Fluorspar (in pegmatites); Apatite, REE, Scheelite, Mo	• Diagenic • Occurs in veins along faults, fractures, and shear zones. • High-T pegmatites and veins • Sedimentary deposits related to hydrothermal springs	• Barite is exported as barium sulphate (barytes). It is directly shipped after initial crushing.	Brownfield
Beryllium	Associated with Li, Ta, Nb, scheelite, bismuth By-product: Bi	• Hosted by beryl-emerald in Murchison. • It is sourced from pegmatites fields of Northern Cape, Mpumalanga and Limpopo.	• Beryllium emissions during production and use are minor. • Concentration of beryllium in the atmosphere, the surface and on drinking water is low.	Brownfield
Bismuth	By-product: Ag, Cu, Arsenopyrite	• Occurs in a form of native bismuth and bismuthinite. • It is deposited by epigenic ore fluids		
Coking Coal	By product: Ammonia, Hydrogen, sulphides	• South Africa produces predominantly thermal coal and imports most of its hard coking coal. • Bituminous	• Processing processes: →bake coking coal in an unoxygenated oven to make it "plastic" before it solidifies to coke particles. • Environmental impact:	• Makhado Project in Limpopo, southwest of Musina (Brownfield)

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Main commodity	Other commodity(ies) (co- or by-product)	Deposit geology	Industrial factors	Development stage
			→Saline and acidic water from mining operations, sourced from pyrite and iron sulphide, are toxic for aquatic life. →Abandoned and operating mines emit methane gas which is a greenhouse gas. →South Africa has no law on pollution but has particulate emission standards on atmospheric emissions from coal utilization. →Underground water infills contaminate surface water and aquifers. →Coal dumps cause low-level atmospheric emissions, land degradation, groundwater pollution.	• Uitkomst Colliery (Brownfield)
Cobalt	Associated with Ni, Cu, Zn, U, Precious Metals	• Associated with hydrothermal deposits		Brownfields
Copper	Associated with Zn, Pb; Barite (Kaapmuiden greenstone); W, Ag (Rustenburg Layered Suite) By products: Sb, fluorspar	• VMS Deposits along the Copper-Zinc Line in Murchison Greenstone Belt • In Black Mountain and Broken Hills base-metal mining district, copper deposition occurs as strata bound sedimentary exhalative. • Prieska, Areachap and Jacomynspan have volcanic exhalatives. • Kaapmuiden greenstone belt: volcanogenic massive sulphide deposits	• Environmental impact: →oxidation of sulphides when exposed to the atmosphere creates sulphuric acid which results in heavy-metal drainage and leaching. →In the Okiep copper district is arid therefore, acid drainage is localized, as opposed to the Concordia area. →Smelters contribute to the sulphur emissions into the air and copper soil pollution	Brownfields
Fluorspar	Associated with hematite, barite, Sn Is a by-product of molybdenum deposits	• Volcanogenic forming intrusive pipes and extrusive stratiform deposits. • Manto-type forming lenticular bodies. • Hydrothermal stockwork, veins and pipes		Brownfields

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Main commodity	Other commodity(ies) (co- or by-product)	Deposit geology	Industrial factors	Development stage
Graphite	Associated with coal, Precious metals	• Associated with hydrothermal deposits	• Processing graphite involves grinding and screening methods to recover disseminated flake graphite and fine flakes are recovered by flotation processes.	Brownfields
Lithium	Associated with Be	• The main source of lithium in South Africa is pegmatites. • Exploitable lithium mineral occurs in a pyroxene end-member, spodumene. • Spodumene occurs in zoned pegmatites in the Limpopo and Northern Cape, whereas in the southern parts of KwaZulu-Natal and southeastern parts of the Vredefort dome, in the Free State, it is unzoned.	• There are no Li refinery plants known in South Africa. • Lithium ore is beneficiated to separate out by products. Environmental impacts: soil degradation and biodiversity loss	Brownfields
Magnesite	Associated with scheelite	• Supergene and hypogene deposits occurring as stockwork veinlets (Kaapmuiden area BGB)		
Manganese	Associated with Fe, P, Ba, W, Cu, Zn	• BIF-hosted sedimentary deposits (Kalahari Manganese Field and Rooinekke deposits) • Karst-hosted deposits- (Postmansburg Manganese Field) • Ooilitic deposits (Tolwe manganese deposits)	Manganese beneficiated in South Africa High-purity Mn sulphate for the Li battery market produced in the only plant outside China.	
Nickel	Associated with Pt, Pa, Rh, Au, Cu (Uitkomst Complex); Cu, Co, Zn (Bushveld complex)	• Magmatic stratiform deposits and nickeliferous pipes • Lateritic deposits • Hydrothermal deposits	• Environmental impact: →oxidation of sulphides when exposed to the atmosphere creates sulphuric acid which results in heavy-metal drainage and leaching.	?

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Main commodity	Other commodity(ies) (co- or by-product)	Deposit geology	Industrial factors	Development stage
Phosphate	Associated with apatite	• Igneous origin (Glenover, Bushveld complex and Soutpansberg pegmatites) • Phosphatic limestones, nodular and calcareous sands (Saldanha and Mamre) • Metasomatic vein-type deposits (Potgietersrus and Middelberg district)		Brownfields
PGMs	Associated with Sn, V, Ti, chromite, base metals By-products: nickel and copper	• Layered mafic intrusions	• Processing processes: →From mining, the ore is processes using froth floatation process. 13 concentration plants owned by Amplats exits. →Floatation concentrate is dried and smelted in an electric furnace. There are four smelter complexes for PGMs. →PGMs are refined, removing base metals by precipitation, redissolution and thermal reduction. There are only three PGM refineries in SA. →Refined PGMs are fabricated into ingots, wire/rod, tube, and chemical compounds and then sold to end-users. • Environmental impacts: →Water requirements for the concentration stage not met due to limited water supply. →Waste rock and effluent water need to be treated before being discharged into the environment. →Dust, gases, and effluent water generated from smelters pollute the environment.	Brownfields
REEs	Associated with fluorspar, apatite (phosphate), vermiculite (Cu), phlogopite	• Occurs in carbonatite and alkaline complexes. • Deposition occurred by hydrothermal processes.		

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Main commodity	Other commodity(ies) (co- or by-product)	Deposit geology	Industrial factors	Development stage
	By products: Zr, U, Ag, Au, Pa, Pt, Ni, Magnetite,	• Epithermal deposits have low REE content		
Tantalum		• Pegmatites are the main source of Ta.		
Niobium	Associated with Sn, Ta, beryl, tourmaline, garnet Occurs as a by-product	• Brookite is the host of Nb. • Pegmatites are the main source of Nb		
Tin	Associated with scheelite, Pb and Cu	• Hosted in cassiterite. • Occurs as syngenetic pegmatite-pneumatolytic pipes (in Zaaiplaats),and epigenic deposits as fault breccia and replacement deposits within arkositic sediments and quartz (Rooiberg Leeuwpoort), felsites, granites and granophyres. • Pegmatites of granite-gneiss terrains (Bushmanland sequence and Richtersveld Complex)	Sn is crushed, screened and separated, and smelted in South Africa	
Titanium	Ilmenite and rutile are associated with zircon, monazite and garnet By product: Pig-iron recovered from processing ilmenite	• Sedimentary origin from beach placer deposits	• Tisand conducts dune mining and mineral separation. • RBIT conducts the smelting and beneficiation process. Environmental impact: • TiO2 processes requires the use of sulphuric acid which has a negative environmental impact. The use of sulphuric acid has been reduced by switching from ilmenite to a slag feedstock or chloride process, which is more environmentally friendly. • Less waste is produced from the chloride process. • Ilmenite is only chlorinated in places where laws permit the inexpensive deep welling of iron dichloride.	• Brownfields

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Main commodity	Other commodity(ies) (co- or by-product)	Deposit geology	Industrial factors	Development stage
Tungsten	• Associated with Cu, Mo	• Occurs in high grade copper sulphide deposits or as magmatic hydrothermal zones associated with potassic alteration and skarn metasomatic deposits		Brownfields
Vanadium	• Associated with Pb-Zn (Zeerust)	• Hosted by titaniferous magnetic seams in the Bushveld Complex • Manganese wad layers (Zeerust, Transvaal)		

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1.2. Prospectivity and mineral high potential mapping

1.2.1 Selection of the ECRM for mineral prospectivity

Among the 34 ECRMs present in South Africa, only four were selected for Mineral Potential Mapping (MPM) to demonstrate the principle of the method (**Al, Ba**, **F**, and **Mn**). For each commodity, up to three areas of interest were defined around localities where known occurrences are recorded in the mineral databases of the French Geological Survey (BRGM) and/or Council for Geosciences (CGS). The lack of geoscientific data (e.g. aerial and ground geophysics, satellite data, soil and stream geochemistry) and the relatively low resolution of the geological maps used for this study (varying from 1:2M to 1:250k) imply only limited interest of the weakly constrained mineral potential maps for exploration. There was no use to illustrate this for the whole range of CRM's. The MPM was performed using the disc-based association (DBA) grid method coupled with Random Forest (RF) method (*Vella, 2022*); the algorithm applying these principles has been labelled "FAMME" by the author. The method analyses the local spatial associations of geological variables and features of various natures to describe the relationships between the predictors and the mineralization. This allows the identification of geological environments in the study area around each node of the DBA grid, and the integration of both quantitative and non-quantitative spatial data, such as geophysical anomaly maps and location of geological map units, respectively. In a second step, RF classification is used to perform a generalization of complex geological environments and features and evaluate their likelihood to host potential mineralization occurrences by giving a score between 0 (low potential) and 1 (high potential). The database for the MPM of South Africa comprised the following:

- SIG-Afrique mineral resources database – BRGM
- GIS Council of Geoscience mineral resources data base – CGS
- GIS Council of Geoscience 1:1,000,000 geological map –CGS
- GIS Council of Geoscience 1:1,000,000 structural data (faults, thrusts)
- GIS Council of Geoscience 1:1,000,000 dykes
- GIS Council of Geoscience merged 1:250,000 geological maps –CGS
- SIG-Afrique 1:2,000,000 structural data (faults, thrusts) – BRGM
- UNCCD 1:500k SOTER – soil map of southern Africa
- SRTM (Shuttle Radar Topography Mission)
- Slope

The DBA grid for predictive modelling is mainly defined by **five parameters**:

- Size of cell – d;
- Buffer for lithologies – R;
- Buffer for mineral occurrences – R1. It can be null (= false), in this case the search radius will be restricted to the cell size (d)
- Buffer for faults – R2. It can be null (= false), in this case the search radius will be restricted to the cell size; it can also take into account the distance of the cell to the neighbouring faults (distance)
- Buffer for soils – R3. It can be null (= false), in this case the search radius will be restricted to the cell size

In order to maximize the grid resolution while minimizing overlaps and cells with only one lithology, the parameters of DBA grid for the four selected commodities in individual areas of interest (AOI) used in this study are as indicated in Table 2:

Table 2 The applied parameters for production of the MPM of South Africa

Param/AOI	Al_East	Ba_East	Ba_West	F_NE	F_SW	Mn_East	Mn_Cen	Mn_West
d	2500	1750	3000	1800	1000	1750	1400	1400
R	10000	7000	6000	9000	6000	7000	7000	7000
R/d	4	4	2	5	6	4	5	5
R1	2000	1000	3000	2000	2000	2000	2000	2000
R2	no faults	500	1000	distance	500	750	500	750
R3	false	no soil	no soil	false	false	false	false	false

1.2.2 Mineral high potential areas

Eight mineral potential maps, which were produced for the four ECRM's **Al** (bauxite), **Ba**, **F**, and **Mn** are presented in Appendix_1.2_MPM_RSA. The results of the DBA-RF (TN, FN, FP, TP = confusion matrix) together with the critical parameter for the assessment of the analysis are shown in Table 3.

Table 3 Results of data driven mineral potential mapping in South Africa applying the FAMME

	TN	FN	FP	TP	TPR	FPR	PPA [%]	Prec. [%]	Acc. [%]	J-score	Thresh.
Al (bauxite)	28559	1	1411	156	0.99	0.05	5.2	9.96	95.3	0.95	0.56
Ba-East	78222	1	977	53	0.98	0.01	1.3	5.15	98.8	0.97	0.45
Ba-West	6783	1	16	23	0.96	0.00	0.6	58.97	99.8	0.96	0.68
F-NE	90646	1	2269	222	1.00	0.02	2.7	8.91	97.6	0.97	0.41
F-SW	113621	0	1276	250	1.00	0.01	1.3	16.38	98.9	0.99	0.6
Mn-East	81973	20	8605	543	0.96	0.10	10.04	5.94	90.5	0.87	0.54
Mn-Central	68865	15	3280	238	0.94	0.05	4.86	6.77	95.4	0.90	0.49
Mn-West	54161	3	5808	291	0.99	0.10	10.12	4.77	90.4	0.89	0.51

Note: *True Positive (TP) and True Negative (TN) correspond to the number of grid cells, which are correctly predicted by the RF model (i.e. mineralized and non-mineralized cells, respectively). Inversely, False Positive (FP) and False Negative (FN) correspond to the number of grid cells, which are incorrectly predicted by the RF model (i.e. mineralized instead of non-mineralized cells and non-mineralized instead of mineralized cells, respectively).* ***FP indicate cells with high mineral potential****, which so far are not indicated in the mineral occurrence data base. From these data the following useful parameters are calculated: True positive rate (TPR, also "recall") = TP/(TP+FN), False positive rate (FPR) = FP/(FP+TN), Percentage of prospective area (PPA) = (TP+FP)/All, Precision = TP/(TP+FP), Accuracy = (TP+TN)/All and J-score = TPR – FPR.*

The statistically most favourable factors for exploration of each commodity are shown in Table 4.

Table 4 Statistically most favourable factors for exploration of each commodity

	F1	F2	F3	F4	F5	F6
Al (bauxite)	srtm	Pvo	slope	ACh	Frr	jd
Ba-East	slope	srtm	APmg	ANbr	APon	APft
Ba-West	slope	fault	srtm	EC-STa	STkp	ED-CAkn
F-NE	Rnb	Rsc	srtm	PTe	slope	Rra
F-SW	STrv	srtm	ECbp	STlv	STk	ECbw
Mn-East	ANml	srtm	Lpe	ORsw	ANbr	Rtr
Mn-Central	srtm	SDwo	ANkl	ANrv	ORgm	ANff
Mn-West	Ope	slope	srtm	Lpq	fault	S-Dn

Bauxite - Al

Bauxite forms by weathering of bedrock under tropical conditions; chemical and physical processes transform the rocks into in-situ soils called saprolite. Aluminium and iron are among the immobile elements that are concentrated in the residual soils, which are known as bauxite and laterite. Bauxitic soils in Republic of South Africa (RSA) are restricted to the Eastern Cape, Kwazulu-Natal, and Mpumalanga provinces in the east of the country over an area of approximately 90,000 km^2 size. Here,

98 bauxite deposits are registered in the mineral databases of BRGM and CGS. The AOI for the MPM study was increased around this central part to ca. 250,000 km.

The data for the production of the MPM comprised the 250k geological maps of RSA, the UN-CCD 500k SOTER soil map of southern Africa, the SRTM and the slope. Tectonic structures were not taken into account, as they play no role in the genesis of saprolite. The resulting MPM shows, besides locations with known bauxite occurrences, high potential in the areas in-between and in a horseshoe shaped area NW of the principal bauxite zone, which could be an interesting target for future green field exploration.

The DBA-RF model has an accuracy of ~95 % and indicates that about 5 % of the AOI have potential for bauxite. The statistically most favourable factors are, in decreasing order, **srtm**, **Pvo** (Volksrust Formation = shale siltstone, minor sandstone), **slope**, **Ach** (Rhodic Acrisols), **Frr** (Rhodic Ferralsols) and **jd** (Jurassic dykes), the latter of which are abundant in that area but probably of minor importance for the formation of bauxite.

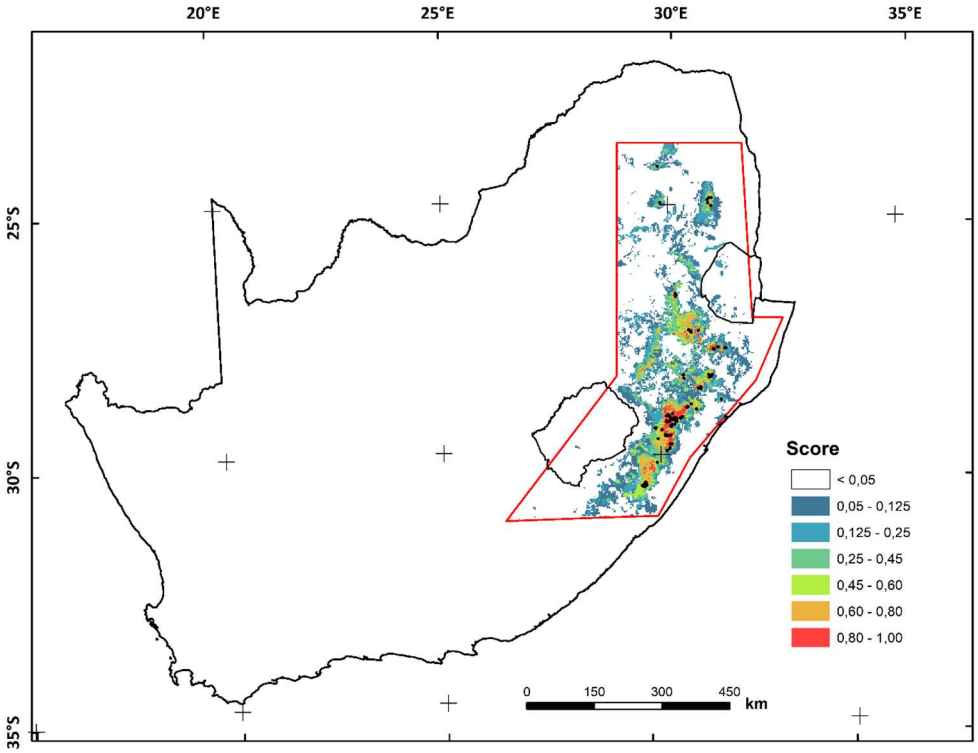

Figure 3. Mineral Potential Map of bauxite (Al). The investigated AOI is outlined in red; known occurrences are indicated as black dots.

Barite - Ba

Barite is the main mineral for barium; it forms under widely varying conditions, including sedimentary, magmatic and structural-controlled environments. In South Africa, the known mineral occurrences are situated mainly in the NE Limpopo-Mpumalanga provinces (51 occurrences), a second province is located in the western Namaqua Belt (14 occurrences). Accordingly, two AOI (Ba-East, ca. 240,000 km^2) and (Ba-West, ca. 60,000 km^2) were defined for which the MPM's were produced.

The DBA-RF model for northeastern RSA (Ba-East) has an accuracy of ~99 % and indicates that about 1.3 % of the AOI is prospective for barium deposits. The statistically most favourable factors are, in decreasing order, **slope**, **srtm**, **APmg** (Makhutswi gneiss), **ANbr** (tonalite), **APon** (Onverwacht Group,

hornblende gneiss), and **APft** (Figtree Group: siltstone, shale, greywacke, chert, ferruginous chert, pyroclastics).

The DBA-RF model for the Namaqua Belt (Ba-West) has an accuracy of 100% and marks about 0.6 of the AOI as prospective for barium deposits. The statistically most favourable factors are, in decreasing order, **slope**, **fault**, **srtm**, **EC-STa** (Aggeneys Subgroup: Quartz-muscovite-biotite-sillimanite schist, muscovite schist, pebbly gneiss, quartzite, magnetite quartzite, marble, amphibolite, conglomerate, grunerite-garnet-magnetite rock), **STkp** (Klip Bakken Gneiss), and **ED-CAkn** (Knersvlakte Subgroup: Green and purple mudrock, shale, siltstone, sandstone, limestone, gritstone, conglomerate, minor chert).

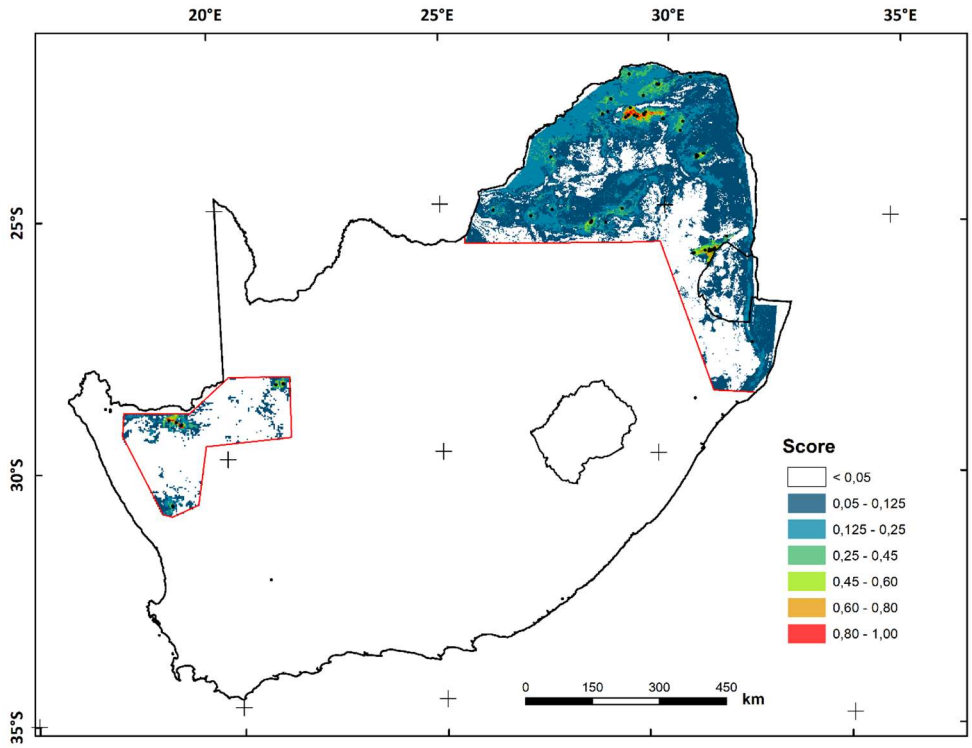

Figure 4. Mineral Potential Map of barite (Ba). The investigated AOI's are outlined in red; known occurrences are indicated as black dots.

Fluorite - F

Fluorite is the main mineral for fluorine and occurs in South Africa in sedimentary, fault controlled (vein type) and magmatic deposits. Three very large deposits (class A) in the Limpopo-Mpumalanga provinces northeastern South Africa (AOI: F-NE, ca. 325,000 km^2) are of carbonate-hosted Mississippi Valley type (MVT) and six large to very large deposits are associated with granite. Altogether 68 mineral occurrences are described in the database of BRGM and CGS in this region. A second area with 12 fluorite occurrences is situated at the eastern termination of the Namaqua Belt in the northern Cape Province (AOI: F-SW, ca. 115,000 km^2), which is however, largely obscured by overlying Cenozoic sands of the Kalahari.

The data for the calculation of the MPM in the northeastern AOI (F-NE) comprised the 1M geological map (CGS), 1M structural data (CGS), UNCCD 1:500k SOTER soil map, srtm, and slope. The MPM shows high potential around the known occurrences and in their wider extension, thereby following roughly the geology of the northwestern Witwatersrand basin and the srtm. In the central part the prospective area has a horseshoe shape comprising most of the higher scores. Additionally, smaller curvilinear

belts are situated in the west and NE of the AOI. The DBA-RF model has an accuracy of ~97 % and indicates that about 2.7% of the AOI is prospective for fluorine. The statistically most favourable factors are, in decreasing order, **Rnb** (Nebo granite: Pink to grey, coarse-grained to porphyritic biotite/hornblende granite, microgranite), **Rsc** (Schrikkloof Fm: fine-grained, flow-banded, porphyritic and spherulitic felsite), **srtm**, **PTe** (Epipetric Plinthosols), **slope**, **Rra** (Rayton Fm: quartzite, hybrid metasomatised and fenitised rocks).

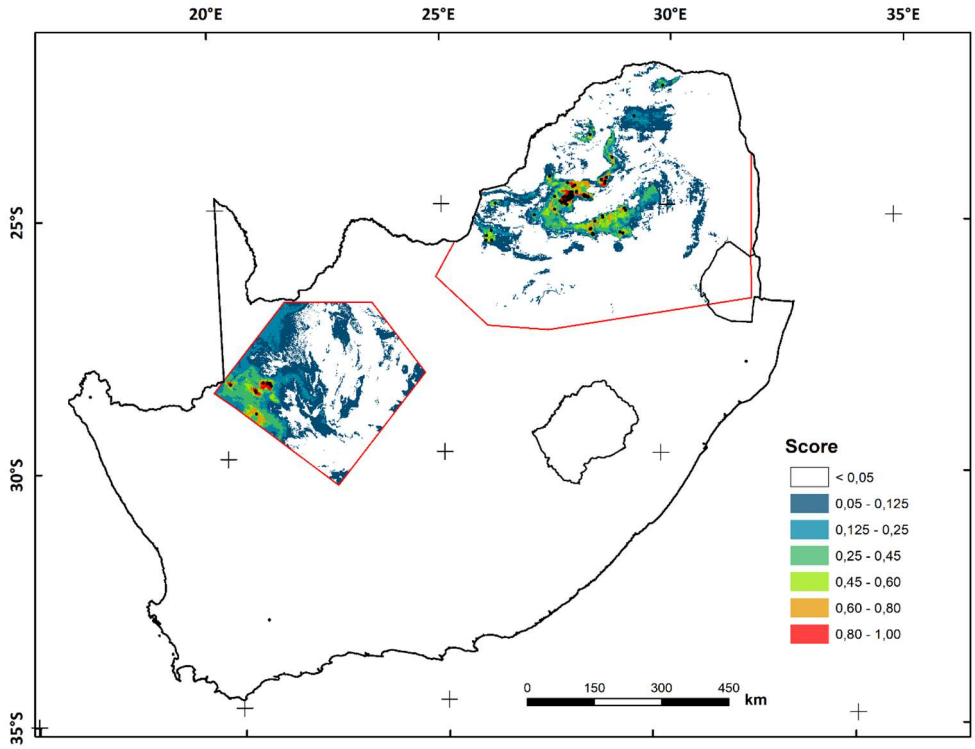

Figure 5. Mineral Potential Map of fluorite (F). The investigated AOI's are outlined in red; known occurrences are indicated as black dots.

The data for the calculation of the MPM in the Northern Cape Province (AOI: F-SW) included again the 1M geological map (CGS), 1M structural data (CGS), UNCCD 1:500k SOTER soil map, srtm, and slope. The prospective area is limited to the western corner of the AOI, where the basement is outcropping. The MPM illustrates four smaller areas with medium to high mineral potential around the known Fluorite occurrences. The DBA-RF model has an accuracy of ~99 % and indicates that about 1.3% of the AOI is prospective for fluorite. The statistically most favourable factors are, in decreasing order, **STrv** (Riemvasmaak Gneiss: Pink-weathering coarse-grained or augen leucogneiss), **srtm**, **ECbp** (Biesje Poort Subgroup: Grey, fine- to medium-grained, pelitic, quartz-feldspar and amphibole gneisses, lenses of quartzite, amphibolite, calc-silicate rocks, marble, schist), **STlv** (Louisvale Granite: Light grey, moderately to well foliated biotite granite), **STk** (Keimoes Suite: Dark grey to leucocratic, equigranular to porphyritic granite, granodiorite, charnockite, minor diorite), **ECbw** (Brakwater Metamorphic Suite: Fine-grained quartz-feldspar gneiss, biotite gneiss, amphibolite, calc-silicate rocks, aluminous gneiss, minor quartzite, garnetiferous augen gneiss).

Manganese – Mn

South Africa is home to 80% of the Earth's known manganese resources and the country is presently the biggest producer of this commodity in the world. All major deposits are situated in two areas of north-central and north-eastern RSA in the Postmansburg and Kalahari Manganese fields where they are hosted by the Palaeoproterozoic Transvaal Supergroup. The age of the unconformity-bounded

deposits at the base of the Pretoria Group is about 2100-2000 Ma. Two areas of interest (Mn-East, ca. 275,000 km^2, 166 occurrences and Mn-Central, ca. 140,000 km2, 49 occurrences) were defined within these areas for the MPM. The third group of manganese occurrences in southwestern RSA follows the Cape Fold Belt over about 850 km length, parallel to the coasts of the Indian and Pacific oceans. The area of interest (Mn-West) has a size of about 115,000 km and includes 50 occurrences. A fourth, small group of five Mn occurrences in the Namaqua Belt of northwestern RSA was not considered for MPM.

The data for the calculation of the MPM in the AOI "Mn-East" comprised the 1M geological map (CGS), 1M structural data (CGS), UNCCD 1:500k SOTER soil map, srtm and slope. The MPM shows that areas with medium to high Mn-potential follow the general geology outlining the structure of a basin. In the SW part of the AOI a branch off from the main structure and an isolated arc display medium to high scores on the MPM but are devoid of known occurrences. They represent therefore new exploration targets. The DBA-RF model has an accuracy of ~91 % and indicates that about 10% of the AOI is prospective for manganese. The statistically most favourable factors are, in decreasing order, **ANml** (Malmani Subgroup: dolomite, stromatolitic, interbedded chert, minor carbonaceous shale, limestone and quartzite), **srtm**, **Lpe**, **ORsw** (Swaershoek Formation: Medium- to coarse-grained sandstone (pebbly in places), conglomerate, trachyte, quartz porphyry), **ANbr** (Black Reef Formation: Quartzite, subordinate conglomerate and shale), and **Rtr** (Timeball Hill and Rooihoogte Formations: Mudrock, quartzite (ferruginous in places), wacke, chert breccia, minor diamictite, conglomerate, shale, magnetic ironstone)

The data for the calculation of the MPM in the AOI "Mn-Central" comprised the 1M geological map (CGS), 1M structural data (CGS), UNCCD 1:500k SOTER soil map, srtm and slope. The resulting MPM shows the highest scores around the known Mn deposits in the central part of the AOI. However, slightly elevated Mn potential is suggested in the NE part, which is covered below Kalahari sands and in the sand-covered area to the west of the known deposits, thereby outlining a basin geometry. These somehow surprising results could be interesting for future green field exploration. The DBA-RF model has an accuracy of ~95 % and indicates that about 4.9% of the AOI is prospective for manganese. The statistically most favourable factors are, in decreasing order, **srtm**, **SDwo** (Wolhaarkop Formation: Ferruginised brecciated banded ironstone), **ANkl** (Klippan Formation: Conglomerate, talus breccia, quartz arenite, shale, andesite, limestone), **ANrv** (Reivilo Formation: Chert-poor dolomite characterized by giant stromatolite domes, laminated, iron-rich dolomite, ferruginous chert), **ORgm** (Gamagara Formation: Conglomerate and shale), and **ANff** (Fairfield Formation: Stromatolitic dolomite)

The data for the calculation of the MPM in the AOI "Mn-West" comprised the 1M geological map (CGS), 1M structural data (CGS), UNCCD 1:500k SOTER soil map, srtm and slope. The resulting MPM shows high scores around the known targets which can be combined into an arc-shaped irregular ridge in the central part of the AOI. Several curvilinear structures between the known occurrences show high scores, especially at the eastern termination of the AOI and provide new exploration targets. The DBA-RF model has an accuracy of ~90 % and indicates that about 10% of the AOI is prospective for manganese. The statistically most favourable factors are, in decreasing order, **Ope** (Peninsula, Pakhuis and Cedarberg Formations: Pebbly quartz arenite, diamictite, minor conglomerate, mudrock, siltstone and shale), **slope**, **srtm**, **Lpq** (Lithic Leptosols), **fault**, **S-Dn** (Nardouw Subgroup: Pebbly quartz arenite, diamictite, minor conglomerate, mudrock, siltstone and shale).

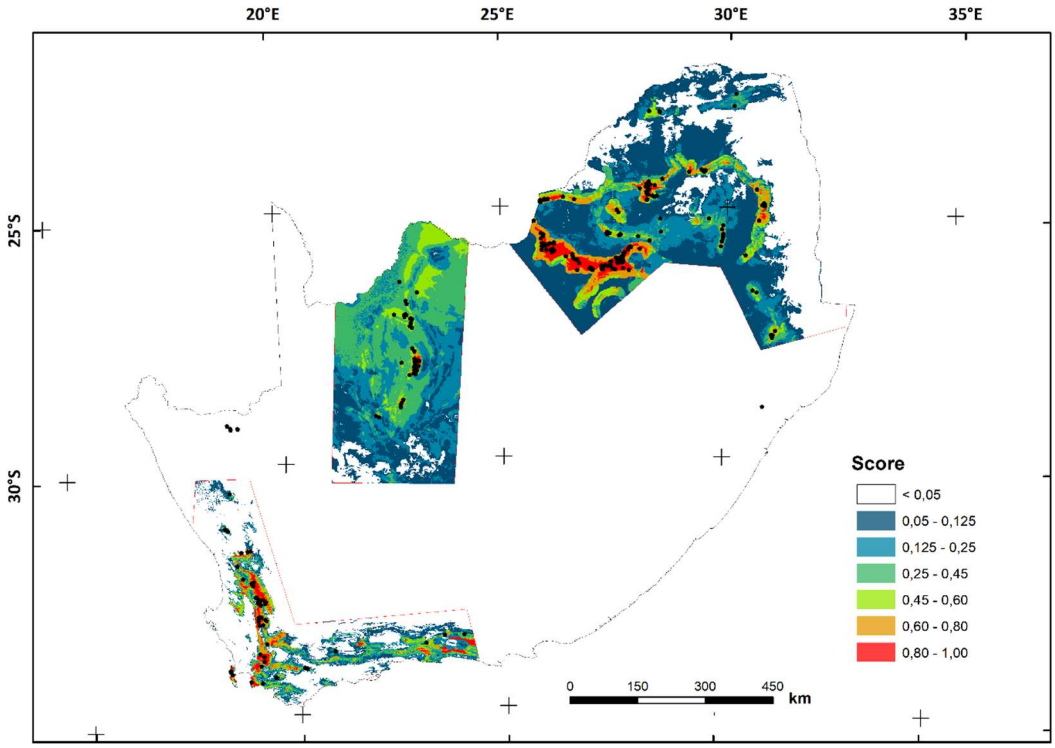

Figure 6. Mineral Potential Map of manganese oxides (Mn). The investigated AOI's are outlined in red; known occurrences are indicated as black dots.

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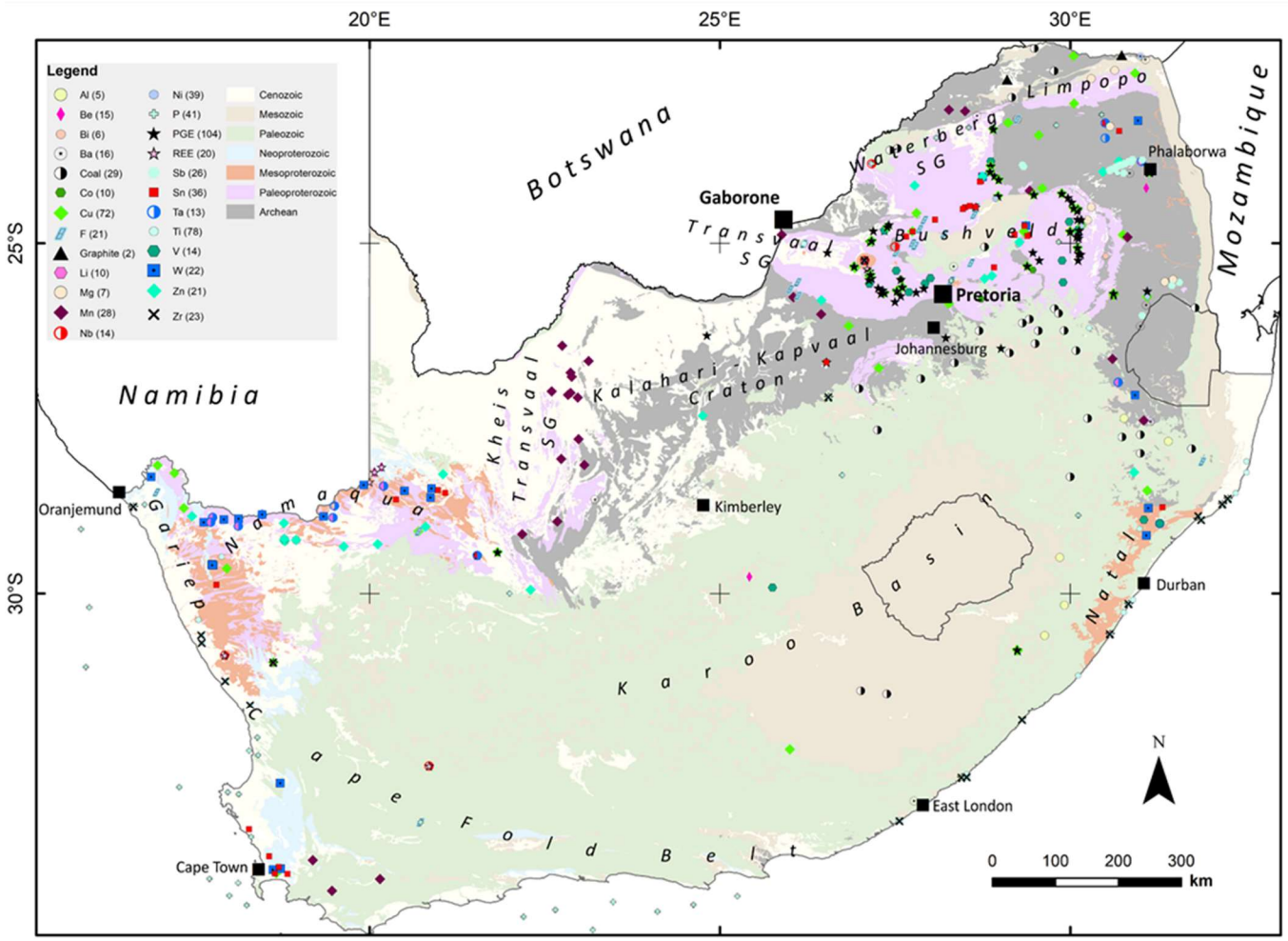

Figure 7 Map of the Main CRM deposits of South Africa

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1.3. Ore processing and refining capacities

South Africa has well-developed mineral processing industry as far as the primary mineral processing phases (crushing, grinding, milling, flotation, chemical, pyro-metallurgical and biological mineral extraction) are concerned. The larger mining operations and especially high-value metals (gold and PGM's) have vertically integrated these processing operations. The energy intensive phases of these industries have suffered heavily from the effects of ongoing load-shedding in South Africa and have made large investments to adjust their operations and increase their independence from the national electricity grid. Metal refining operations and more specialised, knowledge-intensive product developments largely occur off-shore. The overall trend since the 2008 market decline has been downward, as the industry was also affected by load shedding since then. In individual cases, the processing facilities for specific mineral commodities are being developed or improved, however.

Table 5: List of major ECRM's mined in South Africa and description of processing activity

Commodity	Description of industry activity
Phosphate Rock 301 000 t mined annually	A majority of the phosphate rock produced in South Africa is mined from the foskorite zone at the Phalaborwa Igneous Complex which has been industrially mined since 1953 and is still currently exploited by the state-owned enterprise Foskor (Roux et al., 1989). This opencast mine has the capacity to yield 2.6 million tons per annum of phosphate rock concentrate from processing 35 million tons of ore per annum. As of 31 March 2022, Foskor produced 1.58 million tons (2021: 2.17 million tons) of phosphate rock concentrate; 294 000 tons (2021: 301 000 tons) of phosphoric acid and 197 000 tons (2021: 264 000 tons) of granular fertiliser (MAP) (Foskor, 2022). Foskor uses the phosphate rock to produce phosphoric acid and fertilisers including monoammonium phosphate and diammonium phosphate at its plant in Richards Bay (Yager et al., 2022). Nationally, phosphate rock is currently being mined at a rate of 34 million tons per year and ore reserves have been estimated to be 70 years and resource of + 100 years (Porteus, 2018). Mine ore is upgraded from 6.8% P2O5 to a final rock phosphate product of 37 % P2O5 (Porteus, 2018). The Elandsfontein formation on the West Coast is also poised to be a major contributor of phosphate rock ore. Production at the mine was planned for the first quarter of 2017 by the owning companies Kropz Elandsfontein and African Rainbow Capital (Yager et al., 2022). The company plans to produce 1 Mtpa on site for international export and domestic sale (Kropz, 2023; Yager et al., 2022). However, due to various challenges the mine had been delayed and the last update from the company put expected steady state production to begin 2022. The company announced their first bulk sale of 33,000 tonnes of phosphate concentrate in January 2023 (Kropz, 2023). In August, Kropz announced that the commissioning of the mine was delayed for an undetermined period. The companies planned to produce 1.5 Mt/yr of phosphate rock for domestic and export markets (Kropz, 2023).
Fluorspar 223 000 t mined annually	South Africa has the largest fluorspar reserves globally with 17 % of the world total (DMRE, 2009). In 2017 the national production of fluorspar was a marked increase from the previous year where 177,000 t was produced (Yager et al., 2022). Most of the South Africa fluorspar production occurs at Vergenoeg Mine majority owned by Minersa Group. In 2017 they increased their output to 223,000 from 177,000 in 2016. According to Yager et al., (2022), the maximum production capacity of acid-grade fluorspar is 250, 000 tpa and 30, 000 tpa of metal grade at Vergenoeg Mine. Sepflour's Nokeng mine is positioned to become another major contributor to the industry. The mine began operations in 2019 and the mine is reported to have a maximum capacity of 600 000 tpa of 185, 000- 130,000 tpa of acid grade fluorspar of 97 % fluorspar. Buffalo fluorspar mine as well as the Witkop fluorspar mine owned by Sallies have previously been active producers in the fluorspar industry but have since been mothballed. In 2020, 97% of the fluorspar was exported to countries like Germany, the Netherlands, the United States, India and China (OEC, 2020). Approximately 5% of the fluorspar

	mined in the country was consumed locally due to a lack of domestic processing facilities. A majority of the fluorspar in the country is used by NECSA's subsidiary, Pelchem SOC to produce hydrofluoric acid (Yager et al., 2022).
Silicon 51 000 t mined annually	South Africa is a major contributor to the silicon metal industry, though the industry has seen some slow-down. Previously, a major player in the industry was Ferroglobe which produced silicon metal at its eMalahleni and Polokwane (Yager et al., 2022). The two facilities host furnaces and crushing facilities to produce silicon metal. Their Polokwane plant can produce 51,000 tonnes per annum (Shabalala, 2022). However, due to high operating costs and a decline in the price of silicon metal Ferroglobe ceased production of silicon metal (Yager et al., 2022). Additionally, challenges with securing a reliable energy supply due to the scheduled rolling blackouts or "loadshedding" implemented by the national power utility company, Eskom[2], has resulted in difficulties restarting operations.
Nickel 31 800 t mined annually	Most of the South Africa's nickel production is as a co-product of PGM mining. In fact, ~ 87 % of South Africa's total nickel output is a co-product of PGM mining (DMRE, 2009). Around 12 % of the domestic output and primary nickel is mined at Nkomati Nickel which has been placed on care and maintenance due to high cost of operation and low profit margins (ARM, 2022). The main concentrator at Nkomati has a maximum capacity of 375 kt of ore per month (Nornickel, 2020). African Rainbow Minerals has considered restarting mine operations as nickel prices have seen an uptick. National reporting of nickel production is sporadic however, the DMRE (2009) reported that in 2006 South Africa produced 1.4 Mt of nickel ore and 384.1 kt of refined nickel in 2009. According to a USG survey, Implats, a major PGM producer in South Africa, produced 17,100 t of refined nickel in 2017, of which 4,500 t was a co-product of the company's PGM mining operations (Yager, 2022). In 2020 the company produced 15, 400 t of refined nickel. Amplats owned by Anglo American produced 26,100 t of refined nickel in 2017 and 23,036 in 2019 which fell substantially to 13,874 t in 2020. Another potential major contributor to the Nickel industry is a joint venture between Sibanye-Stillwater's Lomnin mine and Thakadu Group which was aiming to build a nickel sulphate plant at Lonmin's base metals refinery with a maximum capacity of 30 000 t annually of nickel sulphate and an average steady state of 25 000 t/y. The nickel sulphate production will be targeting the lithium-ion battery market (Thakadu Group, 2021).
Aluminium 714,000 t mined annually	Currently, South Africa does not produce bauxite. Instead, primary aluminium is produced from imported alumina (Yager et al., 2022). As it stands, the South32 owned Hillside aluminium smelter in Richards Bay is the major producer of aluminium in South Africa. In 2022 saleable production from the Hillside smelter stood at 714 kt which was a 3 kt decrease from the previous year due to the impact of increased load shedding.
Vanadium 7700 t mined annually	South Africa is one of the world's major producers of vanadium. According to the US Geological Survey, in 2020, South Africa produced an estimated 22,000 metric tons of vanadium, which was about 2% of global production. Most of this vanadium comes from the Bushveld Igneous Complex. There are two primary vanadium producers in South Africa: Glencore and Bushveld (Yager, 2022). Evraz Highveld Steel and Vanadium was previously a major contributor to the industry, but the company has since dissolved with its assets likely to be bought by Robusteel (Liedtke, 2021). Rhovan Mine owned by Glencore produced 9,500 t in 2017. Vamecto mine owned by Bushveld can produce 2,850 t/yr and Bushveld plans on upgrading this to 5000 t/y (Yager, 2022). Bushveld also owns the Vanchem primary vanadium processing facility. This facility produces vanadium pentoxide, ferrovanadium and vanadium chemicals and is capable of producing vanadium trioxide. Vanchem uses the salt-roast beneficiation process.

[2] Eskom Hld SOC Ltd or Eskom (Afrikaans: Elektrisiteitsvoorsieningskommissie) is a South African electricity public utility.

Titanium	According to the DMRE (2009) the production of titanium between 2006 and 2009 fluctuated between 950 kt to 1223 kt. In 2019 South Africa produced 820 kt of ilmenite and 110 kt of rutile (Roux, 2020). The biggest titanium producer in South Africa is Richard Bay Minerals (RBM) the company also produced pig iron and processed ilmenite to titanium slag (Yager, 2022). In 2019 RBM approved the development of the Zulti South Project but has however paused their work here. Based on their production plans including Zulti South and North as well as their current operations, RBM's total ilmenite production could increase to more than 2.2 Mt/yr. RBM produced 880,000 t of titanium slag in 2012 (Yager, 2022). KZN Sands Fairbreeze owned by Tronox located 20 km south-west of Richards Bay produces a titanium slurry by using hydraulic mining at the Hillendale mine. Fairbreeze had a capacity of 500,000 t/yr of ilmenite, 55,000 t/yr of zircon, and 25,000 t/yr of leucoxene and rutile (Yager, 2022). There is also a processing complex in Empangeni, 20 km west of Richards Bay which has smelting capacity for ilmenite to produce titanium dioxide slag (DMRE, 2008). Namakwa Sands also owned by Tronox which is an open-pit mine and concentration plant located 385 km north of Cape Town (Tronox, 2023). Here after primary concentration the ore is further processed in a secondary concentration plant to yield a magnetic and non-magnetic stream (Tronox, 2023). This facility produced 180,000 t of titanium slag in 2017. There was also 26,000 t of rutile as well as 450,000 t of ilmenite. A key player in R&D as it pertains to titanium feedstock is Mintek. In collaboration with Anglo American they developed a DC arc smelting process used by the Tronox-operated plants in South Africa (DMRE, 2008). A major player in the upstream titanium value chain is Nyanza Light Metals plant which produces titanium dioxide pigment (Roux, 2020). Together with a New Zealand company they plan to construct a pigment plant with a 100,000 tpa capacity.
PGMs 271 000 t mined annually	South Africa is the world's largest PGM producer owing the nation's vast PGM reserves. South Africa's PGM output is predominantly produced in the Bushveld Complex with 0.1 % coming from the gold deposits of the Witwatersrand and Free State, and the Phalaborwa copper deposit (DMRE, 2010). In 2017, platinum-group metal mine production fell from 263.653 kg in 2016 and 304,00 kg in 2007 to 260,264 kg (Yager, 2022). Platinum made up 50 % of PGM mine output by volume in 2017 (Yager, 2022). Amplats, owned and operated by Anglo American, is one of the largest PGM producers in South Africa. In 2017 Amplats produced 155,500 kg of refined PGMs specifically 78, 129 kgs of refined platinum, 51,893 kg of refined palladium, 10,053 kg refined rhodium, and 15,500 kg of refined iridium and ruthenium (Yager, 2022). Modikwa Mine produced 10,022 kgs in 2017, Union mine produced 9,558 and the Mototolo Platinum mine produced 5,704 kg. The Mogalakwena Mine produced 370,000 ounces of refined platinum. Kroondal which is 50% owned by Sibanye Stillwater has two concentrator plants which process ore at a rate of 590, 000 t a month. In 2022 Amplats PGM production fell by 30 % from the previous year to 28 000 kg owing to the rebuild of the Polokwane smelter. In 2022 Amandelbult produced 20,213 kgs of PGMs, which is a minor decrease from the previous year's production at 21,914 kgs (Anglo American, 2022). The smaller Unki and Mototolo mines also owned by Amplats produced 6, 577 kgs and 8,221 kgs in 2022 respectively. The jointly owned Bafokeng Rasimone Platinum Mine. The mine produces around 4847 platinum per year and in 2017 it produced 8,800 kgs of PGMs. Styldrift Mine also owned by Royal Bafokeng Platinum produced 6151 kg of PGMs in 2021 which marked an 11 % increase from the year before (Royal Bafokeng Platinum Ltd., 2021). Implats, another major player in the PGM industry produced a total of 92,685 kg of refined PGMs in 2017 (Yager, 2022). Impala is 96% owned by Implats and has operations situated on the western limb of the world-renowned Bushveld Complex near Rustenburg in South Africa (Yager, 2022). Here, 36,500 kgs of PGMs (including

	gold) were produced in 2018. Two rivers, a joint venture between Impala and African Rainbow Minerals and managed by African Rainbow Minerals. The operation comprises two on-reef decline shafts and a concentrator plant and has a life-of-mine offtake agreement with Impala Refining Services (IRS). In 2016 Two Rivers produced 183 400 ounces of refined platinum. Bokoni Mine which has recently been acquired by African Rainbow Minerals for which African Rainbow Minerals Targeted steady-state production of 300 000 ounces per annum by 2028 (ARM, 2021). Other major mines include Lonmin owned by Sibanye-Stillwater which produced 338,475 kg of refined PGMs in 2018, Marula mine owned by Impala which produced 210 000 ounces of concentrate in 2020 (Impala, 2021). There is also Booysendal which is owned by Northam Platinum which in 2018 produced 185 000 oz of PGMs concentrate.
Cobalt 2,300t mined annually	Most of South Africa's refined cobalt production is a co-product of PGM mining as well as of the single nickel mine operation, the Nkomati mine. The USGS estimates South Africa's cobalt reserves at 15 kt (DMRE, 2009). Most of the cobalt reserves can be found in Merensky Reef, the Plat Reef and UG2 chromitite layer. These three layers are in the Bushveld Complex geological formation. South Africa's cobalt is produced as a by-product of the mining and refining of platinum-group metals (PGMs) operations as well as a by-product of a single nickel mine operation, the Nkomati mine (DMRE, 2009). In 2017 the refined cobalt production from PGM operations was 1,062 t while the cobalt associated with nickel was at 851 t.
Lead 35 000 t mined annually	From 2000 to 2009 South Africa's lead mine output was relatively stable at an average of above 40 kt per annum. The closure of Broken Hill and Swartberg mine in 2006 resulted in a 13.3 % production drop (DMRE, 2014). Black Mountain Mine owned by Vendanta Resources Ltd. is a major producer of lead in the country. In 2017, the mine produced 48,150 t of lead ore (Yager, 2022). Gamsberg mine also owned by Vendanta Resources Ltd was completed in 2019 and has increased national production. Its current production of this mine is 400,000 t/yr (Vendanta, 2021). The reopening of Swartberg shaft at Black Mountain in 2013 did contribute to production though limited.
Manganese 14 900 t mined annually	South Africa possesses 75 % of the world's identified manganese resources (DMRE, 2013). As of 2017, manganese ore production in South Africa was 14.14 Mt, which represents a marked increase from 10.81 Mt in 2016 and the measly 6 Mt in 2007 (Yager, 2022). This gradual increase can be attributed to increased production at Mamatwan, the Nchwaning, and the Wessels Mines as well as the opening of the Kalahari, the Kudumane, and the Tshipi Borwa Mines (Yager, 2022). A major contributor in the industry is South 32 Ltd. which operates Mamatwan open pit mine and the Wessels underground mine near Hotazel in Northern Cape Province (South32 Ltd., 2023; Yager, 2022). Mamatwan mines has a mining output capacity of 2.3 Mtpa and Wessels has 0.6 Mtpa at an optimised rate (South 32 Ltd, 2016). Assmang, a subsidiary of Assore, operates Gloria mine as well as Nchwaning 2 and Nchwaning 3 all of which are collectively known as Black Rock. Output at Black Rock increased from 2.71 Mt in 2016 to 3.62 Mt in 2017 (Yager, 2022). An expansion project at the mine is expected to increase total production of Black Rock to 4.6Mtpa.
Coking Coal	South Africa has abundant amounts of thermal coal, however, coking coal is fairly limited. Makhado project in the Limpopo Province in 2019 at the Soutpansberg coal field will represent one of the only coking coal projects in the country. According to MCMining which owns the mine, production was anticipated to begin in 2020 however it is unclear whether production has begun. The company plans to produce 700,000 t/yr of coking coal.

2. Assessment of the ECRM value chain

2.1. Characterisation of the value chain for primary and secondary raw materials

South Africa currently has some 2000 operating mines, quarries, and mineral processing facilities (DMRE, 2022). Administration of the minerals industry is the responsibility of the Department of Mineral Resources and Energy (DMRE) governed by the Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) and the Mine Health and Safety Act (Act No. 29 of 1996). The two Acts, along with other enabling legislation, provide the regulatory framework for the promotion and regulation of the mining, minerals, and petroleum industry with a mission to ensure equitable access to and sustainable development of the nation's mineral resources and related matters.

Three DMRE's divisions deal primarily with minerals. Minerals and Petroleum Regulation is responsible for minerals management, mineral regulation and administration, and environmental enforcement and compliance. A Mining, Minerals and Energy Policy Development division deals with mining, minerals, and energy policy development management; minerals policy; economic analysis and statistics; economic growth, promotion, and global relations and with minerals and energy planning. A Mine Health and Safety Inspectorate division deals with health and safety of employees in the mining industry through mine, health and safety management and a mine safety inspectorate (DMRE, 2021).

Performance of the DMRE has attracted criticism from the private sector variously due to a poorly functioning mining cadastral system, opaque decision-making, delays in processing mining permits and discontinuing the publication of up-to-date mineral statistics.

2.1.1 List of the mining and recycling projects

Private sector

South Africa's major mining companies, listed in Table 6, collectively produce approximately 90% of mineral production by value. While the country has some 2000 operating mines, referred to above, production in all commodity categories is overwhelmingly undertaken by large mining groups that have been in existence for several decades, save for platinum, coal, and manganese where several new entrants were established in the 2000s.

Table 6 Major mining companies by commodity group[3]

Platinum	Coal
Anglo American Platinum	Coastal Fuels
Barplats	Exxaro Resources
Bauba platinum	Glencore Coal
Impala Platinum	HCI
Ivanplats	Ilima Coal
Limberg Mining Company	Kuyasa Mining
Nkwe Platinum	Mbuyelo Group
Northam Platinum	MC Mining
Platinum Group Metals	Msobo Coal
Royal Bafokeng Platinum	Sasol Mining

[3] Source: Minerals Council, 2023. Note: Several companies mine more than one commodity.

Sedibelo Platinum Siyanda Resources Wesizwe Platinum	Seriti Resources Thungela
Manganese	**Gold**
Assore Kudumane Resources SA Manganese Koornfontein Mines South32 - Tshipi é Ntle United Manganese of Kalahari Vaalbult	DRDGOLD Gold Fields Harmony Gold Pan African Resources Theta Gold Village Main Reef
Chrome	**Zinc/Copper**
Chrometco Glencore Chrome Samancor Tharisa	Black Mountain Orion minerals Palabora Mining Company
Diversified mining	
African Rainbow Minerals Sibanye-Stillwater	

A full list of CRM mining operations and projects is provided in the Appendix_2.1_MINING_LIST.

South Africa's formal small and mid-tier producers that are not represented by the organized mining industry are estimated to contribute about R88 billion to the economy and provide 45 000 direct jobs. This sector contributed 7.5% to the R1.18 trillion value of mining production and 9.5% to total employment in 2022. These companies are most active in industrial minerals followed by diamonds, coal, iron ore and manganese, gold, chrome and PGMs (Minerals Council, 2023).

The composition of net fixed investment for the period 1993 to 2021 is shown in **Figure 8**. From 2014 onwards fixed investment has declined, initially tracking commodity prices but deeper structural issues have taken over. Various factors are contributing to this capital expenditure decline: constrained electricity supply; a swing in the capital-labour ratio in favour of labour, evident since 2008, despite mines becoming deeper; input costs running ahead of commodity price rises; a worsening security situation; deteriorating quality of transport, logistics and border services constraining export performance; policy uncertainty around changing Mining Charter requirements, prospecting rights and a collapse of the Government's mining cadastral system hindering mining permitting. Cumulatively these factors are substantial problems for the mining industry.

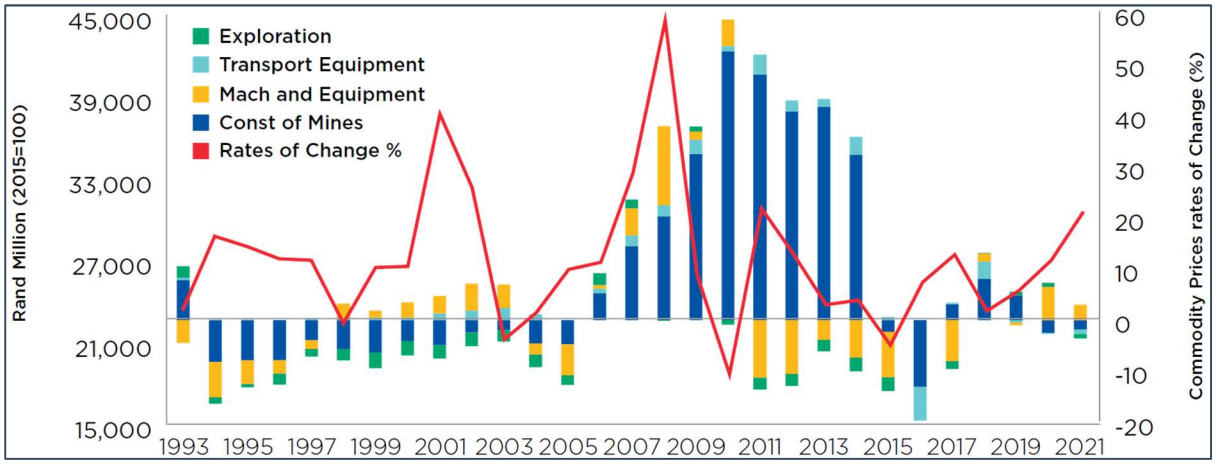

Figure 8 Composition of net fixed investment (LHS constant 2015 Rand) compared to commodity price movement (RHS % change) 1993 to 2021[4]

In response to these problems, several strategies have been started by the organized mining industry, including:

- Working with the state-owned rail operator Transnet to improve capacity and reliability of rail bulk transport.
- Recognizing that mining research, development and innovation capacity has been denuded over time, the mining industry needs to modernize in technical, safety, environmental and social spheres. The Minerals Council has encouraged members to increase R&D efforts and act through research partnerships with the public science system, see section on Mandela Mining Precinct below.
- Efforts to revive exploration activity directed at the DMRE, the Council for Geoscience and Treasury to improve the regulatory environment and pool of capital. South Africa attracted 2% of global exploration in 2012, but less than 1% today.
- Improving security in the mining industry through the application of 4th Industrial Revolution technologies.

Informal players

Accurate information on informal small-scale mining is not available but has increased in recent years as unemployment has risen. To assist informal miners, the DMRE has established an artisanal mining directorate to provide technical assistance, improve safety and reduce environmental damage.

Illegal mining and criminal extortion have become pervasive and extremely costly to the formal mining sector causing significant lost lives and revenue. Theft of infrastructure, products, and diversion of goods during transport have escalated in recent years. Illegal mining in abandoned mines is a major risk to the health and safety of surrounding communities. A hierarchy of participants runs through a well managed 5 tier criminal syndicate system from underground workers through to top international receivers and distributors usually work through international refineries and intermediary companies. Joint police, prosecution and mining company committees operate to counter this scourge, yet combatting these violent and entrenched criminal syndicates is extremely challenging.

[4] Source: Minerals Council, 2023 based on data from Stats SA, World Bank, SA Reserve Bank

Recycling Operations

South Africa has several recycling operations for various types of metals. It must be noted that tailings reprocessing on large mines is sometimes allowed in partnership with smaller companies. These operations are limited in number and are always confined to the mine property under license, to maintain effective control over health and safety of operators. Table 7 lists the independent (not on mine site) metal recycling facilities known in South Africa. Table 8 lists the tailings retreatment projects in South Africa.

Table 7: Recycling operations in South Africa

Name of company	Location	Commodity recycled	Degree of maturity
Star Recycling Company	Gauteng	Copper, Brass, Aluminium, Lead, Zinc & Stainless steel, Iron, Steel	Operational
Amalgamated Metal Recycling (a subsidiary of Insimbi Group)	Cape Town, Gauteng, Durban	Fe, steel, Al, Cu, zinc, stainless steel, lead, Ni, brass, Sn, bronze, etc.	Operational
Primo Recycling	Gauteng	Iron steel, aluminium, copper, stainless steel, lead, nickel, brass, tin and bronze	Operational
Maningi Metals	Gauteng	iron, steel, aluminium, copper, stainless steel, lead, nickel, brass, tin and bronze	Operational
AST Recycling	Johannesburg, Cape Town, Durban	E-waste, catalytic converters	Operational
Cast Products	Johannesburg	Steel	Operational
Vulcan Metal & Logistics	Johannesburg	iron, steel, aluminium, copper, stainless steel, lead, nickel, brass, tin and bronze	Operational
Wykco Group	Gauteng	iron, steel, aluminium, copper, stainless steel, lead, nickel, brass, tin and bronze	Operational
Palladium Recycling	Gauteng	PGMs	Operational
Blue Sky Metals	Kwazulu-Natal	iron, steel, aluminium, copper, stainless steel, lead, nickel, brass, tin and bronze	Operational
Desco Electronic Recyclers	3 Branches: Gauteng, KZN and Western Cape.	WEEE and associated plastic waste as well as ferrous/ non-ferrous metals recovery.	Operational
Kusini Resources Proprietary Limited	Gauteng	Mine waste recycling and value recovery. PGM recovery from catalysts	Operational

Table 8 Tailings retreatment projects in SA

Name of company	Location	Commodity recycled	Ownership	Degree of maturity
Louis Moore Tailings facility	Limpopo	-		Development
Mooinooi Tailings Plant	North West	PGMs	Samancor	Operational
Marikana Eastern Tailings Dam	North West	PGMs	Sibanye-Stillwater	Operational

Name of company	Location	Commodity recycled	Ownership	Degree of maturity
Zandfontein Tailings Dam	North West	PGMs	Eastern Platinum (Barplats)	Operational
Thakadu Battery Plant	Johannesburg	Nickel and Cobalt	Thakadu	Operational
Sylvania Dump Operations	North West	PGMs	Sylvania Platinum Limited	Operational
Booysendal South tailings storage facility	Limpopo	PGMs	Northam	Operational
Western Limb Tailings Retreatment	North West	PGMs	Sibanye-Stillwater	Operational
Marikana Bulk tailings retreatment	North West	PGMs	Sibanye-Stillwater	Operational

2.1.2 Existing ESG indicators

Environmental, Social and Governance (ESG) reporting has become a requirement by many stock exchanges world-wide. There are different internationally acknowledged ESG standards and frameworks, which include:

- The Global Reporting Initiative (GRI), the most used sustainability reporting framework that maps out principles and performance indicators for companies to report on ESG performance;
- The Carbon Disclosure Project, a reporting system through which companies disclose greenhouse gas emissions, water management and climate change strategies;
- The United Nations Global Compact, a sustainability initiative for companies to align their strategies and operations in the areas of human rights, labour and anti-corruption;
- The International Finance Corporation Sustainability Framework
- The Equator Principles

In the South African context, the Johannesburg Stock Exchange (JSE) Sustainability Reporting Index is the recognised exchange body which regulates ESG reporting on the South African Securities Exchange. When issuing their Sustainability and Climate Change Guidance, the JSE emphasised that "While intended primarily for JSE-listed companies, this guidance will also be of value to institutional investors and the different entities that they invest in (including non-listed companies and debt issuers), as well as a range of stakeholder groups interested in sustainability/ESG disclosure and performance." (Johannesburg Stock Exchange, JSE's Sustainability and Climate Change Disclosure Guidance, 2022) The JSE prides itself for its progressive listings requirements incorporating the King Codes and its 2004 Sustainability Reporting Index (SRI), which they call the ESG Index. The JSE is signatory to the UN-backed Principles for Responsible Investment (PRI), the co-chair of the Global Investors for Sustainable Development Alliance, and a member of the World Federation of Exchanges' Sustainability Working Group. However, the JSE acknowledges that while it is considered to have existing requirements for sustainability/ESG disclosure "…no detailed guidance to assist listed companies on sustainability/ESG reporting has been issued until now." (ibid)

As the South African Environmental, Social and Governance Committee (SAMSEG Committee) reported, "Numerous organisations have moved towards greater transparency when disclosing ESG information in recent years and have contributed greatly through the development of industry-specific technical standards." (The South African Environmental, Social and Governance Committee, 2017) The South African Minerals Reporting Code (SAMCODE) Standards Committee provided leadership in the development and publication of the South African guideline for the reporting of ESG parameters within the solid minerals, oil and gas industries (the SAMESG Guideline), which was first released in 2016. According to SAMCODE Standards Committee the guideline has evolved to provide

direction on ESG reporting requirements for public reporting, as defined in SAMREC (South African Minerals Reporting Code).

The SAMESG Guideline provides guidance on the reporting of the following aspects:

- Organisational structure, systems, policies, procedures and risk management plans;
- Compliance related ESG aspects;
- Key environmental parameters;
- External social and political parameters;
- Internal social parameters;
- Conformance and compliance audits;
- ESG liability; and
- Risk analyses and materiality processes

There are technical standards which SAMESG acknowledges and promotes, which include, the International Standard for Organisation (ISO), the World Bank Group Equator Principles, the Principles for Responsible Investment, and the International Finance Corporation Sustainability Framework. The SAMESG also recognises the OECD Guidelines for Multinational Enterprises, the ISO 26000 Guidance on Social Responsibility, Code for Responsible Investing in South Africa, Principles for Responsible Investment, the King Report on Governance for South Africa and the International Corporate Governance Network. It is noteworthy that the Chairperson of the SAMESG Committee observed that "Sustainability reporting is largely undertaken voluntarily by companies, regardless of their listing status on a stock exchange." (Steele-Schober, T, 2021)

Steele-Schober mentioned that the SAMESG is intended to encourage JSE-listed mineral developers to filter through information that many are already collecting to support their voluntary sustainability reporting processes. SAMESG also aims to provide guidance to the junior and mid-tier companies on what information investors are interested in and assist them prepare such information in a manner that best showcases their company's approach to ESG integration. SAMESG helps companies collect and report on site-level data.

2.1.3 Economic links between the formal and informal sectors

Informal mining in South Africa predates the current era by centuries. South African communities made utensils and crafts out of clay and also manufactured agricultural and hunting implements out of iron for centuries before the era of recorded history. .

The formalisation of mining during the colonial era at first allowed indigenous people to participate in mining as claim owners and as labourers in what ranged from artisanal to mechanised operations (Ledwaba, P and Mutemeri, N, 2017).

With the retrenchments in the gold mines and deplorable economic conditions many South Africans started engaging in illegal artisanal mining on abandoned shafts. Artisanal mining gained recognition through the White Paper on Minerals and Mining Policy (1998) when the Department of Minerals and Energy (DME) took a position to redress past injustices. These policy propositions were translated into legislation in the Minerals and Petroleum Resources Development Act of 2002 (MPRDA). However, despite efforts to support the Artisanal and Small-Scale mining (ASM), the sector remains informal even with an increase of the number of permits issued. The DMRE also acknowledges that "*the extent of the industry in terms of players involved, number of people employed, its socio-economic impact, investments, and its contribution to the Gross Domestic Product (GDP), in the form of taxes and royalties is not properly documented"* (DMRE, 2022).

In a new Artisanal and Small-Scale Mining Policy of 2022, the DMRE distinguishes between Artisanal mining and Small-Scale mining. According to the Policy, Artisanal mining refers to "*traditional and customary mining operations using traditional and customary ways and means. This includes the*

activities of individuals using mostly rudimentary mining methods, manual and rudimentary tools to access mineral ore, usually available on surface, or at shallow depths." Small-Scale mining is defined as "*a prospecting activities or mining operation which does not employ specialised prospecting, mechanised mining technologies, chemicals including mercury and cyanide or explosives; or the proposed prospecting or mining operations do not involve an investment or expenditure which exceed such amount as may be prescribed*." (Ibid)

Ledwaba and Mutemeri unpack the illegal form of Artisanal and Small-Scale mining with an observation that it is linked to socio-economic and political imperatives. They differentiate between so called "Zama-Zamas"[5] and the informal Artisanal and Small-Scale miners who are compelled by socio-economic and political factors. The Zama-Zamas are often (but not always) associated with organised criminal gangs and international syndicates while informal Artisanal Small-Scale miners are often given permission by local authorities and would welcome efforts to formalise them (Ledwaba, P, and Mutemeri, N, 2017).

The Artisanal and Small-Scale Mining Policy of 2022 aims to formalise all illegal Artisanal and Small-Scale mining and create an enabling environment for the sector to prosper. The Informal Artisanal and Small-Scale mining sector when formalised and supported could make meaningful contribution to livelihoods, government revenue and the country's economy. There are no legal restrictions as to the type of mineral chosen by artisanal and small-scale miners and as such involves a wide range of minerals, from precious minerals to construction materials. The number of people working in the sector, formal and informal, is estimated between 10 000 and 30 000.

The Artisanal and Small-Scale Mining Policy of 2022 distinguishes between artisanal and small-scale mining in terms of prescribed investment limits. The investment maximum for artisanal mining is R1 million and the maximum investment for small-scale mining is R10 million. Provision is made for a graduation process from artisanal mining to small-scale mining and from small-scale mining to junior mining. The Policy and legal framework will also have different requirements for artisanal mining permit and small-scale mining permit. Permit holders will be formalised and required to affiliate to established associations representing them. Artisanal and small-scale mining permits will become real rights, like mining rights, and holders will be able to transfer, mortgage and capitalise them.

Regarding extent and scope of permits, the DMRE says that "Considering the rudimentary nature of artisanal mining and particularities of small-scale mining the duration and size of permits should be determined taking into consideration factors such as but not limited to the type of mineral being mined, technical and financial resources required, and the environmental impacts associated with the extraction of that mineral." (DMRE, 2022). The DMRE will preserve artisanal and small-scale mining permits for South Africans, with particular consideration given to Historically Disadvantaged South Africans (HDSAs), women, cooperatives and vulnerable groups . Recognising the existence of foreign nationals in illegal mining the DMRE proposes a transitional period for all illegal miners to come forward to be formalised.

ASM operations will be restricted to surface and open cast mining, given the limited skills and financial resources for environmental management and health and safety considerations. The Policy empowers artisanal and small-scale miners to add value to their minerals and trade in the open market. The DMRE will consider a regulated market or a central buying agency for artisanal and small-scale miners to ward off syndicates who often take advantage of the miners. The Policy will enable cooperation between large mining operators and artisanal and small-scale miners through Tributing Agreements.

[5] "Zama-Zama" is a term derived from the Zulu language "-zama", stem of "ukuzama", which means "to try, strive, or make an attempt to obtain something". The term is in common use for illegal miners, often of foreign origin, operating in South Africa.

Owners of tailings and dumps will be encouraged to work with artisanal and small-scale miners considering environmental management and water related legal requirements.

The Small-Scale Mining Directorate will be capacitated to provide institutional support to the artisanal and small-scale mining sector in the areas of training, funding applications and government's incentive schemes. The DMRE is cognisant of the cost factor associated with compliance regarding environmental laws for artisanal and small-scale miners. The occupational health and safety requirements are as stringent as those for mining right holders. In response to these challenges the Artisanal and Small-Scale Mining Policy proposes that government should collaborate with institutions such as the MQA, Mine Health and Safety Council (MHSC), and Organised business to train and empower permit holders to comply with environmental and health and safety requirements. The Policy further proposes that government should have an integrated approach to monitoring compliance and devise mechanisms to provide incentives and disincentives in order to encourage compliance.

2.2. Identification of the bottlenecks along the value chain

In August 2022, the Trade and Private Sector Development (TPSD) Facility of Development Alternatives Incorporated (DAI Global), LLC published a report titled: *"Study on a potential EU - South Africa partnership on Raw Materials Value Chains".* This report was derived from extensive research and many interviews about the climate and opportunities for EU investment in critical mineral projects in South Africa. It touches on many similar issues to the AfricaMaVal project. This chapter has been compiled with inputs from that report as it relates to critical minerals, value chains and the specific projects identified.

The aim of the DAI Global research was to analyse the value chains of specific important raw materials in South Africa and to pinpoint potential avenues of collaboration between the European Union and South Africa.

Ten minerals were examined in the study: cobalt, fluorspar, vanadium, rare earth elements, and the six platinum group metals (PGM): ruthenium, iridium, osmium, palladium, and rhodium. A value chain analysis of green hydrogen and trash from electrical and electronic equipment was also conducted as part of the study.

2.2.1 List of the main bottlenecks and the links between them

The DAI Global report identified the following bottlenecks for the CRM value chains analysed:

Table 9: CRM constraints and opportunities for engagement (per DAI Global, 2022)

CRM	Constraints to investment/ growth
Vanadium	Significant investment is required in vanadium exploration. South Africa's proposed government exploration strategy identifies the following challenges to increasing exploration investment in the broader mining sector. Thus far, section s12J of the Income Tax Act, and other similar incentives have not proven of benefit to junior explorers. There exist limitations to the diversity of available financial instruments, particularly for junior miners. Lack of dissemination of available legislative benefits has resulted in a disjuncture on the use of tax rebate benefits to support exploration development. The rate of commercialisation of flow batteries remains hindered by the high capital costs associated with the sourcing and extraction of vanadium and the low solubility of the vanadium salts that the battery employs.

CRM	Constraints to investment/ growth
	The availability of project financing and the fact that the domestic financial sector is not experienced in new energy storage technologies will be an impediment to the development of VRFBs. There is room to grow South African exports of vanadium however, given the direction set out in The South African Steel and Metal Fabrication Master Plan 1.0, this would (from the perspective of the South African government) need to be balanced against local needs. The best approach to satisfying both goals would be to increase production of vanadium, which requires greater investment in exploration and investment in production capacity.
Fluorspar	Greater investment is required in exploration activities. Whilst South Africa is the fourth highest producer of fluorspar, decades of a lack of investment into exploration and expansion of production have left the country with significantly less production than its counterparts. There has been a reluctance to invest in the technology and infrastructure required for beneficiation of fluorspar. This is exacerbated by a skills shortage and the length of time it takes to develop fluorochemical facilities. Long development timelines also necessitate large up-front capital deployment. Investment in Sepflour's undeveloped Welgevonden and Kruidfontein prospects is an option for European investors.
REE	A lack of experience in and data on this sector's performance in South Africa will make it difficult for many investors to participate at the various stages of the value chain. European investors could partner with mining companies to provide risk capital and fund the exploration and development of REEs in South Africa. Due to the early stage of development, there is ample opportunity for European companies to position themselves early to participate in the beneficiation of REEs (once supply is ready), through equipment supply, technology transfer and capacity building.
Cobalt	The growth of the cobalt sector is not prioritised by the South African government. Local beneficiation of cobalt has not been prioritised, as such there may be opportunities for European companies to assist in the creation of local cobalt value chains that are matched to South Africa's relatively limited supply. European companies that produce beneficiated products like cobalt salt and cobalt metal could explore the role of South Africa in actualising the desire of Democratic Republic of the Congo (DRC) and Zambia to produce value added intermediary products for battery production. This aligns well with Southern African Development Community (SADC) regional value chain development efforts supported by the African Development Bank (AfDB). The beneficiation of the limited quantities of cobalt produced by South Africa could then be linked to cobalt production from the DRC, Zambia and Zimbabwe helping to meet the critical mass required for such investments. In addition, South Africa also offers well developed financial markets for capital raising.
PGM's	South Africa's PGM sector is vertically integrated from mining to fabrication, however there are areas within the sector that require further development. There is limited domestic capacity to service, refurbish and fix the smelters and furnaces used to process PGMs, resulting in mining companies being forced to wait for international practitioners to attend to their equipment which can result in expensive backlogs. South Africa lags behind in the creation of PGM related research and knowledge products which has resulted in limited domestic technology development for future products that utilise PGMs. • Limited capacity to service smelters and furnaces. • Lagging R&D in PGM related products. • Sibanye-Stillwater's increased focus on digitization and automation provides several points of entry for EU businesses given that these areas of innovation are not strengths of the South African economy. • The catalytic converter sector, in the long-term, is threatened by the growth of electric vehicles, this will have upstream effects on the demand for the PGMs most in demand by the sector. • Technologies and companies that can help increase local production of fertilizers to more modern methods would likely appeal to South African companies. Given the intense need for water treatment solutions in the mining sector, the potential role

CRM	Constraints to investment/ growth
	for PGMs in these solutions, and Europe's leadership in the circular economy, there is significant scope for cooperation in this area. • PGM producers are investigating green energy alternatives due to South Africa's struggles with energy supply, this provides opportunity for profitable working relationships with EU alternative energy suppliers.

The DAI Global report (2022) further identified the following general barriers to entry for CRM value chains analysed for South Africa, reflected from the Fraser Institute report 2021:

Energy Instability

Due to increased energy demand that has put stress on Eskom's (South Africa's power company) ageing coal-fired infrastructure, the country has seen energy instability since 2008. Both mining firms and the nation's economy as a whole have suffered as a result of loadshedding. Companies like Goldfields, Anglo American, Sibanye Stillwater, and Impala Platinum are evaluating their possibilities for renewable energy in response to a change in legislation that permits them to produce 100MW of their own energy needs. The nation has started putting plans into action to boost energy supply by using a diverse range of energy sources. The DMRE's goals to develop renewable energy sources and decommission coal power plants until 2030 are outlined in the most recent Integrated Resource Plan (IRP 2019). The government released its National Infrastructure Plan 2050 in 2021 for public feedback, which calls for developing affordable solar and wind technologies to improve the energy infrastructure.

Infrastructure constraints

Inadequate network coverage, inadequate maintenance, and incapacity are the key constraints on South Africa's rail and road infrastructure. Lack of spare parts, theft of copper cables, and vandalism have all negatively impacted Transnet, the nation's state-owned rail, port, and pipeline company . As a result, the country's coal and iron ore exports have suffered billions of rands in losses as they have been forced to truck and stockpile their goods. For the upcoming years, the South African government has set aside R900 billion (until 2027) to upgrade the country's transport infrastructure. Furthermore, third-party access to the goods rail network is made possible by the White Paper on National Rail Policy, which was approved by the cabinet in March 2020. Transnet has already begun to make slots on the network accessible for private train operators.

Inadequate Geoscientific Data

Precompetitive geoscientific data are few. Even with the recent growth in mapping by the CGS, just 9% of the nation is currently mapped at the 1:50,000 scale. The inability to obtain geodata impedes investment in exploratory endeavours.

Uncertainty in Policy and Poor Implementation

Although South Africa has a strong mining policy and regulatory framework, there have been implementation issues. Investment is discouraged by the burdensome administrative procedures and the occasionally contradictory policies and regulations. For instance, there are still significant backlogs and lengthy wait periods in South Africa since the country's cadastral system is still not up to date and cannot be used to manage the issuance of rights and licences. The South African Mineral Resources Administration System (SAMRAD) system is broken, and the DMRE has made several pledges to replace it with a new, functional cadastral system, but they have failed to deliver. The Mining Charter adoption has been the other major source of uncertainty. It was finally adopted in 2018 after 16 years

of debate, but not before the Minerals Council South Africa (MCSA) filed a lawsuit challenging the Mining Charter's local procurement requirements and black economic empowerment (BEE) targets. A Gauteng High Court affirmed the "once empowered, always empowered" premise in 2021 and struck down the local procurement requirements, ruling that the Mining Charter was a policy document rather than enforceable legislation or subordinate legislation. The mining sector and foreign investors now have more policy certainty thanks to this ruling.

Labour Conflicts and Social Unrest

The mining sector has frequently served as the backdrop for civic unrest and worker problems. The historical power of unions in South Africa, the expectations fostered by the country's Social and Labour Plans (SLPs), and years of steadily deteriorating socioeconomic conditions could all be contributing factors. Mining corporations may be pulling out due to investor fear caused by this political unpredictability. The present administration has made an effort to reassure foreign investors that political will exists to address the instability challenges.

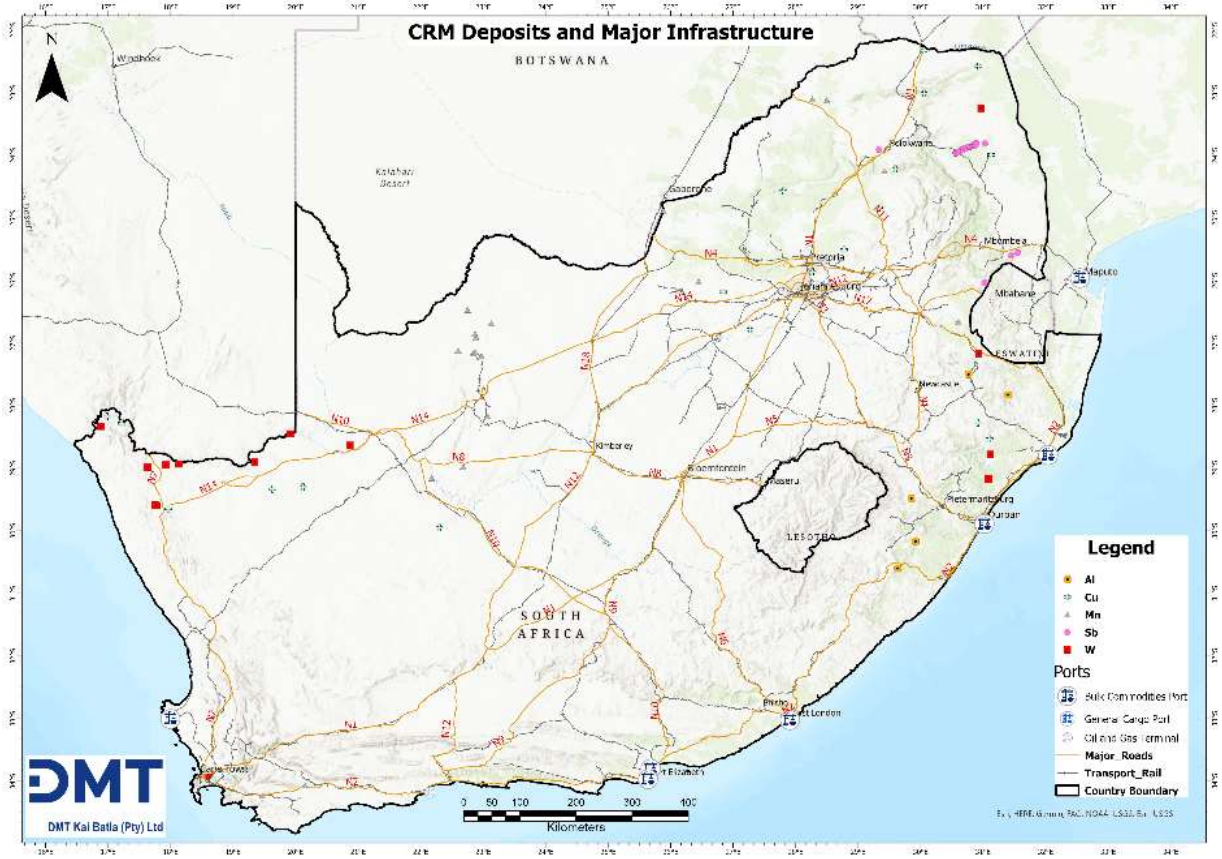

Figure 9: Map of CRM occurrences in SA, with major road, rail and port infrastructure.

3. Investment/financing prospects for ECRM projects in South Africa

3.1. Legal and regulatory context for in-country financings

Context

Ownership Requirements

South Africa's Constitution affords individuals the right to acquire and hold rights in property and, to dispose of such rights. It also affords property owners protection against arbitrary expropriation, subject to equitable compensation. Foreign investors may acquire property in South Africa but cannot register a mortgage bond exceeding the amount of capital they have introduced from offshore. Regarding business, the Companies Act does not impose any requirement for local ownership or directorship. A company must have a public officer responsible for dealings with the South African Revenue Services, who must be resident in South Africa.

A foreign company looking to establish a business in the country generally incorporates a private company as it provides the benefits of limited liability, separate legal personality and perpetual existence despite changes in shareholding, with less stringent requirements than those required of a public company in relation to corporate governance and financial reporting. If the foreign company does not wish to incorporate a separate legal entity it can register as an external company or branch office in South Africa which will be registered by the Companies and Intellectual Property Commission of South Africa (CIPC) and will be governed by the same founding documents by which its foreign head office is governed. Partnerships can be created by contractual agreement under common law and so too can unincorporated joint ventures (regulated by contract law) which may or may not be partnerships. Incorporated joint ventures are incorporated in the form of companies in which the joint venture partners each hold shares. A joint venture company, like any other company, is regulated by the Companies Act but a joint venture agreement is usually concluded to record any additional terms governing the relationship between them.

Foreigners are entitled to hold shares in companies in South Africa. However, in sectors where the company requires certain licenses and permits to operate that require a percentage of shares to be held by South Africans, specifically Black South Africans, there are restrictions on the percentage of shares that can be held by foreign nationals. Mining is one of the affected sectors. Furthermore, if the foreign-owned company wishes to conduct business with the state or with state-owned companies in South Africa, it must comply with the Broad-Based Black Economic Empowerment Act, No.53 of 2003. The Broad-Based Black Economic Empowerment Amendment Act, No.46 of 2013 reinforced provisions for the publication of sectoral Codes of Good Practice and transformation charters for different sectors of the economy to promote black economic empowerment[6]. The Amendment Act imposed an absolute obligation on Government and public entities to apply the Broad-Based Black Economic Empowerment (B-BBEE) Codes in their procurement policies and in issuing licenses and authorisations in sectors such as mining. It also obliged listed entities to report to the B-BBEE Commission on their compliance with B-BBEE law and regulations.

In mining, the preamble to the *Mineral and Petroleum Resources Development Act (MPRDA) No.28 of 2002* reaffirms the State's commitment to bringing about equitable access to South Africa's mineral

[6] Codes of Good Practice for the Minerals Industry were published in the Government Gazette (No.32167) on 29 April 2009

and petroleum resources. Section 100 (2)(a) of the MPRDA required the Minister to "develop a broad-based socio-economic development Charter that will set the framework, targets, and timetable for effecting the entry of Historically Disadvantaged Individual (HDI) South Africans into the mining industry…". Furthermore, Section 100 (2)(b) required that the Charter set out how equitable access to, benefit from and the development of mineral and petroleum resources of the Republic would be promoted. It also required disclosure into how "the holders of mining and production rights would contribute toward the socio-economic development of the areas in which they are operating". Since the commencement of the MPRDA in 2004, there have been four iterations of the *Broad-Based Socio-Economic Empowerment Charter for the South African Mining Industry* (the Mining Charter). In each instance the Mining Charter set compliance targets for: Black ownership[7]; procurement, supplier and enterprise development; local content; employment equity; human resource development; mine community development; workforce housing and living conditions; and sustainable development. In the most recent version of the Mining Charter, non-compliance with the ownership requirements constitutes breach of the MPRDA and subject to the provisions of Sections 94, 47, 98 and 99 of the Act may, amongst other penalties, result in the suspension or cancellation of rights, permits or permissions held.

Critics of the Mining Charter have argued that its frequent revisions have contributed to a protracted period of uncertainty and regulatory instability that may have deterred investment in the mining industry.

On 21st September 2021, the Gauteng Division of the High Court various parts of the Charter, ruling that it provides only policy guidelines and cannot be regarded as subordinate legislation (to the MPRDA). Its provisions are therefore not legally binding, and the Charter should be seen rather as an instrument of policy. This means that non-compliance with the Charter cannot be used by the DMRE to revoke a mining right. However, section 107(1)(I) of the MPRDA still empowers the Minister to make regulations regarding "any other matter the regulation of which may be necessary or expedient in order to achieve the objects of this Act"[8]. While the DMRE has indicated that this may be the way they will proceed, there has not been an amendment of the Mining Charter or the Regulations to the MPRDA since the High Court ruling. In effect, regulatory uncertainty remains, and investment continues to be constrained.

South Africa's commitment to international treaties

South Africa worked hard to achieve the country's diplomatic, political and economic reintegration into the global community following decades of isolation prior to its liberation from Apartheid. Giving expression to the values of equality, nonracialism, non-discrimination, liberty and peace enshrined in the country's constitution were essential for the development of its fledgling democracy.

South Africa's foreign policy approach was characterised by cooperation, collaboration and the building of partnerships. South Africa has traditionally advocated multilateralism through the United Nations and in addition to advocating reform of that organisation's primary structures, South Africa has consistently engaged the north on reforming global economic rules through the World Bank, the International Monetary Fund, the World Trade Organisation and the United Nations Conference on Trade and Development.

[7] Initial compliance targets for Black ownership were 26% shareholding (with no free-carry) within 5 years (i.e. by 2015). Controversially Mining Charter III raised this to 30% in respect of new mining rights (including a 5% carried interest each for employees and host communities) and a minimum 20% effective ownership by historically disadvantaged persons, 5% of which must preferably be for women.

[8] Mineral and Petroleum Resources Development Act, No.28 of 2002

The country has also been a strong advocate for the interests of the African continent. It has supported the development of the African Union (AU) and has nurtured regional integration through the Southern African Development Community (SADC), the Southern African Customs Union (SACU) and the Tripartite Free Trade Area between COMESA, the EAC and SADC. It is also a strong advocate of the African Continental Free Trade Area (AfCFTA). South Africa is a member of the Non-Aligned Movement and in 2011 joined the Brazil, Russia, India and China (BRIC) grouping to form the BRICS. Since 2007, the country enjoys "enhanced engagement" status with the Organisation of Economic Cooperation and Development (OECD) and concluded the Trade and Development Cooperation Agreement (TDCA) with the 28-member European Union (EU) in 2004.

Anti-corruption

In 2001, South Africa adopted the SADC Protocol against Corruption which aims to promote and strengthen the development, within each Member State, of mechanisms needed to prevent, detect, punish and eradicate corruption in the public and private sector. Thereafter, Thabo Mbeki signed the United Nations Convention against Corruption soon after its adoption by the General Assembly of the United Nations in 2003. This convention is the only legally binding universal anti-corruption instrument covering five main areas: preventive measures, criminalization and law enforcement, international cooperation, asset recovery, and technical assistance and information exchange. It covers many different forms of corruption, such as bribery, trading in influence, abuse of functions, and various acts of corruption in the private sector. Since 2007 South Africa is also one of six non-OECD signatories to the OECD Anti-Bribery Convention which establishes legally binding standards to criminalise bribery of foreign public officials in international business transactions, and the country is also a signatory to the United Nations Convention against Transnational Organized Crime adopted by General Assembly in November 2000.

Domestically, the Prevention and Combating of Corrupt Activities (PRECCA) Act, No.12 of 2004 is the country's main anti-corruption and anti-bribery legislation[9]. It creates an offence of corruption that is broadly defined and imposes a statutory reporting obligation in instances where suspicion exists that an offence in terms of the Act has been committed (including bribery). The Act places the responsibility to investigate bribery and corruption on the South African Police Service as the authority with the constitutional mandate to investigate crime in South Africa. However, while there are several public interest groups which take the prevention and combating of corruption and bribery very seriously, the South African government has achieved very few successful prosecutions, particularly in respect of those allegations of corruption and bribery involving high profile individuals or politicians. In short, there is a wide gulf between the government's anti-corruption rhetoric and the reality of its commitment and capacity to prevent bribery and corruption on the one hand, and to prosecute those suspected of it on the other.

Protection of Investment

South Africa's efforts to grow its economy to address the economic and social challenges it faces depend in part on its ability to attract foreign direct investment. As part of that effort, affording investors protection for their investments, particularly against expropriation has typically been through bilateral investment treaties (BITs). They have also been protected by South African common law, local legislation and the South African Constitution. In 2010, following a review of the country's BIT obligations, the South African Cabinet took a decision to develop new legislation to: codify typical

[9] Together with the Prevention of Organised Crime Act, 1998; the Protected Disclosures Act, 2000; the Financial Intelligence Entre Act, 2001; the Protection of Constitutional Democracy Against Terrorist and Related Activities Act 2004; and the Competition Act, 1998.

BIT provisions into domestic law, and strengthen investor protection; terminate first-generation BITs; and refrain from entering BITs in the future unless there are compelling economic and political reasons for doing so[10]. In June 2018, the Protection of Investment Act, No.22 of 2015 was signed into law by President Ramaphosa.

Although the stated purpose of the Act is to protect foreign investors in South Africa, overall, the protections offered in the Act are substantially diminished by amongst others: the removal of investor-state dispute settlement i.e., the right of the foreign investor to directly approach international tribunals in the event of a dispute with the SA government; the omission of a most favoured nation treatment standard; the lack of a "fair and equitable treatment" standard; etc. Whether the Act satisfies its stated objective of providing protection to investors some of whom bemoan the current political uncertainty and populist rhetoric that prevails in relation to matters of nationalization and expropriation, will depend on how it is implemented. Investors should derive some comfort that the Act will be subject to the supremacy of the South African Constitution which prohibits any form of expropriation without just and equitable compensation. Consensus appears to be that a single piece of legislation aimed at all investors offers a more transparent and equitable approach when compared to the conditions under various disparate BITs.

Review of liquidity pockets

In a recent editorial, the President of the South African Institute of Mining and Metallurgy (SAIMM), Ms. Z Botha, gave an overview of the investment climate for exploration in South Africa.

South Africa's development is immediately impacted socio-economically by exploration. Mining companies can potentially add roughly R1.2 billion to the GDP through direct, indirect, and induced impacts for every R1 billion they spend on exploration. For instance, mining generated the most foreign exchange earnings in 2019, directly employed 454 921 people, and contributed 7.8% of the GDP. In March 2022, employment in the mining sector increased by 2%, making it the second most significant quarter-over-quarter increase. According to commentary in the literature, mining activity directly supports ten people for every mineworker employed.

She also quotes Roger Baxter, the former CEO of the Mineral Council, who stated that:

> *'In the Toronto stock market, they've got 1600 listed junior resource companies. On the Sydney stock market, they've got about 600, and on the JSE, there are only about 12. Why the difference? Canadians have got a set of specific incentives that encourage the flow-through of venture capital funding from people from a tax perspective to invest in junior resource mining and their listing requirements are generally small and they raise capital, and they go and find deposits. In South Africa, our investment community are generally conservative and favour big mutual funds. Our return on a liquidated company is about 20c in the rand, whereas in a country like Canada, their liquidation and business rescue rules are quite different, so you get a much higher rate of return if you go into a failed company, even if it's a junior resource company, which is venture capital funded. For some of the smaller companies, to list on any stock exchange is a very expensive business and the cost-benefit of listing on a stock exchange versus raising private equity capital may be a lot more to do on a stock market, so that's why many are going the private route, but I think there are lessons we can learn from both Canada and Australia. South Africa's fiscal framework still does not have the same incentives around*

[10] UNCTAD reports that South Africa retains 12 BITS in-force, has terminated 12 others (mostly with EU countries) and has signed 26 others that are not in force). The country is also signatory to 11Treaties with Investment Provisions, see https://investmentpolicy.unctad.org/international-investment-agreements/countries/195/south-africa

encouraging junior resource companies to set up in South Africa or to look for capital in South Africa.'

These claims are supported by the literature, which frequently cites a major obstacle to greenfield exploration activities in South Africa as being a lack of exploration investment. In particular, that access to resources supporting exploration activities is restricted due to the absence of exploration companies listed on the Johannesburg Stock Exchange (JSE). One significant risk for junior miners is the lack of diversity in the fiscal and financial instruments available to them. A lot of commentary has also been written in the literature on regulatory and policy issues, with particular reference to the barriers of the current exploration timeframes and the "first come, first served" principle. What then needs to happen in order to advance and increase the opportunities and backing for greenfield exploration in South Africa?

Gaining a larger portion of the world market by implementing a cadastral system that would facilitate the application process for the pertinent rights listed in the Mineral and Petroleum Resources Development Act (MPRDA). In order to replace the SAMRAD system, the Department of Mineral Resources and Energy (DMRE) and the State Information Technology Agency jointly released a Request for Bids in March 2023 regarding the design, implementation, upkeep, and support of an online mining licencing system. If this system is successful, it could improve regulatory certainty regarding applications, as well as the speed and effectiveness of processing and resolving issues related to overlapping applications.

To entice investors to participate in exploration projects, tax incentives are required. The development of these specialised junior exploration companies has been extremely successful in Canada, primarily due to the use of the flow-through share tax incentive model to draw in equity investors. The Minerals Council submitted a proposal to the National Treasury in October 2020, proposing tax incentives for the purchase of equity in entities engaged in exploration activities. The proposal was based on the Canadian flow-through shares model and was prepared in conjunction with advisors such as Fasken, one of the biggest business law firms in Canada.

There are recommendations for suitable changes to the regulatory framework to enable sufficient data collection to enable a qualitative-based system (as opposed to "first come, first served"), where application processing will be decided based on how best applicants will achieve the MPRDA's objectives, in order to address regulatory barriers.

The mining sector in South Africa is currently experiencing a lot of positive activity. The JSE's junior, emerging, and exploration members and associations have been able to interact more frequently thanks to the active efforts of the Minerals Council. The JSE's Samuel Mokorosi is working to make it simpler for businesses to join and stay on the exchange while maintaining the highest standards of investor protection. One initiative that aims to simplify the process of listing on the JSE and expose smaller companies to financial markets is the Junior Mining Accelerator Programme. Already enrolled in the programme are two small, black-owned exploratory businesses, and both have expressed how helpful it has been.

Published by the DMRE on April 14, 2022, the Exploration Strategy for South Africa's Mining Industry (Exploration Implementation Plan) serves as a road map for us to accomplish our goal of restoring South Africa's attractiveness and market share in the international minerals sector. South Africa used to account for 5% of all exploration activity worldwide, but that percentage is now less than 1%. This coincides with a critical juncture in the race for rare earth minerals and future minerals, underscoring the importance of strategically positioning mineral-rich nations.

Some significant new initiatives are in the works. For instance, Hive Hydrogen, a collaboration between South Africa's Built Africa and UK-based Hive Energy, aims to build an environmentally friendly ammonia export facility. The Coega Special Economic Zone in the Eastern Cape will host the plant, which is expected to be developed for an estimated US$4.6 billion (R70.5 billion). The facility will use renewable energy to process hydrogen and an air separation unit to extract nitrogen, resulting in an annual production capacity of about 780 000 t of green ammonia. With full operation scheduled for 2026, the first phase is expected to begin operations in 2025. An underground gold mine in Gauteng is being investigated by West Wits Mining, an Australian exploration and development mining company.

In July 2021, the DMRE granted approval for the mining right application. A scoping study places the estimated total resources at approximately 29.1 million tonnes, with a 22-year life-of-mine and an average steady-state annual production of 80,000 ounces for 18 years. There will be five phases to the project's implementation. The first is the Qala Shallows mining area, which is currently being developed after a feasibility study was finished in September 2021. It is anticipated to contribute 40% of the overall production. This stage is expected to require a peak funding requirement of US$50 million (R767 million). Under the Renewable Independent Power Producer Programme (REIPPP), the DMRE has selected 25 renewable energy projects as preferred bidders, of which 19 are either led by or involve foreign investors. The total estimated investment value of the projects is R38 billion, involving four major foreign firms.

Mapping of Financing and Investment Instruments

Table 10: Mining, energy, renewable and other financial instruments and entities in South Africa

Entity	Description	Contacts
Johannesburg Stock Exchange (JSE)	The JSE is a multi-asset class stock exchange that offers listings, trading clearing and settlement, information services and issuer services. Founded in 1887, the JSE is Africa's largest stock exchange by market capitalisation. It is the 16th largest stock exchange in the world. The JSE's primary function is to provide facilities for the listing and trading of securities. It contributes to economic growth and value creation, which are critical to resolving South Africa's challenges. It is the interface between those who provide capital and those who need capital. The JSE promotes sustainable, transparent business and responsible investment. The JSE is a licensed exchange in terms of the Financial Markets Act, which describes its regulatory duties, powers and functions. The Financial Sector Conduct Authority is the lead regulator of the JSE. The JSE offers a wide variety of investment and listing instruments, on its main and Alt-X boards, many of which are tailored to mining, exploration, venture capital and renewable energy projects.	https://www.jse.co.za/
Development Bank of Southern Africa (DBSA)	Development Bank of Southern Africa (DBSA): DBSA was originally formed in 1983. by the South African Government. Today DBSA mobilizes and provides loan finance and technical assistance for major development projects in South	www.dbsa.org.za

Entity	Description	Contacts
	Africa and in neighbouring Southern African countries. DBSA membership is open to any country in Southern Africa. It functions as a "banker's" bank, providing soft loans to governments, local authorities, development corporations, and non-governmental organizations, which in turn make loans to individuals in bank-approved projects. DBSA's financial resources include share capital contributions from its members and loans obtained from financial markets. Grant aid from the South African Government comprises an important source of DBSA's funding.	
Industrial Development Corporation - (IDC)	The Industrial Development Corporation of South Africa Ltd (IDC) is a self-financing, national Development Finance Institution that promotes economic growth and industrial development in South Africa. IDC Gro-E Scheme: The IDC is investing R10-billion over the next five years through its Gro-E Scheme. It offers financial support to start-up businesses, including funding for buildings, equipment and working capital. It also funds companies wanting to expand provided that they show an ability to create jobs and operate in sectors supported by the IDC which include: • Green industries, which include renewable energy, energy efficiency, pollution mitigation, waste management and recycling, and biofuels • Mining value chain, including downstream mineral beneficiation, mining and mining technologies	https://www.idc.co.za/
Anglo-Khula Mining Fund	Anglo-Khula Mining Fund is a joint venture between Anglo American plc and Khula Enterprise Finance to provide financial assistance to junior mining projects. • Equity and or debt instrument with individual investments between R1m and R20m per project • Equity stake will not exceed 49% of the issued share capital of the investee company.	https://www.experthub.info/launch/funding/anglo-khula-mining-fund/
Commercial Banks	The commercial banks have specialist SME divisions, providing finance for qualifying entrepreneurs. Visit the banks' websites to find out about their products and services, and their criteria to obtain finance.	ABSA Bank: www.absa.co.za First National Bank: www.fnb.co.za Nedbank: www.nedbank.co.za Standard Bank: www.standardbank.co.za
Business Partners Limited	Business Partners is an investment company for small and medium enterprises. The company invests between R250 000 and R15 million in SMEs across all sectors, with the exception of farming, on-lending and non-profit organisations.	E-mail: enquiries@businesspartners.co.za Web: www.businesspartners.co.za
Khula Enterprise Finance	Khula Enterprise Finance Limited is an agency of the Department of Trade and Industry (DTI) established in 1996 to facilitate access to finance	E-Mail: helpline@khula.org.za Web: http://www.khula.org.za

Entity	Description	Contacts
	for SMMEs. It is one of the funds being transferred to the Department of Economic Development. Khula provides assistance through various delivery channels. These include commercial banks, retail financial intermediaries (RFIs) and micro credit outlets (MCOs).	
Small Business Growth Trust Fund	This non-sector specific fund is a partnership between Khula and Fabvest Investment Holdings (FABCOS). It provides: • Finance start-ups, expansions, bridging finance and asset-based finance to qualifying SMEs • Qualifying SMEs with the necessary infrastructural support and resources • Fosters entrepreneurship within the SME sector and • Reaches out to SMEs in priority provinces of South Africa •Migrates Black businesses from the informal sector to formal sector	Email: info@sisonkefund.co.za
Identity Development Fund (IDF)	This non sector – specific fund is a partnership between Khula and Identity Development Fund (Pty) Ltd (IDF). Its objectives are to: • Create long-term growth from profitable portfolio investments in SMEs • Promote BEE (black women and youth) • Provide both debt and or equity funding (50%/50%)	Tel: (011) 351 2900
South African Investment Network	This is an online platform that connects entrepreneurs seeking business funding with "angel" investors looking for investment. They maintain that they have access to R83 billion to invest. They connect global and local investors and entrepreneurs.	Web: www.investmentnetwork.co.za
Sasfin Private Equity	Sasfin provides private equity funding for entrepreneurs. It is a versatile form of funding that allows enterprises of any size to unlock their potential without burdening them with excessive debt. Sasfin Private Equity invests its own capital in the client's business and also provides support and guidance to grow the value of the companies in which they invest in the form of strategic insight and, where necessary, operational, financial and governance input.	Web: www.sasfin.com
National Empowerment Fund (N.E.F)	The NEF's is a DTI initiative in 2004 to support the BEE Act 53 of 2003, the South African Government's Broad Based BEE Strategies and related scorecard. The Group and Entrepreneurial Scheme Division of the NEF aim to deliver support to entrepreneurs in the small and medium-sized enterprise sector and to foster business development. In addition, it provides capital to assist in the development of community and rural projects. Furthermore, it seeks to promote a culture of equity investment	Web: www.nefcorp.co.za

Entity	Description	Contacts
	and savings among Historically Disadvantaged Persons (Hips) through various programmes.	
Zimele Investments (Pty) Ltd	Zimele Investments (Pty) Limited is an enterprise development and an empowerment initiative of Anglo America. In line with Anglo American's commitment to South Africa's socio-economic growth, Zimele concentrates on the establishment and promotion of small and medium enterprises (SMEs). Zimele, derived from Zulu and Xhosa meaning, "to be independent", invests in the enterprises through its investment fund and holds minority stakes of up to 20%.	Email:nhiralal@angloamerican.co.za

3.2. Macroeconomic context for in-country financings

State of the Economy

In recent years, the South African economy, Africa's second largest, has faced numerous external and domestic challenges including slowing global growth, geopolitical tensions, an acute power shortage, inefficiencies in several key state-owned enterprises, and increasingly binding infrastructure and logistics bottlenecks. A strong rebound in economic activity in 2021 following the Covid-19 pandemic has not been sustained due in large part to the energy crisis which has seriously retarded the recovery of the energy intensive mining and manufacturing sectors. Predictably, unemployment is close to record highs, particularly amongst the youth and poverty is deep, structural and worsening. Over 18 million South Africans receive poverty-alleviating social grants from the government and South Africa now ranks as one of the world's most unequal countries.

The country's economy remains exposed to global external shocks and cyclical changes and volatility in commodity markets as well as instability in capital flows. Furthermore, in its *Staff Concluding Statement of the 2023 Article IV Mission to South Africa*, the International Monetary Fund (IMF) noted that "… elevated public debt significantly limits the fiscal space available to respond to economic and climate shocks and meet social and developmental needs. Long-standing rigidities in product and labour markets, and governance and corruption vulnerabilities also weigh on growth and employment prospects, threatening social cohesion". In its 2022 Global Risks Report, the World Economic Forum (WEF) observed that "Social cohesion erosion" is a top short-term threat in 31 countries—including Argentina, France, Germany, Mexico and South Africa from the G20. In its 2021 and 2022 Executive Opinion Surveys, in which a sample of leaders were asked "What five risks will pose a critical threat to your country in the next two years?", prolonged economic stagnation, employment and livelihood crises, failure of public infrastructure, the proliferation of illicit economic activity and state collapse were the top responses.

Overcoming the threat of the erosion of social cohesion and the instability that this may bring is of critical importance but will require a multi-pronged approach to address South Africa's long-standing structural impediments to growth. Urgent reforms are needed to restore energy security, alleviate transport and logistics bottlenecks, overhaul underperforming State-owned enterprises and reduce their contingent liabilities, promote private investment, address labour market rigidities, promote and achieve good governance and tackle high structural unemployment. Undertaking them while maintaining macro-economic and financial stability will be challenging, requiring prudent and disciplined fiscal and monetary policy, continuing financial sector development, implementing an

agreed action plan to be removed from the Financial Action Task Force "grey list", and improving South Africa's "junk" (below investment grade) status credit ratings.

On a positive note, the IMF also reported that South Africa's "large external asset position, low levels of foreign currency debt, diversified economy, sophisticated financial system, and flexible exchange rate regime are sources of strength, supported by the South African Reserve Bank's (SARB) pro-active monetary policy that has kept inflation expectations anchored". Subject to the country successfully addressing the structural impediments to growth mentioned above and to reigning in public sector corruption through the implementation of the Zondo Commission's recommendations, growing the economy, creating enough jobs to reduce employment, poverty and inequality may be possible. Doing so will be a necessary pre-requisite for building confidence among consumers, business, and the broader international investment community without whom it will be difficult to secure the capital needed to rejuvenate the mining sector and grow the economy more widely.

In 2022 South Africa's mining industry production was worth R1.18 trillion, employed 475 561 people, exported R877.6 billion and contributed 7.53% directly to GDP. (Minerals Council, 2023). The main commodities mined with their shares of output are shown in Figure 9. The mining industry is highly concentrated with the bulk of output produced by large mining companies.

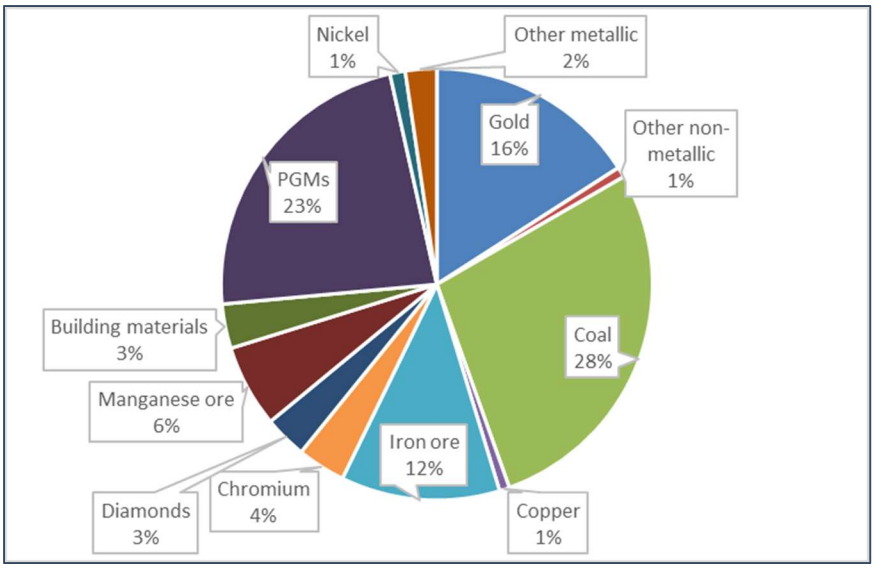

Figure 10 Commodity shares of mining production[11]

Extensive merchandise minerals trade takes place with the EU. Trade is conducted under the EU-SADC Economic Partnership Agreement (EPA) that came into force in 2016. Mineral products are trade duty and quota free under the EPA except petroleum oils. In 2022 South Africa exported goods to the value of 26.8 billion US$ to the EU, 51.14% by value were minerals, metals, ores, basic iron and steel and base metals, shown in Table 1. South Africa contributed 0.37% to all goods imported by the EU which made up 21.75% of total RSA exports. Imports from the EU totalled 24.5 billion US$, representing 0.35% of total EU exports and 21.93% of all RSA imports. Mineral product categories made up 10.96% of imports whereas commodities not elsewhere specified, machinery, vehicles, pharmaceuticals and chemicals make up most of the value of the products imported from the EU by South Africa.

[11] Source: StatsSA P2041, 2023

Table 11 South Africa – EU merchandise minerals trade: products and shares 2022[12]

	PRODUCT DESCRIPTION	RSA EXPORTS			RSA IMPORTS		
HS		**Value MUS$**	**SA % of EU imports**	**EU % in SA Exports**	**Value MUS$**	**SA % in EU exports**	**EU % in SA Imports**
	All products	**26 888**	**0.37%**	**21.75%**	**24 530**	**0.35%**	**21.93%**
'27	Mineral fuels, oils, bituminous substances;	4 300	0.34%	25.23%	1 438	0.24%	5.64%
'26	Ores, slag and ash	3 496	8.22%	21.45%	8	0.06%	14.50%
'71	Precious metals, gemstones	3 345	3.03%	12.44%	51	0.05%	3.37%
'72	Iron and steel	1 129	0.52%	17.02%	509	0.26%	27.96%
'76	Aluminium and articles thereof	553	0.52%	27.56%	102	0.11%	13.97%
'75	Nickel and articles thereof	465	3.61%	41.76%	9	0.11%	49.57%
'25	Salt; sulphur; earths & stone; lime, cement	273	1.60%	33.55%	25	0.18%	6.99%
'74	Copper and articles thereof	80	0.13%	7.78%	97	0.16%	10.25%
'81	Other base metals; cermets; articles thereof	56	0.61%	26.67%	14	0.23%	14.93%
'73	Articles of iron or steel	43	0.03%	3.33%	316	0.22%	25.56%
'83	Miscellaneous articles of base metal	8	0.03%	4.80%	117	0.37%	32.75%
'78	Lead and articles thereof	5	0.16%	12.38%	1	0.04%	3.57%

AfricaMaVal's focus is on the current and future potential for mutually productive relationships in the raw materials sector. Past developments, however, that have a bearing on the capacity, corporate strategies and operating environment do need to be taken into account. Four important themes, not strictly sequential, are set out below in a highly summarised form.

End of the mining house era. South Africa's mining industry, especially gold mining, was developed under a form of mining company ownership led by a few major mining houses (Gencor, Rand Mines, Gold Fields, Anglo American, Union Mines, The Corner House) that were characterised by cross holdings, extensive inter-company cooperation, monopsonistic procurement of inputs through the Chamber of Mines (forerunner to the current Minerals Council) and investment into secondary industries to supply critical inputs such as timber, steel, explosives and mining equipment. Dismantling the mining house structure in the 1980s to focus on core mining competencies also resulted in a pullback from investment in downstream processing.

Divestiture. In the early 1990s Anglo American and Billiton moved their primary listing from the Johannesburg Stock Exchange to London (along with several non-mining conglomerates) arguing they needed to access deeper capital markets. Further mining divestitures have followed, reducing ties to

[12] Source: (ITC TRADE MAP, 2023) Note HS: Harmonised System chapters, EU (27)

South Africa with the commensurately loss of a head office presence, locally based R&D activity and avenues for South Africans to develop careers in the minerals industry, amongst other impacts.

Black Economic Empowerment. Among the many crimes against humanity Apartheid visited on black people of South Africa were racial restrictions in ownership of mineral rights. Major reforms in the mining industry were brought about by the Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA). The Act converted privately held mineral rights to state ownership and established a Mining Charter setting out development obligations for mine adjacent communities, targets for the advancement of black owned businesses and transfer of ownership to black shareholders. Deficiencies in the practical application of the Mining Charter regarding ownership undermined the objectives of spreading ownership to broader groups of historically disadvantaged South Africa, resulting in a narrower group of politically connected individuals reaping most of the benefits.

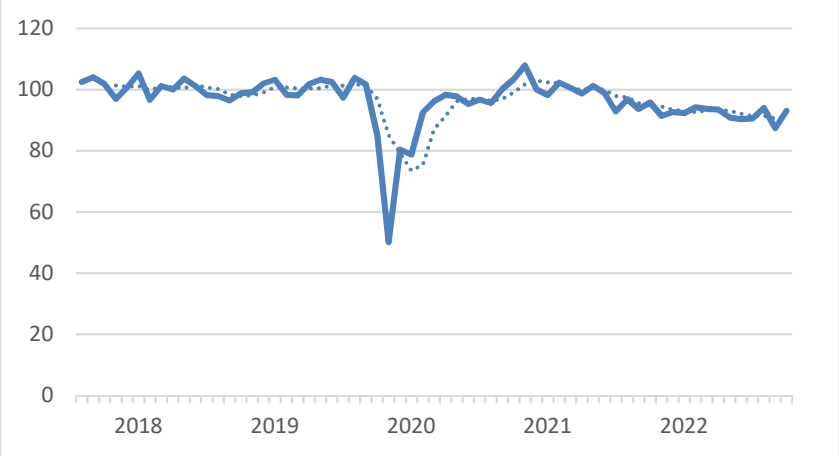

Figure 11 Physical volume of mining production: seasonally adjusted (Base: 2019=100)[13]

Decrease in mining investment. Figure 10 shows the downward trend in output from the mining sector from 2021 onwards compared to the pre Covid-19 period. Net fixed investment has declined as capital has been deployed to maintain current operations and not develop new assets. Factors contributing to this trend are discussed below. If these investment trends are not reversed future mining production will be curtailed.

[13] Source: StatsSA P2041, 2023

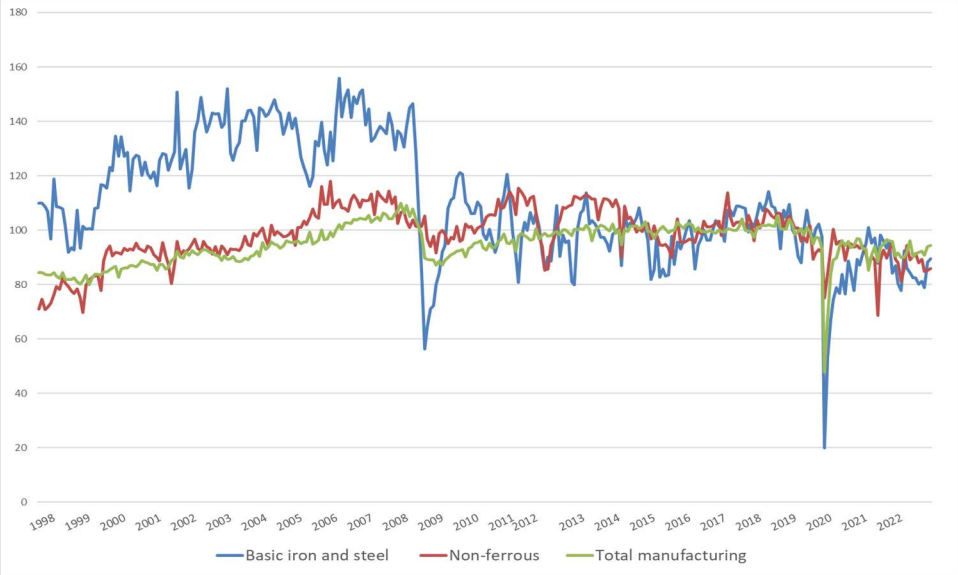

Figure 12 Physical volume basic iron & steel and non-ferrous production: seasonally adjusted[14]

Long-term trends in output from iron & steel and non-ferrous metals production, shown in 11, depicts the contraction in smelting and steel making South Africa has witnessed since 2008, the start of problems with national power company Eskom. Although the metals sector was negatively affected by the 2008 financial crisis, electricity prices that quadrupled in real terms between 2007 and 2022, coupled with power shortages have forced the closure of several ferrochrome and ferro vanadium smelters. Costly and unreliable power has forced mining companies to accelerate the incorporation of renewable energy to their power sources. As of February 2023, the mining industry had clean energy projects for 6.5 GW of electricity on the go, a positive development for the country's energy and carbon intensive minerals industry.

3.3. Political context for in-country financings

Since the advent of non-racial constitutional democracy in South Africa in April 1994, the country can best be described as a parliamentary republic characterised by the separation of functions and powers between its three branches of state namely, the executive, the legislature and the judiciary. The executive, led by the President of South Africa who is head of State and head of government, and his Cabinet is empowered to develop and implement national policy and coordinate the functions of government. It also has the power to propose changes to existing legislation and initiate new policies. Legislative authority is vested in the Parliament of South Africa which elects the President, provides a forum for the consideration and the passage of legislation, and oversees executive action. An independent judiciary is tasked with interpreting and applying the laws of the country. Constitutionally[15], South Africa is a unitary state, but with a three-tier system of government in which national, provincial and local levels of government all have legislative and executive authority. Because of their interdependence and interrelatedness, the Constitution requires the three spheres of government to exercise that authority in a manner consistent with clear principles of cooperative governance.

Since 1994, the African National Congress (ANC) has dominated South Africa's politics, ruling uninterrupted in the national legislature as well as in eight of the country's nine provinces since then.

[14] (Base: 2019=100). Source: StatsSA P3041.2, 2023

[15] The Constitution of the Republic of South Africa, Act No.108 of 1996, was approved by the Constitutional Court (CC) on 4 December 1996 and took effect on 4 February 1997

Nelson Mandela presided over the democratic transition in South Africa winning international respect for his advocacy of national reconciliation, but also focusing domestically on addressing the immense socio-economic problems that were the legacy of Apartheid. This necessitated a profound process of public policy and legislative reform that has fundamentally reshaped the political, constitutional and socio-economic landscape. Over the years and through the Presidencies of Thabo Mbeki (June 1999 to September 2008), Kgalema Motlanthe (September 2008 to May 2009), Jacob Zuma (May 2009 to February 2018) and Cyril Ramaphosa (February 2018 to the present), a succession of national development strategies[16] has provided the policy context and strategic direction for public sector led efforts to give effect to the objects of the Constitution. However, while the ANC's dominance has provided political stability and for the most part, macro-economic stability, the national economy has consistently underperformed and the lasting socio-economic transformation that was anticipated by so many has not materialised.

The state of politics

Despite the dominance of the African National Congress (ANC) in South African politics, the political environment is generally free from formal constraints and opposition parties are permitted to participate in political activity. Women are well represented in government. Voters' individual political choices are largely free from influence by external actors and the military has historically stayed out of politics. The Independent Electoral Commission (IEC) is largely regarded as being independent and the electoral framework is fair. In short, in terms of the formal requirements for democracy South Africa performs well. However, democracy can also be defined by its quality or the degree to which it serves the will and needs of the people. After 29 years and six free and fair national elections it is becoming increasingly apparent that democracy has failed to meet the expectations of the electorate.

A combination of a loss of trust in politicians and institutions, economic stagnation, high unemployment and the desperate and vulnerable living conditions in which most South Africans find themselves are eroding South Africa's political culture, threatening instability. Dissatisfaction and disillusionment about what democracy has delivered is reflected in a decline in voter turnout, which fell from 86.7% in the 1994 national elections to just 65.9% in 2019 (to 46% for the 2021 local government elections)[17] and the fact that increasing numbers of young people eschew voter registration. The 2021 Afrobarometer[18] survey results indicated that 67% of those surveyed were not satisfied with the way democracy works in South Africa. Fully 88% of respondents said that South Africa's democracy had minor or major problems or could not be regarded as a democracy at all. In concluding its 2021 Voter Participation Survey, the IEC noted that political discontent and a loss of political faith "appears to be driven by a perceived unhappiness with the instrumental returns to democracy", and "is undermining mass views of democracy in the country". It also noted that "many citizens do not believe in the duty to vote, do not believe voting makes a difference or that the elected are accountable to the electorate". Growing apathy and declining political participation in the country's democratic system, especially in a young democracy like South Africa's with its undemocratic past, undermines its very legitimacy.

[16] These include: the Growth, Employment and Redistribution Strategy (GEAR); the Accelerated and Shared Growth Initiative for South Africa (ASGISA); the New Growth Path (NGP); and most latterly, the National Development Plan – Vision 2030 (NDP).

[17] IEC, 2021

[18] Afrobarometer is a pan-African, nonpartisan survey research network that provides reliable data on Africans' experiences and evaluations on democracy, governance, and quality of life.

More objectively perhaps, the Economist Intelligence Unit calculates a *Democracy Index* in 167 countries around the world to measure the state of democracy using 60 indicators grouped into five categories: political pluralism, civil liberties, political participation, the functioning of government and political culture[19]. Depending on the score achieved a country is categorized into one of four regime types: full democracies, flawed democracies, hybrid regimes and autocratic regimes. Since measurement on this index began in 2006, South Africa has been classified as a flawed democracy. This is defined as a country where elections are fair and free, and basic civil liberties are honoured but may have issues (e.g., media freedom infringement and minor suppression of political opposition and critics). These nations can have significant faults in other democratic aspects, including an underdeveloped political culture, low levels of participation in politics, and issues in the functioning of governance. In 2022, South Africa ranked 45th out of the 167 countries surveyed, with its index score having declined steadily from 7.91 in 2006) to 7.05 in 2022. Notably, considering the evidence of the erosion of political culture in South Africa presented above, the country's score on this metric of 5.0 (compared to scores of 7.42, 7.14, 8.33 and 7.35 for electoral processes and pluralism, functioning of government, political participation and civil liberties respectively) is telling.

The erosion of South Africa's political culture, and the disillusionment with democracy and government's failure to deliver anticipated socio-economic development for the benefit of the historically disadvantaged, is reflected in the political performance of the ruling party. Since the 2004 national elections when the ANC garnered 69.7% of the popular vote, it has lost ground to opposition parties at every election since then, managing to secure only 57.5% in the 2019 elections[20]. At the 2021 municipal elections the ANC only managed to win 45.6% of the vote amidst a record low voter turnout. This has given rise to a widely held belief that the ANC faces the prospect of losing its majority in the forthcoming 2024 national elections and the party therefore faces an increasingly uncertain future that could further undermine party discipline. Incidents of political violence that have occurred in recent times are widely attributed to factional disputes within the ruling party and this may intensify as more and more ANC politicians perceive a widening gap between their own interests and those of the party.

Corruption and State Capture

The spectre of corruption first came to prominence in post-Apartheid South Africa at around the time of the then R30 billion defence procurement "Arms Deal" in 1999. Events would see businessman and adviser to then Deputy-President Jacob Zuma, Schabir Shaik jailed on corruption and fraud charges, President Thabo Mbeki "recalled" by the ruling party following Zuma's election to the position of president of the ANC at its 2007 Polokwane conference, and thereafter Zuma's ascent to the Presidency of the Republic of South Africa in 2009[21]. Significantly, the arms deal would portend the development of a pervasive culture of corruption within all three spheres of government and in many state-owned enterprises, often encouraged by widespread corporate collusion.

Corruption was at its highest during the period of Jacob Zuma's tenure as president when he and his broad network of supporters, manipulated and altered the structures of many of South Africa's democratic institutions to conceal wholesale corruption and the theft of state monies. A succession of well publicised corruption scandals and so-called "State Capture" (a network of patronage and clientelism) have enabled political elites to accrue tremendous power and wealth.

[19] The Democracy Index or country score is a weighted average of the five category indices.
[20] IEC Election results dashboard
[21] First indicted in 2005, Zuma himself still faces criminal charges relating to alleged corruption relating to the arms deal.

The Zondo Commission[22] appointed by President Ramaphosa in January 2018 on the recommendation of the Public Protector, Thuli Madonsela, was tasked to investigate "matters of public and national interest concerning allegations of state capture, corruption and fraud". Nearly four and a half years later in June 2022, the Commission tabled its final report to the Presidency.

The Commission estimated the total amount of money spent by the state which was 'lost' to state capture was around R57 billion. More than 97% of that was 'extracted' from Transnet and Eskom. The total loss to the state is difficult to quantify but a culture of corruption has spread throughout the public service. Over a period of around a decade, significant damage has been done to state institutions whose capacity to provide public goods and services has been hugely diminished, leaving some of them unable to fulfil their mandates. The most extreme and topical examples of this are the destruction of capacity at the state-owned power utility Eskom, leading to severe shortages of power and daily power outages euphemistically referred to as "load-shedding", and the state-owned rail, ports and pipeline company Transnet, leading to greatly reduced logistics capacity. Unsurprisingly, both have come at great cost to an already underperforming national economy, South Africa as a whole and to the lives of her people.

Although the South African Parliament accepted President Ramaphosa's implementation plans for the Zondo Commission's report 16 recommendations in November 2022, little progress has been made implementing them and widespread corruption continues. At the same time, President Ramaphosa himself was implicated in an alleged corruption case involving an attempt to cover up the theft of around US$4 million in cash, the origin of which is unknown, at Phala Phala, his private game farm. An independent panel appointed by the National Assembly speaker found "prima facie" evidence that the President had breached anti-corruption laws. However, Ramaphosa would later be cleared by the Public Protector[23] of any wrongdoing. Inevitably the uncertainty created around the case was destabilising, causing the South African currency and bond markets to fall.

Economic and political outlook

The persistence of deep-rooted corruption at the highest political level, poor governance and a stagnating national economy have eroded the trust of citizens as poverty deepens and inequality widens.

The mining sector remains one of South Africa's most important economic sectors but is proving vulnerable to limited foreign direct investment into greenfield projects, marginal deposits, ongoing unpredictability in the regulatory landscape, fears amongst investors of resource nationalism, and difficulty in maintaining a social license to operate. The poor performance of state-owned enterprises responsible for energy supply, transport and logistics is another major factor contributing to operational instability and low levels of long-term investment attractiveness in the mining industry. South Africa's reputation as a top-tier mining jurisdiction is under threat and concerns about the real prospect of mining sector reform being conducted with transparency and integrity cannot be discounted.

Pressure is mounting for President Ramaphosa's government to act decisively to restore the global competitiveness of the country's mining sector. In February 2019, speaking at the Investing in African Mining Indaba in Cape Town, Ramaphosa said that he and his government colleagues were "firm

[22] A judicial commission of inquiry to inquire into allegations of state capture, corruption and fraud in the public sector including organs of state chaired by Deputy Chief Justice of the Republic of South Africa, Raymond Zondo

[23] The Public Protector in South Africa is one of six independent state institutions set up by the country's Constitution to support and defend democracy, and has the power to investigate, report on and remedy improper conduct in all state affairs.

believers that the South African mining industry is a sunrise industry". Three years later at the 2022 event, he clung to this notion saying that despite its 150-year history, South Africa's mining industry is a "continuous sunrise industry", while in the same speech acknowledging that the mining industry faces significant challenges. He also lamented that "It is a matter of grave concern that South Africa has fallen into the bottom 10 of the Fraser Institute's Investment Attractiveness Index rankings. We are currently standing at 75th of 84 countries our worst ever ranking." One year on, and South Africa's ranking has fallen further to 57th out of 62, leaving the country in the bottom ten global mining jurisdictions.

The Fraser Institute's annual survey of mining and exploration companies is an attempt to assess how mineral endowments and public policy factors such as taxation and regulatory uncertainty affect exploration and mining investment. It produces an overall Investment Attractiveness Index by combining the Best Practices Mineral Potential index, which rates regions based on their geologic attractiveness, and the Policy Perception Index, a composite index that measures the effects of government policy on attitudes toward exploration investment. In its disaggregated analysis of the most recent results, the Minerals Council of South Africa reported that ''The survey noted South Africa slipped sharply in its policy score because of concerns about infrastructural constraints (electricity and rail) and the availability of skilled labour. Respondents flagged regulatory duplication and worries about the administration and enforcement of existing regulations to also be a deterrent to investment''.

On a positive note for the mining sector, signs that government has recognised the seriousness of the situation include: the establishment of the National Electricity Crisis Committee (NECOM) and the implementation of significant reforms to enable greater private sector investment in electricity generation; the establishment of the National Logistics Crisis Committee (NLCC) to address the rail and ports crisis; and the DMRE having issued a request for proposals for a new cadastral system to replace its dysfunctional SAMRAD system. However, policy and legislative reform that establishes a framework for mining regulation consistent with international best practice is needed as is a commitment to policy clarity and certainty. Rejuvenating the mining industry and maintaining the supply of critical minerals also requires that the structural impediments to growth mentioned above are successfully addressed, that public sector corruption is reduced, and that significant improvements in government's stewardship of the economy more broadly are achieved. These are prerequisites for restoring social cohesion, improving the country's political culture and rebuilding South African's faith in the ability of the country's fledgling democracy to deliver for all its people.

International agreements

International agreements become law in the Republic only after enactment into law by national legislation, but a self-executing provision of an agreement that has been approved by Parliament is law in the Republic unless it is inconsistent with the Constitution or any other Act of Parliament. Customary international law is also law in the Republic unless it is inconsistent with the Constitution or any other Act of Parliament. The South African Treaty Section of the Office of the Chief State Law Adviser is the central record-keeping authority and custodian of all international agreements that South Africa is a party to. That office provides legal advice on South African treaty practice, procedural matters relating to the conclusion of agreements, including instruments of ratification/accession, full powers, president's minutes and certifies agreements. The country is not a party to the Vienna Convention on the Law of Treaties but because the convention is regarded as declaratory of customary international law it binds all states regardless of whether they are a party to it or not.

Extractive Industries Transparency Initiative

Globally, over 50 countries (including 24 in Africa) have committed to strengthening transparency and accountability of their extractive sector management by implementing the Extractive Industries Transparency Initiative (EITI) Standard. Countries are assessed periodically on their progress in meeting the requirements of this standard, including to disclosing information along the extractive industry value chain from how mining rights are awarded, to how revenues make their way through government and how they benefit the public, through validation, the EITI's quality assurance mechanism. Although it has engaged extensively with the EITI Secretariat, South Africa is not a member of the initiative. The main reason advanced for its position is that the country has been extracting minerals and metals on an industrial scale for some than 150 years, and its domestic regulations and processes are adequately transparent, i.e., South Africa does not need to be part of EITI. Nevertheless, the EITI Secretariat has stepped up its outreach efforts to South Africa to prepare the country for a potential candidature application.

Arguably, South Africa's support would add considerable impetus and cachet to the initiative on the African continent and among developing countries endowed with significant natural resources. The EITI International Secretariat has therefore engaged in preliminary discussions with various stakeholders in South Africa on the prospects for EITI implementation in the country although some have indicated the need for a clear indication of the areas in which EITI would add value. South African law already requires disclosure of significant information in the extractive sector and therefore the EITI Secretariat has recently commissioned a disclosure mapping in South Africa to assess the extent to which the EITI implementation could complement current disclosures or address existing gaps in transparency and accountability.

4. Assessment of social, environmental, and governance challenges

4.1. Country-level assessment and context

4.1.1. Mineral/mining policies, industry policies

The South African Mining legislation is premised on a system of state custodianship of mineral resources, whereby the state, through the Minister of Mineral Resources and Energy, issues licenses and rights to applicants on a "first come, first served" basis and when the applicant can demonstrate ability to comply with technical, financial, environmental and socio-economic requirements as prescribed by the minerals and mining legislation. In terms of Section 104 of the MPRDA, the Minister has the right to invite applications from communities in an attempt to address the imbalance in the sector.

The DMRE is responsible for the minerals and mining legislation and their head office is in Pretoria, with regional offices in all the nine provinces. There is also the mine health and safety inspectorate which falls under the auspices of the DMRE. There are various pieces of legislation for the minerals and mining sector and the most important one is the Minerals and Petroleum Resources Development Act 28 of 2002 (MPRDA), which came into effect 01 May 2004. Other important legislation includes, the Minerals and Petroleum Resources Royalty Act, 28, of 2008, the Mining Titles Registration Act, 16, of 1967, the Mine Health and Safety Act, 29, of 1996, the National Water Act,36, of 1998, the Precious Metals Act,37, of 2005, the National Environmental Management Act,107, of 1998 (NEMA) and the Diamonds Act,56, of 1986.

There are various rights, licenses and permits under the MPRDA, which include: **reconnaissance permit**, **prospecting rights**, **mining permits** and **mining rights**. According to South African law, reconnaissance is defined as "any operation carried out for or in connection with the search for a mineral or petroleum by geological, geophysical and photo geological surveys that includes any remote sensing techniques but does not include any prospecting operations other than acquisition and processing of new seismic data." (Werkmans Attorneys, 2017) To apply for a reconnaissance permission the applicant needs to demonstrate technical and financial ability, also lodge a reconnaissance work programme. A reconnaissance permit is valid for one year and it is not renewable or transferable. The permit does not give exclusive rights to apply for or be granted a prospecting or mining right.

Prospecting rights and **mining rights** are obtained by means of an application submitted in a prescribed form to the Regional Manager of the DMRE in the province or region where the mining operation is to take place. The application must be submitted online, must be accompanied by the prescribed application fee and must be motivated by means of detailed documents describing the manner in which the applicant proposes to conduct the prospecting or mining operations in question and comply with the other requirements set out in the legislation.

The **required documents** include:

- a prospecting or mining works programme containing a detailed description of the geology of the resource being mined, the method and time schedule according to which the resource will be mined and a financing plan setting out the economics of the operation and the proposed method in which it will be financed;
- documents demonstrating how the applicant will comply with black economic empowerment requirements;

- a social and labour plan, indicating how the mine will contribute to the sustainable socio-economic development and empowerment of its workers, surrounding communities and labour-sending areas; and
- an application for environmental authorisation, which is prepared in accordance with National Environmental Management Act (NEMA) regulations but submitted to the Regional Office of the DMRE for processing and approval. The prospecting right is granted for up to 5 years and can be renewed for up to 3 years. The holder of a prospecting right has exclusive rights to apply for a mining right. The mining right is granted for a period of up to 30 years renewable for unlimited times for a period of up to 30 years each.

A **mining permit** is commonly issued to **artisanal and small-scale miners** and it covers an **area not in excess of 5 hectares**. The permit is **valid for 2 years** and can be **renewed for three times**, for a period of 1 year each. Artisanal and small-scale mines are subjected to the same requirements as large mines regarding, health and safety, environmental management, etc. In 2022, the DMRE has published a policy specifically for the ASM sector to support its growth. The policy is also aimed to eradicate the problem of illegal mining, which is widespread in the Country.

In terms of Section 5 of the MPRDA, prospecting rights and mining rights are limited real rights in respect of the land to which they relate. Section 5 expressly authorizes the holder of a prospecting right or mining right to enter the land in question together with his or her employees, and to bring on to that land any plant, machinery or equipment and build, construct or lay down any surface, underground or undersea infrastructure that may be required for the purpose of prospecting, mining, exploration or production, as the case may be. (Hayes, E, 2022) Prospecting and mining rights constitute limitations of the rights of ownership of the landowner. “An emphasized recognition of the tension between rights of mineral right-holders in terms of the MPRDA and informal land-right holders (customary title holders) in terms of the Interim Protection to Informal Land Rights Act, 31, of 1996 (IPILRA) has brought about an increase in recent litigation.” (ibid)

According to the recent High Court ruling, “…where land is held on a communal basis by a community that is subject to IPILRA, a mining right can only be granted if that community provides its full and informed consent thereto, through a majority decision at a meeting convened for the purpose of considering such a disposal and of which they have been given sufficient notice, and in which they have had reasonable opportunity to participate.” (ibid) The MPRDA provides that the prospecting right or mining right holder can compensate the landowner or lawful occupier for any loss or damage suffered as a result of the prospecting or mining activities even though such payment of compensation will not serve as a prerequisite for access to land for purposes of prospecting or mining.

For the duration of the mining right the right-holder is practically the owner of the mineral in question. Prospecting and mining rights can be transferred subject to the consent of the Minister of Minerals and Energy. Except in the case of listed business entities, the Minister’s consent is required for the transfer of a controlling stake in a business that holds the mining right, in terms of section 11 of the MPRDA.

Mining rights are protected by the MPRDA and the Constitution. “…interfering with the lawful mining activities of the holder of a valid mining right constitutes an offence under the MPRDA and may be punished by imprisonment or the imposition of a fine or both. In civil law, the holder of a mining right may obtain an interdict (injunction) prohibiting all third parties, including a landowner from hindering or interfering with its mining activities and may enforce its rights against any third parties.” (ibid) However, the recent decision by the Constitutional Court has put the responsibility on to the Regional Manager of the DMRE, in terms of Section 54 of the MPRDA to resolve disputes between the right-holder and the landowner or lawful occupiers. The South African Constitution protects property rights and that includes prospecting rights and mining rights.

In addition to the mining right, a person wishing to conduct mining activities requires the following additional permits or licenses:

1. a further environmental authorisation authorising in detail the listed activities that will form part of the mining and mineral processing activities, should these listed activities incidental to the operations not be covered by the environmental authorisation forming part of a mining right;
2. a waste management license in respect of, inter alia, management of tailings;
3. a water use license in respect of use of any natural water sources, as well as to make provision for treatment, storage and disposal of water in the mine itself and in tailings dams, etc, and
4. air quality licenses, if required

Other licenses depend on the nature of mining activities to be undertaken, or the natural, social and cultural environment where the mining activities are to take place. The most important and most common licenses would be:

1. licenses for the possession, processing and beneficiation of precious metals;
2. licenses for the possession, processing and beneficiation of uncut diamonds;
3. licenses for the possession, beneficiation, transportation and exporting of nuclear materials and radioactive materials;
4. licenses for the destruction or relocation of archaeological sites or graves; and
5. zoning of land for mining purposes in areas subject to town planning schemes.

The South African minerals and mining legislation does not discriminate against foreign investors. When a foreign company conducts business in South Africa it would need to register as an external company in terms of the Companies Act. There are numerous tax incentives enjoyed by foreign companies holding prospecting rights or mining rights, in terms of the MPRDA and specific tax laws. South Africa implements a system of exchange control in terms of which approval is required from the South African Reserve Bank to transfer sums of money to and from South Africa.

The Mine Health and Safety Act (MHSA) 1996 prescribes health and safety requirements in the mining industry of South Africa. The act aims to hold the employer primarily responsible for the health and safety of all persons at the mine, including employees, contractors and visitors. The MHSA places detailed obligations on the employer to provide sufficient training regarding the health and safety hazards and risks encountered at the mine, and how to deal with such situations. The employer is also required to provide personal protective equipment to all persons at the mine. It is further required that the employer keeps record of the health of employees including establishing baseline each employee's baseline from when they commence their employment, undertaking annual health assessments for all employees, and performing final exit assessments when they terminate employment. Failure by an employer to take reasonable steps to ensure health and safety conditions for its employees constitutes an offence according to MHSA. The Chief Inspector of Mines or his/her delegates are empowered by law to cease all activities at a mine until an identified risk is sufficiently addressed. The new Broad-Based Socio-Economic Empowerment Charter for the South African Mining and Minerals Industry, 2018 (the Mining Charter, 2018), came into effect on 01 March 2019. The Mining Charter introduced a number of socio-economic empowerment compliance criteria on holders of new and existing mining rights. The Mining Charter also introduced additional socio-economic requirements to which holders of mining rights must comply. The six requirements are: 1. Ownership by Historically Disadvantaged South Africans (HDSA), which includes procurement, supplier and enterprise development; 2. Human resource development; 3. Employment equity; 4. Mine community development; 5. Housing; and 6. Living conditions. Although the High Court ruled against the DMRE developing a subordinate law and set aside some of the requirements of the Charter, employment equity, human resource development, mine community development, housing and living conditions are still a requirement. Again, 30 percent of black economic empowerment is still a requirement,

though according to the Court's ruling, the DMRE can no longer dictate how it should be split, in terms of HDSAs, employees and communities.

The DMRE has developed Codes of Good Practice for the minerals industry, in 2009. The Codes cover the following aspects: ownership; management control; employment equity; human resource development; preferential procurement; mine community and rural development; beneficiation; housing and living standards. The codes use specific scorecards for each of the eight elements to measure performance.

4.1.2 Mining regulations

MPRDA regulations (2004) were recently amended in 2020. They specifically guide the implementation of the MPRDA. The regulations provide clarity on how to comply with the MPRDA. Part I of the regulations deals with minerals and petroleum regulation, which covers applications for reconnaissance permits, prospecting rights, mining rights and mining permits and other related rights and permits, the processes of which were described in detail in 4.1.2. Part II deals with social and labour plans and all the processes involved. Part III deals with environmental regulations for mineral development, petroleum exploration and production, which covers the application process for environmental authorization through to the contents of the closure plan. Part IV deals with pollution control and waste management, which covers aspects such as, principles of pollution control and waste management, air quality management and control, fire prevention, noise management and control, blasting, vibration and shock management and control, etc. The regulations further provide clarity on appeals against administrative decisions.

The amendments introduce regulations dealing with the lodgement of applications under sections 52 and 53 of the MPRDA and amend regulations dealing with internal appeals under the MPRDA. The Amendment Regulations repeal certain regulations relating to environmental matters. They provide various amendments to the Mineral and Petroleum Resources Development Regulations, 2004, which include amendment on consultation with interested and affected persons and amendments to the provisions on social and labour plans. Under the Amendment Regulations the definition of 'interested and affected persons' has been extended to mean a natural or juristic person or an association of persons with a direct interest in the proposed or an existing operation or who may be affected by the proposed or existing operation, including: mine communities (as defined by the Amendment Regulations), landowners, Traditional Council, land claimants, lawful occupiers, holders of informal rights, any other person whose socio-economic conditions may be directly affected by the proposed or existing prospecting or mining operation.

The Amendment Regulations provide for the term 'meaningful consultation' which means that the applicant has in good faith facilitated participation in such a manner that reasonable opportunity was given to provide comment by the landowner, lawful occupier or interested and affected party in respect of the land subject to the application about the impact that the prospecting or mining activities would have to his right to use of the land by availing all the information pertaining to the proposed activities enabling these parties to make informed decision regarding the impact of the proposed activities. In terms of the Amendment Regulations, meaningful consultation must be conducted in terms of public participation process prescribed in the Environmental Impact Assessment (EIA) Regulations. The Social and Labour Plan (SLP) process was also expanded to include labour-sending areas.

The prospecting or mining right holder is required to publish the SLP in English and the dominant language in the community. In addition to submitting the annual report on compliance with the SLP to the Regional Manager, a mining right holder is required to convene 3 meetings per annum with mine communities, interested and affected persons, to update them about the progress made on the implementation of the approved SLP. The outcome of such meetings will form part of the annual report (Fasken Attorneys, 2020).

The 2004 Regulations did not prescribe the form or content in which a section 52 notice is to be made to the Minister. The Amendment Regulations introduced regulations dealing with the manner and form in which such notice is to be made to the Minister. According to the Amendment Regulations, a mining right holder must submit a notice in respect of section 52 (1) of the MPRDA to the Minister after consultations with registered trade union/s, affected employees or their nominated beneficiaries are concluded. The notice must include details of prior consultations such as dates, times, attendance registers, minutes, considerations, proposals resolutions, agreements, recommendations, reports and records. An affidavit is also required to confirm that the factors contemplated in section 51 (1) or (2) of the MPRDA exist.

The Amendment Regulations further provide a template for section 53 applications and set out specific information that applicants will need to provide if they intend to use the surface of any land for purposes contrary to any object of the MPRDA. The information required include: the type of approval applied for; motivation for the proposed use; a report on meaningful consultation with interested and affected persons in the mining industry; a report on meaningful consultation with the Council for Geoscience regarding both the mineral potential of the land concerned and the possible presence of dolomitic formations thereof; comments and concerns raised by parties with interest in prospecting, mining, exploration and production in the area; and a geological map of the area applied for. The applicant is also required to confirm whether the holders of prospecting, mining, exploration and production rights within a two (2) kilometre radius have been identified and meaningfully consulted with and whether they have objected to the proposed land development. (Ibid)

Regulation 38 of the Amendment Regulations sets out a number of amendments to Regulation 74 of the 2004 Regulations dealing with appeals against administrative decisions taken under the MPRDA. In terms of the Amendment Regulations, any person who appeals against an administrative decision must lodge a written notice of appeal to the Director General or the Minister. The notice of appeal must be submitted within 30 days of the date the appellant becomes aware of the decision in respect of which the appeal is made.

The Amendment Regulations provide for the repeal of certain environmental regulations for mineral development, petroleum exploration and production (regulations 48 to 55, regulations 63 to 73), save for regulations 56 to 62, which deal with mine closure and transfer of environmental liabilities. Clarification amendments have been incorporated to the principles of mine closure to provide that: 1. The risks pertaining to environmental impacts are to be quantified and managed proactively, in accordance with the provision of NEMA, Financial Provision Regulations, 2015 and the EIA Regulations; 2. The residual possible latent environmental impacts are to be identified and qualified in accordance with NEMA, Financial Provision Regulations and EIA Regulations; and 3. The land is to be rehabilitated as far as practicable to its natural state, or to a predetermined and agreed standard or land use which conforms with the concept of sustainable development in accordance with the provisions of NEMA, Financial Provision Regulations and the EIA Regulations.

Regulation 58 has been amended to provide that the Minister may transfer liabilities and responsibilities identified in the environmental authorization and the required closure plan to a competent person. Consequential amendments have also been made to Regulation 59 which deals with the qualifications of the person to whom responsibilities can be transferred to and Regulation 61 which deals with closure objectives. Clarification amendments have also been incorporated to Regulation 61 to provide that among others, the objectives of a mine closure are: 1. The identification of key objectives for mine closure to guide project design, development and management of environmental impacts which must be in accordance with NEMA and the EIA Regulations; and 2. To provide proposed closure costs in accordance with NEMA and Financial Provision Regulations.

4.1.3. Taxation and royalties

South African mining companies are subject to normal taxes, such as standard income tax on companies, withholding taxes on dividends to shareholders, value added tax (where applicable), transfer duties in respect of transfers of land or prospecting and mining rights, and carbon tax in the event that the taxpayer conducts a prescribed listed activity, and such activity exceeds the prescribed greenhouse gas emissions threshold. However, mining companies may deduct large portions of capital expenditure against their taxes and may ring-fence capital expenditure and taxable income in respect of distinct mining operations (redemption allowance).

Mining companies are also subject to royalty payment over and above the taxes referred to above. This is in terms of the Minerals and Petroleum Resources Royalty Act, 28, of 2008. In terms of the Act, "a person who wins or recovers a mineral resource in South Africa (an extractor) must pay a royalty for the benefit of the National Revenue Fund in respect of the transfer of that mineral resource to another party. Under the terms of Section 4 of the Royalty Act, a formular is prescribed for calculating the extent of the royalty, based on the earnings before interest and taxes from gross sales of refined or unrefined mineral resources. …The maximum royalty in respect of refined mineral resources is 5 percent, and the maximum royalty in respect of unrefined mineral resources is 7 percent." (Hayes, E, 2022)

4.1.4 Land-use and mineral rights

The question of land-use and the impact on mineral rights is covered by the MPRDA and other legislation such as, the Municipal Systems Act, 32 of 2000, Spatial Land-Use Management Act, 16 of 2013 and the Interim Protection of Informal Land Rights Act, 31 0f 1996. In terms of the MPRDA, prospecting and mining right-holders are supposed to consult with interested and affected parties, including landowners and lawful occupiers before they commence with their operations. The consultation process is outlined in the Environmental Impact Assessment Regulations, 2014. The Mining Charter 2018 and its Implementing Guidelines are specific as to how consultations in respect of social and labour plan (SLP) are to be conducted. The applicant or prospecting right and mining right holder is required to consult with the local municipality, traditional leaders, community, community-based organisations, etc. The obligations on the applicant or mining right holder to consult with communities are more extensive than other landowners because of recent court decisions, which have held that the consent of the community must be obtained before mining can commence. (Werkmans Attorneys, 2017)

Where the landowner or a community denies the prospecting right or mining right holder access to the land the matter should be referred to the Regional Manager of the DMRE before the courts can be approached. There is mounting pressure on the DMRE to consider other land-use options when granting prospecting rights, mining rights and mining permits. The Human Rights Commission has found that the DMRE disregarded the Municipal Systems Act, Spatial Land-Use Act, and the Interim Protection of Informal Land Rights Act in granting mining rights. The Commission recommended that, "Such land-use approvals must be secured from the applicable municipalities prior to the DMRE granting the licenses and permits. (The South African Human Rights Commission, 2019)

The apartheid system prevented rural communities and individuals from holding land in their own names, giving these rights and additional powers to selected traditional authorities. As a result, there is tenure insecurity, which affects millions of rural communities who do not have recorded rights to their land. Traditional authorities took advantage of this situation and started negotiating mining deals without the consent of communities. Members of the Wilgespruit Farm in the North West Province, approached the Constitutional Court to challenge their chief for granting the mining company permission to mine their land without their consent. The Constitutional Court ruled in the community's favour and confirmed that their consent for both mining activities and relocation was needed. After the judgement and subsequent negotiations, the settlement compensation agreed by

the mining company was significantly greater. The judgement is so important because its findings apply to all communities in South Africa. (du Plessis, L, 2022)

In the event that communities are to be relocated for the purposes of mining, "…the MPRDA has no explicit provisions for resettlement of landowners, lawful occupiers, holders of informal and communal land rights, mine communities and host communities…"(Mine Community Resettlement Guidelines, 2022) The Mine Community Resettlement Guidelines are intended to outline the process and requirements to be complied with by the applicant or the holder of a prospecting right, mining right or mining permit when such an application or right will result in physical resettlement of landowners, lawful occupiers, holders of informal and communal land rights, mine communities and host communities, from their land.

The Mine Community Resettlement Guidelines provide for the development of the Resettlement Plan, Resettlement Action Plan and Resettlement Agreement. According to the Guidelines, a Resettlement Plan is a broader consultative document which is concerned with project description; impact analyses; costs and budgetary considerations and consultation mechanisms. The Resettlement Action Plan lists the steps to be taken in order to achieve the goals set out in the resettlement plan. The Resettlement Agreement serves to record the commitments made by the mining right holder in the resettlement plan and the resettlement action plan. The agreement must be signed by all the relevant stakeholders and submitted to the Regional Manager.

In South Africa, the question of land use post mine closure is being investigated by university students and professional mining institutes such as the Southern African Institute for Mining and Metallurgy (SAIMM). "Mining as a temporary land use often leaves behind a negative legacy particularly to the mine host communities, who are left behind with no alternative use of the land and any economic prospect. Therefore, by planning for mine closure with the 'end use' of the land in mind, the mining industry in South Africa has the opportunity to realise innovative sustainable land uses and create functioning ecosystems post mine closure." This is according to GCI PhD student Ntombifuthi Monedi-Noko. (Global Change Institute, 2023) The President of the Southern African Institute of Mining and Metallurgy, Mr Mthenjane M I, vowed that the issue of post-mining use of rehabilitated land would constitute the primary focus of his tenure. (Mthenjane M I, 2019).

The Mining Charter comprises of six elements, which are: ownership; inclusive procurement, supplier and enterprise development; human resource development; employment equity; mine community development; housing and living conditions. Since the SLP is a five-year plan, the mine is required to make commitments with regard to each of the six elements and on an annual basis decide, in consultation with the beneficiary communities, how they will implement the plans. The purpose of the SLP is to promote employment, advance social and economic welfare, contribute to transforming the mining industry, and ensure that mining companies contribute to the development of the areas where they operate. (Center for Applied Legal Studies, 2016) According to the Mining Charter, 2018, mining right holders operating in the same area, may collaborate on identified projects to maximize the socio-economic developmental impact, in line with their SLPs. A mining right holder must implement 100 percent of SLP commitments in any given financial year and any amendment/variation of the SLP, including the budget, requires the approval of the Minister, in terms of Section 102 of the MPRDA.

4.1.5. Environment

Protection of the environment is of cardinal importance to the mining industry and the people of South Africa as it is anywhere else in the world. The South African Constitution provides that the environment generically is a functional area of concurrent national and provincial legislative competence, while some aspects of more specific environmental aspects (such as air pollution, potable water supply systems, domestic wastewater and sewage disposal systems) are within the executive and administrative authority of local government. The mining industry is required to comply

with provisions of NEMA and other environmental statutes when applying for prospecting rights, mining rights and throughout the lifespan of their operations. NEMA sets out a number of core principles, aimed at sustainable development, sustainable exploitation of natural resources, management of environmental impacts from economic activities and emphasizing the right of people to live in an environment that is not harmful to their health and wellbeing.

According to Section 2(2) of NEMA: environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably. In addition to NEMA, there are several specific environmental management Acts such as: the National Water Act, 36, of 1998; the National Environmental Management: Waste Act, 59, of 2008; the National Environmental Management: Air Quality Act, 39, of 2004; the National Environmental Management: Biodiversity Act, 10, of 2004; the National Environmental Management: Integrated Coastal Management Act, 24, of 2008; and the National Environmental Management Act: Protected Areas Act, 57, of 2003. There are various regulations as well as norms and standards accompanying the Acts. Other legislation dealing with environmental issues both at national and provincial levels include: the MPRDA (in the context of prospecting and mining, and exploration and production activities); Water Services Act, 108 of 1997; National Forests Act, 84, of 1998; National Heritage Resources Act, 25, of 1999; Marine Living Resources Act, 18, of 1998 (Bowmans Attorneys, 2020).

The key government departments and agencies involved in the administration and enforcement of environmental laws are: the Department of Forestry, Fisheries and Environment; the DMRE; the Department of Water and Sanitation; South African Heritage Resources Agency; the Department of Agriculture; Metropolitan, District and Local Municipalities. Environmental directorates in the nine provinces are also responsible for the administration and enforcement of environmental laws in their respective provinces. In order to obtain a prospecting or mining right, the applicant will need to perform either a basic assessment or an environmental impact assessment that incorporates an environmental management plan or programme.

According to the Environmental Impact Assessment Regulations, 2014, the applicant should appoint an Environmental Assessment Practitioner (EAP) and, where necessary, a Specialist as well, who are independent. The EAP must have the expertise to conduct environmental impact assessment and inform the applicant of all registered interested and affected parties. The EAP must identify whether a basic assessment or Scoping and Environmental Impact Reporting (S&EIR) process must be applied to the application. If S&EIR is applied to the application, a scoping report will have to be submitted to the relevant office of the DMRE, followed by the environmental impact assessment (EIA) report. Both reports require a public participation process of at least 30 days each. The environmental impact assessment report must be accompanied by the specialist' report, environmental management plan and closure plan. Authorization based on the basic assessment takes up to six months while EIA authorization could take up to a year. There is an appeal process against administrative decisions which should be exhausted before approaching the courts.

Financial Provisioning Regulations, 2015, require that an applicant or right holder should make financial provision for rehabilitation and remediation; decommissioning and closure activities; as well as remediation and management of latent or residual environmental impacts which may become known in future, including the pumping and treatment of polluted or extraneous water. The applicant or right holder must use one or a combination of the following methods for financial provisioning: 1. A financial guarantee from a bank registered in terms of the Banks Act, 1990 or from a financial institution registered by the Financial Services Board as an insurer or underwriter; 2. A deposit into an account administered by the Minister of Mineral Resources and Energy; or 3. A contribution to a trust fund established in terms of applicable legislation. (Financial Provisioning Regulations, 2015)

Failure to adhere to license, permit or authorization conditions constitute an offence and may lead to the withdrawal or suspension of the license, permit or authorization. The South African National Environmental Compliance and Enforcement Reports are prepared on an annual basis, covering all the nine provinces and various sectors. The reports show an upward trend in enforcement efforts judging by an increase in the number of criminal dockets and admission of guilt fines issued. In 2017/18, the total amount of administrative fines paid in respect of rectification of activities undertaken without the necessary authorization was R10 million. There is also an increase in the number of non-governmental organizations, environmental associations and interest groups who monitor and report companies for environmental non-compliance. However, the DMRE does not publish its environmental compliance and enforcement reports, which conceals non-compliance in the sector.

In line with its international commitments as a member of the United Nations Framework Convention on Climate Change, South Africa has recently implemented a carbon tax regime through the Carbon Tax Act, 15, of 2019. There is mounting social pressure for lenders to disclose the climate change impacts/greenhouse gas emissions and climate change related financial risk of the projects in which they invest. The Ministry of Forestry, Fisheries and Environment has published the Climate Change Bill in 2022 to mitigate the effects of climate change while fostering climate friendly practices. The Bill involves all three spheres of government and requires them to identify how climate change affects their functions and to take steps to address them. Each sphere of government is required to conduct a climate change needs and response assessment every five years. 4.1.6. Societal and community aspects, cultural heritage

Prospecting and mining take place on land that is often occupied or surrounded by communities. In 2016, members of the United Nations Development Programme and World Economic Forum identified the global mining industry as having an unprecedented opportunity to mobilize resources to advance the Sustainable Development Goals, given their activities are often located in remote and less developed areas, and can when managed correctly, bring investment and infrastructure at scale. (BMC Public Health, 2022) The MPRDA addresses societal and community aspects relating to mining, though they are often politicised as civil society organizations and sometimes, political parties rally behind communities to hold mining companies to account.

Mining often pollutes water, air, soil, and can disrupt farming activities and community life. In order to offset these impacts, and to ensure communities share the benefits of mining, applicants of prospecting and mining rights are required to consult with municipalities, traditional authorities, and communities in order to develop SLPs showing how they intend to contribute towards the development of communities affected by their operations. Once approved by the DMRE, SLPs become binding and legal documents against which the mine’s performance will be measured.

4.1.6. Societal and community aspects, cultural heritage

Cultural heritage in South Africa is varied as there are many cultural groups, each practicing their unique culture. Thorough consultation with communities, and not desktop study, will give the mining company an understanding of the community’s cultural values and heritage. Some communities have spiritual sites, such as graveyards, mountains and so forth, which they revere. Therefore, the relocation of graves to give way to mining projects could be an insult to people’s cultural belief systems. In terms of natural heritage South Africa has 8 world heritage sites which were declared by the United Nations Educational, Scientific and Cultural Organization (UNESCO). They are: 1. Isimangaliso Greater St Lucia Wetland Park; 2. The uKhahlamba Drakensberg Park; 3. Robben Island; 4. The Fossil Hominid Sites of Sterkfontein, Swartkrans, Kromdraai and the environs; 5. The Mapungubwe Cultural Landscape; 6. Vredefort Dome; 7. The Cape Floral Region; and 8. The Richtersveld Cultural and Botanical Landscape. The Cape Floral Region makes up only 0.04 % of the world’s land area, yet contains an astonishing 3% of its plant species, making it one of the world’s richest areas for plants and one of the globe's 18 biodiversity hotspots. The protected areas include:

Table Mountain; De Hoop Nature Reserve; Boland Mountain Complex; Groot Winterhoek Wilderness Area; Swartberg Mountains; Boosmansbos Wilderness Area; Cederberg Wilderness Area; Baviaanskloof; Kirstenbosch Botanical Gardens. (South African History Online, 2023)

4.1.7. Public health and safety

Mining in South Africa poses serious health and safety problems to communities. Mining communities tend to experience an influx of people, either working for the mines and their contractors or looking for opportunities from the mines. Such an influx often presents mining communities with unprecedented health problems. Communities begin to experience high prevalence of HIV, STDs, TB[24] and other diseases because of mining in their vicinity. In a study conducted among host communities, it was found that, "at a structural level poor access to quality health care…" was the primary contributing factor to the prevalence of HIV, TB and substance abuse. (BMC Public Health, 2022)

It is estimated that South Africa has 20 000 premature deaths resulting from excessive pollution of the air and the environment by coal mining alone. The Presidential Climate Commission and the World Bank Group report shows that coal related activities pollute water and soil, with some devastating effects on health, water and food security (Embellie Advisory, 2023). As of 2014, many of South Africa's approximately 6000 abandoned mines are polluting surrounding surface waters with acidic water and dissolved heavy metals, harming the health and livelihoods of people in surrounding communities. A study led by the Council for Scientific and Industrial Research to assess health risks related to water from the Lower Olifants River found excess amounts of antimony, arsenic, cadmium, mercury and uranium in community water supply samples, elements that can be extremely harmful to human health and marine organisms. Mbere and Steenkamp have done an analysis of 9 large players in the South African mining industry to track key ESG trends. They have found, among others, that many companies have a holistic and comprehensive approach towards the health and wellness of their employees but lack the same approach for community members (N Mbere, S Steenkamp, 2022).

Basic information that communities require to understand the impacts of mines and to hold mining companies accountable for harmful activities is often not publicly available. Such information includes, environmental authorisations, environmental management programs, waste management licenses, atmospheric emission licenses, mining rights, mining work programs, SLPs, or compliance and enforcement information. The information is only accessible through a tedious process of access to information law, a procedure which the World Health Organisation has called "seriously flawed" and which the DMRE regularly flouts (Groundwork, Centre for Environmental Rights, Human Rights Watch, Earthjustice, 2019).

In South Africa, the method that is widely used for the extraction of gold is cyanidation process which uses cyanide. Cyanide is a very fast-acting poison that prevents oxygen from being used by the cells resulting in tissue hypoxia and cyanosis. This results in rapid and deep breathing followed by convulsions, loss of consciousness and suffocation. The cyanide in the spent leaching solutions is discharged into large mine tailings dams. Seepage escapes from some of the tailings dams and contaminates soil and water. Dispersion modelling indicates that tens of thousands of people that reside in areas adjacent to tailings dams within the City of Johannesburg may even be exposed to atmospheric cyanide concentrations above the international standards (W Utembe, E M Faustman, P Matatiele and M Gulumian, 2015).

[24] HIV (human immunodeficiency virus), STDs (Sexually transmitted diseases), TB (Tuberculosis)

4.2. Mining practices vs. Environmental, Social and Governance (ESG) goals

ESG is an amalgamation of three distinct disciplines, each with their own underlying knowledge base, areas of focus, and methodologies for approaching problems and solutions. There is, however, considerable overlap amongst the three disciplines with issues in the one area typically impacting on or being impacted by elements of the other two. Sustainable (or responsible) investing describes the process whereby ESG factors are incorporated into the investment of individuals when they invest in companies, organizations or funds. These investment decisions are based on the individual's real or perceived understanding of the environmental and/or social impacts (positive or negative) that will result from their investments in parallel with the expected financial returns (Steele-Schober T, 2021). Investors, regulators and other stakeholders, mostly in first world countries, are urging companies to step up their environmental, social and governance (ESG) disclosures.

SAMESG is the South African guideline for the reporting of environmental, social and governance parameters. The SAMCODES Standards Committee acknowledged that the primary reason for mining companies to adopt ESG reporting is because more investors are incorporating ESG criteria into their valuations and investment strategies (South African Minerals Reporting Codes Standards Committee, 2023). This would explain the disjuncture between what is reported and the practical experience at project level.

This chapter provides an assessment of Environmental, Social and Governance (ESG) challenges in the South African minerals and mining sector. Firstly, there will be an overview of the legislative framework followed by an assessment of compliance by the mining industry, with particular focus on ESG requirements. The chapter will further look at the government's oversight role and make recommendations for best practice based on international experience. The report is the outcome of a desktop study of research reports informed by both field studies and archival research in various fields relating to ESG. Websites of various organizations were browsed to gain their insights on the ESG issues in the South African mining industry. Since ESG is a multifaceted concept even the study approach included contributions from as many disciplines as they are relevant. The Department of Mineral Resources and Energy (DMRE) provided their reports and other relevant documents which provided much needed assistance in the compilation of the report.

4.2.1 Environmental challenges

Mining in South Africa has a history of disregard for the environment due to lack of legislation in the past. As Makua and Kola stated, "Since the late 19th century South Africa has exploited its mineral wealth with little or no regard to the environment." (Makua, M. Pretty, Kola O. Odeku, 2017) Since the dawn of democracy, there has been an improvement in environmental legislation. However, there are still practices of non-compliance by some companies, large and small. According to the Bench Marks Foundation, there are too many loopholes in the legislation governing the mining sector. The problem is further complicated by the involvement of current and former government officials as shareholders, board members or managers in mining companies. (Bench Marks Foundation, 2017)South African artisanal miners are reportedly using mercury for the extraction of gold, which the Artisanal and Small-Scale Mining Policy, 2022, aims to abolish. The Country is ranked second in the world in terms of Hg emissions to the environment. Inhalation, ingestion or dermal absorption of Hg can result in neurological and behavioural disorders, tremors, insomnia, hallucinations, memory loss, neuromuscular effects, headaches and cognitive and motor dysfunction. Acid mine drainage from mining operations and mine tailings dams and dumps contains a variety of toxic metals, some of which are found in high concentrations in soils surrounding mining areas in South Africa.

In its report, the Human Rights Commission mentioned, "Submissions to the National Hearing revealed that there is significant non-compliance with various environmental laws and regulations by mining

companies." The Commission indicated that the problem was amplified by capacity constraints of compliance and regulatory bodies. For instance, for the 1,757 authorised mining operations in 2016, there were only 96 Environmental Mineral Resource Inspectors (EMRIs) employed by the Department of Mineral Resources and an additional 30 earmarked for training. The number of EMRIs had increased to a total of 108 against 1,856 operating mines, by 31 March 2019. Majority of EMRIs are compliance officials and do not have enforcement powers.

During the financial years 2017/18 and 2018/19, there were 253 and 292 inspections prompted by public complaints. (Centre for Environmental Rights, 2020) The Centre for Environmental Rights lamented the process of obtaining environmental compliance and enforcement reports from the DMRE. They further indicated that the DMRE is reluctant to make their enforcement activities and results public. According to the Human Rights Commission, majority of non-compliance cases related to inadequate financial provision for closure and rehabilitation. Other issues included failure to submit revised Environmental Management Programmes (EMPs); failure to conduct dust fallout, noise, and groundwater monitoring exercises; inadequate waste disposal, including hazardous waste; spillages and water pollution; the release of contaminated water back into dams; impeding the flow of rivers; etc. (Human Rights Commission, 2018)

Section 93 of the MPRDA empowers any authorised person to issue compliance orders, instructions, or to order the suspension or termination of a mining license for a variety of reasons, including a breach of any material term, or condition or a contravention of any condition in the environmental authorisation. Moreover, Section 47 of the MPRDA enables the Minister to cancel or suspend mining licenses. The Commission emphasises that such a sanction is generally reserved for extremely serious contraventions because at the time of the Commission's investigation no mining license was ever withdrawn, despite the reported cases of non-compliance. In a study conducted by the Bench Marks Foundation it was found that residents of Soweto experienced respiratory problems, exposure to radioactive mine waste, acid mine drainage, unprotected mine waste sites and there was severe threat to underground water supplies resulting from mining. (Bench Marks Foundation, 2017)

4.2.2 Social and societal issues

Human rights

Human rights in South Africa are protected under the Bill of Rights that appears in Sections 7 to 39 of its 1996 Constitution which guarantees political, economic, social and cultural rights to all people in the country. This commitment is backed up by statutory oversight bodies, such as the South African Human Rights Commission, which protects the rights guaranteed under the Constitution. South Africa is a signatory to various international human rights instruments including the Universal Declaration of Human Rights; African Charter on Human and Peoples' Rights; the International Covenant on Economic, Social and Cultural Rights; and the UN declaration on sexual orientation and gender identity.

Despite these strong constitutional protections for human rights, the government continues to struggle to meet demands for economic and social rights. Issues such as unemployment, corruption, crime, gender-based violence, and threats to freedom of expression remain a concern for many citizens. Concerns also exist about the treatment of migrants, refugees, and asylum seekers, and resultant xenophobia violence. South Africa continues to play an important but inconsistent role in advancing the rights of lesbian, gay, bisexual, and transgender people.

In the mining sector, most large-scale mining companies subscribe to any one of a number of human rights conventions or protocols and the Bill of Rights contained in the South African Constitution. Many of them devote considerable attention to stakeholder engagement, communication and training and awareness building to give effect to their commitments. Despite this, the South African Human Rights

Commission released a scathing report on the damage mining in the country is posing to human rights. The Commission has found that the government is responsible for the harm done to mining-affected communities because of its failure to monitor compliance, poor enforcement, and severe lack of coordination. Although mining companies promise jobs and development, it is fairly unusual for communities affected by mining to see these benefits. Mbere and Steenkamp's analysis showed that ESG initiatives are not being sufficiently integrated into the corporate strategy of mining companies. One of the challenges for mining communities is lack of information about their rights and the law applicable to mining (Centre for Environmental Rights and Lawyers for Human Rights, 2014).

Around the country, mine-host communities often contend that mining companies' social and legal obligations towards development and environmental management are not adequately fulfilled. Where this is the case, mining companies risk failing to maintain their social license to operate or worse. The South African Human Rights Commission (SAHRC) actively engages with the mining industry and mine-affected communities to promote and protect the economic, social, environmental and cultural rights of those impacted by mining.

Labour rights

Labour rights are also guaranteed through the Constitution and various legislation such as the Labour Relations Act, No.66 of 1995, the Occupational Health and Safety Act, No.85 of 1993 and others. South Africa subscribes to the advancement of social and economic justice and has ratified 9 of the ILO's 10 "fundamental"/core conventions of the International Labour Organisation (ILO) since resumption of its membership of the body in May 1996 following the advent of democracy in the country[25].

The South African labour movement has a long and proud history in driving change in the mining industry, since 1982 when the National Union of Mineworkers (NUM) was formed and later affiliated with the Congress of South African Trade Unions[26]. Since the end of Apartheid, NUM succeeded in gaining improvements in workers' rights and on issues of health and safety. However, issues remain, including with housing and living conditions, workers pay, mine modernisation (mechanisation) and the changing nature of work in the industry. The Marikana massacre in 2012 in which 34 mineworkers were killed by police during a wildcat strike indicated problems with the collective bargaining system and amongst other factors led to the rise to prominence of the Association of Mineworkers and Construction Union (AMCU), a previously little-known union. Since then, a protracted period of rivalry between NUM and AMCU saw a violent turf war that claimed many lies and sparked waves of labour unrest. Increasingly though, these two major labour formations have recognised the need to put differences aside in the interest of worker's rights and protection, especially in the context of mounting pressure on workers brought about by deteriorating mining sector performance and stagnation in the economy as a whole/

Socio-Economic issues

Mining in South Africa has both a positive and negative impact on communities. On the positive side the industry contributes to the livelihood of communities in terms of jobs and compensation for the loss of land-use. It is reported that, in 2013 South African mining companies spent R2.7 billion on corporate social responsibility. The report further stated that in the Northern Cape province, 26 mining companies spent R500 million in 2015 alone, on various socio-economic development initiatives. (Minerals Council, 2022) The annual reports of many mining companies reflect spending on community development initiatives such as, the building of schools, clinics, income generating projects and infrastructure. However, such contribution is overshadowed by the general reluctance of

[25] More information on which conventions have been ratified and those which have not can be obtained at https://www.ilo.org/dyn/normlex/en/f?p=1000:11200:0::NO:11200:P11200_COUNTRY_ID:102888

[26] Before 1982 black mineworkers were not allowed to form trade unions.

mining companies to incorporate community development in their corporate strategy. As the Minerals Council observed, there has been an increase in community protests, which often turn violent, against mining companies. Communities complain, among others, about mining companies failing to fulfil their SLP commitments.

The Mining Charter has been in existence for nearly 20 years, but most communities affected by mining are still living in abject poverty. This is partly because the SLPs are often developed without consultation with the people who should benefit from them, and so they may not effectively respond to the challenges experienced by people in communities. It is also partly because not everything that is promised in the SLPs is delivered, and the DMRE does not always check if mining companies fulfil their SLP commitments. (Centre for Applied Legal Studies, 2018) In a question-and-answer session of Parliament, the Minister of Minerals and Energy said, "as of 31 March 2015, a total of 240 mining right holders failed to comply with their SLPs". (National Council of Provinces, 2020) On their website, the Minerals Council acknowledges that "the prevailing socio-economic conditions in host communities, however, do not always reflect the positive contributions that the industry makes nor the outcomes that the industry is striving to achieve." (Minerals Council, 2023)

In their study of the SLP system, the Centre for Applied Legal Studies has found that there was an overreliance on desktop study, without field research or consultation with communities. Again, it was found that mining companies failed to disseminate SLPs to beneficiary communities as required by the Mining Charter, 2018. Progress reports submitted to regional offices are not easily accessible to the public unless communities resort to Promotion of Access to Information Act, 2, of 2000. The International Council on Mining and Metals (ICMM) also acknowledged that, "…there is no consistent, industry-wide approach to measuring and reporting on social and economic contribution. This creates challenges for identifying areas for performance improvement across the industry and hinders efforts to communicate the contribution responsible mining can make to society."

Members of the ICMM (which includes majority of large mining companies in South Africa) will only begin to report using the Social and Economic Reporting Framework from 2023 for 2024 disclosures. (ICMM, 2022)

The Human Rights Commission analysed SLP compliance for the years, 2013/14 and 2015/16, covering the Eastern Cape, Gauteng, Limpopo, Free State and KwaZulu Natal provinces. The compliance levels were dismal, with Gauteng showing no compliance at all for 2014/15 and 2015/2016 respectively. In all the provinces analysed for the same period, only 30% of mining companies complied with the SLP obligations. The Department of Mineral Resources (DMR) assessed the Mining Charter in 2015 to gauge if there was any progress made since the introduction of the Mining Charter. It is reported that 962 operations were due for assessment. Of the 962 mining rights eligible for assessment, only 442 submitted their reports. After their assessment, the Department of Mineral Resources and Energy DMRE concluded that "…there has been limited impact in terms of intended beneficiaries realising optimal economic benefits." (The Department of Mineral Resources, 2015) The Department also recognised the fact that mining companies only complied with the Mining Charter to protect their social license to operate. The results showed that only 36% of mining right holders had met their set target on mine community development. As a result, the mining industry has broadly been faced with increasing tensions with both the workers and host communities.

Since the Mining Charter 2018, requires that traditional authorities be consulted with, as one of the stakeholders in the SLP process, they often hamper broader consultation, especially with the community at large. In some cases, mining companies entered into agreements with traditional authorities without the community's consent and such arrangements would only benefit traditional authorities. Such practices have led to devastating outcomes including the deaths of members of communities opposed to mining. (Liewellyn L, 2019) There is no clear regulatory framework regarding

the role of traditional leaders in the SLP process and that exposes mining communities to exploitation by traditional leaders, mining companies and the government.

In March 2016, an activist, who was chairperson of a community-based organisation was murdered because they were opposed to mining in Xolobeni, Eastern Cape province. Members of the Xolobeni community were raising concerns that the titanium mine that the Australian company, Mineral Commodities Ltd, proposed to develop on South Africa's Wild Coast would displace the community and destroy their environment, traditions and livelihoods. Other mining areas in the Country, including Limpopo, KwaZulu-Natal and the North West Province have had experiences similar to Xolobeni. (Groundwork, Centre for Environmental Rights, Human Rights Watch, Earthjustice, 2019) Mine closure has some devastating effects on communities, especially if it's not properly planned for and managed. In South Africa, mine closure is associated with job losses, pollution, the zama zamas (illegal miners), and acid mine drainage). According to Prof Humby, "poorly regulated mine closure" is a significant problem with some detrimental effects on South Africa's poorest citizens. (Parliamentary Monitoring Group, 2017) In his Presidential address, Mthenjane mentioned, "From a policy perspective, current statutes and regulations in the MPRDA, NEMA and the Water Act are limited to physical rehabilitation and none of these statutes deal in any way with the social consequences of mine closure." (Mthenjane M I, 2019)

Governance

The South African mining industry was established under colonialism and the apartheid system where it had no restraint and had undue influence on government decision-making. This created an environment where mining companies maximized profits at the expense of people and the environment. Research studies show that the situation still persists under the democratic government, where mining companies establish close ties with government at national, provincial and local levels, to violate the Country's laws. (Liewellyn L, 2019) The Companies Act, 71, of 2008 (Companies Act) and the Mining Charter in South Africa are legislative instruments used for the management of the relationships between the stakeholders and the company. Eversheds Sutherland states that "from a mining company's perspective, the Companies Act, as amended read with the Mining Charter illustrate how the voluntary application of King IV corporate principles trigger statutory obligations and consequences." (Eversheds Sutherland) They further argue that the harmonization of the King VI corporate governance principles with the Companies Act and the Mining Charter legislative imperatives could offer a unique contribution towards establishing, for the boards of mining companies, a practical generic framework that will reduce potential liabilities for non-compliance with legislative requirements and ensure that decisions are implemented efficiently and effectively.

Mining companies are increasingly required to invest in broader service activities and that calls for the board to balance its responsibility to the shareholders, the company and the community within which it operates. The regulation process establishes mechanisms to hold the company accountable to its stakeholders, including the society in which it operates. The three most important legal instruments in respect of corporate governance in South Africa are: the Constitution, Companies Act and the Mining Charter. The Constitution ensures that governance and exercise of corporate power is consistent with the Bill of Rights. The Mining Charter ensures broad-based and meaningful transformation of the mining and minerals industry, while the Companies Act empowers the board's continuous independent oversight of material matters. (ibid)

What remains a barrier within the mining industry is the imbalance in the demographics of competitive board members within mining companies. The Mining Charter requires a board composition reflective of the racial and gender demographics of South Africa. However, the BEE Commission notes that the inadequate disclosure of demographics of the boards in the annual reports of most entities poses a challenge on the analyses of transformation at management level and that makes transparency a prerequisite in order for King IV principles to be effective. Eversheds Sutherland

is of the view that the voluntary nature of the King IV principles is such that companies can avoid applying the principles and explain non-compliance without consequences.

The SAMCODES Standards Committee (SSC) has responded to the shift in global recognition of the importance of competent assessment of and reporting on socio-environmental liability through the publication of the South African guideline for the reporting of environmental, social and governance parameters within the solid minerals, oil and gas industries (the SAMESG guideline). The SAMESG was produced to define the relevant ESG aspects which should be reported on in public reports issued for the extractive industries and provides guidance on the reporting of the following aspects:

- Organisational structure, systems, policies, procedures and risk control management plans;
- Compliance related ESG aspects;
- Key environmental parameters;
- External social and political parameters
- Internal social parameters;
- Conformance and compliance audits;
- ESG liability; and
- Risk analyses and materiality processes

The key reporting aspects contained in SAMESG are included in the updated SAMREC (the South African Code for the Reporting of Exploration Results, Mineral Resources and Mineral Reserves) report. In 2019 the SAMESG guideline received the International Standards of Accounting and Reporting Honours Award. The SAMESG Vice Chair commented that “The development of the SAMESG guideline was seen as an imperative considering that resources companies listed on the Johannesburg Stock Exchange, at that time, were not subjected to a formalised standard of reporting on ESG matters and determining their impact on mineral project reserves, resources and valuations.” (South African Minerals Reporting Codes Standard Committee, 2022) With the SAMESG guideline in place, South African mining companies, of all sizes, should be encouraged to consider ESG throughout the lifespan of their operations.

4.2.3 What would be the best practices for a responsible mining?

In South Africa, the mining and environmental laws are tailored to encourage responsible mining, provided they are adhered to. The government needs to take its oversight role serious and impose sanctions where there is non-compliance with the Country’s laws, while providing incentives for compliance, where possible. The call for responsible mining is a world-wide phenomenon which involves all stakeholders such as, government, investors, lenders, downstream customers, industry associations, voluntary initiatives, civil society and organised labour. The South African mining industry has the capacity to meet sustainable development requirements. Almost ten of South Africa’s large mining companies submitted their reports on ESG performance to Responsible Mining Foundation (RMF) for assessment and publishing in the Responsible Mining Index (RMI). The 2022 RMI included 40 companies which have mine sites across 57 countries. (Responsible Mining Foundation, 2022) Although in general, South African mining companies scored low on most of the indicators, more companies should be encouraged to benchmark themselves against international best practice standards. RMF stressed that despite interest in responsible mining standards, the evidence on the ground was still limited.

As Cembi and Romet mentioned, “by incorporating sustainable mining practices that prioritise environmental and social stewardship with proper governance rules, the industry will ensure that the current and future needs of its communities and society at large are met." They further explained that sustainable mining refers to the reduction of negative environmental, social and governance impacts of mining operations, while improving value creation at the local level. (Embellie Advisory, 2023) Steele-Schober, T, stated that profit seeking at the expense of society and the environment has resulted in a disconnect between companies and the real economy, including natural and human capital assets on which companies depend for their profitability. The purpose of directing funds

towards investments which are seen as sustainable is to generate measurable environmental and social impacts in addition to a financial return. (Steele-Schober T, 2021)

Increasing demand for battery and renewable energy metals associated with the ecological transition such as lithium, graphite, cobalt, copper and nickel means that the mining industry should increase its commodity outputs while incorporating key sustainability principles in its operations. The rise of ESG as a key driver for investment and operational success has added a new responsibility to corporate leadership, but also provides an opportunity to increase the sustainability of operations and securing the relevant social license to operate. Strategic investment should be made in areas that contribute to the collecting of accurate ESG data based on sound metrics, establishing the ESG impact of business operations, and by communicating ESG processes and results to a range of stakeholders varying from local communities to investors. Mbere and Steenkamp suggest, a key ESG opportunity exists for companies to roll out holistic and pro-active health and wellness programmes to community members with focus on their mental, physical and financial health. There is mounting pressure, by investors and regulators, for companies to disclose ESG performance and set targets. The King IV Guidance Paper on Responsibilities of Governing Bodies in Responding to Climate Change and JSE Sustainability and Climate Disclosure Guidance, as well as global disclosure standards will help to strengthen reporting on ESG goals. Mbere and Steenkamp advise that companies should invest in new technology and the relevant software to process the collected ESG data so that they have the relevant information to report to their governance structures, shareholders and potential investors. (Mbere N, Steenkamp S, 2022)

Responsible mining practices should avoid economic strain for mining communities after mine closure. The President of SAIMM stated that, “by creatively developing economic succession planning principles into the actual design of the mine, the sustainable economic viability of the project’s affected communities is ensured by using mining as the catalyst for other forms of economic activity.” (Mthenjane M I, 2019)

5. Business network between the European Union and the Republic of South Africa

5.1. Assessment of the upstream and downstream business ecosystem

5.1.1 Context, formal and informal players

Much of the contemporary trade, finance, technology and cultural links between the Republic of South Africa (RSA) and the EU were laid down in the period prior the establishment of South Africa as a democratic state in 1994. Parts of the RSA were colonised by the Netherlands (1652-1795 and 1803-1806) and Great Britain (1795-1803 and 1806-1910 and as a dominion to 1961). Archaeological evidence shows mining took place in South Africa before the emergence of anatomically modern humans, however, modern mining was launched by the discovery of diamonds and gold in 1867 and 1886 respectively, extensively capitalised by the City of London which ramified into deep mining, finance, and industrial links with Great Britain.

This chapter sets out the context of South Africa's minerals industry before moving onto examine existing networks and organisations with the potential to participate in the AfricaMaVal project. The main government bodies and research agencies involved in the mining and mineral industry are presented in Table 10 below, adapted from Dai Global, 2022.

Table 10: Key government and institutional players in the South African mining and energy industries.

Institution	Role
DMRE	Is the primary regulator of the mining industry under the MPRDA.
Entities that Report to the DMRE	
Regulatory and other entities	
Mine Health and Safety Council (MHSC)	The MHSC advises the Minister of Mineral Resources on occupational health and safety legislation based on research focused on improving and promoting health and safety in South African mines.
South African Diamond and Precious Metals Regulator (SADPMR)	The Diamond Exchange and Export Centre (DEEC) was established by the South African Diamond and Precious Metals Regulator (SADPMR), in terms of section 59(b) of Act No. 30, 2005 and started operating on the 14th of January 2008. It was established to administer the Diamonds Act, 1986 (as amended) and the Precious Metals Act, 2005 (Act 37 of 2005). The Precious Metals Act, 2005 (Act 37 of 2005) commenced on 1 July 2007 and Regulations made under the Act took effect on 9 July 2007. These Regulations were amended on 4 April 2008.
National Energy Regulator of South Africa (NERSA)	NERSA's mandate is to regulate the electricity, piped gas and petroleum pipelines industries in terms of the Electricity Regulation Act, 2006 (Act No. 4 of 2006), Gas Act, 2001 (Act No. 48 of 2001) and Petroleum Pipelines Act, 2003 (Act No. 60 of 2003).

South African Nuclear Regulator (NNR)	This is a public entity which is established and governed in terms of Section 3 of the National Nuclear Regulator Act, (Act No. 47 of 1999) to provide for the protection of persons, property and the environment against nuclear damage through the establishment of safety standards and regulatory practices.
Petroleum Agency of South Africa (PASA)	This is the official agency responsible for the promotion and regulation of South Africa's petroleum resources.
State Owned Corporations (SOCs) and Funds	
Central Energy Fund (CEF Group)	This is a Schedule 2[27] state owned diversified energy company that is involved in the search for appropriate energy solutions to meet the energy needs of South Africa, the Southern African Development Community and the sub-Saharan African region, including oil, gas, electrical power, solar energy, low-smoke fuels, biomass, wind and renewable energy sources.
PetroSA	This is a subsidiary of the CEF Group; it is the national oil company of South Africa and is registered as a commercial entity under South African law. The company holds a portfolio of assets that spans the petroleum value chain.
Strategic Fuel Fund (SFF)	This is another subsidiary of the CEF; it manages the country's strategic crude oil stockpile as well as the commercialisation of its substantial crude oil storage facilities in the Western Cape.
South African Gas Development Company (iGAS)	iGAS is another subsidiary of the CEF and was established for the development of hydrocarbon gas and gas infrastructure in Southern Africa.
African Exploration Mining and Finance Corporation (AEMFC)	This is the State-Owned Mining Company established to secure South Africa's energy supply primarily through the mining and supply of coal for the generation of electricity, as well as securing other resources that will provide energy for the future, including key minerals for beneficiation in the energy and steel value chain.
State Diamond Trader (SDT)	The SDT is a state-owned entity established in terms of Section 14 of the Diamonds Act 56, 1986, as amended ("the Act"). It operates in the diamond industry with the aim to grow local diamond beneficiation. The mandate of the SDT is to buy and sell rough diamonds and to promote equitable access to and beneficiation of the country's diamond resources
PELCHEM	This is a wholly owned subsidiary of NECSA SOC Ltd and is the sole producer and supplier of fluorochemicals in the Southern Hemisphere.
Research and Development Entities	

27 Schedule 2 public entities are business enterprises that are required to generate revenue to fund their operations.

MINTEK	Mintek is South Africa's national mineral research organisation and it is one of the world's leading technology organisations specialising in mineral processing, extractive metallurgy and related areas. Working closely with industry and other R&D institutions, Mintek provides service testwork, process development and optimisation, consulting and innovative products to clients worldwide.
Council for Geoscience (CGS)	The CGS is mandated to provide for the promotion of research and the extension of knowledge in the field of geoscience as well as the provision of specialised geoscientific services.
Mining Qualifications Authority (MQA)	The MQA is a Sector Educational and Training Authority (SETA) and is responsible for the administration of skills development programmes for the mining and minerals sector.
South African Nuclear Energy Corporation (NECSA)	NECSA was established as a public company by the Republic of South Africa Nuclear Energy Act in 1999 and is wholly owned by the State. To develop, utilise and manage nuclear technology for national and regional socio-economic development through: Applied R&D; Commercial application of nuclear and associated technology; Contributing to the development of skills in science and technology.
NTP Radioisotopes (NTP)	NTP Radioisotopes is a leading global producer and supplier of nuclear medicine and radiation-based products and services and is a subsidiary of NECSA.
South African National Energy Development Institute (SANEDI)	It was established in 2011 under the National Energy Act, 2008 (Act No. 34 of 2008). The Act provides for SANEDI to direct, monitor and conduct energy research and development, promote energy research and technology innovation as well as undertake measures to promote energy efficiency throughout the economy.
The Council for Scientific and Industrial Research (CSIR)	CSIR is a national research and development organisation that undertakes directed, multidisciplinary research and technological innovation in areas of national key interest, namely: agriculture and food; chemicals; health; manufacturing; mining; defense and security; smart mobility and places and enterprises and institutions.
Other Relevant Government Departments and related entities	
Department of Environment, Forestry and Fisheries (DEFF)	Regulates all activities pertaining to the environment as stipulated by NEMA.
Department of Water and Sanitation (DWS)	Regulates water and waste management.
Department of Transport (DoT)	Regulates South Africa's transportation infrastructure.
Transnet	Is a SOC that manages South Africa's ports, rail and pipeline infrastructure

Department of Agriculture, Land reform and Rural development (DALRRD)	Regulates land rights in South Africa.
Department of Employment and Labour	Is responsible for matters related to employment.
Department of Science and Innovation (DSI)	This department is responsible for research and innovation.
Department of Trade, Industry and Competition (DTIC)	Is responsible for the development and regulation of commercial and industrial policy.

5.1.2 Relationships at local or regional levels

The Republic of South Africa has diplomatic relations with EU member states alongside recognizing the Delegation from the EU which functions as a diplomatic mission representing the EU to South Africa together with the 27 Member States with the main objective to implement a Trade, Development and Cooperation Agreement.

European Union business chambers

National business chambers that represent companies in the minerals industry or declare a focus on minerals related cooperation in their scope of activities are the following:

The European Union Chamber of Commerce and Industry of Southern Africa: https://www.euchamber.co.za

Amongst its 'key themes' it lists 'green and circular economy' and within that it says the following: "We will identify partnership opportunities between South African and EU companies in the following sectors: Green Economy: Demand-side energy efficiency and market for Energy Service Companies (ESCOs), wind and solar power, biomass power plants, power fuels, Urban mobility, battery storage".

This business council acts as an umbrella body for national business councils of EU member states to communicate views regarding legislation or business affairs to South African authorities.

Table 11 EU member business councils in South Africa

National business council	Website	Minerals
Austrian Business Council	https://austrianbc.co.za/	Yes
The Belgian Chamber of Commerce for Southern Africa (BCCSA)	https://belgianchambersa.co.za	No

Czech Trade	https://www.czechtradeoffices.com/en/za	No
Nordic-South African Business Association	https://www.nsba.co.za/	No
Business Finland	https://finlandabroad.fi/web/zaf/team-finland-in-country	Yes
The French South African Chamber of Commerce Industry (FSACCI)	https://www.fsacci.com	No
The German Chamber of Commerce and Industry for Southern Africa (AHK Southern Africa)	https://suedafrika.ahk.de/	Yes
Business Sweden	https://www.business-sweden.com	Yes
Swedish private companies	http://www.swedenafricachamber.se/	Yes

Austrian Business Council

The Austrian Business Council has private members as well as members of the following industries: manufacturing, engineering, energy, and mining. It declares that "The main areas of cooperation are projects in the fields of biotechnology, ICT, renewable energy, health sciences, food and nutrition, mining, security and sustainable agriculture."

Business Finland

Business Finland office in South Africa offers advisory services and support for finding local networks and consultants. It also answers requests for Angola, Botswana, Namibia, Zambia, and Zimbabwe.

"In our work, we focus on the sectors where the supply of Finnish companies and the demand in South Africa meet best. These include energy, smart mining, circular economy, digitalisation and 4IR technologies, agriculture, and food, as well as education and skills development."

Southern African – German Chamber of Commerce

The Southern African – German Chamber of Commerce and Industry has established a Competence Centre for Mining & Mineral Resources (CCMR), commissioned by the German Federal Ministry for Economic Affairs and Energy. The CCMR is aligned with the Resource Strategy of the Federal Republic of Germany. The Centre´s focus is on Southern Africa, more specifically South Africa, Zambia, Zimbabwe, and the Democratic Republic Congo where mining is one of the most important industries. These sources will contribute to the security and diversity of the German resource supply and will be markets for German technology, products and services.

https://suedafrika.ahk.de/en/competence-centres/mining-mineral-resources

Objectives of CCMR are to:

- Create Market Transparency
- Communicate programme objectives
- Provide Services
- Promote German Technologies

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5.1.3 Overview of the local or regional clusters

Using the term cluster in a broad sense to refer to organisations that could cooperate to some degree on shared interests there are at least five potential clusters that could be focal points for networking within the scope of the AfricaMaVal project. Some of these networks or proto-clusters overlap with potential partner institutions listed in section 5.2.2 below.

An emerging critical minerals/battery metals mining sector. Several junior miners are actively pursuing projects in South Africa targeting critical minerals independently from the well-established PGM, chrome, manganese, vanadium mining sectors. These junior miners cannot be treated as a cluster yet, nor is formal cooperation between them known to the authors, however, they are raising South Africa's profile as a supplier of critical minerals. Relevant projects are the following:

- Marula Mining producing high-grade run-of-mine lithium ore at its Blesberg lithium and tantalum mine in the Northern Cape;
- Rainbow Rare Earths developing a mixed rare earth recovery plant to treat phosphate tailings from the Phalaborwa mining complex;
- Thakadu Group, positioning itself as a multi-asset producer of battery raw materials, has built nickel sulphate refinery in Marikana adjacent to Sibanye-Stillwater's base metals refinery to beneficiate the nickel and cobalt output by-products from the PGM stream; and
- Bushveld Energy in a joint venture with the IDC has built a vanadium electrolyte plant in East London with an 8 million litre annual capacity, the largest plant in the world outside of China.
- Sibanye-Stillwater with major gold and uranium and PGM mines in South Africa is building a global portfolio of green minerals, however, none in South Africa to date.

National science councils. Publicly funded research on national development priorities for the minerals industry is carried out at Mintek and the Council for Scientific and Industrial Research. Both science councils also perform research on contract for the minerals industry.

Academic collaboration networks. Networks in place which align with the AfricaMaVal include the Centre of Excellence for Integrated Mineral and Energy Resource Analysis at the University of Johannesburg and University of the Witwatersrand. A Mineral to Metals program at the University of Cape Town; Mining Resilience Research Centre at the University of Pretoria and the Centre for Sustainability in Mining and Industry at Wits. Minerals related teaching and academic research information is listed in section 5.2.3.1 below.

Hydrogen Society Roadmap. A large-scale multi-stakeholder initiative to prepare for future hydrogen use commenced in 2007. The Hydrogen Society Roadmap was published in 2021 showing how South Africa could leverage its significant natural renewable resources, mineral endowment, and capabilities to stimulate local demand for renewable hydrogen and build a viable green-hydrogen export market. The roadmap defines priority actions to create markets, skills, manufacturing capacity, infrastructure, standards, international cooperation, transition strategies and build a stronger partnership between government, the private sector and civil society by putting in place an enabling policy environment (Dept. Science and Innovation, 2021).

Mining inputs and capital equipment cluster. South Africa's minerals industry needs for consumables, machinery and equipment, specialist engineering, scientific and financial services are met by suppliers

that collectively make up a large share of the most technically advanced engineering and technical services parts of the economy. Minerals industry inputs companies comprise of local and international original equipment manufacturers (OEMs) drawing on tier 2 and 3 suppliers. These firms constitute an established supplier base with expertise spanning across an extensive range of commodities and product groupings. Most firms head offices are based in Ekurhuleni and Johannesburg with fabrication, warehousing and distribution centres located across South Africa. From this base export trading extends into Southern Africa, Central and West African mining regions, however, import competition from Chinese and Indian equipment suppliers has increased over time.

Of the clusters referred to above, mining inputs comes closest to the architype with a geographical centre and formal relations between participating firms. Two export councils established as public private partnerships between the South African Department of Trade, Industry and Competition (dtic) and firms in the capital equipment and electro-technical sectors operate to educate and advocate on behalf of member firms on issues pertaining to mining, construction, beneficiation, and utilities sectors within the export context.

Councils facilitate collaboration between members, between sectors and all along the value chain which is not prohibited by competition law. These are:

- SA Capital Equipment Export Council (SACEEC); https://saceec.com

Mineral processing equipment and valves and actuators are also clustered under SACEEC.

- SA Electro-technical Export Council (SAEEC); www.saeec.org.za

In addition to these entities, South Africa as a country is signatory to a host of regional trade cooperation and customs agreements. These are presented in the table below.

Table 12: Regional and African Trade agreements that South Africa is signatory to

Agreement type and title	Type of Agreement	Countries Involved	Main Objective/Terms	Products Involved
Customs Union				
Southern African Customs Union (SACU)	Customs Union	Botswana, Eswatini, Lesotho, Namibia and South Africa	Duty free movement of goods; a common external tariff applied on goods entering any of the countries from outside the SACU	All products
Free Trade Agreements (FTAs)				
Southern African Development Community (SADC): Protocol on Trade in Goods	Free Trade Agreement: Protocol on Trade in Goods	Among 13 of the 16 SADC Member States. Angola is in the process to accede to the free trade agreement; the DRC and Comoros have	A FTA, with 85% duty-free trade achieved in 2008. The 15% of trade, constituting the "sensitive list", was largely liberalised from 2009 to 2012.	Most products

		not yet acceded.		
Southern African Development Community (SADC): Protocol on Trade in Services	Services trade liberalization: Protocol on trade in services	Among 15 of the 16 SADC Member States. (Comoros being the exception.)	Liberalize trade in services. Seven of the 15 signatory countries have ratified; awaiting a further 3 countries to ratify the Protocol, for it to enter into force.	Six services sectors initially (communication, construction, energy, finance, transport, tourism); other sectors might follow in a second round of negotiations.
Trade, Development and Cooperation Agreement (TDCA) (Link: schedule 10 to the Customs and Excise Act, Part 1A: https://www.sars.gov.za/Legal/Primary-Legislation/Pages/Schedules-to-the-Customs-and-Excise-Act.aspx	Free Trade Agreement	South Africa and the European Union (EU)	The EU offered to liberalise 95% of its duties on South African originating products by 2010. In turn, by 2012, South Africa offered to liberalise 86% of its duties on EU originating products.	The TDCA was reviewed, with the aim of broadening the scope of product coverage. This took place under the auspices of the Economic Partnership Agreement (EPA) negotiations between SADC and the EU. Resulting from these negotiations, the TDCA trade chapter was replaced by the SADC-EU Economic Partnership Agreement.
EFTA-SACU Free Trade Agreement (FTA)	Free Trade Agreement	SACU and the European Free Trade Association (EFTA) – Iceland, Liechtenstein, Norway and Switzerland	Tariff reductions on selected goods	Industrial goods (including fish and other marine products) and processed agricultural products. Basic agricultural products are covered by bilateral agreements with individual EFTA States
Economic Partnership Agreement between the SADC EPA States, and the European Union and its Member States (Link: schedule 10 to the Customs and Excise Act, Part 1B: https://www.sars.gov.za/Legal/Primary-Legislation/Pages/Schedules-to-the-Customs-and-Excise-Act.aspx	Economic Partnership Agreement	South Africa, Botswana, Eswatini, Namibia, Lesotho and Mozambique (referred to as the SADC EPA Group), and the European Union (EU)	SA's core interest has been to harmonise trading regimes between SACU and the EU; to secure further market access in agriculture (beyond the SA-EU Trade Development and Cooperation Agreement (TDCA) provisions) and regain some policy space lost under the TDCA.	The agreement covers most products. It replaces the Trade Chapter of the TDCA.
Preferential Trade Agreements (PTAs)				
SACU-Southern Common Market (Mercosur) PTA (Link: schedule 10 to the Customs and Excise	Preferential Trade Agreement	SACU and Argentina, Brazil, Paraguay and Uruguay.	Tariff reductions on selected goods. It entered into force on 21 October 2016	About 1 000 product lines on each side of the border

Act, Part 7: https://www.sars.gov.za/Legal/Primary-Legislation/Pages/Schedules-to-the-Customs-and-Excise-Act.aspx		(Although Venezuela has since joined MERCOSUR, it is not party to the PTA with SACU.)		
Zimbabwe/South Africa bilateral trade agreement	Bilateral Preferential Trade Agreement	South Africa and Zimbabwe	Preferential rates of duty, rebates and quotas on certain goods traded between the two countries	Note: the agreement has been in existence since 1964 and was reviewed in 1996. It was terminated in November 2018, following the implementation of the wider-scope SADC free trade area which includes both South Africa and Zimbabwe.
Non-reciprocal Trade Arrangements				
Generalised System of Preferences (GSP)	Unilateral preferences granted under the enabling clause of the WTO; these preferences are not contractually binding upon the benefactors	Offered to South Africa as developing country by: the EU Norway Switzerland Russia Turkey The US Canada Japan	Products from developing countries qualify for preferential market access into these markets	Selected industrial and agricultural products
Africa Growth and Opportunity Act (AGOA) https://agoa.info/images/documents/5695/bills-114hr1295enr.pdf	Unilateral assistance measure; similar to the GSP programmes but wider in scope	Granted by the US to 39 sub-Saharan African countries	Preferential access to the US market through lower tariffs or no tariffs on selected products	Duty free access to the US market under the combined AGOA/GSP programme stands at approximately 7 000 product tariff lines.
Current Trade Negotiations				
SACU-India PTA	Preferential Trade Agreement	SACU and India	Tariff reductions on selected goods	SACU and India are in the process of exchanging tariff requests
SADC-EAC-COMESA Tripartite FTA	Free Trade Agreement	26 countries with a combined GDP of US$860 billion and a combined population of approximatel y 590 million people	The Tripartite Framework derives its basis from the Lagos Plan of Action and the Abuja Treaty establishing the African Economic Community (AEC), which requires rationalisation of the continent's regional economic communities.	The FTA will, as a first phase, cover only trade in goods; services and other trade-related areas will be covered in a second phase. The framework agreement and several annexes have been concluded; ratification in member countries are underway. South Africa has ratified. Ratifications have not

			The Tripartite initiative comprises three pillars that will be pursued concurrently, in order to ensure an equitable spread of the benefits of regional integration: market integration, infrastructure development and industrial development	yet reached the required number for it to enter into force. Negotiating the tariff liberalization schedules are underway. The negotiating modalities require that duties on 60 to 85% of tariff lines be liberalized upon entry into force; the remaining tariff lines will be subject to negotiation for liberalization, with implementation over a 5 to 8 year period. Work in Phase II has commenced
The African Continental Free Trade Area (AfCFTA)	Free Trade Agreement	The AfCFTA integrates a market of 55 countries with a combined GDP of over US$ 3.3 trillion and a population of more than 1 billion people. The AfCFTA builds on the Tripartite Free Trade Area (TFTA) with the Common Market for East and Southern Africa (COMESA), East African Community (EAC) and the Southern Africa Development Community (SADC). The AfCFTA therefore presents new market access opportunities in West Africa and North Africa which will be beneficial for the export of South African	The key objectives of the AfCFTA is to among others, create a single market for Goods, Services, and enhance economic integration in the African Continent in accordance with the Pan African Vision of "An integrated, prosperous and peaceful Africa" enshrined in Agenda 2063; promote structural transformation of the State Parties; boost intra-Africa trade by progressively eliminating tariffs and non-tariff barriers to trade in goods; progressively liberalize trade in services; cooperate on customs matters and the implementation of trade facilitation measures; and design a mechanism for the settlement of disputes concerning their rights and obligations. The AU Assembly launched the AfCFTA negotiations during the 25th Ordinary Summit of Head of States and Governments on 15 June 2015 in Johannesburg, South Africa; adopted the legal instruments establishing the AfCFTA on 21 March	– Agreement establishing the AfCFTA – Protocol on Trade in Goods and Annexes – Protocol on Trade in Services – Protocol on the Rules and Procedures for the Settlement of Disputes. Phase II of the negotiations will cover Competition, Intellectual Property and Investment. The AfCFTA is being pursued under the development integration approach which places emphasis on market integration, infrastructure and industrial development, to address Africa's productive capacity and supply side constr

		value added products services.	2018 in Kigali, Rwanda and launched the operational phase of the Agreement during the Extra-Ordinary Summit held July 2019 in Niamey, Niger. South Africa signed the Agreement and deposited the instrument of ratification on 1 July 2018 and 10 February 2019, respectively. Effectively, the Agreement entered into force as at 30 May 2019.	

5.2. Building new B2B relations

5.2.1 Promoting local content and enabling mining cluster actors

To drive transformation in the mining industry to overcome the legacy of racial exclusion in ownership, positions of authority and to open business opportunities for black owned businesses, a tri-partite process of government, business, and organized labour in 2002 prepared the Broad-Based Black Socio-Economic Empowerment Charter for the South African Mining and Minerals Industry, commonly known as the Mining Charter. Targets were set for changes to be effected in six areas: Ownership; Mine Community Development; Employment Equity; Human Resource Development; Inclusive Procurement, Supplier and Enterprise Development; and Housing and Living Conditions. In 2010 changes were made to align it more closely with national legislation on Broad-Based Black -Economic Empowerment. In 2018 after three years of consultations that had not reached consensus, government went ahead with a new version of the Mining Charter (G.G. , 27 Sept 2018).

For local content Mining Charter III, a 70% minimum of the total mining goods budget needed to be spent on South African manufactured goods, and spent with Historically Disadvantaged Persons, women and youth owned and controlled companies, as well as BEE compliant companies, which could be phased in over 5 years to reach the target. For services an 80% minimum of total services spend needed to be sourced from South African companies, excluding non-discretionary expenditure. A two-year transitional period was allowed, with the first year set at 70%. To calculate local value addition an unusual definition of sales price of the capital good, component or consumable in Rand (excluding profit mark-up, intangible value such as brand value and indirect overheads) was applied. A 70% minimum of the total R&D budget needed to be spent on South African public or private entities.

The Minerals Council turned to the courts over the wide latitude of ministerial digression and onerous ownership transfer provisions. The high court declared the Mining Charter a policy, not a form of subordinate law and set aside prescriptive clauses on ownership and procurement, holding that the MPRDA comprehensively deals with empowerment requirements attached to mining rights that are binding on holders of mining rights (RSA Judicary, 21 September 2021). The other provisions on Mine Community Development; Employment Equity; Human Resource Development; and Housing and Living Conditions still stand.

Mining company procurement practices appear to have reverted to or improved upon the targets set in the 2010 Mining Charter II. Compliance is tracked by the DMRE on a mine-by-mine basis. The last

date for which consolidated information is available reported that 75.4% of expenditure on capital goods (R16.9 billion) was incurred on BEE entities against the Mining Charter 2010 target of 40%. For services 75.1% of expenditure was incurred on BEE entities (R45.5 billion), compared with the Mining Charter 2010 target of 70%. For consumables 79.0% of consumable goods were procured from BEE entities (R45.3 billion) against a target of 50% (Minerals Council, 2019).

5.2.2 Potential partner institutions for an Africa-focused critical minerals network

On account of its rich mining history, South Africa has developed an extensive network of institutes and organisations that support the research and development of various facets of mining and exploration knowledge. A list of these institutions is presented in the tables that follow.

Table 13: South African institutions related to the mining industry

Institution	Information
COUNCIL FOR GEOSCIENCE https://www.geoscience.org.za/	The Council for Geoscience (CGS), one of the National Science Councils of South Africa, is the custodian of the nation's geoscience data. It is mandated to provide for the promotion of research and knowledge in the field of geoscience as well as the provision of specialised geoscientific services to a variety of clients, including the state. The clientele base is national, throughout the SADC region, and further afield, including North Africa, Asia, and South America.
COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH www.csir.co.za	The Council for Scientific and Industrial Research (CSIR) is South Africa's national science council for applied research and development (R&D). While it exists primarily to improve the technological base of the South African economy, it also works regionally and overseas leveraging multi-disciplinary expertise through public, private, and international partnerships in support of science, engineering, and technology (SET). It is in a strategic alliance with the University of Pretoria known as the Southern Education and Research Alliance (SERA) collaborates locally and internationally with universities, NGO's, companies, and multinational bodies. The CSIR also has partnerships with other local science councils, such as Mintek and the Council for Geoscience.
MANDELA MINING PRECINCT https://mandelaminingprecinct.org.za/	The Mandela Mining Precinct is a public-private collaboration between the Department of Science and Innovation (DSI) and the Minerals Council of South Africa that is managed by the CSIR. It is an

	initiative aimed at revitalising mining research, development, and innovation in South Africa with a view to promoting longevity and the sustainability of the industry.
MINING EQUIPMENT MANUFACTURERS OF SOUTH AFRICA https://memsa.org.za/	Mining Equipment Manufacturers of South Africa (MEMSA) is a formal industry cluster established in 2016 with the support of the Department of Trade, Industry and Competition (dtic) to build a competitive advantage for South African mining equipment manufacturers by providing access to key markets and championing existing and future local technology and innovation.
MINING QUALIFICATIONS AUTHORITY https://mqa.org.za/	The Mining Qualifications Authority (MQA) is a statutory body with a board consisting of the state, employers, labour and community organisations within the sector. MQA is responsible for quality assuring and administering several skills development initiatives
MINTEK https://www.mintek.co.za	Mintek is a state-owned, science council specialising in mineral processing, extractive metallurgy, and related areas. Their primary mandate is to serve South Africa's national interest through research, development, and technology transfer, to promote mineral technology and to foster the establishment and expansion of industries in the field of minerals and products derived therefrom.
INDUSTRIAL DEVELOPMENT CORPORATION https://www.idc.co.za	The Industrial Development Corporation of SA Ltd (IDC) is a state-owned development finance institution primarily mandated to provide funding for the development of industry through infrastructure development and investment aimed at stimulating economic growth in South Africa and regional integration with the rest of Africa. Funding is generated through income from loan and equity investments and exits from mature investments and borrowings from commercial banks, development finance institutions (DFIs), and other lenders.
MINERALS COUNCIL https://www.mineralscouncil.org.za/	The Minerals Council South Africa (Minerals Council), formerly the Chamber of Mines of South Africa is a mining industry employers' organisation that serves its members and promotes their interests by providing strategic support and advisory input

COPPER DEVELOPMENT ASSOCIATION AFRICA https://www.copper.co.za/	The Copper Development Association Africa (CDAA) is committed to promoting and expanding the interests of the copper and copper alloy industry throughout Africa. The Association has close links with the European Copper Institute (ECI) and the International Copper Association, Ltd (ICA).
FERRO ALLOY PRODUCERS ASSOCIATION https://fapa.co.za/	The Ferro Alloy Producers Association (FAPA) is an industrial association of ferroalloy smelting operations involved in the beneficiation of South Africa's ores and minerals into ferroalloys for local consumption and export markets
SOUTH AFRICAN STAINLESS STEEL DEVELOPMENT ASSOCIATION https://sassda.co.za/	The Southern Africa Stainless Steel Development Association (Sassda) provides a platform for Sassda members to collectively promote the sustainable growth and development of the industry.
STEEL AND ENGINEERING INDUSTRY FEDERATIONS OF SA https://www.seifsa.co.za/	The Steel and Engineering Industries Federation of Southern Africa (SEIFSA) is a national employer Federation representing the Metals and Engineering industry.
INSTITUTE OF MINE SURVEYORS OF SA https://www.ims.org.za/	The Institute of Mine Surveyors of SA is a non-statutory, South African Qualifications Authority (SAQA) recognised professional body. The primary objectives of the Institute are to advance the science and practice of mine surveying and allied disciplines, to promote and protect the character and interests of the profession of mine surveying
SOUTHERN AFRICAN INSTITUTE OF MINING AND METALLURGY https://www.saimm.co.za/	The Southern African Institute of Mining and Metallurgy (SAIMM) started as a learned society in 1894. This professional body enjoys both local and international links aimed at disseminating knowledge and assisting its members source information regarding technological developments in the mining, metallurgical and related sectors.

Table 14 South African Universities with minerals specialization

University	Chemical Engineering	Mining Engineering	CIMERA[28] member	Minerals Research units
University of Cape Town	✓		✓	✓
University of Fort Hare			✓	
University of the Free State				✓
University of Johannesburg	✓	✓	✓	✓
University of Kwazulu Natal	✓		✓	
University of Limpopo	✓		✓	✓
University of Mpumalanga				
Nelson Mandela University				
North West University	✓			
University of Pretoria	✓	✓	✓	✓
Rhodes University	✓		✓	
Sefako Makgatho Health Sciences University				
University of South Africa	✓			
University of Stellenbosch	✓		✓	✓

[28] CENTRE OF EXCELLENCE FOR INTEGRATED MINERAL AND ENERGY RESOURCE ANALYSIS (https://cimera.co.za)
The Centre of Excellence (CoE) for Integrated Mineral and Energy Resource Analysis (CIMERA) is hosted by the Department of Geology at the University of Johannesburg (UJ) and co-hosted by the School of Geosciences at the University of the Witwatersrand (Wits). Launched in 2014 by the National Research Foundation (NRF) section of the South African Department of Science and Technology (DSI). The CoE is funded by the (previous) Department of Science and Innovation (DSI) and the National Research Foundation (NRF), with contributions from the University of Johannesburg and the University of the Witwatersrand. CIMERA has diverse, local, and international collaborations. CIMERA is a central hub for research and training in mineral and energy resource analysis (for both scientific and economic sectors) in South Africa and Africa more broadly but also to make key mineral and energy resource information to policymakers and the community in general.

Walter Sisulu University				
University of Venda			✓	
University of the Western Cape	✓		✓	
University of the Witwatersrand	✓	✓	✓	✓
University of Zululand				

5.2.3 Strengthening African mining clusters

South Africa's minerals industry is deeply engaged with the implications of decarbonizing production and at company and organised industry level committed to a just energy transition. An engagement around critical minerals that aligns with these issues and enhancing the resilience, sustainability and good governance would doubtless be welcomed. In conclusion a note of caution should be conveyed- nevertheless. Mining companies' obligations for employment equity and human resource development under the Mining Charter are likely to limit their ability to commit resources to any critical minerals initiative that did not contribute directly to meeting those obligations.

Funded by
the European Union

6. Energy and digital transition: develop a strategy for the EU and Africa Partnership

6.1 Assessment of local EU funded activities

The EU has a long history of support to the South African development process. The EU mentions that South Africa is one of their ten strategic partners globally. Through the Budget Support Programme the EU funds Good Governance and Development Programmes, Sector Reform Programmes, and State Building Programmes. Other areas which the EU assists South Africa on include Peace and Security, Human Rights, Migration, Social Cohesion, Energy, and Innovation. The EU invests in many strategic areas of South Africa's development trajectory and their role is based on partnership. A typical example is in their supported initiatives which include policy dialogues on issues such as natural resources management, food waste, circular economy and natural capital accounting. The EU and South Africa work together to boost strategic public and private investment through investment programmes and operations that blend grants and loans. The EU is part of the International Partners Group formed to support South Africa's Just Energy Transition.

During 2022, South Africa developed the Just Energy Transition Investment Plan for the first 5 years since its agreements with international parties at COP26. This chapter provides a brief overview of that document[29] and the commitments outlined therein.

6.1.1 Context and partnerships

Risks associated to energy and climate change are significant for South Africa. These include dangers related to physical, social, and transitional aspects as well as inadequate investment in the electrical infrastructure and shortages of electricity. Specific interventions are needed to manage and mitigate the effects of transition, especially for impacted workers, communities, small businesses, and exporters' exposure to carbon trade barriers, given the high carbon intensity of industry and economic dependence on fossil fuel value chains. In the meanwhile, seizing new business opportunities presented by green technology can spur economic diversification, industrial growth, and innovation. This will pave the way for a sustainable and resilient future with respectable employment, reduced rates of poverty, and social inclusion.

The idea of a just transition is crucial when analysing the effects of moving to a low-carbon economy and a society that is resilient to climate change by the middle of the century. The Presidential Climate Commission (PCC) completed the Just Transition Framework after extensive consultations with industry, government, organised labour, and civil society. The framework was approved by Cabinet in August 2022 and will serve as the overarching framework for South Africa's climate transition.

The government of South Africa has committed to decarbonization; this is outlined in the country's Just Energy Transition Investment Plan (JET IP) for the five-year period 2023–2027. This plan is in line with the country's updated Nationally Determined Contribution (NDC), which was filed with the UNFCCC prior to its Conference of the Parties 26 (COP 26) in Glasgow in November 2021, and its Long-term Low-Emissions Development Strategy (LEDS), which was submitted to the UNFCCC in 2020

South Africa has established this JET IP to outline its priority investment requirements for the next five years in the electricity, NEVs, and GH2 sectors in order to meet the goals of energy security, just

[29] The JET IP is available from: https://www.thepresidency.gov.za/content/south-africa%27s-just-energy-transition-investment-plan-jet-ip-2023-2027

transition, and economic growth. Within these sectors, just transition initiatives—especially those resulting from the Mpumalanga Province's electrical sector transition—are highlighted. Two cross-cutting priorities for skills development and municipal capacity have been recognised as essential elements of the JET IP.

The JET IP is based on the National Development Plan (NDP) 2036 of South Africa, which aims to address the systemic issues of unemployment, inequality, and poverty in the nation. It fits into the broader push for sustainable development, changing energy and climate response policies, and bolstering public-private sector cooperation. The JET IP will be updated on a regular basis to reflect changes in national and international efforts on the climate crisis, the fair energy transition requirements, and the sustainable development difficulties facing South Africa.

A just energy transition is the foundation for South Africa's commitment to reducing greenhouse gas (GHG) emissions to 2030 and beyond, as outlined in its modified 2021 NDC. The JET IP seeks to reflect the hopes and ambitions of the government and its social partners in facilitating a just energy transition. It acknowledges that: (i) the energy transition has significantly disruptive social and economic consequences for a country heavily reliant on fossil fuels; and (ii) the just energy transition gives rise to valuable new economic opportunities for South Africa. As such, it presents the initial building blocks for managing South Africa's just energy transition and broader climate response. Both need assistance from the global community.

Additionally, it identifies the Just Transition factors—particularly the necessity of helping impacted workers and communities get through the transition—as a primary area of focus and investment, one that should prioritise reskilling, skill development, SME development, and social assistance. In order to move the electrical industry into a low-emission trajectory, the JET IP specifies the first priority investments. Along with this industry, it also seeks to expand potential for green industrialization in the fields of green hydrogen (GH2) and new energy vehicles (NEVs). The JET IP incorporates the "just transition" approach from the outset in accordance with the nation's Just Transition Policy and determines the early investments that will have the best chance of assisting in the fulfilment of the present NDC target and longer-term decarbonization. By doing this, it lays out the financial resources required over the following five years to create a phased low-emission development trajectory in compliance with the Paris Agreement, taking into account the national circumstances and policies of the nation, and balancing the benefits of the new economic opportunities with the mitigation of the negative social and economic effects of decarbonization.

The Paris Agreement and related decisions, which recognise that "...enhanced support for developing country Parties will allow for higher ambition in their actions," and which place the developed world's obligation to assist developing countries with their needs for mitigation and adaptation to climate change, place the JET IP in the context of international climate agreements, commitments, and institutional arrangements. In terms of the NDC, South Africa has set a lofty target for 2030, but achieving it will depend on receiving funding and other forms of assistance that would put the nation in the best possible position. This is difficult and calls for significant activity over the next five years. If sufficiently funded and carried out, these steps will enable the "most ambitious possible" outcome in 2030.

The historic Just Energy Transition Partnership (JETP), which was forged at the 26th Conference of the Parties (COP26) of the UNFCCC (United Nations Framework Convention on Climate Change) between the governments of South Africa and the governments of France, Germany, the United Kingdom (UK), the United States (US), and the European Union (EU) (forming the International Partners Group [IPG]), is put into effect by South Africa's Just Energy Transition Investment Plan (JET IP) for the first five years

(2023–2027). The JETP came up as a result of discussions between the parties about the particular economic and social difficulties involved in fairly transitioning South Africa's economy away from its reliance on fossil fuels.

The JETP assists South Africa in achieving the most ambitious emissions reduction range outlined in the country's updated Nationally Determined Contribution (NDC) of 420-350 MtCO2-eq by 2030. The significance and commitment of the partners to enabling a 'just transition', thereby addressing the direct and indirect impact of the energy transition on lives, workers, and communities, is a distinctive element of the JETP. The JETP's vision and objectives are articulated in a Political Declaration1, which aims to "establish an ambitious long-term partnership to support South Africa's pathway to low emissions and climate resilient development, to accelerate the just transition and decarbonization of the electricity system, and to develop new economic opportunities such as green hydrogen and renewable energy."

According to the Political Declaration, the IPG will raise an initial US$8.5 billion between 2023 and 2027, subject to agreement on an investment framework. This catalytic funding is meant to leverage significantly more resources from both private and governmental sources. To put the JETP into action, President Ramaphosa established a Presidential Climate Finance Task Team (PCFTT) in February 2022, tasked with engaging the IPG and analysing the offer, with the goal of advising Cabinet (via an Inter-Ministerial Committee [IMC]) on its composition, affordability, and alignment with South Africa's ambitions and priorities in relation to climate change risks. Figure 12 provids an overview of the JET IP governance framework

Under the leadership of the PCFTT and IPG, an independent JETP Secretariat, supported by the Climate Investment Funds (CIF), provides technical and convening capacities for establishing the investment framework. The South African government and its IPG partners appreciate the milestone reached in establishing this JET IP during 2022, which is critical for moving the collaboration forward and obtaining resources from other funding sources. The initial portfolio outlined in this JET IP focuses on the priorities required to catalyse a sustained just energy transition over the next five years in order to accomplish the country's economic, social, and economic results over the following decades. It also evaluates how to best use the first IPG offer of US$8.5 billion.

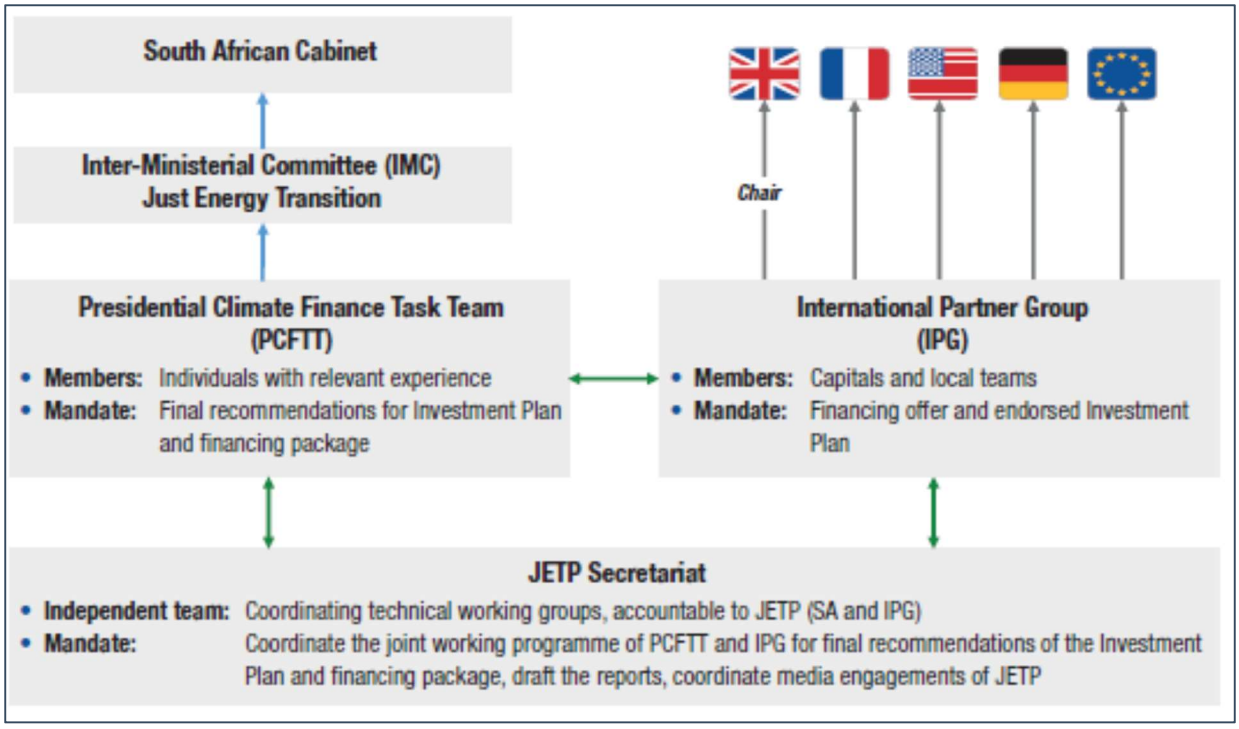

Figure 13: JET IP governance framework

The partners will continue collaborating through 2023 and beyond, with the JET IP serving as one significant step in a longer-term process. This work entails creating a thorough implementation plan that will address governance, accountability, results monitoring, and evaluation mechanisms among other things to guarantee the achievement of intended and significant outcomes. The plan will be updated as needed in response to new information on financing structures, timing of financial flows, and other implementation modalities.

The National Development Plan (NDP) 2030 of South Africa, which focuses on addressing the underlying issues of poverty, inequality, and unemployment in the nation, serves as the foundation for the JET IP. Thus, the energy transition in South Africa presents a chance for the nation to promote innovation, industrial growth, and economic diversity. It is heavily dependent on the amount and kind of financial support it can obtain from the international community to supplement domestic resources. It will take place over several decades in a well-planned manner, within the framework of the nation's energy, climate, and other pertinent policies, using both public and private sector resources. Thus, the JET IP serves as a call to action for both domestic and foreign funders and investors to collaborate with South Africa on the just energy transition journey.

The Government of South Africa and the Governments of France, Germany, United Kingdom (UK), United States (US), and the European Union (EU) (collectively, the International Partners Group [IPG]) signed the Political Declaration at COP26 which gave rise to the Just Energy Transition Partnership (JETP). It undertook to "*Establish an ambitious long-term partnership to support South Africa's pathway to low emissions and climate resilient development, to accelerate the just transition and the decarbonisation of the electricity system, and to develop new economic opportunities such as green hydrogen and electric vehicles amongst other interventions to support South Africa's shift towards a low carbon future*."

This Political Declaration envisaged the IPG to mobilise an initial US$8.5 billion over three- to five years to support the achievement of South Africa's low-carbon future in line with the most ambitious NDC

scenario possible, subject to the concurrence on an investment framework. The Political Declaration also resolved to establish a partnership comprised of South Africa and international partners that will enable:

- "*The accelerated decarbonisation of South Africa's electricity system to achieve the most ambitious target possible within South Africa's Nationally Determined Contribution (NDC) range to the extent of available resources;*
- *South Africa's efforts to lead a just transition that protects vulnerable workers and communities, especially coal miners, women and youth, affected by the move away from coal;*
- *South Africa's nationally determined efforts to successfully and sustainably manage Eskom's debt, define the role of the private sector, and create an enabling environment through policy reform in the electricity sector, such as unbundling and improved revenue collection;*
- *Local value chains (including Micro, Small and Medium Enterprises) to benefit from new areas of economic opportunity; and*
- *Opportunities for technological innovation and private investment to drive the creation of green and quality jobs as part of a prosperous low emission economy*."

President Ramaphosa announced the creation of the Presidential Climate Finance Task Team (PCFTT) in February 2022 in response to the Political Declaration's signing. The team's duties include advising and developing South Africa's JET IP, working with the IPG, and providing recommendations on the financing package to an Inter-Ministerial Committee (IMC) chaired by the Minister in the Presidency. A JETP Secretariat supports both the PCFTT and the IPG.

The US$8.5 billion IPG pledge will be distributed to the priority sectors of electricity, new energy vehicles (NEVs), and green hydrogen (GH2) in South Africa over a five-year period, in accordance with the JET IP's identified scale of need for investment in these areas. Thus, the collaboration between South Africa and the IPG is a first step towards the nation's more comprehensive goals for a just energy transition. In order to support South Africa's greater five-year JET IP needs and the nation's just energy transition over a longer time horizon, it aims to mobilise and harness additional resources from the domestic and international community.

The South African Cabinet and the IPG both endorsed the JET IP, with its priority allocations for the five-year period, in October 2022.

6.1.2 Assessment of the existing platforms and networks

South Africa and the IPG will continue to work closely together, and moving forward, regular progress reports on the JET IP will be given. A number of supportive policies and procedures, such as the Just Transition Framework, which was approved by Cabinet in August 2022, and extensive energy sector reforms that are facilitating investment in renewable energy, were implemented during the course of 2022, when the JET IP was being developed.

A process that includes technical working groups and stakeholder conversations with youth, labour, business, civil society, local government, and faith-based organisations resulted in the development of the JET IP. This process was led by the country and is owned by the country. It made use of the wealth of knowledge that South African officials, academics, businesspeople, and civic society had to provide. With the purpose of improving the effectiveness and impact of the JET IP, particularly in the upcoming implementation phases, the South African government has committed to upholding an

open line of communication with the stakeholders, aided by the Presidential Climate Commission (PCC).

The long-term collaboration between the South African government and the IPG is guided by the priorities specified in the JET IP and their resource requirements, which also help to mobilise additional resources. While all parties recognise that additional public and private resources would be required, the IPG offer of ZAR128 billion (US$8.5 billion)2 is a significant contribution to the aggregate ZAR1.5 trillion offered in this JET IP. Specifically, JETP acknowledges the vital role that charitable capital and the private sector must play in filling the funding gap mentioned in this investment plan, including creating strategies to aid in the just transition in South Africa's impacted areas.

All available forms of finance are required to enable a sustained drive towards South Africa's desired long-term economic, social, and environmental outcomes. The amount of money needed and the pledges made by the South African government to decarbonize are outlined in the country's Just Energy Transition Investment Plan (JET IP) for the five-year period 2023–2027. The JET IP aligns with South Africa's revised Nationally Determined Contribution (NDC), which was filed with the UNFCCC before its 26th Conference of the Parties (COP 26) in Glasgow in November 2021, as well as the country's 2020 Long-Term Low-Emissions Development Strategy (LEDS), which was also submitted to the UNFCCC.

By 2030, the nation is committed to lowering its emissions to between 420 and 350 megatons carbon dioxide equivalent (MtCO2-eq). This target is in line with South Africa's fair contribution to the long-term temperature goal specified in Article 2.1(a) of the Paris Agreement, whereby a target of 350 Mt in 2030 is consistent with a 1.5-degree temperature goal and a target of 420 Mt in 2030 is consistent with a fair contribution to a 2-degree temperature goal. The South African government stated when it submitted its updated NDC that the amount of funding available to assist its shift to lower-carbon technologies will determine its capacity to fulfil the bottom range of this commitment.

6.2 What are the key challenges to cope with the twin transition needs?

South Africa is making good progress towards the twin transition though in some areas more work is still required. There is commitment from the government in terms of policies and budget allocations. On the energy transition front there is tremendous progress with regards to green energy projects. Th JET IP outlines the challenges and has conducted a risk assessment to the main issues confronting the transition.

6.2.1 The twin transition needs

Thus, in order to do this, the international community must likewise have the same degree of ambition in supporting South Africa. The result in 2030 and beyond will largely depend on what South Africa can accomplish in these five years, which will depend on how well the required resources are committed to and mobilised.

According to the official JET IP statement, the programme is designed to:

- "Highlight the actions and investments required for South Africa's economic and social diversification away from a predominantly coal-based economy, including the creation of new industries, employment, skills, and livelihoods in geographies and sectors most affected by the transition, in particular, to ensure that the resources are available to support the workers, communities, and businesses whose livelihoods are negatively affected by the transition;

- Locate the targeted IPG investments within the context of broader country planning for a just transition towards a sustainable, inclusive, and climate-resilient economy, including an emissions reduction trajectory that strives to achieve the lower range of South Africa's updated 2021 NDC;
- Identify the early and catalytic investments required in the sectors identified in the Political Declaration over the next three to five years;
- Identify the indicative costs of these priority interventions and the time scales within which they are required;
- Specify key interventions and the scale of financing required to support workers, communities, and sectors affected by the transition;
- Set out the prioritisation and financing principles that will guide the investments;
- Identify the potential for private sector investment opportunities and partnerships with the public sector; and
- Confirm the enabling policy and regulatory framework that is in place to support the
- implementation of South Africa's just energy transition".

To compile the JET IP, a variety of sources including published studies, data analytics, policy documents, bodies of information, and financial data were gathered and examined. Experts in the relevant professions, including government officials, reviewed and analysed the draughts, and revisions were made based on their feedback. Additionally, a multi-phase consultation procedure was used, which Annexure A summarises.

6.2.2 Proposal of a strategy outline

There is an established relationship between the EU and the South African government as evidenced by the number of initiatives funded by the EU and its member states. That pave way for further cooperation on other areas of strategic importance to the EU. South Africa is a developing country and requires support from developed countries. The EU should target development areas where South Africa requires expertise and financial support to earn more cooperation from the country's leadership and the citizens. The Department of Minerals Resources and Energy is in process of developing a critical minerals strategy and could learn from the EU since they already have a strategy.

There is skills shortage to drive the twin transition and the EU could support the process with skills development. South Africa has an abundance of critical minerals which could be used for the twin transition. Knowledge of how to take advantage of such minerals requires an understanding of the international demand and use of critical minerals. The EU has already done a thorough situation analysis regarding the demand and different uses of critical minerals. Such knowledge could be beneficial to the Department of Mineral Resources and Energy as they are developing the strategy.

6.2.3 Mining Sector Strategy South Africa and potential alignment with the EU partnership

Definition of 'responsible mining' (according to Mining Charter):

- Responsible' mining is defined as increasing economic participation, ownership, access to resources and opportunities, and wage equality for women, youth and persons with disabilities.

- Stronger legislation and monitoring to prevent accidents and related fatalities.

- Limit the incidence of illegal mining, which is partially fueled by growing unemployment and economic constraints in many other sectors. Small-scale mining should also be encouraged,

to prevent illegal mining. Supporting artisanal miners will encourage legitimate mining, particularly if backed by a framework on how to support artisan miners – this framework will have to be developed.

Mining Charter (adopted 2002, revised 2010 and 2018) – mining sector development vision
SA sees opportunities in the energy and transport transformation process, both for its mining sector as well as for the wider development perspectives stemming from promoting value-added activities.

Following key goals:
Economic transformation & job creation, incl
- Growth of jobs
- Industrialization and local growth
- Transformed, diversified and sustainable minerals sector contributing to economic growth
-

This includes battery minerals such as lithium, cobalt, platinum, vanadium and copper. There will be numerous opportunities for both local and international investors in the platinum industry and battery minerals commodities. These opportunities need to be managed in a way that will ensure the sustainability of the mining industry. It is also key to move from a raw export economy to a processing economy.

The promotion of local beneficiation is manifested in legislation and by way of various regulations, such as for instance the Mineral and Petroleum Resources Development Act which states that 'If the Minister, acting on advice of the Board and after consultation with the Minister of Trade and Industry, finds that a particular mineral can be beneficiated economically in South Africa, the Minister may promote such beneficiation…'.

Furthermore, access for beneficiating products to international markets can be improved. This can be done by using bilateral and multilateral agreements to facilitate preferential access, which would increase exports of manufactured products.

To address the lack of innovation in mining beneficiation, investment in research and development will be increased. There will also be a focus on upskilling and increasing capacity, to diversify products and improve the country's manufacturing capability.

The Mining sector seen as critical for wider economic growth, job creation and transformation objectives of the country.
Key for the promotion of the sector and mining activities outcomes is 'research', i.e.
- Geological research
- Research in beneficiation (skills)
- Research in manufacturing (i.e. extended downstream)

Council for Geoscience (GCS) will be transformed and streamlined so as to become a trustworthy partner of commercial businesses. Battery metals will be prioritized in the future.
Investment in exploration to be promoted through implementation of the Geoscience Technical Programme, especially for battery metals, which remain insufficiently explored. Also, RSA is actively looking for new sources of funding for exploration. World Bank and RICS are explicitly mentioned – so here might be a way in for the EU.

Reduce licensing turn-around times
Also stronger reliability of the policy and regulators environment is regarded as important to attract long-term financial investments into the mining and energy industries.

Social issues:

- Programme on reviving mining towns, based on partnerships between DMRE and mining companies, as well as on collaborative
- Efforts between mining companies and municipalities.

6.2.3 Risk assessment

The JET IP has developed a risk assessment that outlines the key risks and planned mitigation measures to the Just Transition in South Africa.

Table 15: Just Transition Risk Assessment and mitigation measures

Risk	Risk Level	Mitigation measure	Residual Risk
Capacity risk: Implementing institutions may have limited experience or skills to implement activities.	High	Projects will be selected with reference to the capacity, knowledge, and sector-specific experience of the implementing institutions and their understanding of regulations and approval requirements. Technical assistance will be provided as necessary to build capacity and support implementation.	Low
Financial risk: This includes debt and credit worthiness, currency risk, and insufficient funding. The national debt position may worsen, leading to an adverse impact on the country's credit rating and undermining its potential to raise funds in the market on favourable terms. As such, there may be insufficient funding to meet the financing needs of the JET IP.	High	JET IP initiatives will follow strict guidelines from National Treasury to ensure debt and credit worthiness considerations have been incorporated in their financing. Risk-appropriate instruments will be deployed in a targeted manner to address specific barriers. Design considerations will be built-in to mobilise additional funding from a range of sources including DFIs, MDBs, climate finance, philanthropies, and the private sector, among others.	Medium
Implementation risk: Private sector projects are delayed by financing, pricing, technology factors, or challenges at local construction sites.	High	Given the multi-sectoral, multi-stakeholder and inter-dependent nature of the JET IP projects and programmes, government will establish mechanisms to monitor such developments and escalate intervention measures where required.	Medium
Policy risk: There may be delays in design and implementation of key reforms needed to provide certainty to the market and key players for their long-term participation in the JET IP's implementation.	High	Clear, long-term policy signals from government and relevant entities will be provided to ensure a predictable regulatory environment that facilitates participation of the private sector and other stakeholders.	Low
Regulatory risk: The risk that regulatory provisions, consistent with efficient licensing, approvals, and cost-reflective tariffs, are not unequivocally adopted by the energy regulator and other regulators, thereby creating	High	The regulatory regime to support the energy sector policy reforms will be resolved to create long-term certainty for energy infrastructure investment.	Medium

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Risk	Risk Level	Mitigation measure	Residual Risk
uncertainty for investments by SOCs, government financiers, and the private sector			
Social risk: Transition efforts will directly and indirectly affect the communities in the coal regions in the short and long terms. These effects must be proactively managed through systematic and real-time efforts.	High	A guideline on just transition financing, including eligibility, relevant entry points, and other key considerations will be provided by government to ensure the most effective and efficient use of available funds. Regular monitoring and coordination across government and implementing institutions, along with regular stakeholder consultations, will ensure that the right types of funds reach the right beneficiaries by addressing their specific needs, while reducing wastage.	Medium
Political risk: including uncertainty caused by national / provincial / local political processes and changes.	. High	The JET IP and its associated policies will be integrated into the long-term country transition pathway planning, so potential short-term political instability does not shift its priorities and adversely affect its implementation timelines.	Medium
Corruption risk: given the multiplicity of entities involved and including potential state capture and misappropriation of funds that can drive funding away from its intended use, resulting in theft, wastage of scarce domestic and international, public, and private capital.	High	Regular monitoring and oversight by a JET IP unit, transparency, tight localised governance structures, and clear safeguards around the use of the funds, along with the periodic reporting and evaluation of the JET IP's progress, will offer tight controls to ensure minimum wastage and prevent the misuse of funds.	Medium
Capital deployment risk: given that some of the funding offers may be dependent on third party intermediaries subject to their own deployment processes and/or project-by-project approval, there is a risk that the access to capital can be delayed or not accessible.	Medium	A JET IP unit will monitor the scale and pace of translation of capital commitments to capital deployed. It will ensure that the implementation plan and access to funding are aligned, focussing on programmatic rather than project-level funding deployments.	Low
Technology risk: Lack of access to new technology from international markets, procurement delays to implementation, challenges with integrating technology to local conditions, knowledge, skills, capacity gaps in managing the installation, operation	Medium	Government will ensure a supportive enabling environment, including predictable and smooth procurement guidelines and the strategic use of public and development finance, to enable technology transfer. Technical assistance and capacity building to expand technical and local capacity will be provided as necessary by the government and its partners. Additional infrastructure and	Low

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Risk	Risk Level	Mitigation measure	Residual Risk
and maintenance of solutions in local markets, among others.		performance guarantees will be provided on a case-by-case basis to facilitate technology transfer.	
Global economic risk: The volatility of international markets, caused by unexpected events, such as a pandemic, war, or political unrest, may have adverse impacts on the availability of funds through public and private sources.	Medium	Regular monitoring of the JET IP will be carried out and a funding strategy adjusted in light of changing macroeconomic considerations.	Medium
Private sector risk: A lack of predictable regulatory environment, a low level of awareness about provisions and programmes, a prevalence of real and perceived risk may discourage private sector engagement and participation in the implementation of the JET IP.	Medium	Clear policy signals by the government, the targeted use of limited public and concessional resources to mitigate real and perceived risks, the use of fit -or-purpose instruments, demonstration projects, public awareness campaigns, and ongoing consultations will be key components of the implementation process.	Low
Safeguards risk: in case of environmentally sensitive regions or sites, vulnerable communities, excluded groups may be impacted by implementation of one or more activities.	Medium	The JET IP implementation will follow the national government and implementing institutions' safeguards measures. Appropriate environmental management and social development measures will be incorporated into the design of projects and programmes. Technical assistance can be provided to upgrade and enhance domestic capacity to implement good practice safeguard measures.	Low
Public health risks: The recent Covid-19 pandemic has illuminated how such an event could be highly disruptive to implementation and undermine the availability of domestic and international financing, as funds are diverted to urgent needs.	Low	Based on lessons learned over the recent pandemic, the JET IP and its associated planning mechanisms will incorporate global health hazards safeguards, while designing scenario interventions. This will include securing long-term, predictable finance, on the best possible terms are locked in order to avoid disruption should availability be constrained in an uncertain market scenario.	Low

In the light of persistent recent power outages, South Africa is aggressively pursuing a path to alternative energy sources. An overview of current green energy projects in South Africa is provided in the APPENDIX_6.1_GREEN_DEAL.

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7. Opportunities for responsible investments

7.1. Proposal of projects to be presented as fact sheets in WP7

7.1.1 Identification of individual exploration, mining and refining projects

In consultation with BGR, we have selected the following projects for assessment as potential investment targets in South Africa.

Project	CRM
Phalaborwa	REE
Zandkopsdrift	REE (Mn sulfate)
Platreef [smelter]	PGE
Sherwood EMM [smelter]	Mn sulfate
Mokopane (Bushveld Minerals)	V
Steelpoortdrift (Vanadium Resources)	V
Zebediale (ZEB Nickel Corp.)	Ni-PGE
Waterberg (Platinum Group Metals)	PGE
Manganese Metal Co. [smelter]	Mn

Fact sheets for each of these projects are being developed by BGR. In addition, two recycling operations were also identified by WRF, and are included in this list:

Project	CRM
Desco Electronic Recyclers	WEEE and associated plastic waste as well as ferrous/ non-ferrous metals recovery.
Kusini Resources Proprietary Limited	Mine waste recycling and value recovery. PGM recovery from catalysts

SPOTLIGHT: MMC

Manganese Metals Company (MMC)

MMC's refinery is situated in Mbombela (Nelspruit), South Africa.

In operation since 1974, It is the world's only producer of high-grade electrolytic manganese metal (EMM) outside China and the world's largest refinery of 99.9% (selenium-free) EMM.

Production: 28000 tpa

Exported: 95%

Employees: 400+

Supplies various quality grades of EMM to a niche market of over 120 established customers in 20 countries.

A new project is underway to produce High Purity Manganese Sulphate Monohydrate (HP MSM) for the battery market.

WHAT TO CONSIDER IF YOU INVEST IN SOUTH AFRICA

Strong Points

South Africa has large market potential, well developed infrastructure and a competitive domestic economy. The country's democracy is also well-established and the rule of law is observed. As a

productive pole, it is the most industrialised, technologically advanced and diversified economy on the African continent.

South Africa's main assets are: The business climate is good and state financial management is competent. The country enjoys a good-sized and active stock exchange. South Africa has shifted from its traditional industries to production and financial services, which are the main contributors to GDP. The tourism and retail sectors have a great potential. The mining sector is a major part of the economy. It is the world's largest producer of chrome, manganese, platinum, vanadium and vermiculite. It is the second largest producer of ilmenite, palladium, rutile and zirconium. It is the world's third largest coal exporter. South Africa is also a huge exporter of diamonds and iron ore (U.S. Geological Survey). The country also enjoys a strategic geographical location, that makes it an ideal hub to access the sub-Saharan markets.

Weak Points

The economic stability of the country has been weakened by the strict lockdown, which has exacerbated social tensions such as widespread poverty and inequality. Investment (13% of GDP) is also at a standstill due to a lack of business confidence and the postponement of public capital expenditure linked to the diversion of funds for emergency needs. Other problems may discourage foreign investors: increased labour strikes in recent years, which rating agencies have warned could further lower South-Africa's credit rating, violence and corruption continue to hinder the economy, while income inequality remains high. Access to electricity is insufficient because of a lack of investment. Lack of high-skilled labour force, high unemployment (33.6% in 2021), rigidity of the labour market immigration laws make the employment of foreign workers more complicated. Import-export process may be difficult. Economy depends on the ore prices and FDI inflows. Market entry is very competitive, as the market is very mature **(Lloyds Bank 2023).**

Conclusion

South Africa is a country that is vastly rich in mineral resources. The limited scope of this report precludes an in-depth treatment of all aspects of the country; rich geology, and the ecosystem of supports systems, institutes of learning, legislation and industry that has developed over more than a century in support of this mineral wealth.

This report provides the reader with an overview of the current scenario and key aspects of CRM prospectivity, institutions and potential in South Africa. The report is an integral part of the larger AfricaMaVal programme and, in that context, provides this country overview specifically aimed at Eu investors and decision-makers. The report demonstrates South Africa's suitability as a destination of choice for stable future CRM supply to the EU.

South Africa remains a significant target for mineral investment in the African continent, despite the rise in the importance of other mining jurisdictions. Its mineral industry is well developed, with a full suite of complimentary institutions and a relative stable economic and regulatory environment.

South Africa's mining and mineral industry is vast and complex. Despite the decline of mining's relative importance in terms of absolute contribution to GDP, it has shaped the landscape of the country, its infrastructure development and labour relations in ways that remain evident to the present day. The new global demand for CRM's has seen South Africa ready to engage with buyers and investors from all over the world and, given the persistent decline of the traditional mineral commodities since the 2008 global financial crisis, this interest is met with eager anticipation from a variety of stakeholders within well-organised sectors in the country.

As a supplier of Critical Raw Minerals, South Africa presents a rich and diverse range of options for mineral investment and exhibits potential for downstream industry development.

The country admittedly has many challenges to investment and sustained growth, including the current electricity crisis and impending elections, in 2024, which may signal a further change in the current dominance of the ruling party.

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References

African Development Bank, (2017). South Africa, in African Economic Outlook 2017: Entrepreneurship and Industrialisation. OECD. https://www.oecd-ilibrary.org/development/african-economic-outlook-2017_aeo-2017-en

African Development Bank, (2018). Republic of South Africa Country Strategy Paper 2018-2022, Southern Africa Development and Business Delivery Office (RDGS). AfDB. https://www.afdb.org/en/documents/document/south-africa-country-strategy-paper-2018-2022-103236

African Development Bank, (2022). South Africa Mid-Term Review of the Country Strategy Paper 2018- 2022 and Country Portfolio Performance Review 2021. AfDB. https://www.afdb.org/en/documents/south-africa-mid-term-review-country-strategy-paper-2018-2022-and-country-portfolio-performance-review-2021

African Development Bank, (2023). African Economic Outlook 2023. AfDB. https://www.afdb.org/en/knowledge/publications/african-economic-outlook

Afrobarometer. 2021. Afrobarometer Round 8 Survey in South Africa: Summary of Results. Available at: https://www.afrobarometer.org/publication/summary-results-afrobarometer-round-8-survey-south-africa-2021-0/ (Accessed May 2023)

Anhaeusser, C. R. (1969). A comparison of pebble and fold deformations in the Nelspruit granite contact aureole, Barberton Mountain Land. South African Journal of Geology, 72(2), 49-60.

Anhaeusser, C. R. (1975). Precambrian tectonic environments. Annual Review of Earth and Planetary Sciences, 3, 31.

Anhaeusser, C. R. (1981). Geotectonic evolution of the Archaean successions in the Barberton Mountain land, South Africa. In Developments in Precambrian Geology, 4, 137-160. Elsevier.

Anhaeusser, C. R., & Wilson, M. G. C. (Eds.). (1998). The Mineral Resources of South Africa. Council for Geoscience.

Armstrong, R. A., Compston, W., De Wit, M. J., & Williams, I. S. (1990). The stratigraphy of the 3.5-3.2 Ga Barberton Greenstone Belt revisited: a single zircon ion microprobe study. Earth and Planetary Science Letters, 101(1), 90-106.

Arvis et al., 2018. Connecting to Compete 2018. Trade Logistics in the Global Economy. The Logistics Performance Index and Its Indicators. The International Bank for Reconstruction and Development/The World Bank, 82 p.

Arvis et al., 2018. Connecting to Compete 2018. Trade Logistics in the Global Economy. The Logistics Performance Index and Its Indicators. The International Bank for Reconstruction and Development/The World Bank, 82 p.

Begbie, L. (2022). South Africa's Debt Sustainability: A Multi-factor Approach. University of Cape Town unpublished manuscript. https://open.uct.ac.za/handle/11427/37062

Bench Marks Foundation, Policy Gap 12, Waiting to Inhale, 2017

Bench Marks Foundation, Policy Gap 12, Waiting to Inhale, 2017

Blengini, G.A., Latunussa, C.E.L., Eynard, U., Torres de Matos, C., Wittmer, D., Georgitzikis, K., Pavel, C., Carrara, S., Mancini, L., Unguru, M., Blagoeva, D., Mathieux, F., Pennington, D., 2020. Study on the EU's list of Critical Raw Materials (2020). Final report. European Commission, ISBN 978-92-76-21049-8, doi: 10.2873/11619, 158 p.

Blengini, G.A., Latunussa, C.E.L., Eynard, U., Torres de Matos, C., Wittmer, D., Georgitzikis, K., Pavel, C., Carrara, S., Mancini, L., Unguru, M., Blagoeva, D., Mathieux, F., Pennington, D., 2020. Study on the EU's list of Critical Raw Materials (2020). Final report. European Commission, ISBN 978-92-76-21049-8, doi: 10.2873/11619, 158 p.

BMC Public Health, Health and Wellbeing needs and priorities in mining host communities in South Africa: a mixed-method approach for identifying key SDG3 targets, 2022.

BMC Public Health, Health and Wellbeing needs and priorities in mining host communities in South Africa: a mixed-method approach for identifying key SDG3 targets, 2022.

Bordy, E. M., & Eriksson, P. (2015). LITHOSTRATIGRAPHY OF THE ELLIOT FORMATION (KAROO SUPERGROUP), SOUTH AFRICA. South African Journal of Geology: Being the Transactions of the Geological Society of South Africa = Suid-Afrikaanse Tydskrif Vir Geologie: Syndie Die Verhandelinge van Die Geologiese Vereniging van Suid-Afrika, 118(3), 311–316.

Botha, Z. 2023. A glass half full for SA for SA exploration and Mining. SAIMM Journal online. Monday, 11 September 2023. https://www.saimm.co.za/journal-presidents-corner/1042-a-glass-half-full-for-sa-for-sa-exploration-and-mining

Bowmans Attorneys, Guide-Environmental law in South Africa, 2020

Bowmans Attorneys, Guide-Environmental law in South Africa, 2020

Bowmans. (2018). A brief guide to doing business in South Africa, 2018. Johannesburg: Bowmans.

Brandl, G., Cloete, M., Anhaeusser, C. R., Johnson, M. R., & Thomas, R. J. (2006). Archaean greenstone belts. In The Geology of South Africa. 9-56. Geological Society of South Africa/Council for Geoscience Johannesburg/Pretoria.

Byerly, G. R. (1999). Komatiites of the Mendon Formation: Late-stage ultramafic. Geologic Evolution of the Barberton Greenstone Belt, South Africa, 329, 189.

CAMERON, E. N. (1978). The lower zone of the eastern Bushveld Complex in the Olifants River trough. Journal of Petrology, 19(3), 437-462.

Carranza E. J. M., 2017. Natural resources research publications on geochemical anomaly and mineral potential mapping, and introduction to the special issue of papers in these fields. Natural Resources Research 26(4), 379-410.

Carranza E. J. M., 2017. Natural resources research publications on geochemical anomaly and mineral potential mapping, and introduction to the special issue of papers in these fields. Natural Resources Research 26(4), 379-410.

Cawthorn, R. G. (2015). The Bushveld Complex, South Africa. In Layered intrusions. 517-587) Springer, Dordrecht.

Cawthorn, R. G., Lee, C. A., Schouwstra, R. P., & Mellowship, P. (2002). Relationship between PGE and PGM in the Bushveld Complex. The Canadian Mineralogist, 40(2), 311-328.

Centre for Applied Legal Studies, The Social and labour Plan Series, Phase 1: System Design Trends Analyses, 2016

Centre for Applied Legal Studies, The Social and Labour Plan Series, Phase 2: Implementation Operation Analyses Report, 2017

Centre for Applied Legal Studies, The Social and Labour Plan Series, Phase 3: Alternative Models for Mineral-Based Social Benefit, 2018

Centre for Applied Legal Studies, The Social and labour Plan Series, Phase 1: System Design Trends Analyses, 2016

Centre for Applied Legal Studies, The Social and Labour Plan Series, Phase 2: Implementation Operation Analyses Report, 2017

Centre for Applied Legal Studies, The Social and Labour Plan Series, Phase 3: Alternative Models for Mineral-Based Social Benefit, 2018

Centre for Environmental Rights and Lawyers for Human Rights, Mining and Your Community: Know Your Environmental Rights, 2014

Centre for Environmental Rights and Lawyers for Human Rights, Mining and Your Community: Know Your Environmental Rights, 2014

Centre for Environmental Rights, Environmental Compliance Monitoring and Enforcement at Mines: The Department of Mineral Resources and Energy's Performance During the Financial Years 2017 to 31 March 2019, 2020

Centre for Environmental Rights, Environmental Compliance Monitoring and Enforcement at Mines: The Department of Mineral Resources and Energy's Performance During the Financial Years 2017 to 31 March 2019, 2020

Centre for Environmental Rights, et al. 2016. The threats to human rights from mining and coal-fired power production in South Africa. Universal Periodic Review of South Africa 2017.

Coetzee, L. L. (2001). Genetic Stratigraphy of the Paleoproterozoic Pretoria Group in the Western Transvaal, Master of Science, University of Johannesburg. https://search.proquest.com/openview/1619ae6f5bc07914739a84e72b17fc59/1?pq-origsite=gscholar&cbl=2026366&diss=y

Coface, (2023). South Africa Economic Analysis. Coface for Trade. https://www.coface.com/Economic-Studies-and-Country-Risks/South-Africa

Coffin, M. F., & Eldholm, O. (1994). Large igneous provinces: crustal structure, dimensions, and external consequences. Reviews of Geophysics, 32(1), 1-36.

Dai Global, LLC. 2022. Study on a potential EU - South Africa partnership on Raw Materials Value Chains. Trade and Private Sector Development (TPSD) FacilityDann, J. C. (2000). The 3.5 Ga Komati Formation, Barberton greenstone belt, South Africa, part I: new maps and magmatic architecture. South African Journal of Geology, 103(1), 47-68.

Development Alternatives Incorporated (DAI Global), LLC. Trade and Private Sector Development (TPSD) Facility. *Study on a potential EU - South Africa partnership on Raw Materials Value Chains*. August 2022.

De Swardt, T. (2022). Determining the risk of a sovereign debt default in South Africa and the consequences thereof; an international overview. University of Stellenbosch. https://www.ekon.sun.ac.za/blog/2022-3-23-stellenbosch-students-win-priz/tiaan-de-swardt---budget-speech-.pdf

De Wit, M. J., Furnes, H., & Robins, B. (2011). Geology and tectonostratigraphy of the Onverwacht Suite, Barberton greenstone belt, South Africa. Precambrian Research, 186(1-4), 1-27.

Deloitte, (2022, December 2). Africa Economic Outlook. Deloitte Insights. https://www2.deloitte.com/us/en/insights/economy/emea/africa-economic-outlook-03-2022.html

Deloitte, (2023, April). South Africa Economic Outlook. Deloitte. https://www2.deloitte.com/xe/en/insights/economy/emea/africa-economic-outlook-04-2023.html

Department of Forestry, Fisheries and Environment, Environmental Impact Assessment Amendment Regulations, 2014

Department of Forestry, Fisheries and Environment, Environmental Impact Assessment Amendment Regulations, 2014

Department of Forestry, Fisheries and Environment, Financial Provisioning Regulations, 2015

Department of Forestry, Fisheries and Environment, Financial Provisioning Regulations, 2015

Department of Forestry, Fisheries and Environment, National Environmental Management Act, 107, of 1998

Department of Forestry, Fisheries and Environment, National Environmental Management: Air Quality Act, 39, of 2004

Department of Forestry, Fisheries and Environment, National Environmental Management: Protected Areas Act, 57, of 2003

Department of Forestry, Fisheries and Environment, National Environmental Management: Waste Act, 59, of 2008

Department of Forestry, Fisheries and Environment, National Environmental Management Act, 107, of 1998

Department of Forestry, Fisheries and Environment, National Environmental Management: Air Quality Act, 39, of 2004

Department of Forestry, Fisheries and Environment, National Environmental Management: Protected Areas Act, 57, of 2003

Department of Forestry, Fisheries and Environment, National Environmental Management: Waste Act, 59, of 2008

Department of Mineral Resources and Energy (DMRE), (2022). The Exploration Strategy for the Mining Industry of South Africa. DMR. https://www.energy.gov.za/files/policies/Exploration-Strategy-for-the-Mining-Industry-of-SA.pdf

Department of Mineral Resources and Energy, Amendment Regulations, 2020

Department of Mineral Resources and Energy, Amendment Regulations, 2020

Department of Mineral Resources and Energy, Assessment of the Broad-Based Socio-Economic Empowerment Charter for the South African Mining and Minerals Industry (Mining Charter), May 2015

Department of Mineral Resources and Energy, Assessment of the Broad-Based Socio-Economic Empowerment Charter for the South African Mining and Minerals Industry (Mining Charter), May 2015

Department of Mineral Resources and Energy, Broad-Based Socio-Economic Empowerment Charter for the Mining and Minerals Industry, 2018

Department of Mineral Resources and Energy, Broad-Based Socio-Economic Empowerment Charter for the Mining and Minerals Industry, 2018

Department of Mineral Resources and Energy, Mine Community Resettlement Guidelines, 2022

Department of Mineral Resources and Energy, Mine Community Resettlement Guidelines, 2022

Department of Mineral Resources and Energy, Mine Health and Safety Act, 29, of 1996

Department of Mineral Resources and Energy, Mine Health and Safety Act, 29, of 1996

Department of Mineral Resources and Energy, Minerals and Petroleum Resources Development Act: Artisanal and Small-Scale Mining Policy, 2022

Department of Mineral Resources and Energy, Minerals and Petroleum Resources Development Act, 28, of 2002

Department of Mineral Resources and Energy, Minerals and Petroleum Resources Development Regulations, 2004

Department of Mineral Resources and Energy, Minerals and Petroleum Resources Royalty Act, 28, of 2008

Department of Mineral Resources and Energy, Minerals and Petroleum Resources Development Act: Artisanal and Small-Scale Mining Policy, 2022

Department of Mineral Resources and Energy, Minerals and Petroleum Resources Development Act, 28, of 2002

Department of Mineral Resources and Energy, Minerals and Petroleum Resources Development Regulations, 2004

Department of Mineral Resources and Energy, Minerals and Petroleum Resources Royalty Act, 28, of 2008

Department of Rural Development and Land Reform, Interim Protection of Informal Land Rights Act, 31, of 1996

Department of Rural Development and Land Reform, Interim Protection of Informal Land Rights Act, 31, of 1996

Department of Trade Industry and Competition (DTIC), (2010). A South African Trade Policy and Strategy Framework. DTIC. https://www.tralac.org/files/2012/12/Trade-Policy-and-Strategy-Framework-2010.pdf

Department of Trade Industry and Competition (DTIC), (2021). A Trade Policy for Industrial Development and Employment Growth. DTIC. http://www.thedtic.gov.za/wp-content/uploads/SA_Trade_Policy.pdf

Department of Trade Industry and Competition (DTIC), (2022). Report on South Africa's Trade Portfolio, Presentation to the Select Committee on Trade and Industry. Economic Development, Tourism, Employment and Labour DTIC. http://www.thedtic.gov.za/media-room/parliamentary-presentations/presentations/

Department of Trade Industry and Competition (DTIC), (2023). Trade Agreements. DTIC. http://www.thedtic.gov.za/sectors-and-services-2/1-4-2-trade-and-export/market-access/trade-agreements/

Dept. Science and Innovation. (2021). Hydrogen Society Roadmap for South Africa 2021. Pretoria: Department of Science and Innovation.

DMRE. (2021). Annual Report 2020/21. Pretoria: Department of Mineral Resources and Energy.

DMRE. (2022). D1-2022 Operating Mines, Quarries and Mineral Processing Plants in SA. Pretoria: Department of Mineral Resources and Energy.

Du Plessis, L, Mining and land rights in South Africa: How has the Maledu judgement empowered rural communities?, 2022.

Du Plessis, L, Mining and land rights in South Africa: How has the Maledu judgement empowered rural communities?, 2022.

Dziggel, A., Stevens, G., Poujol, M., Anhaeusser, C. R., & Armstrong, R. A. (2002). Metamorphism of the granite–greenstone terrane south of the Barberton greenstone belt, South Africa: an insight into the tectono-thermal evolution of the 'lower' portions of the Onverwacht Group. Precambrian Research, 114(3-4), 221-247.

Eales, H. V., & Cawthorn, R. G. (1996). The bushveld complex. In Developments in petrology, 15, 181-229. Elsevier.

Economist Intelligence Unit. 2023. Democracy Index 2022: Frontline democracy and the battle for Ukraine. London, EIU.

Edwards, L, (2021). South Africa's International Trade. PRISM Working Paper 2021-1. School of Economics and PRISM. University of Cape Town. https://commerce.uct.ac.za/sites/default/files/content_migration/commerce_uct_ac_za/869/files/PRISM%2520Working%2520Paper%25202021-1%2520-%2520Lawrence.pdf

Edwards, L. and Lawrence, R. (2012). South African Trade Policy and the Future Global Trading Environment. SAIIA Occasional Paper No 128. SAIIA. https://saiia.org.za/research/south-african-trade-policy-and-the-future-global-trading-environment/

Eglington, B. M., & Armstrong, R. A. (2004). The Kaapvaal Craton and adjacent orogens, southern Africa: a geochronological database and overview of the geological development of the craton. South African Journal of Geology: Being the Transactions of the Geological Society of South Africa = Suid-Afrikaanse Tydskrif Vir Geologie: Syndie Die Verhandelinge van Die Geologiese Vereniging van Suid-Afrika, 107(1-2), 13–32.

Embellie Advisory, Towards a Sustainable Mining Environment in South Africa, 2023

Embellie Advisory, Towards a Sustainable Mining Environment in South Africa, 2023

ENCA, Mining halted at Mapungubwe heritage site, for now, 10 September 2017

Eriksson, K. A. (1980). Transitional sedimentation styles in the Moodies and Fig Tree Groups, Barberton mountain land, South Africa: Evidence favouring an Archean continental margin. Precambrian Research, 12(1-4), 141-160.

Eriksson, P. G., Mazumder, R., Catuneanu, O., Bumby, A. J., & Ountsché Ilondo, B. (2006). Precambrian continental freeboard and geological evolution: A time perspective. Earth-Science Reviews, 79(3), 165–204.

Eversheds Sutherland, Harmonising Corporate Governance Framework for South African Mining Companies: King IV, Companies Act and the Mining Charter, 2019

Eversheds Sutherland, Harmonising Corporate Governance Framework for South African Mining Companies: King IV, Companies Act and the Mining Charter, 2019

Fasken Attorneys, Amendments to the Minerals and Petroleum Resources Development Regulations, 2020

Fasken Attorneys, Amendments to the Minerals and Petroleum Resources Development Regulations, 2020

Fortunato, A. (2022). Getting Back on the Curve: South Africa's Manufacturing Challenge. CID Working Paper No 139. Harvard University. https://growthlab.hks.harvard.edu/publications/getting-back-curve-south-africa-manufacturing-challenge

Fraser Institute , Annual Survey of Mining Companies, 2021

Fraser Institute , Annual Survey of Mining Companies, 2021

Fuchs, S., Williams-Jones, A. E., & Przybylowicz, W. J. (2016). The origin of the gold and uranium ores of the Black Reef Formation, Transvaal Supergroup, South Africa. In Ore Geology Reviews, 72, 149–164. https://doi.org/10.1016/j.oregeorev.2015.07.010

G.G. . (27 Sept 2018). Based Socio- Economic Empowerment Charter for the Mining and Minerals Industry, 2018. Pretoria: GOVERNMENT GAZETTE .

Gibson, R. L., Robb, L. J., & Kisters, A. F. M. (1996). Regional setting and geological evolution of the Okiep Copper District, Namaqualand, South Africa. South African Journal of Geology. https://journals.co.za/doi/abs/10.10520/EJC-92e742794

Global Change Institute, Looking at innovative ways to utilise mining land post closure, 2023.

Global Change Institute, Looking at innovative ways to utilise mining land post closure, 2023.

Good, N., & De Wit, M. J. (1997). The Thabazimbi-Murchison lineament of the Kaapvaal craton, South Africa: 2700 Ma of episodic deformation. Journal of the Geological Society, 154(1), 93-97.

Government of the Republic of South Africa. 2018. Broad-Based Socio-Economic Empowerment Charter for the Mining and Metals Industry, 2018. Government Gazette (No. 41934) on 27th September 2018

Government of the Republic of South Africa. Mineral and Petroleum Resources Development Act, No.28 of 2002

Government of the Republic of South Africa. Mineral and Petroleum Resources Development Act, No.28 of 2002: Publication of the Codes of Good Practice for the Minerals Industry. Government Gazette (No.32167) on 29 April 2009

Government of the Republic of South Africa. The Constitution of the Republic of South Africa, Act No.108 of 1996.

Grab, S., & Knight, J. (2015). Landscapes and Landforms of South Africa—An Overview. In S. Grab & J. Knight (Eds.), Landscapes and Landforms of South Africa, 1–9. Springer International Publishing.

Grosch, E. G., Kosler, J., McLoughlin, N., Drost, K., Slama, J., & Pedersen, R. B. (2011). Paleoarchean detrital zircon ages from the earliest tectonic basin in the Barberton Greenstone Belt, Kaapvaal craton, South Africa. Precambrian Research, 191(1-2), 85-99.

groundwork, Centre for Environmental Rights, Human Rights Watch, Earthjustice, We know our lives are in danger, 2019.

groundwork, Centre for Environmental Rights, Human Rights Watch, Earthjustice, We know our lives are in danger, 2019.

Groupe Credit Agricole, (2023). South Africa Economic and Political Overview. GCA. https://international.groupecreditagricole.com/en/international-support/south-africa/economic-overview

Gubanov, A. P., & Mooney, W. D. (2009, December). New global geological maps of crustal basement age. In AGU Fall Meeting Abstracts, 2009,T53B-1583).

Gutzmer, J. (1996). Genesis and alteration of the Kalahari and Postmasburg manganese deposits, Griqualand West, South Africa: Unpublished Ph. D. thesis, Johannesburg, Rands Afrikaans University.

Hamman, J. N., Rozendaal, A., & Jordaan, W. (1996). Gabbro-norite-hosted Ni-Cu-(Co)-sulphide mineralization in southern Namaqualand and its relationship to the cupriferous

Hausmann, R, Sturzenegger, F, Goldstein, P, Muci, F and Barrios, D. (2022). Macroeconomic risks after a decade of microeconomic turbulence: South Africa 2007–2020. SA-Tied Working Paper No. 206. UNU-WIDER. https://www.wider.unu.edu/publication/macroeconomic-risks-after-decade-microeconomic-turbulence#:~:text=South%20Africa%20(2007%E2%80%932020)&text=Real%20GDP%20growth%20decelerated%20more,rapidly%20rising%20public%20debt%20load.

Hayes, E, Spotlight: Mining Law in South Africa, The Mining Law Review, 11th Edition, 2022

Hayes, E, Spotlight: Mining Law in South Africa, The Mining Law Review, 11th Edition, 2022

Heinrichs, T. K., & Reimer, T. (1977). A sedimentary barite deposit from the Archean Fig Tree Group of the Barberton Mountain Land (South Africa). Economic Geology, 72(8), 1426-1441.

Hofmann, A. (2005). The geochemistry of sedimentary rocks from the Fig Tree Group, Barberton greenstone belt: Implications for tectonic, hydrothermal and surface processes during mid-Archaean times. Precambrian Research, 143(1-4), 23-49.

Honohan, P. and Orphanides, A. (2022). Monetary Policy in South Africa 2007–21. WIDER Working Paper 2022/29. UNU-WIDER. https://www.wider.unu.edu/publication/monetary-policy-south-africa-2007%E2%80%9321

https//:www.mineralscouncil.org.za/about/board-and office-bearers

https//:www.mineralscouncil.org.za/about/board-and office-bearers

Independent Electoral Commission. 2022. Democracy's dividend: results from the voter participation survey (VPS) 2021. IEC, Centurion

Independent Electoral Commission. 2023. Results Dashboard. Available at: https://results.elections.org.za/dashboards/npe/app/dashboard.html (Accessed May 2023)

Industrial Development Corporation (IDC), (2013, December). South African Economy: An overview of key trends since 1994. IDC Department of Research and Information. https://www.idc.co.za/wp-content/uploads/2018/11/IDC-RI-publication-Overview-of-key-trends-in-SA-economy-since-1994.pdf

Industrial Development Corporation (IDC), (2023, February). Economic Overview: Recent developments in the global and South African Economies. IDC Department of Research and Information. https://www.idc.co.za/economic-overview-recent-developments-in-the-global-and-south-african-economies/

ING Bank, (2023). South Africa: Key takeaways from the 2023 budget. ING Bank N.V. https://think.ing.com/articles/south-africa-key-takeaways-from-the-2023-budget/#:~:text=Real%20GDP%20growth%20is%20forecast,and%20a%20less%20supportive%20global

International Council for Mining and Metals, Social and Economic Reporting Framework and Guidance, 2022

International Council for Mining and Metals, Social and Economic Reporting Framework and Guidance, 2022

International Monetary Fund (IMF), (2020). South Africa: 2019 Article IV Consultation —Press Release; Staff Report; and Statement by the Executive Director for South Africa, IMF Country Report No. 20/33. IMF. https://www.imf.org/en/Publications/CR/Issues/2020/01/29/South-Africa-2019-Article-IV-Consultation-Press-Release-and-Staff-Report-and-Statement-by-49003

International Monetary Fund (IMF), (2022). South Africa: 2021 Article IV Consultation—Press Release; Staff Report; and Statement by the Executive Director for South Africa, IMF Country Report No. 22/37. IMF. https://www.imf.org/en/Publications/CR/Issues/2022/02/10/South-Africa-2021-Article-IV-Consultation-Press-Release-Staff-Report-and-Statement-by-the-513001

International Monetary Fund (IMF), (2022). South Africa: Selected Issues. IMF Country Report No. 22/38. IMF. https://www.imf.org/-/media/Files/Publications/CR/2022/English/1ZAFEA2022002.ashx

International Monetary Fund (IMF), (2023a). South Africa: Staff Concluding Statement of the 2023 Article IV Mission. IMF. https://www.imf.org/en/News/Articles/2023/03/21/mcs032223-south-africa-2023-article-iv-mission#:~:text=This%20progress%20is%20welcome%20and,and%20reduce%20poverty%20and%20inequality.&text=Growth.,term%20growth%20outlook%20has%20deteriorated.

International Monetary Fund (IMF), (2023b). South Africa: Article IV Consultation —Press Release; Staff Report; and Statement by the Executive Director for South Africa. IMF Country Report No. 23/194. IMF. https://www.elibrary.imf.org/view/journals/002/2023/194/002.2023.issue-194-en.xml

International Monetary Fund (IMF), (2023c). South Africa: Selected Issues. IMF Country Report No. 23/195. IMF. https://www.imf.org/-/media/Files/Publications/CR/2023/English/1ZAFEA2023002.ashx

International Monetary Fund. 2023. Staff Concluding Statement of the 2023 Article IV Mission. IMF: Washington, DC. Available at: https://www.imf.org/en/News/Articles/2023/03/21/mcs032223-south-africa-2023-article-iv-mission (Accessed May 2023)

Investec (2023), Macro-economic outlook: South Africa's electricity crisis dims the economic growth outlook. Investec Bank. https://www.investec.com/content/dam/south-africa/content-hub/annabel-bishop/sa-economics/documents/Macro-economic-outlook-24-March-2023.pdf

Investec (2023), Rand Note. The Investec View. Investec Bank. https://www.investec.com/en_za/focus/economy/rand-note.html

ITC TRADE MAP. (2023). trade statistics for international business development. Retrieved from Trade Map: https://www.trademap.org/Index.aspx

Johannesburg Stock Exchange, JSE's Sustainability and Climate Change Disclosure Guidance, June 2022

Johnson, M. R., Van Vuuren, C. J., Hegenberger, W. F., Key, R., & Show, U. (1996). Stratigraphy of the Karoo Supergroup in southern Africa: an overview. Journal of African Earth Sciences, 23(1), 3–15.

Kamo, SL, & Davis, DW (1994). Reassessment of Archean crustal development in the Barberton Mountain Land, South Africa, based on U-Pb dating. Tectonics, 13 (1),167-192.

Kaufmann D., Kraay A., Mastruzzi M., 2010. The Worldwide Governance Indicators: Methodology and Analytical Issues. World Bank Policy Research Working Paper 5430.

Kaufmann D., Kraay A., Mastruzzi M., 2010. The Worldwide Governance Indicators: Methodology and Analytical Issues. World Bank Policy Research Working Paper 5430.

Kearney, 2023. Foreign Direct Investment Confidence Index 2023, Kearney. https://www.kearney.com/service/global-business-policy-council/foreign-direct-investment-confidence-index

Khamfula, Y. (2004). Macroeconomic policies, shocks and economic growth in South Africa. School of Economic and Business Sciences University of the Witwatersrand. http://www.wits.ac.za https://www.imf.org/external/np/res/seminars/2005/macro/pdf/khamfu.pdf

Kinnaird, J. A. (2005). The Bushveld large igneous province. Review Paper, The University of the Witwatersrand, Johannesburg, South Africa, 39pp.

Kohler, E. A., & Anhaeusser, C. R. (2002). Geology and geodynamic setting of Archaean silicic meta volcaniclastic rocks of the Bien Venue Formation, Fig Tree Group, northeast Barberton greenstone belt, South Africa. Precambrian Research, 116(3-4), 199-235.

Koperberg Suite of the Okiep Copper District, South Africa. South African Journal of Geology: Being the Transactions of the Geological Society of South Africa = Suid-Afrikaanse Tydskrif Vir Geologie: Syndie Die Verhandelinge van Die Geologiese Vereniging van Suid-Afrika, 99(2), 153–168.

Kose, M. Ayhan, and Franziska Ohnsorge, eds. (2020). A Decade after the Global Recession: Lessons and Challenges for Emerging and Developing Economies. Washington, DC: World Bank.

https://thedocs.worldbank.org/en/doc/b9e2c532907731fc33861df9d018b2eb-0350012021/original/Decade-after-global-recession.pdf

Kruener, A., Byerly, G. R., & Lowe, D. R. (1991). Chronology of early Archaean granite-greenstone evolution in the Barberton Mountain Land, South Africa, based on precise dating by single zircon evaporation. Earth and Planetary Science Letters, 103(1-4), 41-54.

Kruger, F. J. (1990). The stratigraphy of the Bushveld Complex: a reappraisal and the relocation of the Main Zone boundaries. South African Journal of Geology, 93(2), 376-381.

Kruger, F. J. (2005). Filling the Bushveld Complex magma chamber: lateral expansion, roof and floor interaction, magmatic unconformities, and the formation of giant chromitite, PGE and Ti-V-magnetite deposits. Mineralium Deposita, 40(5), 451-472.

Ledwaba, P, and Mutemeri, N, Preliminary Study on artisanal and small-scale mining in South Africa, 2017

Lenhardt, N., Eriksson, P. G., Catuneanu, O., & Bumby, A. J. (2012). Nature of and controls on volcanism in the ca. 2.32–2.06Ga Pretoria Group, Transvaal Supergroup, Kaapvaal Craton, South Africa. Precambrian Research 214-215, 106–123.

Llewellyn, L, How South Africa's rural communities are getting a raw deal from mining companies, The Conversation, 14 July 2019

Llewellyn, L, How South Africa's rural communities are getting a raw deal from mining companies, The Conversation, 14 July 2019

Lloyds Bank, (2023). Investing in South Africa. https://www.lloydsbanktrade.com/en/market-potential/south-africa/investment-environment

Loewald, C and M, Stern, eds. (2022) Unlocking growth prospects in post-pandemic South Africa. SARB. https://www.resbank.co.za/content/dam/sarb/what-we-do/research/UNLOCKING%20GROWTH%20PROSPECTS%20FINAL%20050423.pdf

Lowe, D. R., & Byerly, G. R. (Eds.). (1999). Geologic evolution of the Barberton greenstone belt, South Africa, 329. Geological Society of America.

Makua M Pretty, Kola O. Odeku, Harmful mining activities, environmental impacts and effects the mining communities in South Africa: a critical perspective, Environmental Economics (open access), 2017

Makua M Pretty, Kola O. Odeku, Harmful mining activities, environmental impacts and effects the mining communities in South Africa: a critical perspective, Environmental Economics (open access), 2017

Mbere, N and Steenkamp, S, ESG in the South African mining industry: What's missing?, 2022.

Mbere, N and Steenkamp, S, ESG in the South African mining industry: What's missing?, 2022.

McClung, C. R., Gutzmer, J., Beukes, N. J., Mezger, K., Strauss, H., & Gertloff, E. (2007). Geochemistry of bedded barite of the Mesoproterozoic Aggeneys-Gamsberg Broken Hill-type district, South Africa. Mineralium Deposita, 42(5), 537–549.

McCourt, S., Armstrong, R. A., Grantham, G. H., & Thomas, R. J. (2006). Geology and evolution of the Natal belt, South Africa. Journal of African Earth Sciences 46(1), p.71–92.

McNaughton, N. J., Pollard, P. J., Groves, D. I., & Taylor, R. G. (1993). A long-lived hydrothermal system in Bushveld granites at the Zaaiplaats tin mine; lead isotope evidence. Economic Geology, 88(1), 27-43.

Mikomangwa, P. (2022 November, 1). South Africa: Analyzing South Africa's debt trap. The Exchange Online. https://theexchange.africa/countries/south-africa/south-africa-debt/

Minerals Council South Africa, At Work - Community, 2023

Minerals Council South Africa, At Work - Community, 2023

Minerals Council South Africa, Social Impacts and Benefits of Mining, 2022

Minerals Council South Africa, Social Impacts and Benefits of Mining, 2022

Minerals Council. (2019). Mining Industry Transformation Progress Report for 2019. Johannesburg: Minerals Council.

Minerals Council. (2023). Facts & Figures pocketbook 2022. Johannesburg: Minerals Council.

Minerals Council. (2023, June 13). Members. Retrieved from Minerals Council: https://www.mineralscouncil.org.za/about/members

Miyajma, K. (2019). Exchange rate volatility and Pass-Through to Inflation in South Africa. IMF Working Paper WP/19/277. IMF. https://www.imf.org/-/media/Files/Publications/WP/2019/wpiea2019277-print-pdf.ashx#:~:text=To%20shed%20some%20light%20on,limited%20extent%20in%20South%20Africa.

Mthenjane M I, Post-mining use of rehabilitated land – an opportunity for the South African mining industry for sustainable development, The Southern African Institute of Mining and Metallurgy, 2019

Mthenjane M I, Post-mining use of rehabilitated land – an opportunity for the South African mining industry for sustainable development, The Southern African Institute of Mining and Metallurgy, 2019

Nedbank, (2022). What does the July repo rate increase mean for you? Nedbank blog. http://www.personal.nedbank.co.za

NEDLAC, (2023, June). Economic and Employment Trends in South Africa. Issue 3. NEDLAC. https://nedlac.org.za/wp-content/uploads/2023/06/June-2023.pdf

NEDLAC, (2023, March). Economic and Employment Trends in South Africa. Issue 1. NEDLAC. https://nedlac.org.za/wp-content/uploads/2023/03/April-2023-Issue-1_Final.pdf

Newton, A. R., Shone, R. W., Booth, P. W. K., Johnson, M. R., Anhaeusser, C. R., & Thomas, R. J. (2006). The Cape fold belt. The Geology of South Africa, 521-530.

Nex, P. A. M., Cawthorn, R. G., & Kinnaird, J. A. (2002). Geochemical effects of magma addition: compositional reversals and decoupling of trends in the Main Zone of the western Bushveld Complex. Mineralogical Magazine, 66(6), 833-856.

Nyathi, N. (2014). Stratigraphy, sedimentary facies and diagenesis of the Ecca Group, Karoo Supergroup in the Eastern Cape, South Africa [University of Fort Hare]. https://core.ac.uk/download/pdf/145034612.pdf

OECD, (2015). South Africa Policy Brief. OECD Better Policies Series. OECD. https://www.oecd.org/policy-briefs/south-africa-territorial-development-for-more-inclusive-growth.pdf

OECD, (2020). OECD Economic Surveys South Africa. OECD. http://www.oecd.org/economy/south-africa-economic-snapshot/

OECD, (2021, October 14). Tax and fiscal policies after the COVID-19 crisis. OECD Policy Responses to Coronavirus (COVID-19). OECD. https://www.oecd.org/coronavirus/policy-responses/tax-and-fiscal-policies-after-the-covid-19-crisis-5a8f24c3/

OECD, (2022). OECD Economic Outlook. Volume 2022 Issue 2: Preliminary Version. OECD. https://doi.org/10.1787/f6da2159-en

Parman, S. W., & Grove, T. L. (2004). Petrology and geochemistry of Barberton komatiites and basaltic komatiites: evidence of Archean fore-arc magmatism. Developments in Precambrian Geology, 13, 539-565.

Pharoe, B. K., Evdokimov, A. N., Gembitskaya, I. M., & Bushuyev, Y. Y. (2020). Mineralogy, geochemistry and genesis of the post-Gondwana supergene manganese deposit of the Carletonville-Ventersdorp area, North West Province, South Africa. Ore Geology Reviews, 120, 103372.

Portfolio Committee on Trade and Industry, (2010, May 12). Report of the Portfolio Committee on Trade and Industry on South African Trade Policy and Strategy Framework. https://static.pmg.org.za/docs/2010/comreports/100517pctradereport.htm

Pretoria High Court: Case No. 20341/19, 2021

Pretoria High Court: Case No. 20341/19, 2021

Puchner, R. A. (2002). The geology and rock mass quality of the Cenozoic Kalahari Group, Nchwaning Mine Northern Cape. https://ukzn-dspace.ukzn.ac.za/handle/10413/4108

PWC, (2022, June 30). South Africa Economic Outlook. PWC. https://www.pwc.co.za/en/press-room/south-africa-economic-outlook-june-2022.html

PWC, (2023 January 30). South Africa Economic Outlook. PWC. https://www.pwc.co.za/en/press-room/south-africa-economic-outlook-january-2023.html

PWC, (2023, April 24). South Africa Economic Outlook. PWC. https://www.pwc.co.za/en/press-room/south-africa-economic-outlook-april-2023.html

PWC, (2023, March 30). South Africa Economic Outlook. PWC. https://www.pwc.co.za/en/press-room/south-africa-economic-outlook-march-2023.html

Reimer, T. O. (1967). Die Geologie der Stolzburg-Synklinale im Barberton Bergland (Transvaal, Südafrika). [MS thesis], 108.

Reimer, T. O. (1990). Arcbaean Baryte Deposits of Southern Africa. Geological Society of India, 35(2), 131-150.

Republic of South Africa (National Treasury), (2020). Supplementary Budget review 2020. https://www.treasury.gov.za/documents/national%20budget/2020s/review/fullsbr.pdf

Republic of South Africa (National Treasury), (2021a). Budget review 2021. https://www.treasury.gov.za/documents/national%20budget/2021/review/FullBR.pdf

Republic of South Africa (National Treasury), (2021b). Medium Term Budget Policy Statement 2021. https://www.treasury.gov.za/documents/mtbps/2021/mtbps/FullMTBPS.pdf

Republic of South Africa (National Treasury), (2022a). Budget review 2022. https://www.treasury.gov.za/documents/national%20budget/2022/review/FullBR.pdf

Republic of South Africa (National Treasury), (2022b). Medium Term Budget Policy Statement 2022. https://www.resbank.co.za/content/dam/sarb/publications/quarterly-bulletins/boxes/2022/december/The%202022%20Medium%20Term%20Budget%20Policy%20Statement.pdf

Republic of South Africa (National Treasury), (2023). Budget review 2023. https://www.treasury.gov.za/documents/national%20budget/2023/review/FullBR.pdf

Rozendaal, A., & Horn, R. (2013). Textural, mineralogical and chemical characteristics of copper reverb furnace smelter slag of the Okiep Copper District, South Africa. Minerals Engineering, 52, 184–190.

Rozendaal, A., Rudnick, T.-K., & Heyn, R. (2017). Mesoproterozoic base metal sulphide deposits in the Namaqua Sector of the Namaqua-Natal Metamorphic Province, South Africa: a review. South African Journal of Geology: Being the Transactions of the Geological Society of South Africa = Suid-Afrikaanse Tydskrif Vir Geologie: Syndie Die Verhandelinge van Die Geologiese Vereniging van Suid-Afrika, 120(1), 153–186.

RSA Judiciary. (21 September 2021). High Court of South Africa Gauteng Division Case 2034/19. Johannesburg: High Court Gauteng.

Sachs, M. (2021). South Africa faces a slowly worsening chronic fiscal crisis, The Conversation. https://theconversation.com/south-africa-faces-a-slowly-worsening-chronic-fiscal-crisis-172247#:~:text=First%2C%20the%20chronic%20position%20of,are%20crowding%20out%20social%20spending.

Sanlam, (2020). A Sovereign Debt Crisis? Sanlam Corporate Investments. https://www.sanlaminvestments.com/SISharedDocuments/Sovereign-Debt-Crisis.pdf

Schouwstra, R. P., Kinloch, E. D., & Lee, C. A. (2000). A short geological review of the Bushveld Complex. Platinum Metals Review, 44(1), 33-39.

Schweitzer, J. K., Hatton, C. J., & De Waal, S. A. (1995). Economic potential of the Rooiberg Group: volcanic rocks in the floor and roof of the Bushveld Complex. Mineralium Deposita, 30(2), 168-177.

Söhnge, A. P. G., & Halbich, I. W. (1983). The Cape Fold Belt-Perspective. Geodynamics of the Cape Fold Belt, 12, 1-6.

South African Environmental, Social and Governance Committee, The South African Guideline for Reporting of Environmental, Social and Governance Parameters within the Solid Minerals and Gas and Oil Industries, 2017

South African Human Rights Commission, National Hearing on the Underlying Socio-Economic Challenges of Mining-affected Communities in South Africa, 2018

South African Human Rights Commission, National Hearing on the Underlying Socio-Economic Challenges of Mining-affected Communities in South Africa, 2018

South African Human Rights Commission, SAHRC Report on Mining Affected Communities and DMR response, 2019

South African Human Rights Commission, SAHRC Report on Mining Affected Communities and DMR response, 2019

South African Minerals Reporting Codes Standards Committee, ESG-Is here to stay, 2022.

South African Minerals Reporting Codes Standards Committee, ESG-Is here to stay, 2022.

South African Presidential Economic Advisory Council, (2020). How should South Africa deal with rising national debt? Fiscal policy options for inclusive growth in a debt-constrained environment. The Presidency. https://www.thepresidency.gov.za/sites/default/files/05.%20How%20should%20South%20Africa%20deal%20with%20rising%20National%20Debt%202020.pdf

South African Reserve Bank (SARB), (2022). A new framework for implementing Monetary Policy in South Africa, Financial Markets Division SARB. https://www.resbank.co.za/en/home/what-we-do/financial-markets/monetary-policy-implementation-framework#:~:text=The%20SA%20Reserve%20Bank%20implements,surplus%20or%20tiered%20floor%20system.

South African Reserve Bank (SARB), (2023). Monetary Policy Implementation Framework. SARB. https://www.resbank.co.za/en/home/what-we-do/financial-markets/monetary-policy-implementation-framework

South African Revenue Service (SARS), (2010). Merchandise Trade Statistics December 2010. SARS. https://www.sars.gov.za/wp-content/uploads/Docs/TradeStats/2010/Merchandise-Trade-Statistics-for-December-2010.pdf

South African Revenue Service (SARS), (2012). Merchandise Trade Statistics December 2012. SARS. https://www.sars.gov.za/wp-content/uploads/Docs/TradeStats/2012/Merchandise-Trade-Statistics-for-December-2012.pdf

South African Revenue Service (SARS), (2014). Merchandise Trade Statistics December 2014. SARS. https://www.sars.gov.za/wp-content/uploads/Docs/TradeStats/2014/Dec/Merchandise-Trade-Statistics-December-2014.pdf

South African Revenue Service (SARS), (2016). Merchandise Trade Statistics December 2016. SARS. https://www.sars.gov.za/wp-content/uploads/Docs/TradeStats/2016/Dec/Merchandise-Trade-Statistics-Dec-2016.pdf

South African Revenue Service (SARS), (2018). Merchandise Trade Statistics December 2018. SARS. https://www.sars.gov.za/wp-content/uploads/Docs/TradeStats/2018/Dec/Merchandise-Trade-Statistics-December-2018.pdf

South African Revenue Service (SARS), (2020). Merchandise Trade Statistics December 2020. SARS. https://www.sars.gov.za/wp-content/uploads/Docs/TradeStats/2020/Dec/Trade-Statistics-December-2020.pdf

South African Revenue Service (SARS), (2022). Merchandise Trade Statistics December 2022. SARS. https://www.sars.gov.za/wp-content/uploads/Docs/TradeStats/2022/Dec3461/Trade-Statistics-December-2022-1.pdf

StatsSA P2041. (2023). Mining: Production and sales (Preliminary) January 2023. Statistics South Africa .

StatsSA P3041.2. (2023). Manufacturing: Production and Sales April 2023. Pretoria: Statistics SA.

Steele-Schober, T, The Importance of ESG for Mineral Reporting , Journal of the Southern African Institute of Mining and Metallurgy, vol.121 N.6, Johannesburg, June, 2021

Steele-Schober, T, The Importance of ESG for Mineral Reporting , Journal of the Southern African Institute of Mining and Metallurgy, vol.121 N.6, Johannesburg, June, 2021

Steele-Schober, T, The Importance of ESG for Mineral Reporting, Journal of the Southern African Institute of Mining and Metallurgy, vol.121 n.6 Johannesburg, June 2021 DMRE (Department of Mineral Resources and Energy), Artisanal and Small-Scale Mining Policy, 2022

Stern, M. and Ramkolowan. Y. (2021). Understanding South Africa's trade policy and performance. South African Reserve Bank Working Paper Series WP/20/17. SARB. https://www.resbank.co.za/en/home/publications/publication-detail-pages/working-papers/2021/UnderstandingSouthAfricastradepolicyandperformance

Thamm, A. G., Johnson, M. R., Anhaeusser, C. R., & Thomas, R. J. (2006). The cape supergroup. The Geology of South Africa, 443-460.

The geology of the Barberton area. Vol. 15. Union of South Africa, Department of Mines, 1956.

Toulkeridis, T., Peucker-Ehrenbring, B., & Kroner, A. (1993). Geochemistry and timing of magnesite formation in the Barberton greenstone belt. In International colloquium on Africa geology, 345-347.

Trade and Industrial Policy Strategies, (2022). The Real Economy Bulletin Third Quarter 2022. TIPS. https://www.tips.org.za/manufacturing-data/the-real-economy-bulletin/quarterly-bulletin/item/4457-the-real-economy-bulletin-third-quarter-2022

Trade and Industrial Policy Strategies, (2022). TIPS Tracker Fourth Quarter 2022. TIPS. https://www.tips.org.za/manufacturing-data/tips-import-tracker/item/4560-import-tracker-q4-2022

Trower, E. J., & Lowe, D. R. (2016). Sedimentology of the~ 3.3 Ga upper Mendon Formation, Barberton Greenstone Belt, South Africa. Precambrian Research, 281, 473-494.

Tsikos, H., Beukes, N. J., Moore, J. M., & Harris, C. (2003). Deposition, Diagenesis, and Secondary Enrichment of Metals in the Paleoproterozoic Hotazel Iron Formation, Kalahari Manganese Field, South Africa. Economic Geology and the Bulletin of the Society of Economic Geologists, 98(7), 1449–1462.

Twist, D., & French, B. M. (1983). Voluminous acid volcanism in the Bushveld Complex: A review of the Rooiberg Felsite. Bulletin Volcanologique, 46(3), 225-242.

UNCTAD, (2022). World Investment Report 2022. United Nations. https://unctad.org/system/files/official-document/wir2022_en.pdf

UNCTAD, (2023). World Investment Report 2023. United Nations. https://unctad.org/system/files/official-document/wir2023_en.pdf

UNCTAD, (2023).Trade and Development Report Update - Global Trends and Prospects. United Nations. https://unctad.org/system/files/official-document/gdsinf2023d1_en.pdf

United Nations Conference on Trade and Development. Investment Policy Hub: International Investment Agreements Navigator. Available at: https://investmentpolicy.unctad.org/international-investment-agreements/countries/195/south-africa (Accessed May 2023)

United Nations. 1966. International Covenant on Economic, Social and Cultural Right. General Assembly Resolution 2200A (XX1. UN, New York

United States Department of State, (2021). 2021 Investment Climate Statements: South Africa. USA. https://www.state.gov/reports/2021-investment-climate-statements/south-africa/

Utembe, W, Faustman, E M, Matatiele, P, and Gulumian, M, Hazards identified and the need for health risk assessment in the South African mining industry, Human and Experimental Toxicology, vol. 34 (12)

Utembe, W, Faustman, E M, Matatiele, P, and Gulumian, M, Hazards identified and the need for health risk assessment in the South African mining industry, Human and Experimental Toxicology, vol. 34 (12)

Vella, A. 2023. Highlighting mineralized geological environments through a new Data-driven predictive mapping approach. PhD thesis University Orléans, France

Vennemann, T. W., & Smith, H. S. (1999). Geochemistry of mafic and ultramafic rocks in the type section of the Kromberg Formation, Barberton greenstone belt, South Africa. Geologic Evolution of the Barberton Greenstone Belt, South Africa. Geological Society of America, Special Papers, 329, 133-150.

Viljoen, M. J. (1969). An introduction to the geology of the Barberton granite-greenstone terrain. Spec. Publ. Geol. Soc. S. Afr., 2, 9-28.

Von Gruenewaldt, G. (1973). The modified differentiation index and the modified crystallization index as parameters of differentiation in layered intrusions. South African Journal of Geology, 76(1), 53-61.

Walraven, F. (1987). Textural, geochemical and genetic aspects of the granophyric rocks of the Bushveld Complex.

Walraven, F., Armstrong, R. A., & Kruger, F. J. (1990). A chronostratigraphic framework for the north-central Kaapvaal craton, the Bushveld Complex and the Vredefort structure. Tectonophysics, 171(1-4), 23-48.

Werkmans Attorneys, A Guide to Mining in South Africa, 2017

Werkmans Attorneys, A Guide to Mining in South Africa, 2017

Williams, D. A. C., & Furnell, R. G. (1979). Reassessment of part of the Barberton type area, South Africa. Precambrian Research, 9(3-4), 325-347.

World Bank, (2021). Country Partnership Framework with The Republic of South Africa for the period FY22 – FY26. World Bank. https://documents1.worldbank.org/curated/en/139701627178427304/pdf/South-Africa-Country-Partnership-Framework-for-the-Period-FY22-FY26.pdf

World Bank, (2023, April) Macro Poverty Outlook for South Africa : April 2023 (English). Macro Poverty Outlook (MPO) Washington, D.C.: World Bank Group. http://documents.worldbank.org/curated/en/099550204132331586/IDU0f2bdab130c9c904ff40bd3f0d5cf3cf3b775

World Economic Forum. 2022. The Global Risks Report 2023 (17th Edition). Geneva, 2022

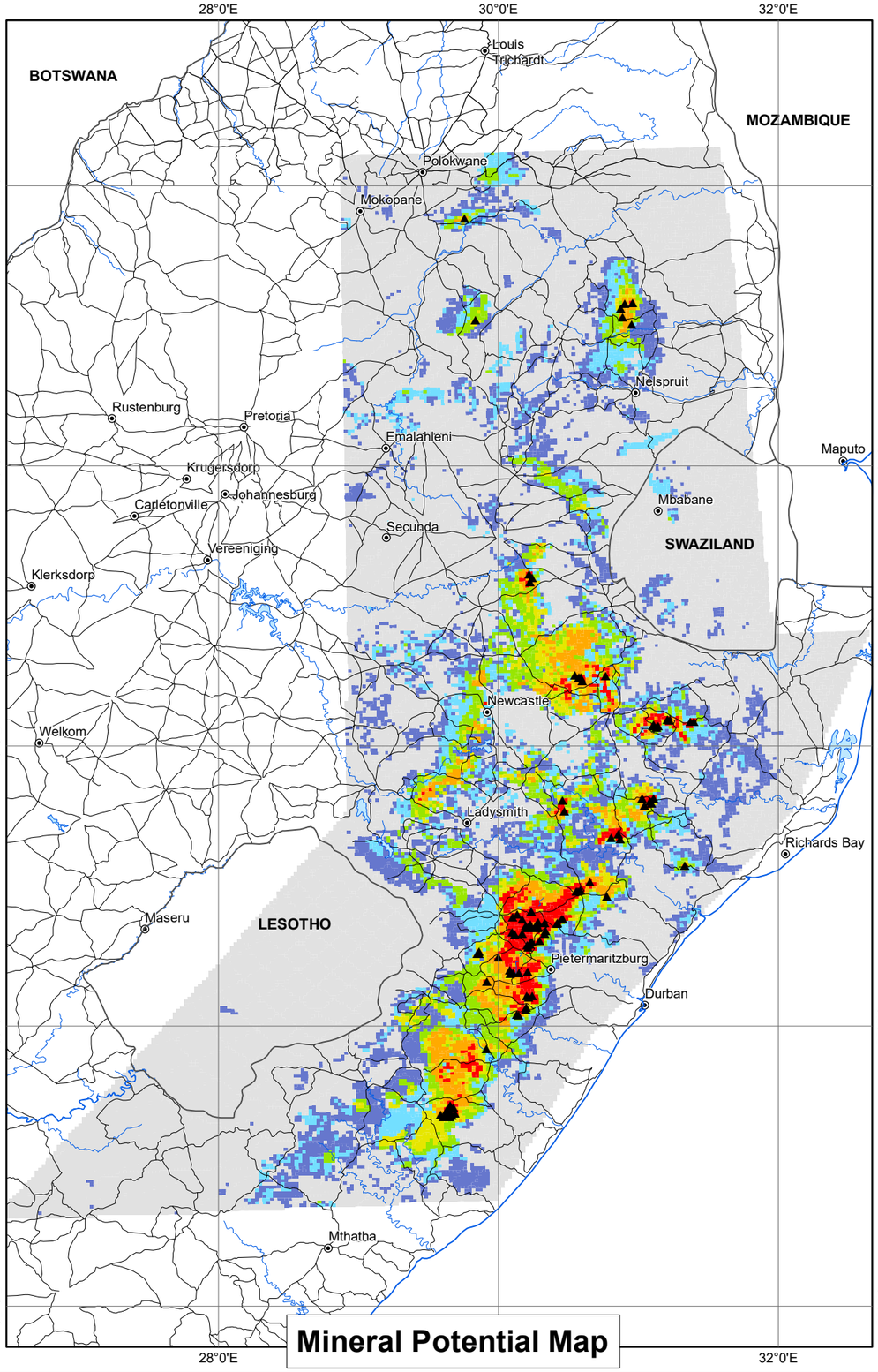
World Economic Forum. 2023. The Global Risks Report 2023 (18th Edition). Geneva, 2023

APPENDICES

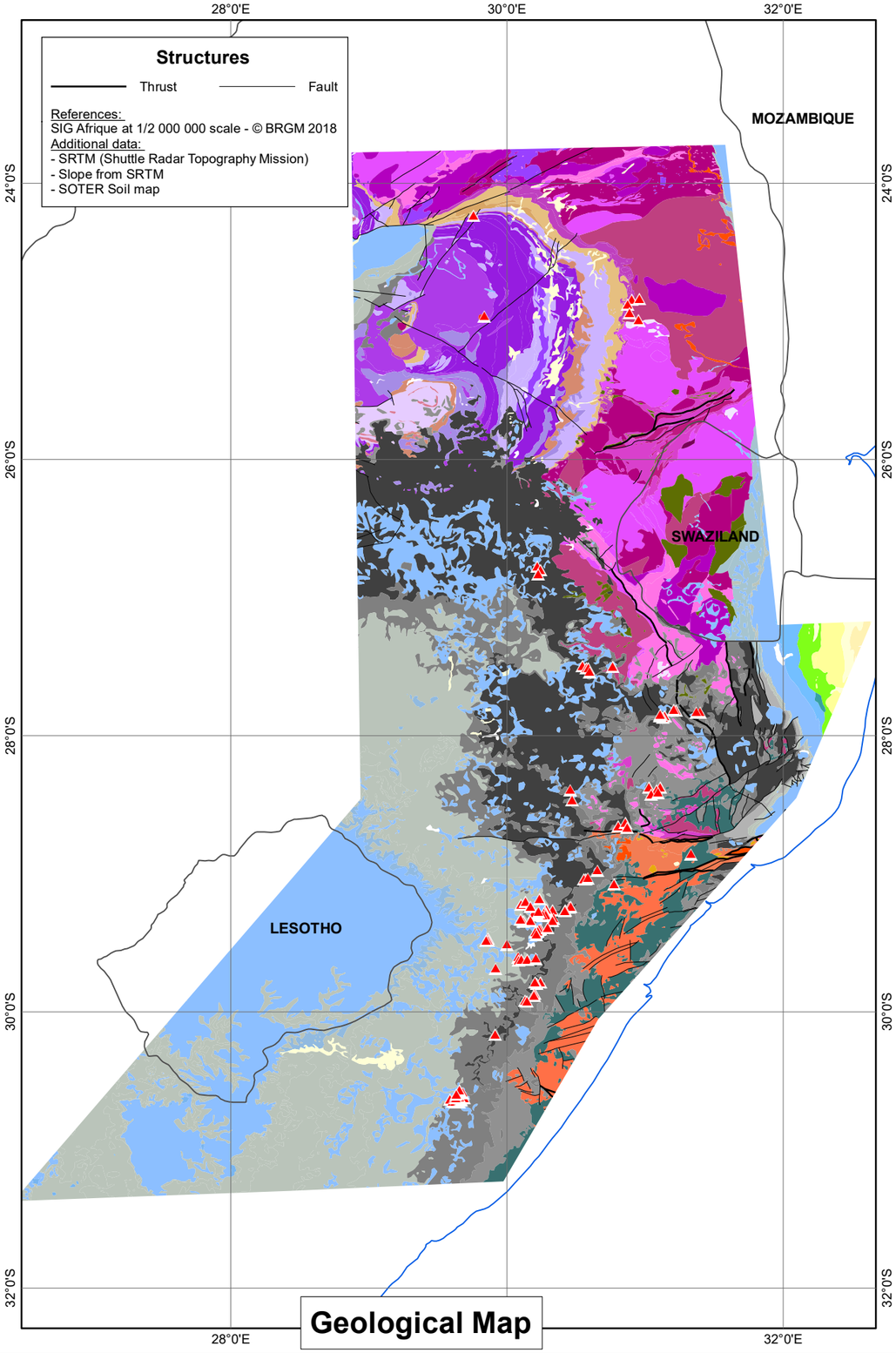
Funded by
the European Union

Country: REPUBLIC of SOUTH AFRICA

MINERAL POTENTIAL MAP - *ALUMINIUM-BAUXITE (Al)*



Mineral Potential Map



Geological Map

Structures

Thrust — Fault

References:
SIG Afrique at 1/2 000 000 scale - © BRGM 2018
Additional data:
- SRTM (Shuttle Radar Topography Mission)
- Slope from SRTM
- SOTER Soil map

Legend

Score

< 0.05
0.05 - 0.125
0.125 - 0.25
0.25 - 0.45
0.45 - 0.60
0.60 - 0.80
0.80 - 1

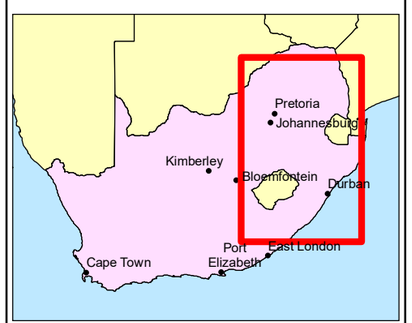
Known occurrences

▲ ▲ Aluminium (Al)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 28559 94.80% Non-occurrence in database Non-occurrence predicted	False positive Cells: 1411 4.68% Non-occurrence in database Occurrence predicted
False negative Cells: 1 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 156 0.52% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.56
Cell size: 2500 m



N

0 50 100 200 Km

Datum : WGS84 (World Geodetic System 1984)

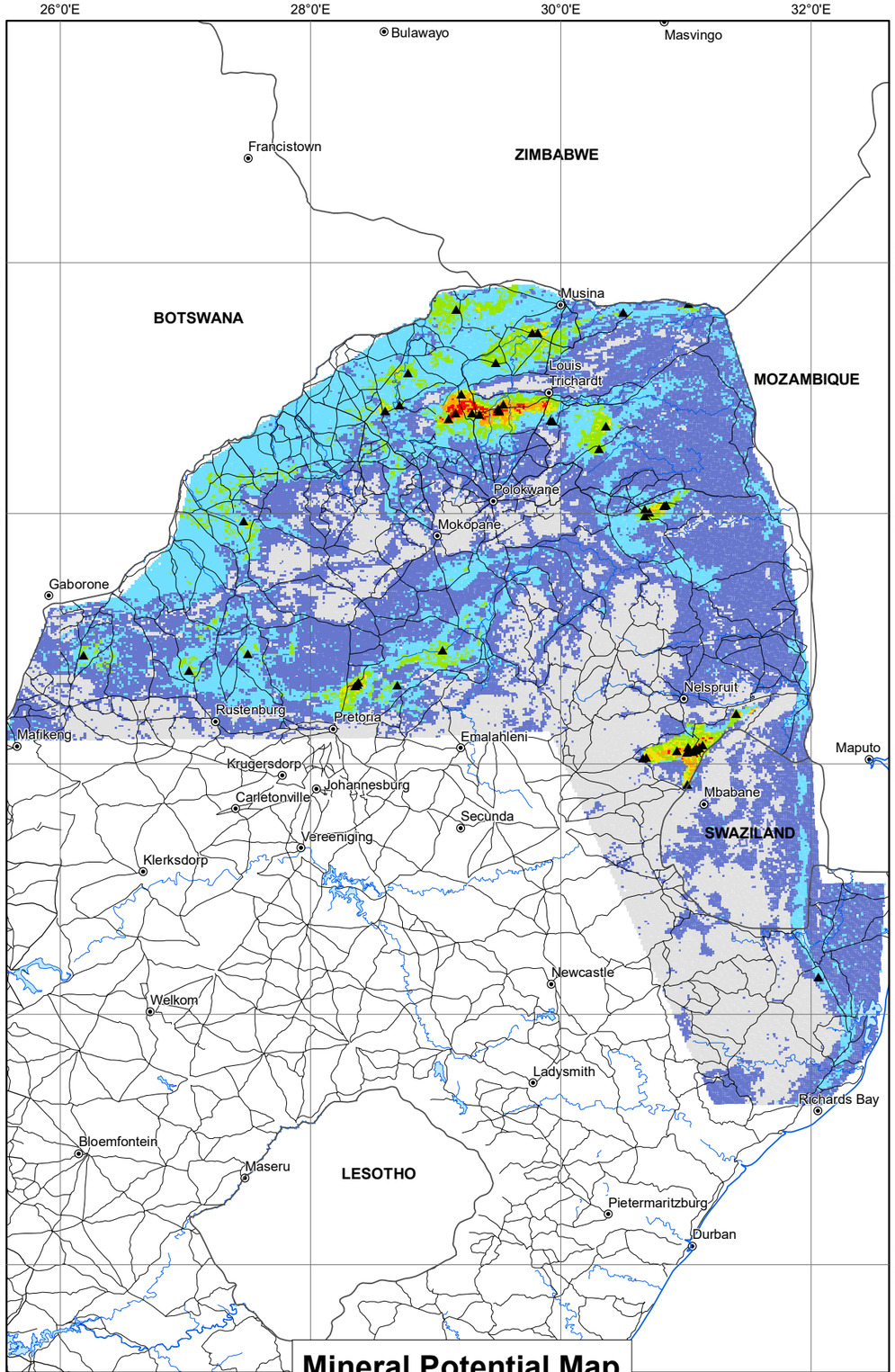
January 2024

Géosciences pour une Terre durable
brgm

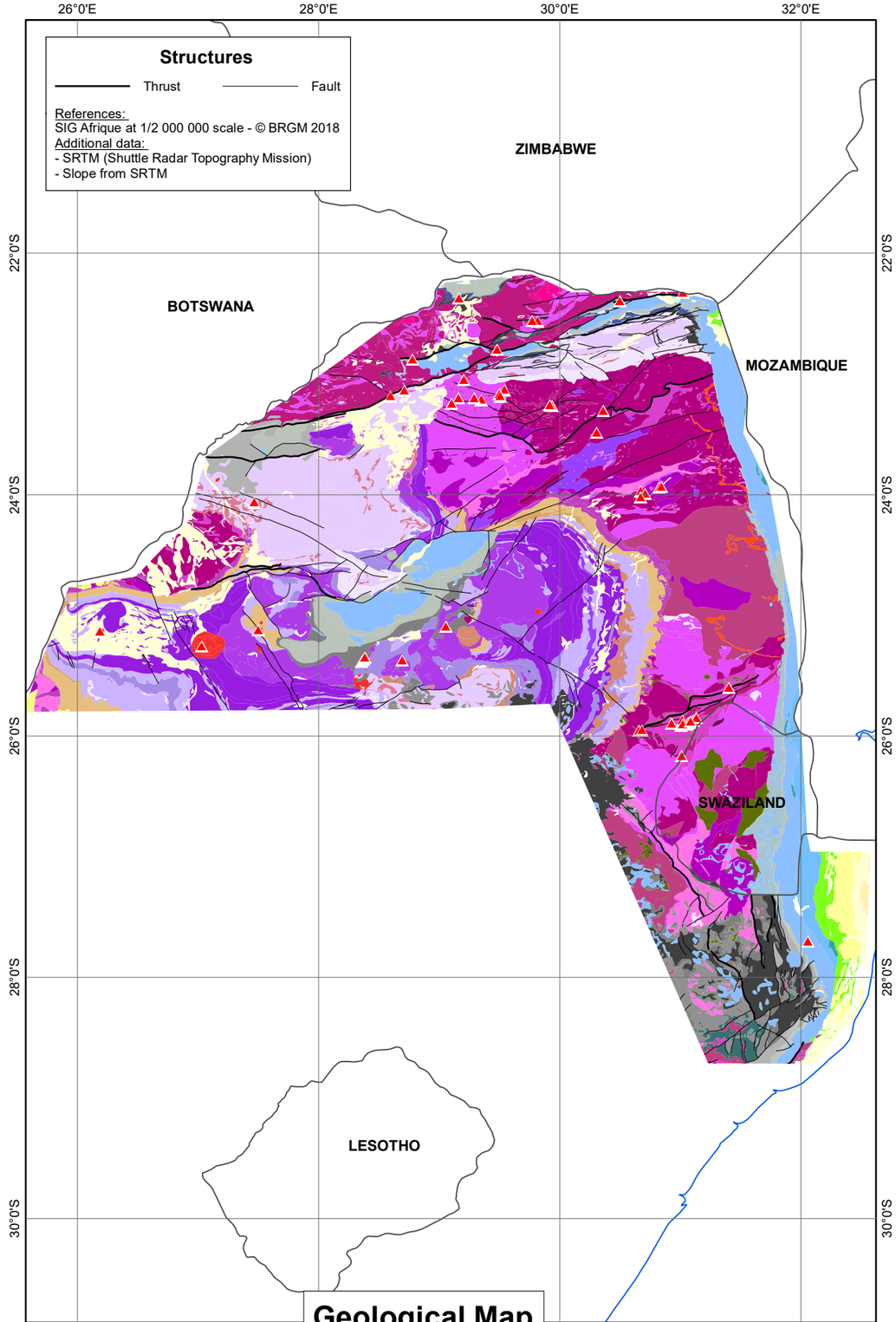
Country: REPUBLIC of SOUTH AFRICA (East)

MINERAL POTENTIAL MAP - *BARIUM (Ba)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

	< 0.05
	0.05 - 0.125
	0.125 - 0.25
	0.25 - 0.45
	0.45 - 0.60
	0.60 - 0.80
	0.80 - 1

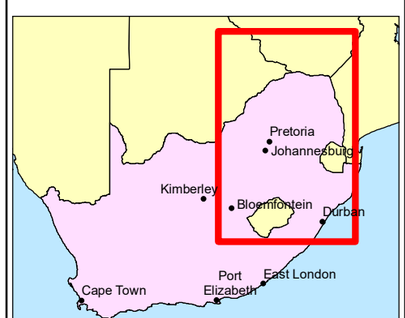
Known occurrences

▲ Barium (Ba)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 78222 98.70% Non-occurrence in database Non-occurrence predicted	False positive Cells: 977 1.23% Non-occurrence in database Occurrence predicted
False negative Cells: 1 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 53 0.07% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.45
Cell size: 1750 m



N

0 50 100 200 Km

Datum : WGS84 (World Geodetic System 1984)

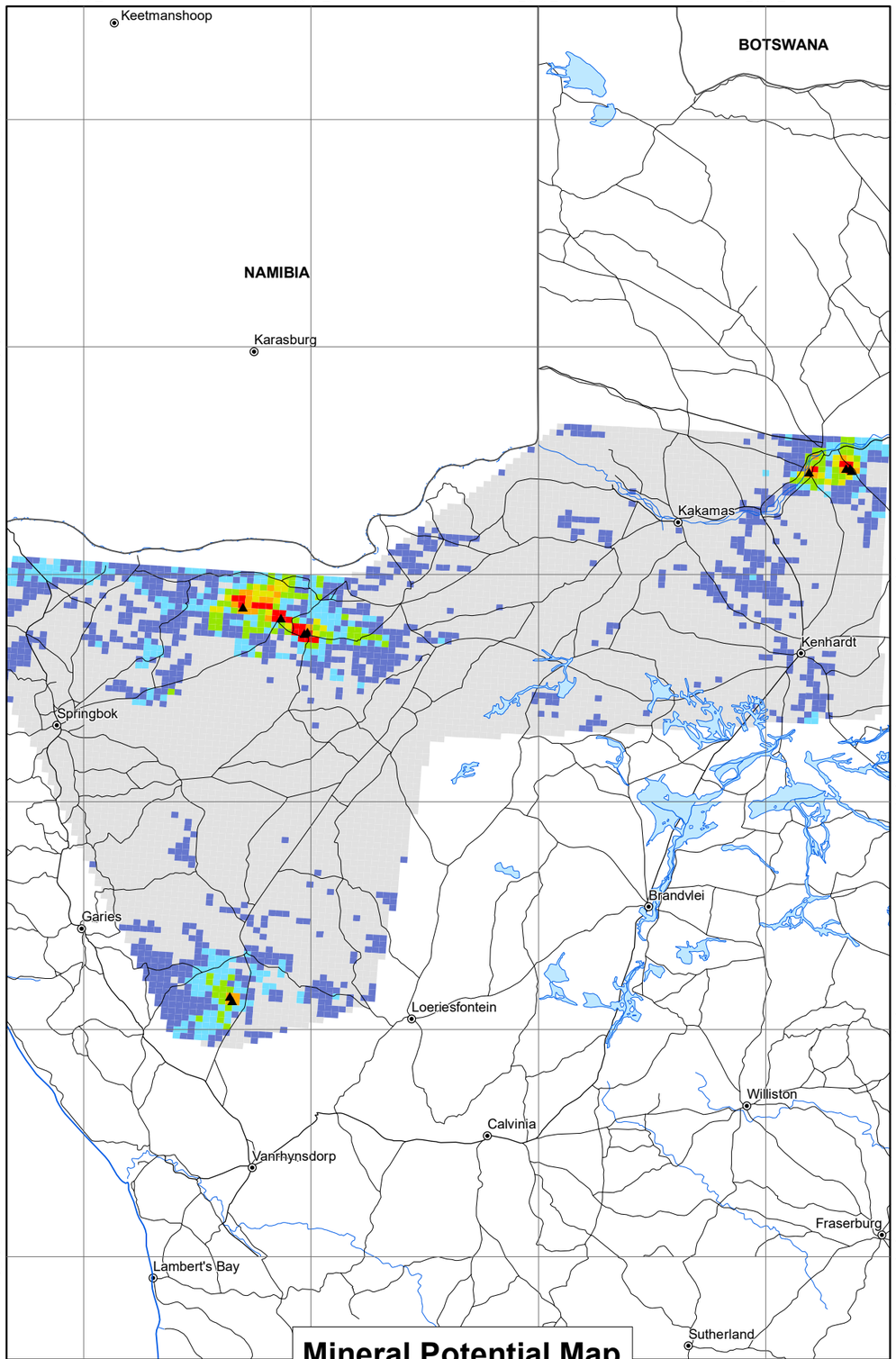
January 2024

Géosciences pour une Terre durable
brgm

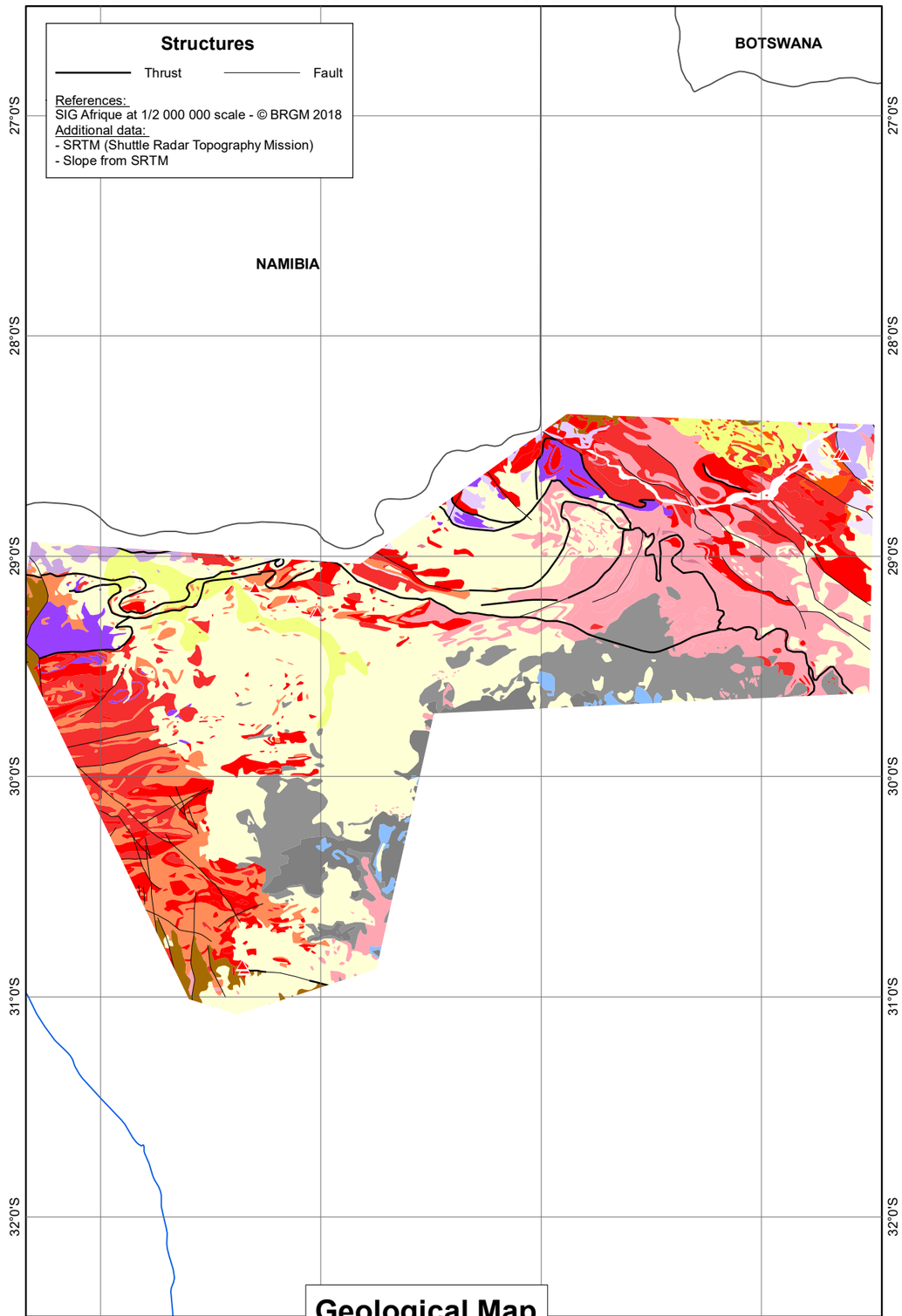
Country: REPUBLIC of SOUTH AFRICA (West)

MINERAL POTENTIAL MAP - *BARIUM (Ba)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

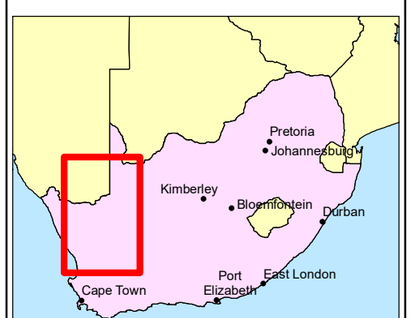
Known occurrences

▲ Barium (Ba)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 6783 99.42% Non-occurrence in database Non-occurrence predicted	False positive Cells: 16 0.23% Non-occurrence in database Occurrence predicted
False negative Cells: 1 0.01% Occurrence in database Non-occurrence predicted	True positive Cells: 23 0.34% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.68
Cell size: 3000 m



N

0 25 50 100 Km

Datum : WGS84 (World Geodetic System 1984)

January 2024

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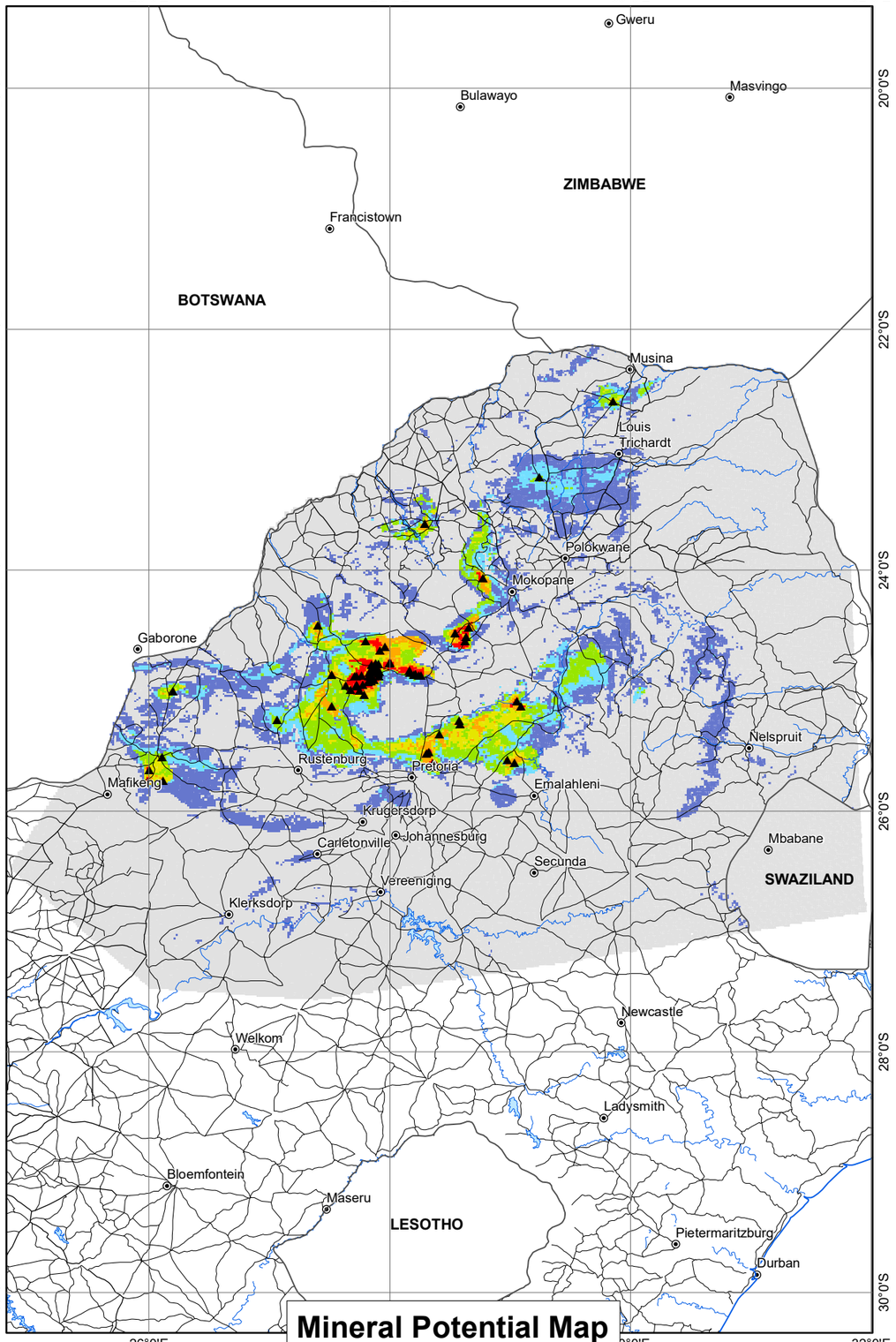
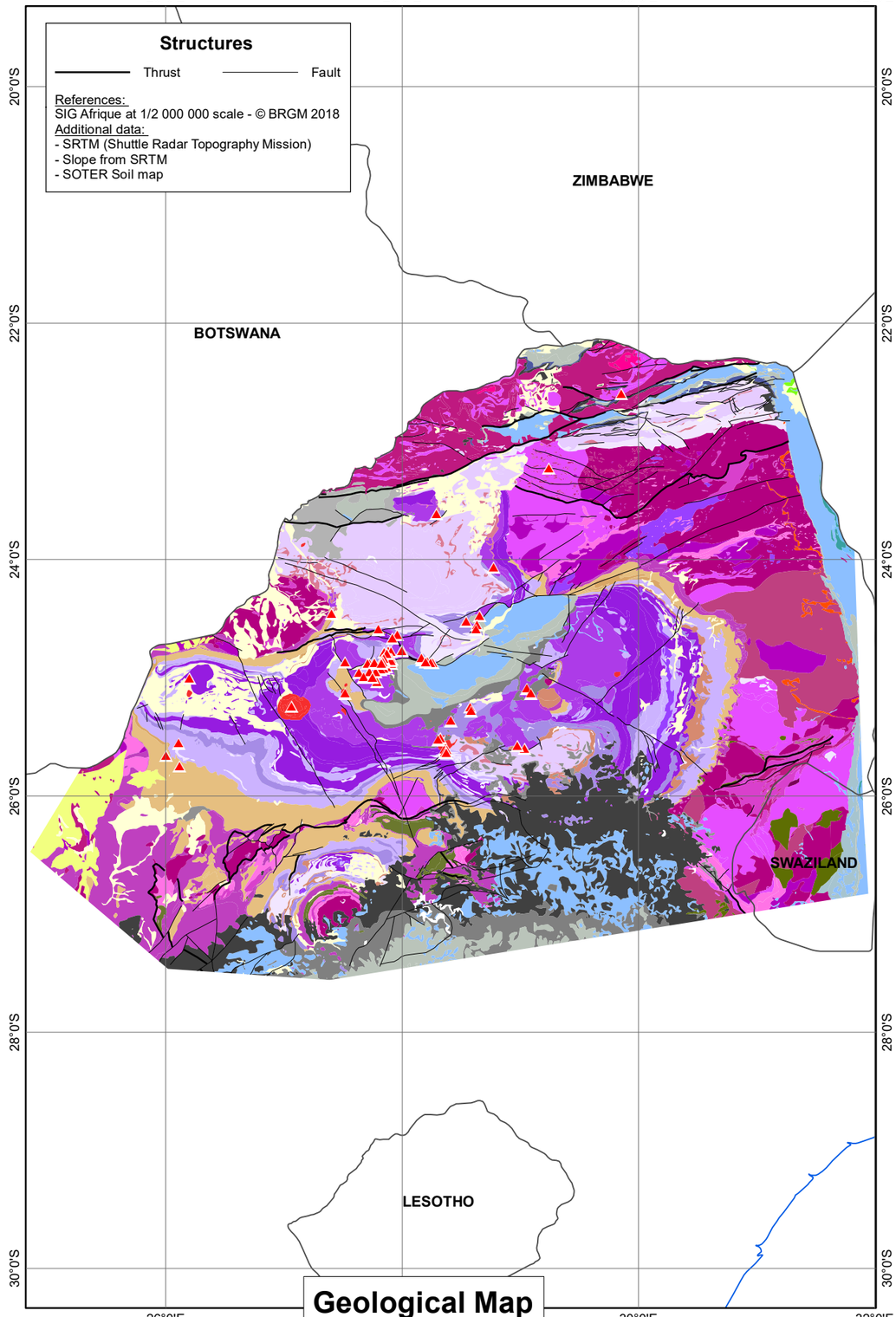
Country: REPUBLIC of SOUTH AFRICA (North East)

MINERAL POTENTIAL MAP - *FLUORINE (Fl)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

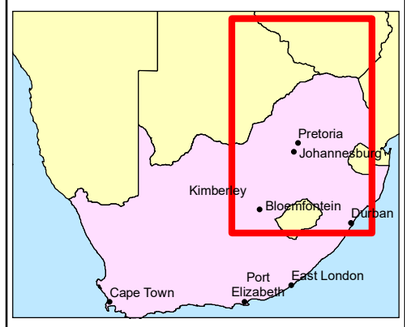
Known occurrences

▲ ▲ Fluorine (Fl)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 90646 97.32% Non-occurrence in database Non-occurrence predicted	False positive Cells: 2269 2.44% Non-occurrence in database Occurrence predicted
False negative Cells: 1 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 222 0.24% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.41
Cell size: 1800 m



N

0 50 100 200 Km

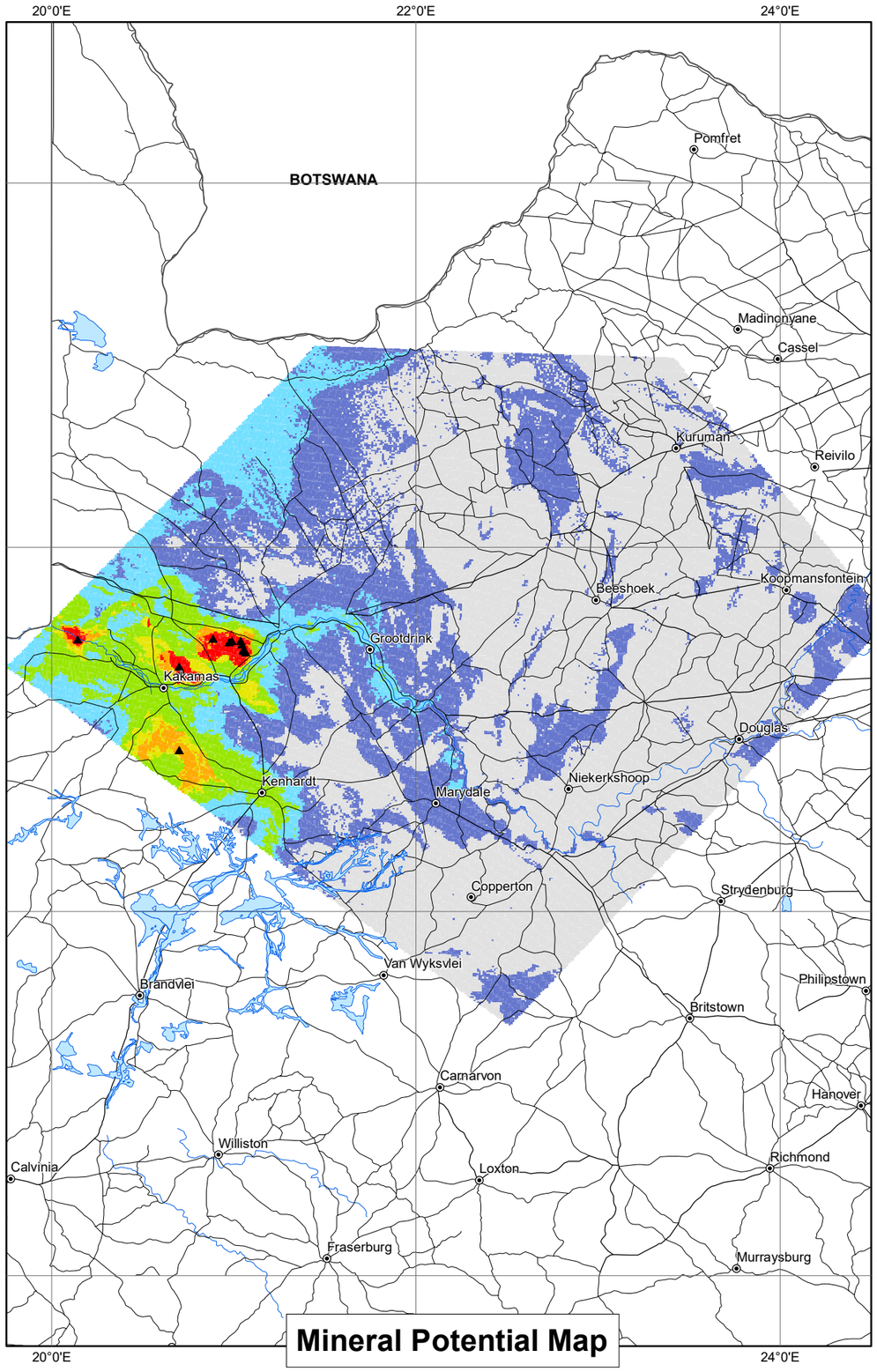
Datum : WGS84 (World Geodetic System 1984)

January 2024

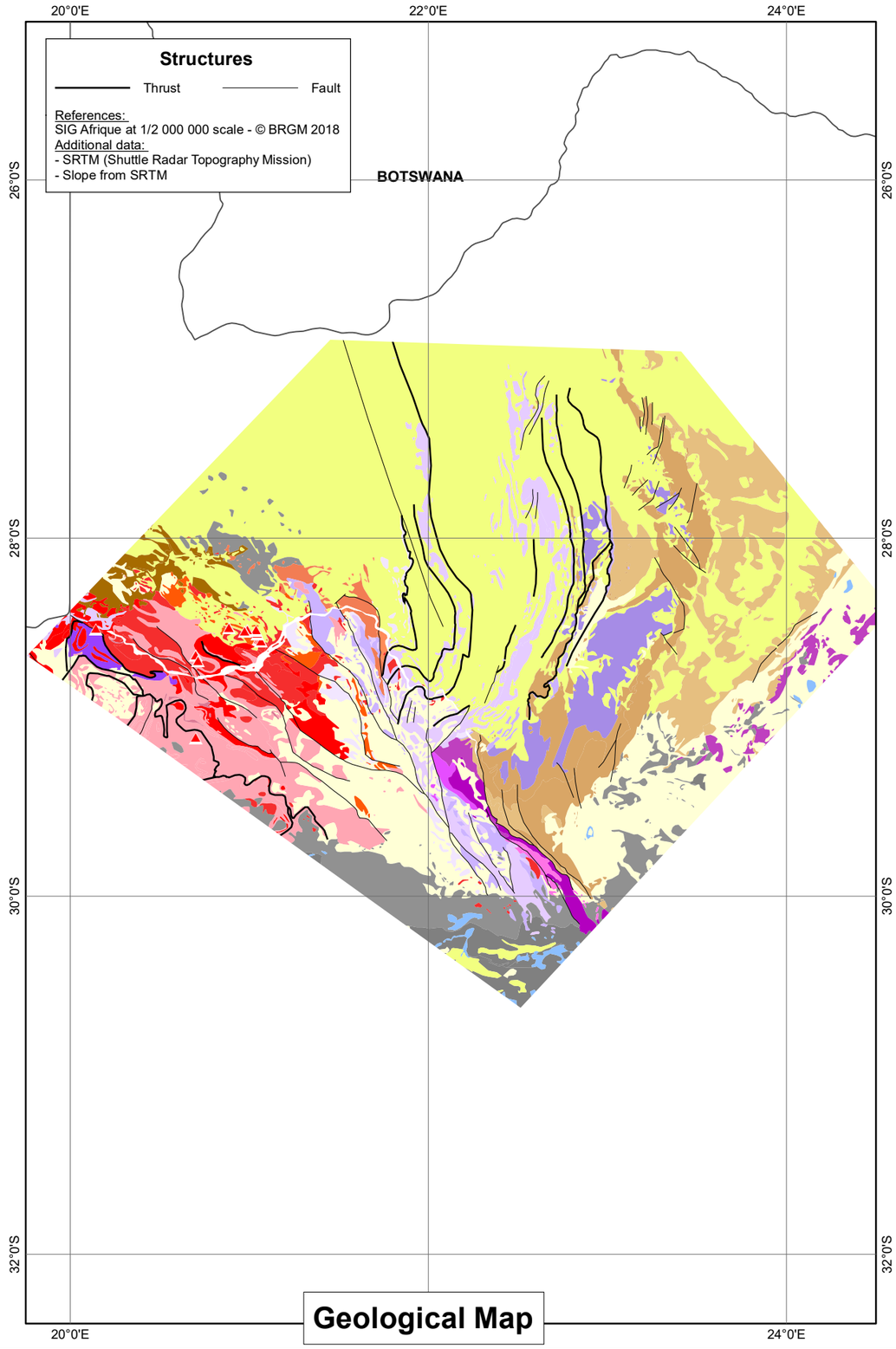
Géosciences pour une Terre durable
brgm

Country: REPUBLIC of SOUTH AFRICA (South West)

MINERAL POTENTIAL MAP - *FLUORINE (Fl)*



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

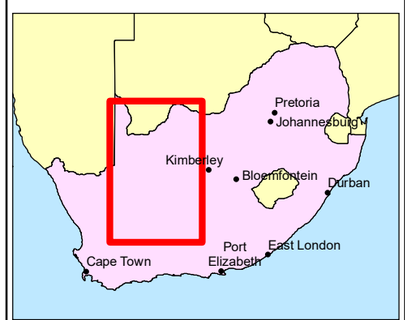
Known occurrences

▲ ▲ Fluorine (Fl)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 113621 98.67% Non-occurrence in database Non-occurrence predicted	False positive Cells: 1276 1.11% Non-occurrence in database Occurrence predicted
False negative Cells: 0 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 250 0.22% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.60
Cell size: 1000 m



N 0 37,5 75 150 Km

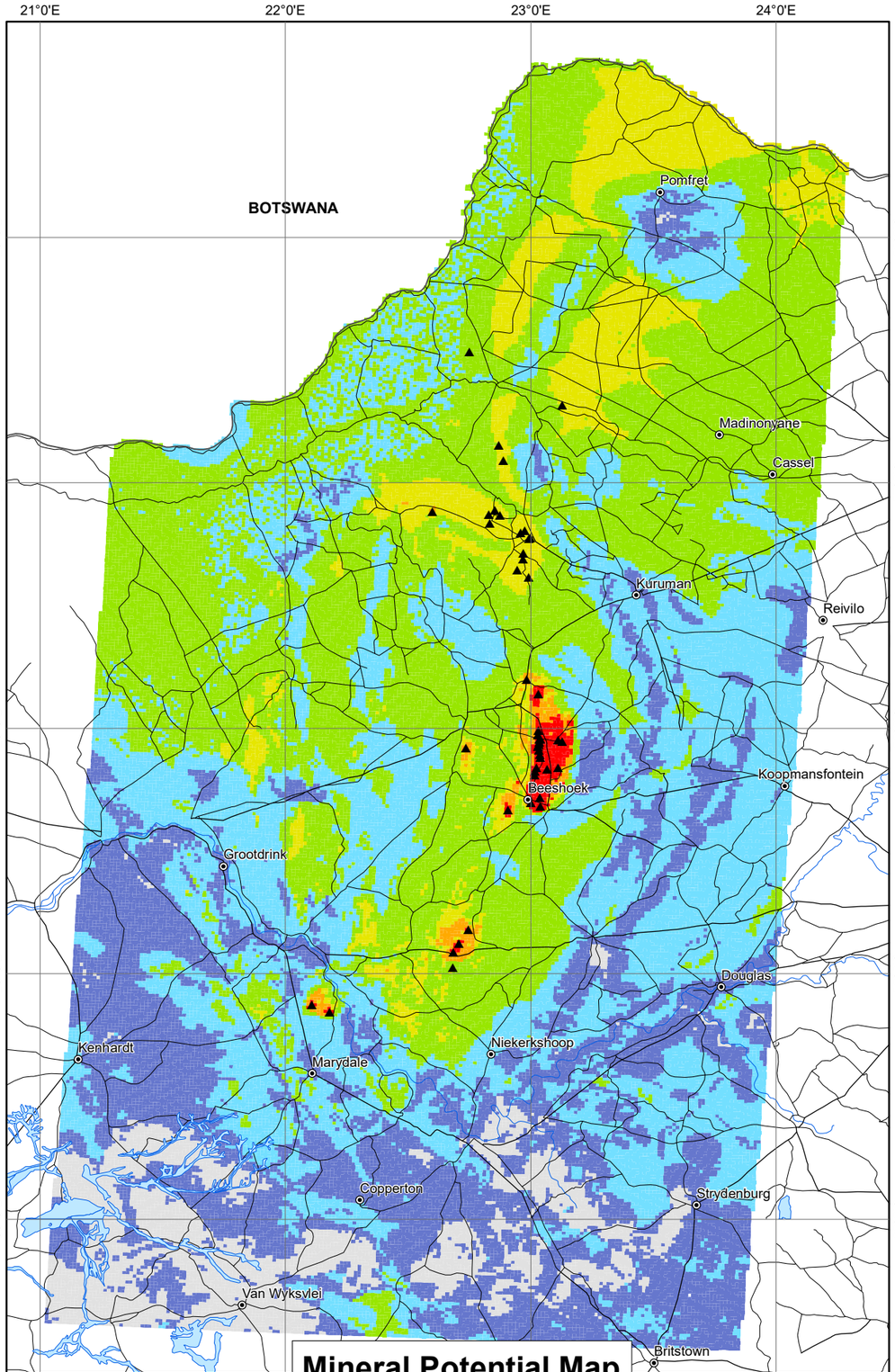
Datum : WGS84 (World Geodetic System 1984)

January 2024

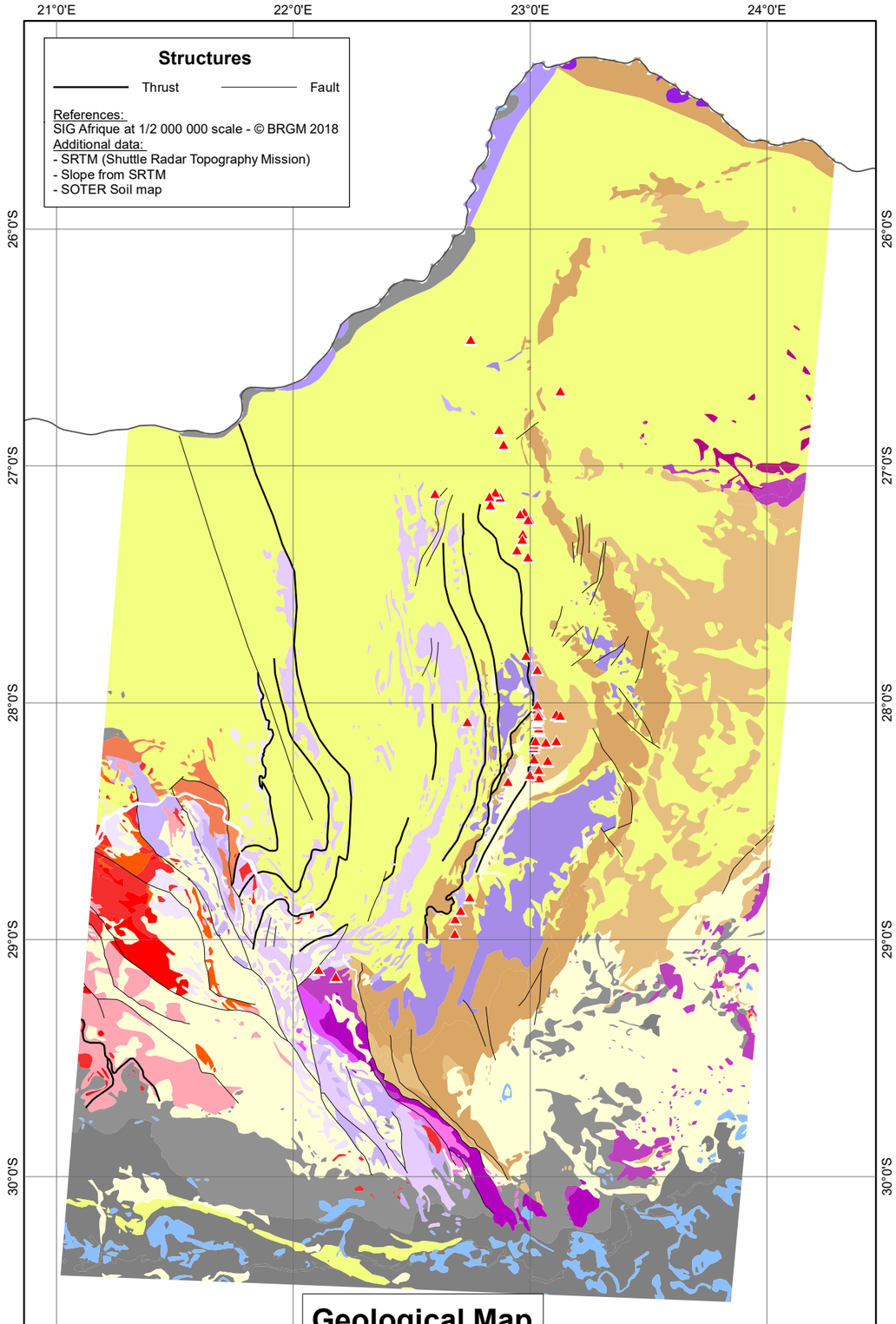
Country: REPUBLIC of SOUTH AFRICA (Center)

MINERAL POTENTIAL MAP - *MANGANESE (Mn)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

Known occurrences

▲ ▲ Manganese (Mn)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 68865 95.12% Non-occurrence in database Non-occurrence predicted	False positive Cells: 3280 4.53% Non-occurrence in database Occurrence predicted
False negative Cells: 15 0.02% Occurrence in database Non-occurrence predicted	True positive Cells: 238 0.33% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.49
Cell size: 1400 m

N

0 25 50 100 Km

Datum : WGS84 (World Geodetic System 1984)

January 2024

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APPENDIX 2.1 MINING LIST: List of Major CRM operations in South Africa (DAI Global 2022)

CRM	Stakeholder	Details	Origin
Vanadium: Mining	Bushveld Minerals	Developing the Brits and Mokopane Vanadium Resources; and the processing operations at their Vametco and Vanchem facilities	South Africa
	VTM Mining	Developing the Vanadium resource at Tweefontein in Limpopo	South Africa
	Ironveld PLC	Developing a vanadium and titanium project at the Bushveld Complex	UK
	VR8 Resources	Developing the Steelpoortdrift Vanadium Project	Australia
	International Resources Limited South Africa	Operating Mapochs Mine	China
Vanadium Processing	Highveld Robusteel	Processors of vanadium and producers of steel	South Africa
	Vanchem	Vanadium-processing facility and beneficiation plant owned by Bushveld Minerals	South Africa
	Vanadium and Magnetite Exploration and Development Co SA Pty Ltd (Vametco)	Is a vanadium processing operation owned by Bushveld Minerals	South Africa
	Bushveld Energy	Subsidiary of Bushveld Minerals that manufactures vanadium energy storage systems	South Africa
	Glencore	Glencore owns a majority stake in the Rhovan-Bakwena Vanadium Venture which mainly produces ferrovanadium and vanadium pentoxide.	UK/ Switzerland
	Abengoa	Energy company that signed an agreement with Bushveld Minerals to establish a solar-plus-storage microgrid at the Vametco Alloys vanadium mining and processing plant	Spain
	Invinity	Storage battery manufacturing company	UK
	German Competence Centre for Mining and Mineral Resources	Arm of the German Chamber of Commerce	Germany
Flourspar: Mining	Sepflour	Owns Wallmannsthal, Welgelegen/Welgevonden and Kruidfontein and operates Nokeng fluorspar mine project,	South Africa
	SA Fluorite (Pty) Ltd	Partial owner and developer of Doornhoek Flourspar Project	South Africa

CRM	Stakeholder	Details	Origin
	Southern Palace (Pty) Ltd	Partial owner and developer of Doornhoek Flourspar Project. Part of the Luxembourg based Eurasian Resources Group	UK
	Minerales y Productos Derivados SA (Minersa)	Jointly owns Vergenoeg fluorite mine	Spain
	South Africa's MEDU Capital	Jointly owns Vergonoeg fluorite mine	South Africa
Flourspar: Processing	**Department of Science and Technology**	Launched the local beneficiation Fluorochemical Expansion Initiative	**South Africa**
	Department of Trade, Industry and Competition	Launched the local beneficiation luorochemical Expansion Initiative	South Africa
	Pelchem SOC Ltd.	Is the sole producer and supplier of fluorochemicals in the Southern Hemisphere	South Africa
	Rare Earth Refiners (RER)	A refinery which exclusively licenses dry fluorination technology developed and patented by Necsa	South Africa
REE: Mining	Frontier Rare Earths Ltd	Developer of Zandkopsdrift	Luxembourg
	KORES – Korean Resource Corporation	Listed on the Toronto stock exchange Acquired a 10 % interest in Zandkopsdrift in 2012	South Korea
	Glenover Pty Ltd	Glenover held the prospecting rights for the Glenover carbonatite complex in a JV with Galileo Resources PLC.	UK
	Galileo Resources PLC	JV partner on Glenover	UK
	Afrimat	Acquired Glenover in 2021	South Africa
	Steenkampskraal Monazite Mine (Pty) Limited	Hold a "new order" mining right for Steenkampkraal till 2030. Owner of Steenkampskraal Monazite Mine (Pty) Ltd.	South Africa
REE: Processing	Industrial Development Corporation	Is undertaking a 'Mine 2 Magnets' value chain prefeasibility study for the manufacturing of rare earth magnets in South Africa.	South Africa
	Mintek	Is undertaking a 'Mine 2 Magnets' value chain prefeasibility study for the manufacturing of rare earth magnets in South Africa.	South Africa
Cobalt: Miners	Anglo American Platinum	Largest PGM miner in South Africa that mines cobalt	South Africa
	Anglo American	Holding company for Anglo American Platinum	UK
	Impala Platinum	Major PGM miner in South Africa that mines cobalt	South Africa

CRM	Stakeholder	Details	Origin
	Sibanye-Stilwater	Major PGM miner in South Africa that mines cobalt	South Africa
	Northam Platinum	Major PGM miner in South Africa that mines cobalt	South Africa
	African Rainbow Minerals	The owner and operator of Nkomati mine that mines cobalt as a by-product.	South Africa
	Norilsk Nickel	A 50% percent shareholder in the Nkomati Nickel mine	Russia
Cobalt: Processing	Sasol	Uses cobalt as a catalyst for its gas-to-liquid process	South Africa
	Mintek	Is undertaking a 'Mine 2 Magnets' value chain pre-feasibility study for the manufacturing of rare earth magnets in South Africa	South Africa
PGM's: Mining	Anglo American Platinum Limited (AMPLATS)	The world's largest primary producer of platinum (±38% of global annual supply)	South Africa
	Impala Platinum Holdings Limited	A holding company that operates mines that produce PGMs, as well as nickel, copper and cobalt.	South Africa
	Sibanye-Stillwater	A major PGM producer in South Africa.	South Africa
	Sedibelo Platinum Mines Ltd (Platinum Limited)	A South African PGM producer with operational assets and reserves (5.8% of SA PGM resources)	South Africa
	African Rainbow Minerals (ARM)	ARM has interests in a wide range of mines, including PGMs, iron, coal, copper, and gold.	South Africa
	Platinum Group Metals Ltd	The operator of the Waterberg Project, an underground palladium and platinum deposit located in South Africa	Canada
	Eastern Platinum Ltd (Eastplats)	A PGM and chrome operating Company with a tailings retreatment operation and projects in development	Canada
	Northham	An integrated PGM producer	South Africa
	Wesiswe Platinum Ltd	A South African public company that intends to enter the PGM market once it completes construction of its PGM mine	South Africa
PGM's: Processing	Impala Refining Services (IRS)	Provides smelting and refining services through offtake agreements with Group companies (except Impala) and third parties.	South Africa
	Tenova Pyromet	Small smelter and furnace refurbishing company	South Africa
PGM's: End users in SA	BMW, Mercedes Benz, Volkswagen, Nissan, Mahindra, Isuzu, Toyota, Ford	Car manufacturers operating in South Africa	Various nations (Germany, Japan, India, USA)

CRM	Stakeholder	Details	Origin
	Department of Trade, Industry and Competition	Responsible for initiatives and policy to support local beneficiation in the South African automotive sector.	South Africa
	Department of Science and Innovation	Part of the South African hydrogen economy stakeholders consortium	South Africa
	South African National Energy Development Institute	Part of the South African hydrogen economy stakeholders consortium	South Africa
	Bambili Energy	Part of the South African hydrogen economy stakeholders consortium	South Africa
	ENGIE	Part of the South African hydrogen economy stakeholders consortium	France
	First Mode, Ballard, NPROXX, Plug Power, ABB, Nel	Various companies involves in AMPLAT's nuGEN project, including engineering consultants, hydrogen storage, fuel cell systems, and automation	Various countries
	AMT Composites, Thermitec, Specialised Moulding	Manufacturers of platinum-catalysed silicone	South Africa
	Omnia	A chemicals company that produces nitric acid	South Africa
	Sasol	An energy company that produces nitric acid and fertilisers	South Africa
	AEL Mining Services	A company that produces explosives	South Africa
	Kynoch, Profert, TRIOMF, Nutri-Flo, Nitrophosk, Jara	Companies that produce fertiliser	South Africa
	Durban Water Recycling (Pty) Ltd,	A local municipality that recycles water	South Africa
	Veolia	A producer of water recycling technologies	France
	Coca Cola Beverages	A beverage company that uses recycled water	USA
	Rustenburg Local Municipality Wastewater Treatment Plant	A water treatment facility	South Africa
	Whirlpool, Defy, Samsung, LG Electronics, HiSEnse, Univa	Consumer electronics companies that produce products in South Africa	Various countries
	South Africa Electrotechnical Export Council (SAEEC)	PPP between government and electrotechnical industry	South Africa

CRM	Stakeholder	Details	Origin
	Swift Heat and Control, Heating elements and Control CC, Thermon Africa, BMR Controls CC	Thermocouple manufacturers	South Africa
	NGK Spark Plugs	Sparkplug manufacturer	South Africa
E-Waste collection, recycling and processing	Africa E-waste	Collection and dismantling of WEEE in Gauteng, 10% from SADC	South Africa
	Bolunga Enterprise	Collection and dismantling of WEEE in the Eastern Cape	South Africa
	Cape E-waste Recyclers	Collection and dismantling of WEEE in the Western Cape	South Africa
	Computer Scrap Recycling	Collection and dismantling of WEEE in the Western Cape	South Africa
	Desco Electronic Recyclers	Collection and dismantling of WEEE in the Gauteng and KZN	South Africa
	Electronic Cemetery EWaste Management	Collection, dismantling and pre-processing in Gauteng, Western Cape and KZN, has contracts with large corporates SOEs and manufacturers	South Africa
	E-waste Africa	Collection and dismantling in KZN	South Africa
	INCA Metals (PTY) Ltd	Collection and preprocessing of lamps in Gauteng, KZN, Western and Eastern Cape	South Africa
	Reclite (PTY) Ltd	Collection and dismantling in the Eastern Cape; scrap metal trading company	South Africa
	SA Precious Metals	Collection and preprocessing of lamps in Gauteng, KZN, Eastern and Western Cape	South Africa
	Sibanye Recycling	Developed a proprietary environmentally friendly fully automated hydrometallurgical solution to process PCBs in South Africa (Only processing company)	South Africa
	SIMS Recycling Solutions LTD	Collection, dismantling and preprocessing in KZN	South Africa
	Sindawonye Granulators and Processors	Collection, dismantling and preprocessing in KZN	South Africa
	SmartMatta	Largest WEEE recycling firm in SA, Collection, dismantling and preprocessing in Gauteng and Eastern Cape Collection in Gauteng, Western Cape and KZN	South Africa
	Tshwane Electronic Waste	Collection and dismantling in Gauteng, Western Cape and KZN	South Africa
	Universal Recycling Company (PTY) LTD	Collection, dismantling and processing in Gauteng; Sources inputs from SA and SADC	South Africa

CRM	Stakeholder	Details	Origin
	Waste Plan LTD	Collection in Gauteng, Western Cape and KZN	South Africa

Table 1: List of CRM recycling operations in SA and state of maturity

Name of company	Location	Commodity recycled	Owner	Degree of maturity
Brits Vanadium Project	North West	Vanadium	Bushveld Minerals	Prospecting
Rietfontein 338JQ Project	North West	Chrome and PGMs	Sukuma Millenium	Prospecting
Roan / Doornpoort Project	North West	Vanadium	Sable Metals & Bushveld Minerals	Prospecting
Tjate Platinum Project	Limpopo	PGMs	Jubilee	Prospecting
Bauba Platinum Project	Limpopo	PGMs	Bauba Resources	Exploration
Hacra Project	North West	PGMs	Sylvania Platinum	Exploration
Kalahari Platinum project	North West	PGMs	Glacier Resources	Exploration
Lesego Platinum Project	Limpopo	PGMs	Lesego Platinum	Exploration
Mareesburg Project	Limpopo	PGMs	East Plats	Exploration
Tamboti Platinum (Pty) Ltd	Mpumalanga	PGMs	African Rainbow Minerals	Exploration
Volspruit Platinum	Limpopo	PGMs	Sylvania Resources	Exploration
Steelpoortdrift Vanadium Project	Limpopo	Vanadium	Vanadium resources	Scoping
Waterberg Platinum Project / Group Metals Waterberg Operations	Mpumalanga	PGMs	Platinum Group Metals	Feasibility

Name of company	Location	Commodity recycled	Owner	Degree of maturity
Grootboom Project	Mpumalanga	PGMs	Last owned by Platmin	On-hold
Highveld Steel & Vanadium	North West	Vanadium	Evraz	On-hold
Onderstepoort Project				On-hold
Rooipoort Platinum Project	Mpumalanga	PGMs and Nickel	Caledonia Mining	On-hold
Smokey Hills Platinum Mine	Limpopo	PGMs	Thunder Platinum	On-hold
Spitzkop Project	Mpumalanga	PGMs	EastPlats	On-hold
Tweespalk Project	North West	PGMs	Platinum Group Metals	On-hold
War Springs Project	Limpopo	PGMs	Platinum Group Metals	On-hold
VanMag Mine	Limpopo	Vanadium	Bushveld Minerals	On-hold
Bakubung Platinum Mining Project	North West	PGMs (platinum, palladium, rhodium), nickel and cobalt by-products	Wesizwe	Development
Platreef project	North West	PGMs	Ivanhoe Mines	Development
Nkwe-Garatau Project	Limpopo	Platinum, Palladium, Rhodium	Zijin	Development
Tivani Iron Ore Project	Limpopo	Vanadium, phosphates	Ferox Minerals	Development
Booysendal	Mpumalanga	iron, steel, aluminium, copper, stainless steel, lead, nickel, brass, tin and bronze	Northham	Operational
Crocodile River Mine	North West	PGMs	Eastplats	Operational
Doornbosch PGM Plant	North West	PGMs	Sylvania Platinum	Operational

Name of company	Location	Commodity recycled	Owner	Degree of maturity
Modikwa Mine	Limpopo	PGMs	African Rainbow Minerals	Operational
Mokopane Vanadium Project	Limpopo	Vanadium	Bushveld Minerals	Operational
Nkomati Mine	Mpumalanga	PGMs, nickel, chrome, cobalt, copper	African Rainbow Minerals	Operational
Pilanesberg Platinum Mine	North West	PGMs	Sedibelo Resources	Operational
Rooderand Project	North West	PGMs	Chrometco	Operational
Siyanda Bakgatla Platinum Mine (Union)	Limpopo	Pt, Rh, Ir, Palladium, Co, Ni	Siyanda Platinum	Operational
Tharisa Platinum Mine	North West	PGMs	Tharisa Minerals	Operational
Vametco Mine	North West	Vanadium	Bushveld Minerals	Operational
Phalaborwa rare earths project	Mpumalanga	Neodymium, praseodymium and dysprosium	Rainbow Rare Earths	Operational
Vanchem Processing Plant	North West	Vanadium	Bushveld Minerals	Operational
Maseve Platinum	North West	PGMs	Royal Bafokeng Platinum	Care and Maintenance
Messina Platinum mines	Limpopo	PGMs	DRA global	Care and Maintenance

Horizon Europe Framework Programme (HORIZON)

D9.3 – SENEGAL case study

WP9 - Task 9.4

Date [15/12/2023]

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Table of Contents

1. Extended Critical Raw Materials (ECRM) supply potential of Senegal 9
1.1. Inventory of the ECRM 9
1.1.1 Geological setting 9
1.1.2 Known Ore deposits and occurrences 10
1.2. Prospectivity and mineral high potential mapping 13
1.2.1 Selection of the ECRM for mineral prospectivity 13
1.2.2 Mineral high potential areas 14
1.3. Ore processing and refining capacities 15
2. Assessment of the ECRM value chain 18
2.1. Characterisation of the value chain for primary and secondary raw materials 18
2.1.1 List of the mining and recycling projects 18
2.1.2 Status of economic links between the formal and informal sectors 22
2.2. Identification of the bottlenecks along the value chain 24
3. Investment/financing prospects for ECRM projects in the Senegal 29
3.1. Fiscal, legislative and regulatory context for in-country financings 29
3.2. Macroeconomic context for in-country financings 57
3.3. Political context for in-country financings 66
4. Assessment of social, environmental, and governance challenges 70
4.1. Country-level assessment and context 70
4.1.1. Mineral/mining policies, industry policies 70
4.1.2. Mining regulations 71
4.1.3. Taxation and royalties 71
4.1.4. Land-use and mineral rights 72

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4.1.5. Environment 72
4.1.6. Societal and community aspects, cultural heritage 73
4.1.7. Public health and safety 74
4.2. Mining practices *vs.* Environmental, Social and Governance (ESG) goals 74
4.2.1 Environmental challenges 74
4.2.2 Socio-economic issues 75
4.2.3 What would be the best practices for a responsible mining? 77
5. Business network between the European Union and Senegal 79
5.1. Assessment of the upstream and downstream business ecosystem 79
5.1.1 Context, formal and informal players 79
5.1.2 Relationships at local or regional levels 80
5.2. Building new B2B relations 80
5.3. Promoting local content and enabling mining cluster actors 80
6. Energy and digital transition: develop a strategy for the EU and Africa Partnership 83
7. Opportunities for responsible investments 86
7.1. Identification of individual exploration, mining and refining projects 86
7.2. ASM sector country profiles 86
Country profiles on ASM sector developments and investment 86

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List of Figures

Figure 1: Synthetic geological map with the location of ECRMs from Senegal 11
Figure 2. Flowchart processes diagram 17
Figure 3. Facilities at a glance 17
Figure 4. Fertilizer manufacturing process 17
Figure 5. Printscreen of the mining cadastre map portal from Senegal 19
Figure 6. Worldwide Governance Indicators (WGI) of Senegal and Africa countries from 2011 to 2021 24
Figure 7: Logistics Performance Index (LPI) of Senegal from 2010 to 2018 25
Figure 8: Policy factors that may influence mining company decisions 26
Figure 9. Historical gross domestic product (GDP) per capita from 2011 to 2021 for Senegal & projected estimations from 2022 to 2030 (Sources: World Data Bank, S&P) 57
Figure 10. Historical and projected nominal GDP and real GDP growth for Senegal (Sources: S&P) 58
Figure 11. Historical and projected real GDP growth of Senegal [%] 58
Figure 12. Distribution of gross domestic product (GDP) of Senegal across economic sectors from 2011 to 2021 [%] (Source: Statista) 58
Figure 13. Foreign direct investment net, net inflows, net outflows from 2013 to 2020 in Senegal 60
Figure 14. Historical official exchange rate in Senegal (CFA per US$, period average) 62
Figure 15. Historical and projected data on inflation indicators in Senegal (S&P Global, 2022) 63
Figure 16. Historical and projected data on public debt and debt/GDP of Senegal (S&P Global, 2022) 64
Figure 17. Historical and projected data on public debt interest payment of Senegal (S&P Global, 2022) 64

List of Tables

Table 1: Main processing units 16
Table 2: Main ECRM occurences and mines 21
Table 3. Proposal of projects to be presented as opportunities for investments in Senegal 86

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Abbreviations and Acronyms

Acronym	Description
AfCFTA	African Continental Free Trade Area
BCEAO	Banque Centrale des Etats de l'Afrique de l'Ouest
BEAC	Banque des États de l'Afrique centrale Bank of Central African States
CEDEAO	Communauté économique des États de l'Afrique de l'Ouest Economic Community of West African States
CIT	Corporate Income Tax
CPI	Consumer Price Index
DBA	Disc-based association
DEEC	Department of the Environment and Classified Establishments
ECOWAS	Economic Community of West African States
ECRM	Extended Critical Raw Materials
EFE	Entreprise Franche d'Exportation Free Export Zone Enterprise
EITI	International Extractives Transparency Initiative
ESG	Environmental, social and governance
FDI	Foreign direct investment
FX	Forex – Foreign Exchange market
GDP	Gross domestic product
HMS	Heavy Mineral Sands
ICCAs	Indigenous and community conserved areas

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IMF	International Monetary Fund
IUCN	International Union for Conservation of Nature
JV	Joint Venture
LDSF	Local Development Support Fund
OHADA	Organisation pour l'Harmonisation en Afrique du Droit des Affaires Organization for the Harmonization of Business Law in Africa
PSE	Plan Senegal Emergent
RF	Random Forest
SGTC	Septies of the General Tax Code
UNESCO	United Nations Educational, Scientific and Cultural Organization
WAEMU	West African Economic and Monetary Union
XOF	West African CFA Franc
ZES	Special Economic Zones

Wording

Mineral prospectivity: "Mineral potential mapping is concerned with quantifying and mapping the likelihood that mineral deposits are present in a study area. It is synonymous to mineral prospectivity mapping, which is concerned with quantifying and mapping the likelihood that mineral deposits may be found by exploration in a study area."

Keywords

ECRM, Mineral potential, Ore processing, Refining capacities, Recycling units, Value chain, Primary raw material, Secondary raw material, Bottlenecks, Finance, Investment, Sustainability, ESG, Land-use, Taxation, Mining regulation, Mining policies, Child labor, Responsible extraction, Senegal, Pan-African

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Executive Summary

This report provides the reader with an overview of the key aspects regarding mineral resources, supporting regulations and institutions, as well as any related provisions in the prospecting of Critical Raw Materials (CRMs) in Senegal. The report is an integral part of the larger AfricaMaVal project and, in that context, provides this country overview specifically aimed at European Union (EU) investors and decision-makers.

AfricaMaVal is focusing on the minerals and metals present in the fourth list of CRMs for the EU as well as on Copper (Cu), Nickel (Ni), Tin (Sn) and Manganese (Mn) that are particularly pertinent considering Africa's geological potential and their critical status in the digital and energy twin transitions. Senegal is host of some of the ECRM as well as P, Ti, Sn, and Cu thus the intended work will look at the availability of these elements. In 2020, the mining sector represented about 6% of State Revenue and contributed 4% to the GDP, as well as accounted for approximately 38% of exports.

The assessment will also include value chain for these critical minerals therefore activities such as exploration, extraction, processing, and recycling will be evaluated. Fiscal regulation as well as the macroeconomic and political context will be scanned to give an overview of the country regime. ESG regulations and challenges will be depicted for the investors to better understand the background and questions to address when it comes to launch activities on the ground. A list of downstream to upstream actors related to the mining sector will assist deciders to build their Business to Business network. This country profile will try to address the needs of the EU green deal according to the country strategies and planifications. Eventually, this report will underline some project opportunities or recommendations.

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- Control Risk for providing the overview on the political context

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1. Extended Critical Raw Materials (ECRM) supply potential of Senegal

1.1. Inventory of the ECRM

1.1.1 Geological setting

Senegal is composed of two major geological entities: **the Mesozoic to Cenozoic sedimentary basin** to the west and **the Paleoproterozoic-Palaeozoic basement** to the east, which is itself divided in two parts, the **Mauritanides belt** which covers the Neoproterozoic to the Palaeozoic and a part of West African craton, the **Birimian domain** starting during the Paleoproterozoic. Thus, the geological history of Senegal reflects a history that began 2.0 Ga ago.

In the Birimian domain, the predominant mafic formations, with associated sedimentary sequences (called the Mako Group) probably record the formation of an oceanic crust toward 2.25-2.20 Ga and therefore the presence of a juvenile Birimian crust produced by mantle extraction. The initiation of a subduction geodynamic context leads to the production of the magmatic suite of Sandikounda-Soukouta, by partial melting of the juvenile oceanic crust. Mostly composed of granodiorite, the suite evolves from migmatitic rocks dated at 2.17 Ga to late sub-spheric plutons dated at 2.14 Ga. Such major diapirism of Eo-eburnean age is the source of peri-plutonic gravity driven deformations that correspond to the earliest tectonic stages. The onset of the silicoclastic Dialé-Dalema basin, at *ca.* 2.1 Ga, reflect a subsequent distensive tectonic stage, followed by a regional N-S shortening between 2.1 and 2.06 Ga. This compressive event is characterized by a transcurrent Eburnean tectonic with an NE-SW axis and synchronous felsic magmatism (suites of Saraya and Boboti). A set of NW-SE and NE-SW conjugate shears are ultimately marking the imprint of a late-Eburnean E-W shortening event.

Postdating the Birimian basement, several generations of Mesoproterozoic to Neoproterozoic dolerite swarms are dated at 1.5 Ga (Noumoufoukha suite), 1.3 Ga (Kédougou suite), 1.15 Ga (Sambarabougou suite) and 1.0-0.8 Ga (Boundou Dioé suite). These suites record the successive steps of incipient extension that will lead to the formation of a large sedimentary basin, represented by the Segou/Madina-Kouta Supergroup.

From Neoproterozoic, the **Mauritanides belt** and its foreland record the south-western extension of the intracontinental Taoudeni Basin. It shows three distinct structural domains with an autochtonous domain which covers and extends the Segou/Madina-Kouta Supergoupe, the parautochtonous and the allochtonous domains. These three domains represent evidence to the arc and back-arc context which prevailed to the West of the Taoudeni Basin and the important effect of the Hercynian orogenesis. During the Palaeozoic time, after deposition of the last autochtonous sedimentary deposits within the Mauritanides belt, only distensive events affect the Eastern part of Senegal. The suite of Bandafassi is

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composed of dykes and sill found to the South-East and to the West (within the Mauritanides belt) and reflects distensive events associated to the opening stages of the Atlantic Ocean during Jurassic time.

Then, **the Mesozoic to Cenozoic sedimentary basin**, also known as the Senegal-Mauritania Basin, is the westernmost and largest marginal basin of West Africa: 340,000 km², 1,400 km from north to south, and 500km in its maximum width at the latitude of Dakar, for its onshore part. Because of the Oligocene to Recent sandy cover, the knowledge concerning the stratigraphy of the basin is mainly based upon data from oil and water exploration drillings. The pre-Mesozoic basement, which slopes gently westward in the onshore part of the basin, is downthrown to the west along a north-south fault. It lies at a supposed average depth of 6,000 m underneath Dakar and at more than 8,000 m under the continental shelf of Casamance. This model becomes more complex southward because of the presence of salt diapirs, which pierce the sedimentary cover of the continental shelf of Casamance. Their upward motion started in early Cretaceous and still continues. The northern part of the basin is affected by horsts and grabens system, delineated by roughly north-south trending faults. This block-faulting and uplift tectonics occurred from the late Cretaceous to the late Miocene.

The sedimentary sequence begins with evaporites, such as halite, gypsum and anhydrite of Triassic to Liassic age. Their deposition apparently coincided with a phase of tholeiitic magma activity. The Jurassic (Callovian to Portlandian) consists of a 2,000 m-thick sequence of carbonates. This stage continued with a higher occurrence of detrital elements up to the late Aptian. From late Aptian to the Lutetian, a more extensive clastic sedimentation occurred in the basin. It is represented by fine argillaceous and organic matter-bearing deposits from Albian to Turonian, and by chemical to biochemical deposits since the Paleocene.

After this phase, which represents the major tectonic episode in the history of the basin, and the general withdrawal of the sea, which only locally remained in the Casamance Gulf, the Senegal Basin experienced an essentially continental evolution, from the late Eocene to the Present. Such evolution is characterized by an intense ferralitic weathering and by volcanic events, which occurred in the Cap-Vert area, with two climaxes in the Miocene and Quaternary.

The Miocene volcanism is represented by numerous small and scattered occurrences of alkaline and strongly undersaturated lavas. The Quaternary volcanism, which is confined to the head of the Cap-Vert peninsula, consists of a main complex volcanic edifice, the Mamelles volcano, of minor adjacent vents and of several sets of flows and tuffs, which are interbedded among generally azoic aquiferous sands.

1.1.2 Known Ore deposits and occurrences

Among the 34 raw materials assessed as ECRM by the EU in the new list of 2023, 13 ECRMs have been identified to varying degrees in Senegal (Figure 1) and, except P and Ti commodities, they are all located in the eastern part of Senegal in the Paleoproterozoic-Palaeozoic basement. The identified ECRMs are briefly described below, in order of importance:

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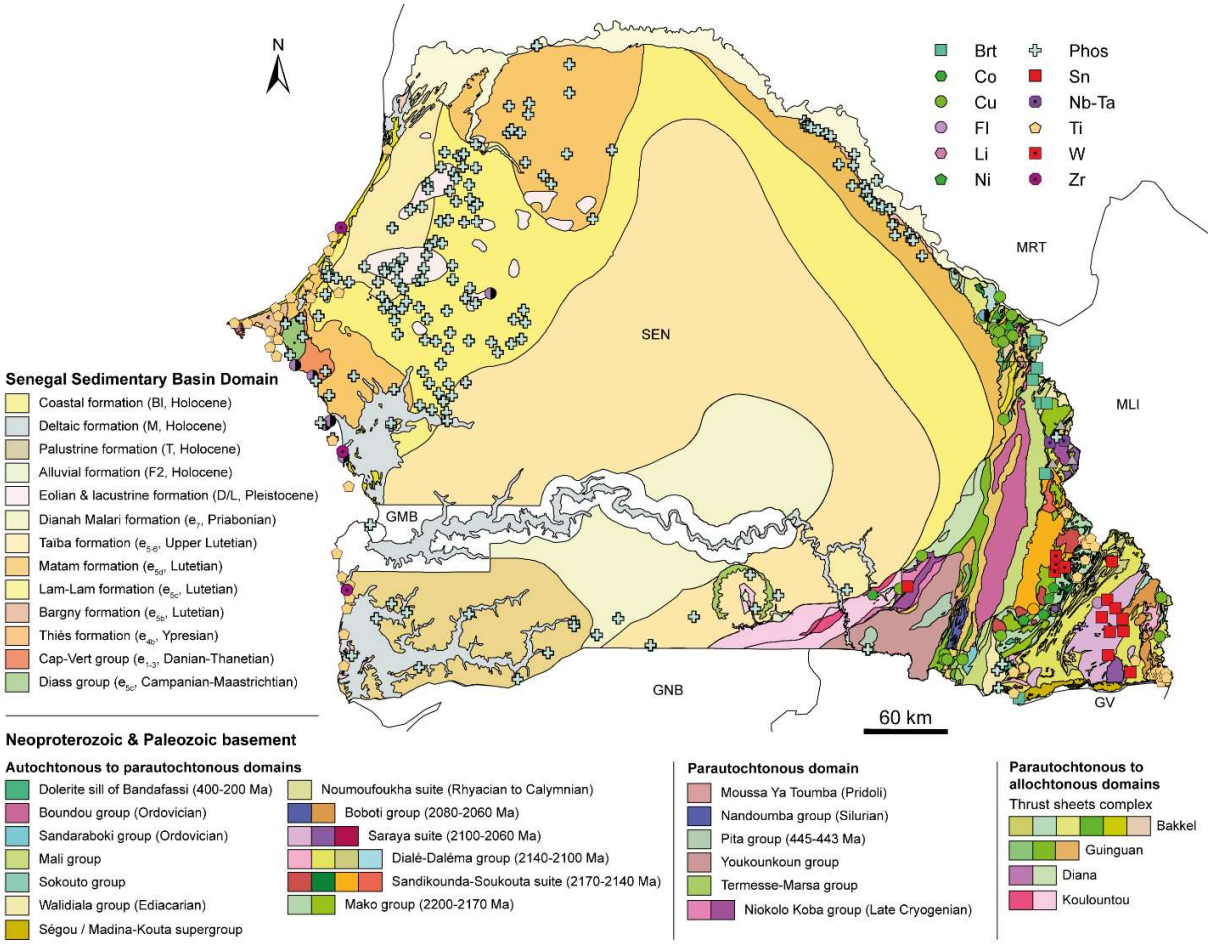

Figure 1: Synthetic geological map with the location of ECRMs from Senegal

- **The currently most important two ECRMs, with active mines:**

  Phosphate rock / phosphorus – P: One hundred sixty eight (**168**) phosphates occurrences are identified, **including 4 active industrial mines and ten of deposits**. Phosphate is the main ECRM located in Senegal, and only contains sedimentary phosphates, both Ca-phosphates (primary, altered, reworked or residual origin) and either Al-phosphates. Stratigraphically, phosphates are mainly located in the Eocene of the Senegalese sedimentary basin (340,000 km²) where the 4 active mine are located in 2023. In this basin, the deposits are not outcropping but generally located under 10 to 40 m of post-Eocene sandy-clay cover. There are some indications of sedimentary phosphates in the Miocene, in Casamance, but located at depth and without economic interest. The paleogeography of the basin, in the Paleogene, constitutes a geological context favorable to the genesis of phosphate during the Eocene and to the formation of deposits of economic interest. It is also important to note

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that some phosphates occurrences are located in the Neoproterozoic of eastern Senegal (Namel phosphates, near Kédougou).

Titanium and zirconium (heavy sands with ilmenite, leucoxene and rutile) – Ti-Zr: Sixty-two (**62**) occurrences are identified, **including one active industrial mine and several artisanal small-scale mines**. Significant heavy mineral deposits are focussed in the area of Mboro, Fass Boye, Diogo and Lompoul over a distance exceeding 50 km. The Atlantic Grande Côte area of north-west Senegal comprises an assemblage of marine sands remaining after the sea retreated in recent times. The prevailing weather is from the northwest and this has contributed to the formation of a normal fore dune system and a series of high aeolian – mobile dunes, which trend north-west and extend inland for up to 4.5 km from the beach. Within the limits of previous reconnaissance drilling, there are other deposits, both to the south-west and north-east for a total strike length drilled of 80 km. There is potential for additional deposits beyond the limits of present drilling.

- **Relative numerous ECRM occurrences, but currently no deposits:**

Copper – Cu: Thirty three (**33**) occurrences, including 16 occurrences where Cu is secondarily associated to Cr, Ni, Au and base metals, are identified. They are mainly located in the Bakel area near the border of Mauritania/Mali, and in the lesser extent near the Salémata near the border of Guinea.

Tin – Sn: Twenty five (**25**) occurrences are identified, and they are mainly located in the Saraya area near the border of Mali, and in the Niokolo Koba national park toward the Mesozoic to Cenozoic sedimentary basin.

- **ECRM with currently few occurrences:**

Barite – Ba: Eleven (**11**) occurrences, including one occurrence where Ba is secondarily associated to marble, are identified, and they are mainly located in the Kidira area near the border of Mauritania/Mali.

Tungsten – W: Eleven (**11**) occurrences, including 5 occurrences where W is secondarily associated to gold, are identified, and they are located along an axis between Sabodala and Tonboronkoto.

Niobium-Tantalum – Nb-Ta: Nine (**9**) occurrences are identified, and they are mainly located in the Saraya-Kédougou near the border of Guinea/Mali.

Lithium – Li: Four (**4**) occurrences are identified in Senegal, and they are located in the Saraya area.

Nickel – Ni: Six (**6**) occurrences, including 3 occurrences where Ni is a co-product of gold and cobalt, are identified in Senegal, in the Makana area.

Cobalt – Co: Only one occurrence is identified in Senegal.

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1.2. Prospectivity and mineral high potential mapping

1.2.1 Selection of the ECRM for mineral prospectivity

Among the 13 ECRMs present in Senegal, **only 4 ECRMs** were selected for mineral prospectivity mapping (MPM): **P, Ti, Cu and Sn**. The choice of this four commodities was constrained by the dataset, as it needs at the very least more than 10 occurrences for a given ECRM to perform a correct prediction. The MPM was performed using the Disc-based association (DBA) grid method coupled to Random Forest (RF) method (see Vella, 2022). This method focus on the local spatial associations of geological variables and features of various natures to describe the relationships between the predictors and the mineralization. This allows the identification of geological environments in the study area around each node of the DBA grid, and the integration of both quantitative and non-quantitative spatial data, such as geophysical anomaly maps and location of geological map units, respectively. Then, RF classification is used here to perform a generalization of complex geological environments and features and evaluate their likelihood to host potential mineralization occurrences by giving a score comprised between 0 (low potential) and 1 (high potential). In Senegal, the data used for MPM are:

For phosphate rock / phosphorus (P):

- Geological maps at 1/200000 scale from PASMI mapping project: Saint-Louis – Dagana and Podor – Saldé (Duvail et al., 2009) and Matam – Semme (Roger et al., 2009);
- SIGAfrique mining database.

For Ti, Cu and Sn commodities:

- Geological maps at 1/200000 scale from SYSMIN mapping project: Bakel Semme Sud-Ouest (Fullgraf et al., 2010b), Tambacounda Dalafi Ouest (Buscail et al., 2010), Kossanto Dalafi Est (Goujou et al., 2010), Linkering/Kolda Kedougou Ouest (Fullgraf et al., 2010a) and Saraya Kedougou Est (Delor et al., 2010);
- Analytical signal from airborne magnetic survey (geophysical data sets from Senegal have been acquired in the frame of the SYSMIN program financed by the EU in 2007 by Fugro, see technical details in Diene et al. (2015));
- Ternary K–Th–U radiometric map (red–green–blue additive chromatic combination applied point by point for the three radiometric measurements) from radiometric survey (see technical details in Diene et al. (2015));
- Mining databases (SIGAfrique database, SYSMIN database and SPGlobal database).

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The DBA grid for predictive modelling is mainly defined by **five parameters**:

- Size of cell – d;
- Search radius for lithologies – R;
- R/d ratio,
- Search radius for mineral occurrences – R_1. It can be null, in this case the search radius will be restricted to the cell size (d)
- Search radius for faults – R_2. It can be null, in this case the search radius will be restricted to the cell size (d) or it can take into account the cumulative length of faults present in the cell size (d).

In order to maximize the grid resolution while minimizing overlaps and cells with only on lithology, the parameters of DBA grid for **P, Ti, Cu and Sn** commodities used in this study are as follows: d = ~ 1333 m, R = 4000 m, R/d = 3, R_1 = 4000 m, R_2 = null (the size of cell was preferred).

1.2.2 Mineral high potential areas

Mineral high potential areas were highlighted for the four studied ECRMs in Senegal. The criteria allowing the assessment of DBA-RF modelling can be found in the table below. All the favorability maps can be found in the Appendix 1.2_MPM_SENEGAL.

	TN	FN	FP	TP	TPR	FPR	PPA (%)	Precision (%)	Accuracy (%)	J-score	Treshold
P	13182	120	2690	607	0.835	0.169	19.9	18.4	83.1	0.665	0.427
Ti	16127	4	893	290	0.986	0.052	6.8	24.5	94.8	0.934	0.447
Cu	15595	37	1036	646	0.946	0.062	9.7	38.4	93.8	0.884	0.440
Sn	13840	15	2908	551	0.973	0.174	20.0	15.9	83.1	0.800	0.435

Notes: *True Positive (TP) and True Negative (TN) correspond to the number of grid cells which are correctly predicted by the RF model (i.e. mineralized and non-mineralized cells, respectively). Inversely, False Positive (FP) and False Negative (FN) correspond to the number of grid cells which are incorrectly predicted by the RF model (i.e. mineralized instead of non-mineralized cells and non-mineralized instead of mineralized cells, respectively).* ***FP could correspond to mineral high potential areas****. True positive rate (TPR), also called "Recall", correspond to TP/(TP+FN), False positive rate (FPR) correspond to FP/(FP+TN), Percentage of prospective area (PPA) correspond to (TP+FP)/All, Precision correspond to TP/(TP+FP), Accuracy correspond to (TP+TN)/All and J-score correspond to TPR – FPR.*

Phosphate rock / phosphorus – P: The favorability map of P (APPENDIX_1.2_MPM_SENEGAL) produced by the DBA-RF model display **large mineral high potential areas**, mainly (1) to the NE part of Mesozoic to Cenozoic sedimentary basin from Semmé to Aéré Lao along the NW-SE oriented border of Mauritania and to the NE part of Mesozoic to Cenozoic sedimentary basin around Yaré Lao and between the lake of Guier and the Dimat region. According to the RF, the most favorable lithology in the studied area is unsurprisingly **the Matam formation** (i.e., limestones, marls and laminated yellow ocher clays with

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attapulgite, fossiliferous and with phosphate horizons) of Ypresian-Lutetian age. The DBA-RF model has an accuracy of ~83 % and indicates that about 19.9 % of the studied area can be prospected for discovering new P deposits.

Titanium – Ti: The favorability map of Ti (APPENDIX_1.2_MPM_SENEGAL) produced by the DBA-RF model display **two mineral high potential areas**, (1) to the SE part of Paleoproterozoic-Palaeozoic basement from Kossanto to Kéniékéniébanding and around Dalafing and Guémédji close to the border of Mali. According to the RF, the most favorable lithologies in the studied area are **sandstones and grauwackes** (BDd-gws and BDd-gw) **from the Dialé-Daléma group** (2140-2100 Ma) **and gabbro and microgabbro bodies from the Sandikounda-Sokouta suite** (2170-2140 Ma). The DBA-RF model has an accuracy of ~95 % and indicates that about 6.8 % of the studied area can be prospected for discovering new Ti deposits.

Copper – Cu: The favorability map of Cu (APPENDIX_1.2_MPM_SENEGAL) produced by the DBA-RF model display **four mineral high potential areas**, (1) to the northern part of Paleoproterozoic-Palaeozoic basement near Bakel close to the border of Mauritania/Mali, (2) to the southern part around Salémata, Bandafassi and Kanéméré and (3) to the east of Saraya very close to the border of Mali. According to the RF, the most favorable predictors and lithological environments in the studied area are magnetic analytical signal (i.e., likely mafic lithologies), the tectonic mélange (MMr-Tr) from the Marsa-Termesse group (i.e., diamictite, grauwacke, silexite and rare mafic breccia) and heterogranular deltaic to river sandstone with conglomeratic channels from the Walidiala group. The DBA-RF model has an accuracy of ~94 % and indicates that about 9.7 % of the studied area can be prospected for discovering new Cu deposits.

Tin – Sn: The favorability map of Sn (APPENDIX_1.2_MPM_SENEGAL) produced by the DBA-RF model display **one large and three small mineral high potential areas**, (1) to the SE part of Paleoproterozoic-Palaeozoic basement around Saraya close to the border of Mali, (2) to the SW part of Paleoproterozoic-Palaeozoic basement toward east and west of Salémata and near Linkéring close to sedimentary basin. According to the RF, the most favorable predictors and lithological environments in the studied area are radiometric analytical signal (i.e., likely granitoids), grauwackes from the Dialé-Daléma group (BDd-gw), siltstone and greywacke with acid tuffite intercalations and rare polygenic breccias (MMa3) from the Mali group and silexite, grauwacke and arkose from the Termesse group (MTr3). The DBA-RF model has an accuracy of ~83 % and indicates that about 20 % of the studied area can be prospected for discovering new Sn deposits.

1.3. Ore processing and refining capacities

Processing units in Senegal are very limited and only focus on Phosphate rocks dedicated to phosphoric acid (Figure 2, Figure 3, Figure 4).

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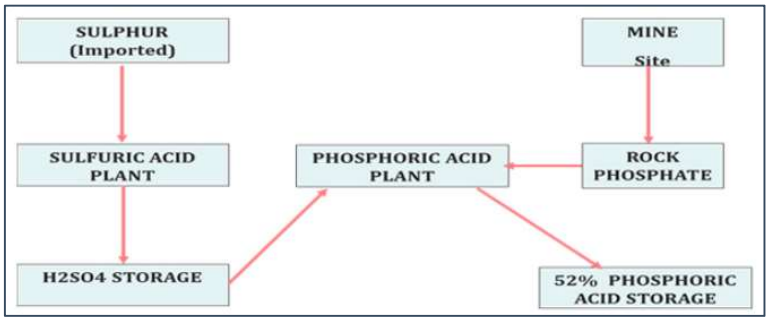
Name processing entity	Processing Facility	Status	ECRM	Owner	Operator	Products	Capa-city
Darou I and Darou II Plant	Plant	Assumed Active	Phosphate rock	JV Indorama [78%] - Industries Chimiques Du Senegal	Industries Chimiques du Sénégal Group	Phospho-ric acid, P2O5	660 000 mt/y
Facilities at Allou-Kagne	Plant	Assumed Active	Phosphate rock		Senegalaise de Phosphates de Thies S.A.	Phosphate rock	
Facilities at Lam Lam	Plant	Assumed Active	Phosphate rock		Senegalaise de Phosphates de Thies S.A.	Phosphate rock	
Facilities at Sebikhotane	Plant	Assumed Active	Phosphate rock		Senegalaise de Phosphates de Thies S.A.	Phosphate rock	

Table 1: Main processing units[1]

Industries Chimiques Du Senegal is the largest producer of phosphate fertilizers in Sub-Saharan Africa and has the biggest industrial complex in Senegal, with three sites in operation. One of the sites is the Taiba mine, located around 100 Km. of Dakar, which counts with extensive reserves of high quality phosphate.

The main processing sites owned by Industries Chimiques Du Senegal (in JV with Indorama Corporation 78 %) are Darou I and Darou II. The phosphate is transformed into phosphoric acid. Subsequently, 10% of the phosphoric acid production is transformed into fertilizer and sold on the local market and 90% is exported to India on behalf of Indorama. The phosphoric acid produced is a 52% commercial grade suitable for industrial use and is exported mainly to Indian fertilizer manufacturers.



[1] USGS 2018 Minerals Yearbook, Vol. III, Senegal Country Chapter, Table 2

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Figure 2. Flowchart processes diagram[2]

DAROU 1	DAROU 2
Commissioning : 1984	Commissioning : 2001
Engineering : KREBS and Cie.	Engineering : KREBS-SPEICHIM / TECHNIP
Nominal Capacity : 300,000 Tons P2O5 / year	Nominal Capacity : 300,000 Tons P2O5/year
1 Sulphuric plant. Capacity : 3000 tH2SO4/day	1 Sulphuric plant. Capacity : 3000 tH2SO4/day
1 Phosphoric plant. Capacity : 1015 tP2O5/day. • 3 stream single effect evaporators.	1 Phosphoric plant. Capacity : 1015 tP2O5 / day • 2 Stream single effect evaporators
1 Utility plant with 2 turbo Generators	1 Utility plant with 1 turbo Generator

Figure 3. Facilities at a glance[3]

INDUSTRIES CHIMIQUES DU SENEGAL is also running a fertilizer-manufacturing unit at the MBAO site, 18kms from Dakar.

DAP/NPK manufacturing process consists of

1. Pre-neutralization
2. Granulation
3. Drying
4. Screening and crushing
5. Final screening, Product cooling
6. Coating and storage
7. Scrubbing system
8. De-dusting system

Figure 4. Fertilizer manufacturing process[4]

[2] Source: Acid plant | Overview of Acid Plant | Acid based Products| Indorama Corporations (ics.sn)
[3] Source: Acid plant | Overview of Acid Plant | Acid based Products| Indorama Corporations (ics.sn)
[4] Source: Manufacturing process of Fertilizers | Acid Storage Ponds | Indorama Corporations (ics.sn)

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2. Assessment of the ECRM value chain

The development of the ECRM value chain in Senegal is very limited due to the historical preference of exporting raw materials. Very few factories and industries are able to utilize local ECRMs due to the limited number of mines that produce them, particularly for the local market.

2.1. Characterisation of the value chain for primary and secondary raw materials

The minerals industry value chain is a series of industrial processing steps that adds value, both in terms of economy and usability from the discovery of valuable minerals to delivery to market as final products. These steps include mineral exploration, first-stage mineral processing, advanced stage mineral processing, product manufacturing, product marketing, and product end-of-life recycling. Each stage represents a value-add on the previous and there are opportunities to invest at each of the major stages. The mineral industry value chain is dynamic and shifts according to commodity market, which is influenced by supply and demand, price fluctuations, changing market structures, jurisdiction, and environmental concerns. An understanding of the mineral industry value chain is important for the effective management and optimization of each stage of the value chain ensuring the smooth flow of materials, maximizing resource utilization, and meeting market demand efficiently

2.1.1 List of the mining and recycling projects

Mining projects: most of the mining project are either located in the Eocene of the Senegalese sedimentary basin (phosphate rocks and titanium) or the Precambrian basement (lithium, copper). See Senegal Mining Cadastre Map Portal (cadastreminiersenegal.sn, Figure 5).

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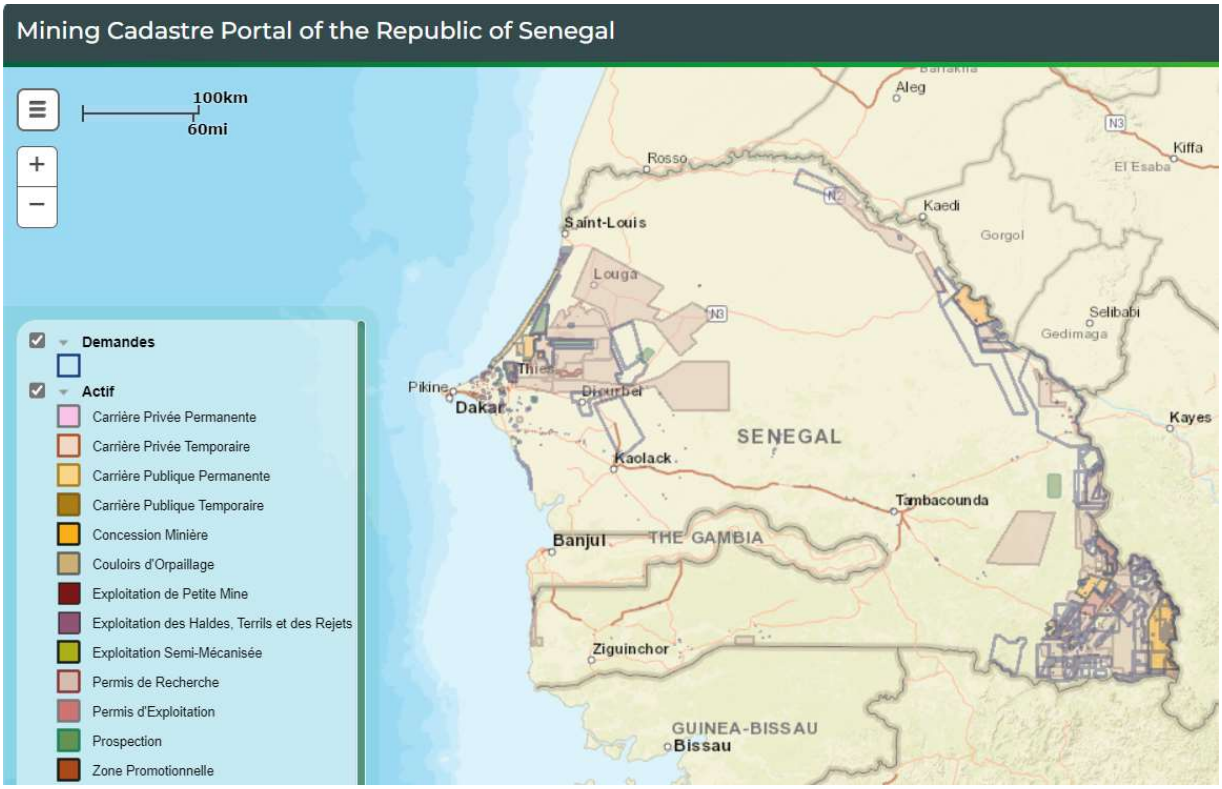

Figure 5. Printscreen of the mining cadastre map portal from Senegal[5]

Most of the biggest mining project in Senegal are related to the Birimian craton and dedicated to gold deposits as the Sabodala Gold Mine and the Massawa Gold Project). However, one of the biggest project dedicated to HMS is located on the western coast:

-**Grande Côte Mineral Sands Project**: Operated by mineral sands company Base Resources, the Grande Côte project is focused on extracting **mineral sands**, including ilmenite, rutile, and zircon, along the Senegalese coast.

Exploration projects: several mining exploration projects are underway in Senegal, particularly in the gold sector. Few research licences are underway as Toubatoul, Ndindy, Orkadiere, Thilogne or Kebemer (mainly dedicated to Phosphate rocks).

No	ECRM	Name of Permit or Mine	Development Stage
1	Copper	BAMBADJI	Exploration / Research Permit
		DIAMBA NORD	Exploration / Research Permit
		GUETHIE	Exploration / Research Permit

[5] source: Senegal Mining Cadastre Map Portal – Trimble Landfolio (cadastreminiersenegal.sn)

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		Several other occurrences	Geological occurrences
2	Lithium	ILYMALO	ASM
		SARAYA	Exploration / Research Permit
		FODE BINEYA	Exploration / Research Permit
		MAYO	Exploration / Research Permit
		SALAMATA	Exploration / Research Permit
		BARABERI	Exploration / Research Permit
		SUD SARAYA	Exploration / Research Permit
		LANDIENI	Exploration / Research Permit
		MISSIRAH SIRIMANA	Exploration / Research Permit
		FARABA	Exploration / Research Permit
		BARIBERIE 1	Exploration / Research Permit
		Several other occurrences	Geological occurrences
3	Magnesium	KANEL	Exploration
		Several other occurrences	Geological occurrences
4	Manganese	KENIEBA south / MEDINA FOULBE	ASM
		GATHIARY	ASM
		SADATOU	Exploration / Research Permit
		DIOMBALOU	Exploration / Research Permit
		DIOUBELA	Exploration / Research Permit
		KENIEBA	Exploration / Research Permit
		Several occurrences	Geological occurrence
		Several other occurrences	Geological occurrences
5	Phosphate rock (P_2O_5)	TAÏBA-TOBÈNE	Mining Concession
		DIENDOURI OUALI DIALA	Mining Concession
		GADDE BISSIK	Exploitation
		BEGAL - BAITI	Exploitation
		LOBE SW NDENDOURI	ASM
		PETITE MINE (LAM-LAM DEPOSIT)	ASM
		AOURE	ASM
		SINTHIOU BAMAMBE	ASM
		THILOGNE	ASM
		TOUBATOUL	Exploration / Research Permit
		NDINDY	Exploration / Research Permit
		ORKADIERE	Exploration / Research Permit

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		KEBEMER	Exploration / Research Permit
		THILOGNE	Exploration / Research Permit
		COKI	Exploration / Research Permit
		KOLDA	Exploration / Research Permit
		NIAKHENE	Exploration / Research Permit
		AINOUMANE	Exploration / Research Permit
		SADIO	Exploration / Research Permit
		MATAM NORD	Exploration / Research Permit
		SUD KANEL	Exploration / Research Permit
		LAMBAYE	Exploration / Research Permit
		GOSSAS	Exploration / Research Permit
		KEUR SAMBA KANE	Exploration / Research Permit
		CHERIF LO-NGAKHAM	Exploration / Research Permit
		NDIOB	Exploration / Research Permit
		TOUBA MERINA	Exploration / Research Permit
		OUROSSOGUI	Exploration / Research Permit
		THILOGNE	Exploration / Research Permit
		NGADIAWANE	Exploration / Research Permit
		MONT ROLLAND	Exploration / Research Permit
		PEKESSE	Exploration / Research Permit
		KOUL	Exploration / Research Permit
		PEKESSE	Prospecting Authorization
		KABE GAYE	Prospecting Authorization
		DODEL	Prospecting Authorization
		Several other occurrences	Geological occurrences
6	Phosphate (phosphoric acid)	DAROU 1 AND DAROU 2	Processing unit
7	Titanium (HMS)	GRANDE COTE MDL DIOGO	Mining Concession
		SUD SAINT- LYESS	ASM
		NIAFRANG	ASM
		G-SAND SARL	ASM
		KAYAR SUD	Exploration / Research Permit
		THIEPPE	Exploration / Research Permit
		SEN-HMC MINING SUARL	Exploration / Research Permit

Table 2: Main ECRM occurences and mines

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ASM projects: In Senegal, ASM mainly focusses on gold. There are few new born activities around ECRM (Ti, Mn, Li, and P).

Recycling projects: Only one recycling activity had been found related to E-waste collection, sorting, pre-treatment operated by SetTIC since 2013 (type of input waste: WEEE: ICT equipment, lamps, cables solar panel, lead acid batteries, lithium Ion batteries, mix wastes from offices, plastic, paper, soiled waste, organic waste). Around 250 tons collected and processed through manual dismantling, manual sorting, shredder, pelletizer (but no end-processing activities).

2.1.2 Status of economic links between the formal and informal sectors

The informal sector is defined as all production units; industry, retail and services, that are not registered at the Chamber of Commerce and do not apply labour laws (Guha-Khasnobis et. Al 2007:47).

The growth of the Senegalese informal sector, leading to the current situation, emerged in the 1970s when reduced agricultural returns resulted in lower profitability and fewer investments in the sector. This economic backlash combined with a rapidly rising inflation caused economic recession. The oil shock of 1974 added to the series of external shocks hitting the economy. Increased official unemployment more or less forced people into unofficial businesses, escaping taxation and regulatory delays.

The situation worsened during the 80s due to among other things severe drought contributing to further deterioration of economic conditions. A previously rather hopeful economic development with increasing trade resulting in an inflow of foreign capital was now overshadowed by a steadily increasing informal sector conquering the trade sector. This resulted in a structural adjustment program initiated by the World Bank and the IMF in striving to take the official economy onto the right track again. Trade was liberalized and privatization became more accepted. The most recent reform is a decentralization of the financial system. By the time these reforms came into force, the situation had already caused a large distortion of the market. Especially the trade sector had been severely hit, resulting in deprived international competitiveness. Meanwhile, the informal sector kept growing. In 2000 it counted for as much as 43% of GDP (Brautigam et al. 2008[6], Sigrid Colnerud Granström).

In Senegal, as in most African countries, the informal sector is large and employs an important segment of the population; therefore, improving its contribution to the economy is essential to growth. Nowadays, the informal sector produces more than half of the country's total economic output and accounts for three-quarters of total employment. In particular, it provides a major source of employment for youth and women, since entry is generally easier than in the formal labor market, while the incomes are always lower.

[6] Brautigam D., O-H. Fjeldstad, M. Moore. 2008. Taxation and State-Building in Developing Countries: Capacity and Consent. Cambridge University Press

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The mining sector in Senegal, like in many other countries, exhibits a complex interplay between formal and informal components. The formal sector typically involves large-scale, regulated mining operations, often conducted by established companies with adherence to legal and regulatory frameworks. On the other hand, the informal sector comprises small-scale and often unauthorized mining activities, conducted by individuals or small groups outside the formal regulatory structures.

The informal sector is composed of relatively small, short-lived production units with rather low levels of human, physical and financial capital. Contracts are unsatisfactory and wages are inefficiently low. Still, the number of people employed is large and increasing, indicating that the informal sector economy is a basic component of the Senegalese economy.

Here are some of the economic links and interactions between the formal and informal sectors in the Senegalese mining industry:

- **Resource Access**:

Formal Sector: Large-scale mining operations often have exclusive access to specific mining sites granted through legal agreements with the government.

Informal Sector: Artisanal and small-scale miners can operate in areas adjacent to or overlapping with formal mining concessions. The informal sector is often driven by individuals seeking livelihoods and economic opportunities.

- **Labor Market Dynamics**:

Formal Sector: Formal mining companies employ a significant workforce, including skilled professionals and laborers.

Informal Sector: The informal mining sector can absorb workers who may not have access to formal employment opportunities. This includes individuals who engage in artisanal mining activities independently or in small groups.

- **Market Dynamics**:

Formal Sector: Minerals extracted from formal mining operations are typically sold through legal channels and contribute to the national economy through taxes and royalties.

Informal Sector: Artisanal miners may sell their produce through informal or illegal channels, which can result in revenue leakage for the government. This informal trade may also involve smuggling and evasion of regulatory frameworks.

- **Environmental and Social Impacts**:

Formal Sector: Large-scale mining operations are subject to environmental and social impact assessments and regulations.

Informal Sector: Artisanal mining, if not regulated, can lead to environmental degradation and pose social challenges. Efforts to formalize or regulate the informal sector aim to address these issues.

- **Government Revenue and Regulation**:

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Formal Sector: The government collects revenue through taxes, royalties, and other fees from formal mining activities.
Informal Sector: Efforts to regulate or formalize the informal sector aim to bring it under the purview of government regulation, ensuring that economic benefits contribute to national development.

2.2. Identification of the bottlenecks along the value chain

The identified bottlenecks during this project have been compiled from data from the World Bank and the Fraser Institute through several pertinent and scored indicators, as following:

- Two criteria from "Worldwide Governance Indicators (WGI)": the government effectiveness and the control of corruption (Figure 6). In light of these, Senegal has considerably increased its Government Effectiveness and improved the control of corruption from 2011-2021 (unavailable data from 2023), and is largely above the average from North and Sub-Saharan Africa countries.

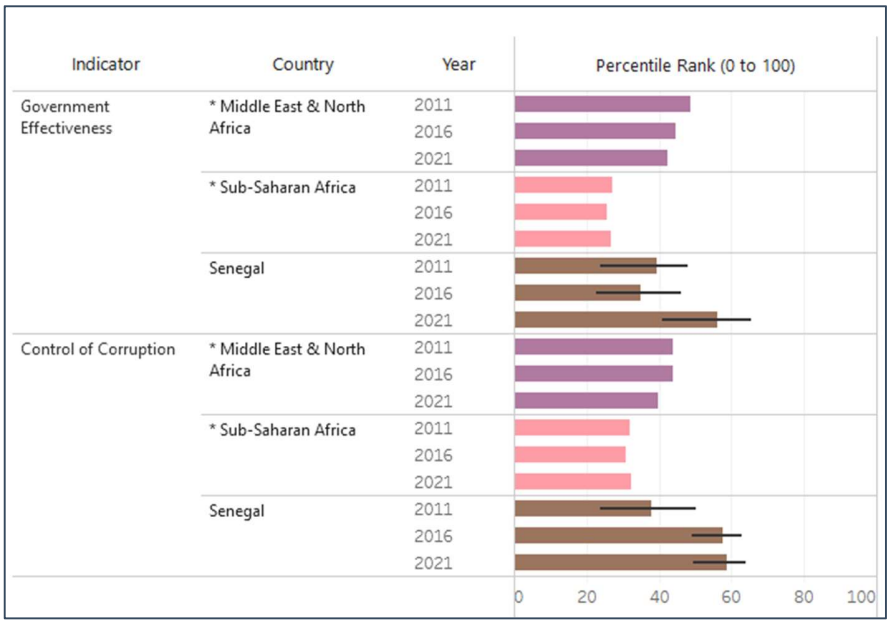

Figure 6. Worldwide Governance Indicators (WGI) of Senegal and Africa countries from 2011 to 2021[7]

- Six criteria forming the "Logistics Performance Index (LPI)": the Timeliness, the Tracking and tracing, Logistics competence, International shipments, Infrastructure and Customs (Figure 7). From 2010 to 2018, we can observe a clear decrease of the logistics performance according to all criteria **that may consist bottlenecks** as the logistic is important to export commodities.

[7] https://www.worldbank.org/en/publication/worldwide-governance-indicators/interactive-data-access

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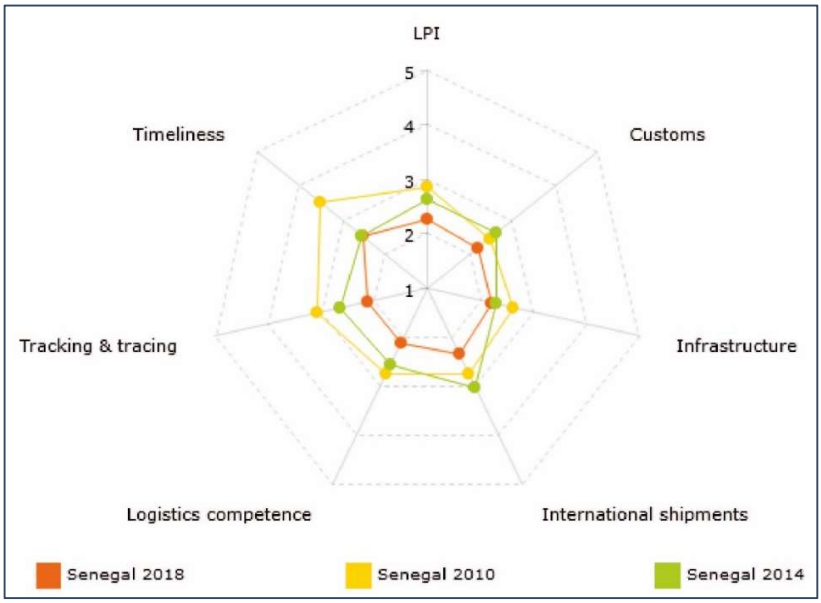

Figure 7: Logistics Performance Index (LPI) of Senegal from 2010 to 2018[8]

- Figure 8 is the result of the annual survey of 2021 from the Fraser Institute which collect the opinions of managers and executives in mining sector about the level of investment barriers that they are confronted. This survey indicates how each of the 15 policy factors below influenced company decisions to invest in various jurisdictions. In light of this survey, we can observe that the only one policy factor that **clearly appears deterrent for investment is the "Infrastructures"**, which is in agreement with LPI (Figure 7). Others policy factors to monitor and that can be represented bottlenecks are the **poor quality of the geological database** and **the lack of labor/skills**. The political stability is also a factor to monitor, as the new presidential elections are approaching and **the political atmosphere is tense**.

[8] https://www.worldbank.org/en/publication/worldwide-governance-indicators/interactive-data-access)

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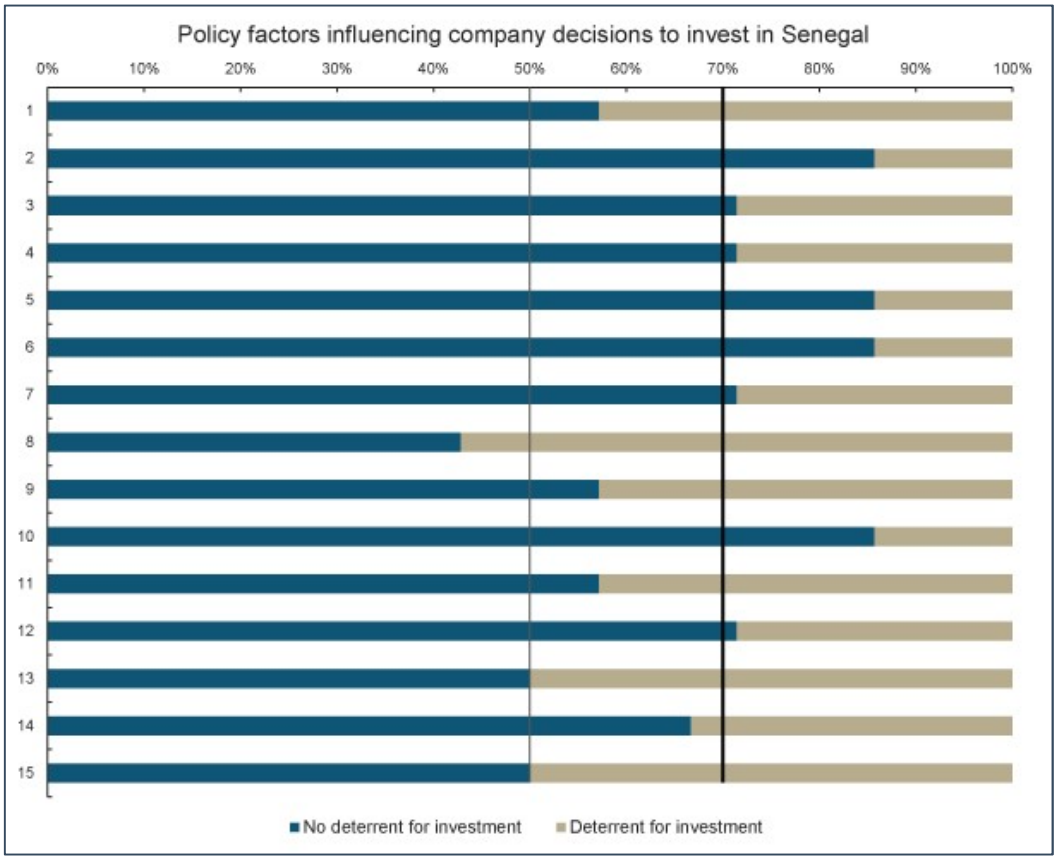

Figure 8: Policy factors that may influence mining company decisions[9]

Infrastructure[10]

Senegal has had a privileged position compared to its neighbors with regard to transit, trade, external markets, and political stability. With an economy heavily focused on international markets—in particular trade and tourism—Senegal is highly competitive compared to other African countries. The costs of exporting and importing are considerably lower than in other coastal countries in the region, but significant progress is still needed to achieve the average international competitiveness of developing countries in general. Senegal's main road corridor runs from Dakar to Bamako, bordering Mauritania. The modernization of the country's one main port and airport, both at Dakar, has improved the subregion's

[9] List of the policy factors: (1) Uncertainty concerning the administration, interpretation, or enforcement of existing regulations; (2) Uncertainty concerning environmental regulations; (3) Regulatory duplication and inconsistencies; (4) Legal; (5) Taxation regime; (6) Uncertainty concerning disputed land claims; (7) Uncertainty concerning what areas must be protected; (8) Infrastructures; (9) Socioeconomic agreements/community development conditions; (10) Trade barriers; (11) Political stability; (12) Labor regulations/employment agreements and labor militancy/work disruptions; (13) Quality of the geological database; (14) Level of security; (15) Availability of labor/skills.

[10] AICD, June 2011

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access to international markets. A major power line connects the northern part of the country, and projects are under way to bring power to the south. A fixed transmission network covers the northern and southern parts of Senegal, but there are no major developments in the central part.

Roads

The existing network of 18,063 km of roads is adequate to provide basic regional, national, and international connectivity, linking Dakar to international border crossings and provincial capitals in the interior. , Despite the relatively poor conditions of the road network due to deferred maintenance, less than one-third of Senegal's firms identify transport services as a major constraint for doing business. Senegal's Logistics Performance Index (LPI), at 2.86, is above the regional average of 2.46. In 2008, Senegal established a sound system for funding road maintenance by adopting a second-generation road fund, FERA (Fonds d'Entretien Routier Autonome) and creating the AATT (Agence Autonome des Travaux Routiers). However, Senegal has complex issues to tackle regarding the provision of rural road accessibility

Rail

Senegal has a binational railway line (between Dakar and Bamako), jointly owned with Mali, which is part of one of the main West African transport corridors. The Dakar-Bamako railway, which was the prime mode of transport during colonial times, could easily compete as a more economical means of transport than road. Senegal's rail transport, if successfully rehabilitated, could offer the best long-haul transport to and from Bamako. However, the dilapidated tracks and outdated rolling stock together with the critical financing situation of TRANSRAIL are the two major problems that need to be urgently addressed in Senegal's railway sector.

Ports

The overall safety of maritime traffic improved significantly in the early 2000s, with the adoption of an updated maritime code and improvements in navigation and signaling equipment at the ports of Dakar, Kaolack, and Ziguinchor. The Port of Dakar is by far the most important port in Senegal and one of the most important ports in West Africa. Its traffic increased by over 300 percent between 1995 and 2005. The involvement of the private sector has improved the financial viability of the Port of Dakar—handling costs have fallen substantially, particularly due to thereduction of dwell times in the port. Time to export and import is just one-third of the level of other Sub-Saharan African countries and about the level of the Organisation for Economic Co-operation and Development (OECD) countries. Costs of importing to Senegal are lower than the regional average, but 1.6 times the costs of importing to an OECD country, whereas costs of exporting from Senegal are now 25 percent lower than the Sub-Saharan African average and at the same level as those faced by OECD countries.

The construction of a USD 1.13bn deep-water port in Senegal had been launched by DP World in 2022. The firm will develop and operate the 300ha container terminal. This port is situated in Ndayane, approximately 50km from Dakar[11].

Power

[11] https://www.ship-technology.com/news/dp-world-port-senegal/?cf-view

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In terms of access to electricity, about 47 percent of the population has access to electricity, and this figure reaches over 80 percent in urban areas. The relative success in expanding access is undoubtedly linked to well-planned reforms in the sector. Senegal has been moving from a unique vertical integrated provider (SENELEC)—which generates, transmits, and distributes electricity—to a model where generation, transmission, and retail distribution is liberalized. However, Senegal's power supply is insufficient to meet the existing and rapidly growing demand.

In short, the main bottlenecks in Senegal that must be monitor and improve are, from upstream to downstream of the value chain:

- the quality of the geological database
- the lack of labor/skills
- the logistic performance (especially, the infrastructures)

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3. Investment/financing prospects for ECRM projects in the Senegal

3.1. Fiscal, legislative and regulatory context for in-country financings

Legal and judiciary security of investments in Senegal

The Senegalese authorities have made a priority of improving the business climate. This has resulted in a number of reforms designed to facilitate business creation, the simplification and digitization of customs procedures, the creation of organizations to support entrepreneurs, and the establishment of tax incentives and Special Economic Zones (ZES).

Recently, law no. 2020-01 related to the creation and promotion of start-ups was adopted. Its aim is to encourage the creation of start-ups and support them throughout their life cycle.

Please find below a **brief overview of the business environment in Senegal**.

Questions	Answers
What is the legal and regulatory framework guaranteeing business security in Senegal?	The legal framework includes national (laws, decrees, orders…) and Community legislation: **1. <u>National legislation (non-exhaustive list)</u>** - Law No°2004-06 of February 6, 2004 on the Investment Code (amended by Law No°2012-32 of December 31, 2012) and its Implementing Decree No°2004-627 of May 7, 2004; - Law No ° 2021-23 of March 20, 2021 on public-private partnership contracts and its Implementing Decree No ° 2021-1443 of October 27, 2021; - Law n°2002-23 of September 4, 2002 establishing a regulatory framework for companies holding public service concessions; - Decree No. 2022-2295 of December 28, 2022 replacing Decree No. 2014-1212 of 22 September 22, 2014 on the Public Procurement Code ("Code de marché public"); - Law No. 2017-06 of January 6, 2017 on Special Economic Zones (SEZs) and its implementing Decree No. 2017-535 of April 13, 2017; - Law No. 2017-07 of January 6, 2017 on the provision of incentives applicable to SEZs; - Law No. 2020-01 relating to the creation and promotion of startups. **<u>Community legislation</u>** • ECOWAS Investment Code (2018) ; • Draft of a WAEMU Community Investment Code; • Draft of a Pan-African Investment Code (ongoing, under the supervision of the African Union Commission).
Has Senegal signed any international investment treaties?	Senegal has signed various bilateral and multilateral investment treaties to date. • The treaties concluded by Senegal contain provisions aimed at providing foreign investors with some protection by incorporating the State's obligation to grant fair and equitable treatment and full protection.

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	• On the bilateral level, Senegal has signed a total of 28 treaties, including 21 with European countries, 14 of which have entered into force[12]. Bilateral treaties with African countries (6 in total) are still at the signing stage. • At the multilateral level, Senegal signed the Convention on the Settlement of Investment Disputes (**"ICSID Convention")** on September 26, 1966. • Likewise, Senegal ratified the Convention setting up the Creation of the Multilateral Investment Guarantee Agency **(MIGA)** through Law No. 1987/05 of January 21, 1987.
Are there any internal structures to promote investment in Senegal?	Senegal has various national agencies and structures for promoting investment, in particular: • The Investment Promotion and Major Projects Agency (***"Agence pour la Promotion*** " or "***APIX***"), the main interface for foreign investors wishing to invest in Senegal. It is also responsible for certain major public works. • The Development and Promotion Agency for Small and Medium-sized Enterprises (***"Agence de Développement et de Promotion des Petites et Moyennes Entreprises***" or "***ADEPME***"), responsible for promoting and supporting Senegalese Small and medium-sized companies (SMEs). • Délégation à l'Entreprenariat Rapide des Femmes et des Jeunes (DER/FJ), responsible for promoting entrepreneurship of young people and women.
What about the judiciary security of investments?	In their dynamic to secure business, the Senegalese authorities have instituted a commercial justice system through Law No. 2017-24 of June 28, 2017 on the creation, organization and functioning of commercial courts and commercial chambers of appeal. The aim is to ensure that commercial disputes are handled promptly by specialized courts. To date, only the Dakar Commercial Court ("***Tribunal de Commerce hors classe de Dakar***") is operational.
What are the main practical obstacles for investors in Senegal?	• Economic vulnerability to global economic conditions, climate change and commodity prices; • Low business productivity and diversity of activities • Underdeveloped infrastructure, particularly in the energy and transport sectors; • A slow-moving administration that is not moving quickly enough to implement the structural policy reforms expected by the markets; • Despite certain improvements, the business environment is still disrupted by a strong tendency towards government interventionism, an often slow justice system and generally weak regulations; • Weak national investment promotion strategies; • Difficulties sometimes encountered by investors in transferring assets held in Senegal, particularly when leaving the country; • High tax burden.

[12] To date, the bilateral investment treaties concluded by Senegal and currently in force are with: Argentina, France, Germany, the United Kingdom and Northern Ireland, India, Italy, the Republic of Korea, Mauritius, Netherlands, Romania, Sweden, Switzerland, Turkey and the United States.

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Overview of the different types of companies and their functioning

	General partnership *(so-called in French "société en nom collectif" or "SNC")*	Limited partnership *(so-called in French "société en commandite simple"or "SCS")*	Unipersonal limited liability company *(so-called in French "société à responsabilité limitée unipersonnelle" or "SARLU")*	Limited liability company *(so-called in French "société à responsabilité limitée"SARL")*	Unipersonal public limited company (so-called in French *"société anonyme unipersonnelle "* or "S.A.U")	Public limited company *(so-called in French sociétété anonyme" or "SA")*	Simplified joint stock company *(so-called in French "société par actions simplifiées" or "SAS")*	De facto partnership *(so-called in French "société de fait")*	undeclared partnership *(so-called in French "société en participation" or "SEP")*	Economic interest group *(so-called in French "Groupement d'Intérêts Economique" or "GIE")*
Minimum amount of share capital	No minimum	No minimum	No minimum	No minimum	XOF 10,000,000	XOF 100,000,000 if if public offering company (and XOF 10,000,000 in any other if not)	No minimum	No minimum	No minimum	No minimum
Nominal value of the share	None	None	XOF 5,000	XOF 5,000	Freely set by the by-laws	Freely set by the by-laws	Freely set by the by-laws	None	None	None
Minimum number of shareholders	2	2	1 (Sole shareholder)	2	1 (Sole shareholder)	2	1	2	2	2
Shareholder liability	Shareholders have indefinite joint and several liability	**For limited/general partners:** indefinite joint and several liability **For active partners:** liability limited to capital contributions	Liability limited to capital contributions	Liability limited to capital contributions	Liability limited to capital contributions	Liability limited to capital contributions	Liability limited to capital contributions	If the existence of the company is officially recognized, the liability of the partners is joint and several and indefinite.	Solidary and unlimited liability for the partners' commitments for all those who have participated in it	Members are solidary liable for payment of group debts, unless otherwise agreed with third party co-contractors.
Corporate officers	Manager	Manager	Manager	General Manager	Genreral Director	**For a public limited company with a Board of Directors :** Chief Executive Officer (CEO) or Chairman of the Board + General Manager **For a public limited company without a Board of Directors :** General Director.	Chairman General Manager (GM) Deputy General Manager (DGA)	Manager (if the existence of the company is proven)	Manager	Director
Types of social contributions	Cash Nature Industry	Cash Nature Industry (only possible for limited/general partners)	Cash Nature Industry	Cash Nature Industry	Cash Nature	Cash Nature	Cash Nature Industry	Cash Nature Industry	Cash Nature Industry	Cash Nature
Appointment of legal auditor	Mandatory if two (2) of the following conditions are met at the end of the year-end : - Balance sheet total over XOF 250 000 000 - Annual turnover over XOF 500 000 000 - Permanent workforce over 50 people".		Mandatory if two (2) of the following conditions are met at the end of the year-end : - Balance sheet total over XOF 125,000,000 - Annual turnover over XOF 200,000,000 - Permanent workforce over 50 people".		Mandatory	Mandatory	Mandatory if two (2) of the following conditions are met at the end of the year-end : - Balance sheet total over XOF 125,000,000 - Annual turnover over XOF 200,000,000 - Permanent workforce over 50 people". or If the company controls or is controlled by one or several other companies	Not provided for	Not provided for	Mandatory if the group issues bonds.

Overview of the main taxes in Senegal

GENERAL REGIME				
Tax	**Taxable basis**	**Rate**	**Declaration and paiment**	**Comments**
Corporate income tax (CIT)	Taxable annual profit which is the accounting profit after tax adjustments.	30%	**Declaration** No later than April 30 of the year following the year of taxation **Payment** - 1st instalment must be paid no later than February 15 of the year following the year of taxation; - 2nd instalment must be paid no later than April 30 (at the same time as the CIT return is filed); - and the balance must be paid no later than June 15 of the year following the year of taxation.	In accordance with the provisions of article 80 of the Mining Code, companies holding research permits may deduct research expenses from their taxable income: - salaries, wages and miscellaneous expenses relating to personnel actually engaged in research work in Senegal ; - depreciation of equipment actually used in research work for the period corresponding to their use; -expenses incurred in Senegal in connection with the actual research work on the perimeter of the mining title, including costs incurred abroad in connection with the establishment of work programs, tests, analyses, studies and training; -costs relating to subcontractors duly approved by the Minister of Mining; -general expenses incurred in Senegal in connection with the execution of approved research programs; -head office expenses incurred in connection with the execution of approved research programs, up to the rate set by the SGTC.
Distribution tax on non-deductible expenses for CIT purpose ("*IRVM sur les réintégrations*")	Certain expenses not allowed to be deducted from the taxable basis of CIT	10/90	Declaration and payment must be made no later by 30 April	
Flate-rate minimum tax *("Impôt Minimum Forfaitaire - IMF")*	Annual turnover (excluding tax) for year preceeding the year of taxation	0.5% of the annual turnover but not exceeding XOF 5,000,000	In the event of a loss-making year, CIT's first instalment (to be paid on 15 February), is replaced by IMF.	New companies (incorporated after 2019) that do not fall under the department in charge of large enterprises are exempt from IMF for a period of three (3) years from their creation date.
Branch remittance tax *("RAS sur les bénéfices réputés distribués")*	Half of the profits made by a permanent establishment established in Senegal whose head office is located abroad and not reinvested in accordance with the provisions of Articles 232 to 242 of the Senegalese General Tax Code ("SGTC").	10%	**Declaration** No later than April 30 of the year following the year of taxation **Payment** : Advance payment at the rate of 5/10ths (i.e. 50%) no later than January 20 Final settlement no later than May 1	
WHT on dividends, interets paid by a company established in Senegal	For dividends : gross amount of dividends For interests and other income : gross amount paid	Dividends : 10% 8%: for interest paid by a bank, a decentralized financial system (SFD), the Caisse des Dépôts et de Consignations, a securities broker; 16%: when the above mentioned interests are not served by one of the above institutions.	**For dividends :** - 1st instalment to be paid no later than January 20 - Balance to be paid no later than July 20 **For interests :** No later than the 15th of the month following the month in which the payments were made	**Conditional :** Applies only in case of payment of the dividends or interest. The rate of WHT may vary in the presence of a Double Tax Treaty (DTT)
Value Added Tax (VAT)	Remuneration paid in exchange for the delivery of goods or the provision of services used in Senegal or whose beneficiary is based in Senegal	Standard rate : 18% Reduced rate : 10% (for services rendered by approved tourist accommodation establishments in Senegal)	Not later than 15 of the month following that in which the chargeable event occurred	
Reverse VAT *("TVA pour compte")*	Gross amount paid for remuneration of services rendered by providers without a PE in Senegal	18%	No later that the 15th of the month following the month in which the payments were made	In the absence of a designated tax representative in Senegal, the VAT is declared and paid (via the reverse charge mechanisme) by the beneficiary of the services (ie. the client based in Senegal) on behalf of the supplier established abroad.
Local Economic Contribution : **- on rental value ("CEL-VL")** **- on added value ("CEL-VA")**	CEL-VL : rental value determined in accordance with the provisions of Article 329 of the SGTC CEL-VA : added value determined in accordance with the provisions of Article 336 of the SGTC	CEL-VL: Owner : 20% of the rental value Lessee : 15% of the rental value CEL-VA : 1% of the added value with a minmum of perception of 0,5% of the annual turnover realized during the year preceeding the year of taxation	**Declaration :** CEL-VL : no later than January 31 of year of taxation CEL-VA : no later that April 30 of the year following the year of taxation **Payment** : CEL-VL : no later than January 31 of the year of taxation CEL-VA : no later than July 31 of the year following the year of taxation	
WHT on salaries and wages (PIT)	Gross salary, taxable allowances and benefits in cash or in kind	Progressive rate from 0% to 43 %.	No later than the 15th of the month following the month in which the payments were made	Where the amount of the deductions does not exceed XOF 20,000, the declaration and payment shall be made not later than the 15th day of the quarter following that of the payment

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GENERAL REGIME				
Minimum Tax ("TRIMF")	Gross salary, taxable allowances and benefits in cash or in kind	Fixed rate from XOF 900 to XOF 36,000, depending on the employees gross salary.	No later than the 15th of the month following the month in which the payments were made	Where the amount of the deductions does not exceed XOF 20,000, the declaration and payment shall be made not later than the 15th day of the quarter following that of the payment
Employer flate-rate contribution ("CFCE")	Gross salary, taxable allowances and benefits in cash or in kind	3%	No later than the 15th of the month following the month in which the payments were made	Where the amount of the deductions does not exceed XOF 20,000, the declaration and payment shall be made not later than the 15th day of the quarter following that of the payment **Note**: New companies (incorporated after 2019) that do not fall under the department in charge of large enterprises are exempt from CFCE for a period of three (3) years from their creation date.
WHT on payments made to third parties (local service providers)	For rent : gross amounts of rents paid by lessee to a lessor not subject to the CIT and whose amount is greater than or equal to XOF 150,000 For other payment : remuneration paid to natural persons domiciled in Senegal in remuneration for the provision of services in the amount of XOF 25,000 or more	5%	No later than the 15th of the month following the month in which the payments were made	Where the amount of the deductions does not exceed XOF 20,000, the declaration and payment shall be made not later than the 15th day of the quarter following that of the payment
WHT on payments made to foreign service providers ("WHT on royalties")	Gross remuneration paid for services rendered by foreign providers	20% (subject to the provisions of DTTs)	No later than the 15th of the month following the month in which the payments were made	Where the amount of the deductions does not exceed XOF 20,000, the declaration and payment shall be made not later than the 15th day of the quarter following that of the payment **Note :** The rate of WHT may vary in the presence of a DTT
Property taxes *("contributions foncières")*	For CFPB : rental value of the built properties determined in accordance with provisions of Articles 290 and 291 of the SGTC For CFPNB : rental value of the non-built properties determined in accordance with provisions of Article 297 of the SGTC	5%	**Declaration** no later than January 31 of year of taxation. **Payment** Spontaneously (on 31 January on the basis of of the tax return filed by the taxpayer) or upon receipt of a warning ("avertissement") issued by the authorities.	**Conditional :** by possession of undeveloped or undeveloped property Unused land, commercial or industrial premises and facilities recorded on the assets side of the balance sheet of CEL-VL companies is exempt from the CFPB and CFPNB. Thus, LEC payers are exempt from making a property tax declaration.
Droits d'enregistrement	Amount excluding taxes of contracts and other transactions subject to registration (in particular leases, public contracts, concessions of intellectual property rights, debt and share assignments, etc.)	Fixed rate : 5.000, 10.000 et XOF 50.000 Proportionnal rate : 10%, 5%, 3%, 2% and 1%	Generally no later than 1 month after the signature of the contract or the act or the entry into use, depending on the nature of the act. In the case of registrations subject to renewal, the renewal shall be carried out under the same conditions as the original document, where applicable.	**Conditional :** by the existence of contracts/documents subject to the registration formality.
Special Tax on Private Cars of Legal Entities *("TSVPPM")*	Tax paid on cars classified as private by the Highway Code, owned, used or maintained in Senegal by companies subject to CIT	Variable rates of 50,000; 100,000 and XOF 200,000 depending on the fiscal power of the car (ie. Horsepower)	no later than January 31 of each year	**Conditional :** by the existence of cars subject to the said tax
Tax on transfer outside the WAEMU Zone	Amount transferred outside the WAEMU area	0.60%	Collected and paid by the bank or financial institution at the time of the transfer	
Special Tax on Insurrance Contracts ("TCA")	The amount of the sums stipulated for the benefit of the insurer and of any accessories from which the insurer benefits directly or indirectly as a result of the insured person's actions	6%, 8%, 5%, 7%, 0,25%, 14% depending on the type of insurrance contract	No later than the 20th following each quarter of the year.	The tax is collected and paid by the insurance companies
Tax on Financial Activities ("TAF")	Income from banking or financial operations (interest and commissions)	Common rate : 17% Reduced rate : 7% on revenue received from operations financing export sales	Not later than 15 of the month following that in which the chargeable event occurred	**Conditional:** the tax is levied on taxable transactions This tax is levied and remitted by banks and financial institutions.

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Foreign exchange regulations

In this section, we will present the regulations applicable to the banking and financial sector, as well as those applicable to foreign exchange controls, in Q&A format.

Question	Answers
How are foreign exchange regulations organized in Senegal?	• Senegal is a member of the West African Economic and Monetary Union (WAEMU), along with seven (7) other states in the sub-region. They share a common currency which is the Francs CFA ("FCFA" or "XOF") and a common Central Bank which is Central Bank of West African States (*"**Banque Centrale des Etats de l'Afrique de l'Ouest**" or "**BCEAO**"*). • These WAEMU Member States have common foreign exchange regulations, as set out in Regulation n°09/2010/CM-UEMOA relating to the External financial relations of the Member States of the WAEMU. • In addition, these States are part of the "Franc Zone" which includes, in addition to the WAEMU Member States, those of the Economic and Monetary Community of Central Africa (***"Communauté Economique et Monétaire de l'Afrique Centrale"*** or ***''CEMAC''***), France, The Principality of Monaco and the Comoros Islands. • Territories other than those of the Franc Zone States are considered as "foreign". However, for certain operations, the term "foreign" is restricted to countries other than those of the WAEMU, in particular for investment and borrowing operations, domiciliation of exports and correlative repatriation of revenues, import and export of gold, issue and sale of foreign securities, etc.
Can a resident company hold both foreign and local bank accounts in foreign currencies?	• In accordance with the provisions of Article 43 of Regulation No. 09/2010/CM, a resident company can hold bank accounts abroad, provided that prior authorization is obtained from the Ministry of Finance. • The request for authorization to open an account abroad must be submitted by an approved intermediary chosen by the applicant to ensure, in the event of authorization, the reporting obligations regarding the account's operation (such as the local bank of the applicant). • The duration of an account abroad cannot exceed one (1) year, renewable for the same duration upon request of the applicant, submitted at least one (1) month before the expiration of the initial period[13]. • Regarding the opening of a local account in a foreign currency, the same requirement applies (authorization from the Ministry of Finance). However, despite the legal possibility provided by Article 43 of the Regulation, from a practical standpoint it is very difficult (if not impossible) for a resident company to open a local account in foreign currency. • The duration of a local account in a foreign currency must not exceed one (1) year[14]. • The application for authorization to open a local account in foreign currency must be filed by the account holder (i.e., local bank). • In all the aforementioned cases, the authorization from the Ministry of Finance is obtained after the favorable opinion of the BCEAO (Central Bank).
Can a foreign company (non-resident) open a foreign currency account?	The opening of a foreign currency bank account (other than the Euro) for a non-resident is subject to prior authorization from the BCEAO. The application must be filed through an approved intermediary and include evidence of the applicant's status and actual residence, as well as the reasons for the request.

[13] Article 11 of Instruction No. 08/07/RFE of the BCEAO dated July 13, 2011, relates to the conditions for opening and operating foreign accounts for non-residents, domestic currency accounts for residents, and accounts for residents abroad.

[14] Article 8 of Instruction No. 08/07/RFE of the BCEAO dated July 13, 2011, relates to the conditions for opening and operating foreign accounts for non-residents, domestic currency accounts for residents, and accounts for residents abroad.

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	If approved, the authorization is granted for a period of two (2) years, renewable under the same conditions. Applications for renewal must be made at least one (1) month before the expiration of the initial period. In the event of refusal or failure to obtain a new authorization from BCEAO within the above-mentioned period, the bank must close the account.
What are the account renewal procedures?	For foreign accounts, renewal applications must be submitted to the Minister of Finance at least one (1) month before the expiration of the initial authorization. This application is examined under the same conditions as the initial application. It should also be noted that in the absence of a new authorization from the Minister of Finance, the authorized intermediary must request that the account be closed upon expiry of the time limit and that the assets held abroad be repatriated to a WAEMU Member State within eight (8) days. Regarding the foreign currency account, the renewal application for the authorization to open a domestic currency account must be addressed by the account holder to the Minister of Finance at least one (1) month before the expiration of the initial authorization. This renewal application is examined under the same conditions as the initial application. If, however, no new authorization is obtained by the end of the period specified in the prior authorization, the account in question must be closed.
Can a local company freely convert its local currency into a foreign one?	Local companies are not prevented from converting their local currency (CFA Francs) into foreign currencies, provided they use the services of a licensed exchange agent or intermediary. The exchange operation may entail costs (intermediary commission, currency volatility, etc.).
Are foreign-origin loans contracted by local companies and foreign investments subject to specific formalities?	• Loans contracted by residents from non-residents must, unless otherwise decided by the Ministry of Finance, be carried out through authorized intermediaries in all cases where the borrowed sums are made available to the borrower in Senegal. • All foreign loans are subject to a statistical reporting obligation to the Department of External Finance of the Ministry of Finance. • Regarding foreign investments in Senegalese companies, they are free but must be declared for statistical purposes to the Department of External Finance[15]. • Furthermore, any liquidation of foreign investments, whether direct or indirect, in the form of assignment between non-residents and residents, must be presented to the authorized intermediary responsible for settlement, along with supporting documents for such liquidation[16].
Are there any restrictions on investing abroad by a resident?	Any foreign investment made by a resident is subject to prior authorization from the Ministry of Finance and must be financed by at least 75% through foreign loans[17].
Are there any restrictions on transferring money abroad?	When it comes to payments for goods or services abroad as part of a current operation or routine transaction, there are no restrictions. However, it is mandatory to use the services of an authorized intermediary (i.e., a local bank). The following operations are considered current: • Payment for goods deliveries. • Payment of salaries. • Payment of insurance fees. • Payment of interest and dividends. • Payment of license or patent royalties.

[15] Article 10, paragraph 6 of Regulation No. 09/2010/CM-UEMOA concerning the External Financial Relations of the Member States of WAEMU

[16] Article 10, paragraph 7 of the aforementioned Regulation No. 09/2010/CM- WAEMU

[17] Article 10, paragraphs 1 and 2 of the aforementioned Regulation No. 09/2010/CM- WAEMU

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	All transfers abroad are subject to the presentation of supporting documents to the intermediary responsible for the payment, when the amount does not exceed XOF 500,000.
Are there any fees involved in transferring money?	Money transfers outside the WAEMU zone are subject to a levy of 0,6%, regardless of the transferred amount. In addition, the intermediary responsible for carrying out the transfer may charge transfer fees and commissions, the amount of which varies according to the pricing conditions applied by the intermediary.
Is it mandatory to repatriate funds to the country?	The holding of bank assets abroad is regulated by the aforementioned Regulation No. 09/2010. According to Article 3 of the Regulation, foreign currencies held by a resident must be sold or deposited with an authorized intermediary or, if applicable, with the Central Bank. Residents are required to transfer to an authorized intermediary bank all foreign currency revenues or proceeds received abroad or paid by a non-resident. These transactions must be executed within a maximum period of one (1) month from the payment due date.

Alternative dispute settlement (ADS)

Alternative dispute settlement (ADS) methods ("Modes Alternatifs de Règlement des Conflits" or "MARC") are an integral part of business security. In Senegal, as well as in other French-speaking African countries, business law is governed by the provisions of the Uniform Acts of the Organization for the Harmonization of Business Law in Africa ("Organisation pour l'Harmonisation en Afrique du Droit des Affaires" or "OHADA").

The Uniform Acts constitute common legislation for matters within their scope of application and apply uniformly to all OHADA member states. OHADA has established two (2) Uniform Acts for Alternative dispute settlement, namely:

- The Uniform Act on Arbitration ("Acte uniforme relatif à l'arbitrage"), in force since March 11, 1999, and revised on November 23, 2017.
- The Uniform Act on Mediation ("Acte uniforme relatif à la médiation''), which came into effect on March 15, 2018.

Alongside these ADS governed by the aforementioned Uniform Acts, traditional methods such as conciliation and settlement/transaction are also recognized.

It is also worth noting that OHADA has a common jurisdiction, the Common Court of Justice and Arbitration ("Cour Commune de Justice et d'Arbitrage" or "CCJA"), which serves both as a Supreme Court for matters covered by the Uniform Acts and as an Arbitration Center.

On the domestic level, the Senegalese authorities, in their desire to promote ADS, introduced provisions governing arbitration in the Code of Civil and Commercial Obligations ("Code des Obligations Civiles et Commerciales" or "COCC") through Law No. 98-30 of April 14, 1998. This law was complemented by Decree No. 98-492 of June 5, 1998, relating to domestic and international arbitration, and Decree No. 98-493 of June 5, 1998, relating to the creation of arbitration institutions. Thus, the Arbitration, Mediation,

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and Conciliation Center of Dakar (“Centre d’arbitrage, de médiation et de conciliation de Dakar” or “CAMC”) was created by the Chamber of Commerce, Industry, and Agriculture of Dakar (“Chambre de commerce, d’industrie et d’agriculture de Dakar” or “CCIDAD”).

Notwithstanding the existence of the CCJA and CAMC, for large-scale projects, in the event of a dispute between the Senegalese authorities and foreign investors, recourse is generally had to international arbitration proposed by the International Chamber of Commerce ("ICC"), based in Paris (France), and by the International Centre for Settlement of Investment Disputes ("ICSID"). In fact, this type of contract generally includes an arbitration clause giving jurisdiction to these arbitration centers (ICC or ICSID).

In any case, the specificities of the different dispute settlement methods encountered in Senegal are described below.

Settlement methods	Nature	Institution’s name	Nature of decision rendered by the organ	Appeal against the decision of the institution	Key benefits	Limitations
Arbitration	Non amicable method	Referee	Arbitral decision with res judicata effect.	Actions for cancellation	Confidentiality (arbitration deliberations are secret) ;	High costs
			The decision may be subject to exequatur by a competent judge.	Recourse for revision	Celerity ;	Complexity of certain cases leading to delays in the procedure.
				Third-party appeal	Freedom granted to the parties in their choice of arbitrators and applicable rules.	
Mediation	Amicable method	Mediator	Mediation agreement	Action for cancellation if a party considers that the agreement is contrary to public policy	Confidentiality and rapidity ;	The parties are not obliged to reach an agreement
					Freedom for the parties in the conduct of the mediation.	Time limit for appealing against an approved or exequatur agreement is very limited (15 days after notification)
			The mediation agreement may be subject to enforcement. It may be submitted to the competent court for homologation or exequatur.		Economically accessible compared to legal proceedings or arbitration;	
Conciliation	Amicable method	Conciliator	Minutes of conciliation (not enforceable)	N/A	Confidentiality ;	Either party may renounce conciliation.
					Simplicity of the procedure ;	Difficulty in enforcing the terms of conciliation (as they are not res judicata).
Transaction	Amicable method	In principle, there is no third party.	Any document recording the will of the parties	N/A	Simplicity	Parties may renounce conciliation at any time
		Exceptionally, there may be a negotiator			Economically accessible	

Immigration Rules in Senegal

Summary of the procedures for obtaining the permits and administrative documents required by foreign nationals in Senegal:

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Obtained document	Persons concerned	Documents to be provided	Cost	Period of validity	Competent service
Entry Visa*	Citizens of foreign countries	Valid passport (minimum 6 months validity) International vaccination certificates required by health regulations;	Between XOF 30,000 and XOF 35,000 or more	3 months (renewable)	Embassy of Senegal abroad Dakar Airport Ministry of the Interior (for nationalities requiring prior authorization and renewal applications)
Residence permit		A signed request addressed to the Minister of Interior A copy of the passport pages with the "ARRIVAL" and/or the "VISA" stamp An extract of criminal record from the country of origin, issued within the last three (3) months A birth certificate issued within the last three (3) months A certificate of residence (issued by the local municipality in Senegal) A medical certificate issued within the last three (3) months Three (3) passport-sized photos XOF 5,000 stamp Payment receipt for the required repatriation deposit** A copy of approved employment contract (for workers) or copy of the tax identification number (called in French "NINEA"), extract from the commercial register (called in French "RCCM"), and bylaws (for entrepreneurs) **Note**: Prior to the issuance of the residence permit, a receipt is provided to the applicant. This receipt can be renewed indefinitely until the residence permit is obtained	Free	6 months (renewable) for the receipt	Police des Etrangers (based in Dakar)

Taxation of investment income

Income from investment is subject to withholding tax ("WHT"). Subject to the provisions of DTT, the rates are as follows:

Financial income	Rates
Dividends	10%*
Income from bonds with a maturity of less than 5 years	13%
Income from bonds maturing in 5 years or more	6%
Lots	16%
Directors' fees and other remuneration	16%
Interest on loans, including shareholder current accounts	16%*
Interest paid by a bank established in Senegal and similar institutions	8%*

** In the presence of a tax treaty, the WHT rate applicable to dividends, interest, and royalties varies depending on the treaty provisions. See hereafter the rates provided by the tax treaties concluded by Senegal:*

WHT rates on dividends, interest and royalties under tax treaties concluded by Senegal and currently in force			
Member State	Dividends	Interets	Royalties
Belgium	10%	16%	10%
Canada	10%	20% on saving bonds 16% for other interests	15%
China	10%	15%	12.5%
UAE	5%	5%	5%
Spain	10%	10%	10%
WAEMU State Members (Ivory Coast, Benin, Burkina Faso, Guinea Bissau, Mali, Niger and Togo)	10%	15%	15%

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France	10%	15%	15%
OCAM (Gabon)	10%	16%	0%
Italy	10%	15%	15%
Iran	5%	5%	8%
Kuwait	10%	10%	20%
Lebanon	10%	10%	10%
Luxembourg	5 % if the beneficial owner of the dividends is a company that holds at least 20% of the capital of the company paying the dividend 10% in all other cases	10%	6 % on royalties paid for the use of ICS equipment. 10% in all other cases
Malaysia	5% if the beneficial owner is a company that directly holds at least 10% of the capital of the company paying the dividend 10% in all other cases	10%	10%
Mauritania	10%	16%	0%
Morocco	10%	10%	10%
Norway	10%	16%	16%
Portugal	5 % if the beneficial owner of the dividends is a company that holds at least 25% of the capital of the company paying the dividend 10% in all other cases	10%	10%
Qatar	0%	0%	0%
Czech Republic	5 % if the beneficial owner of the dividends is a company that holds at least 25% of the capital of the company paying the dividend 10% in all other cases	10%	10%

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United Kingdom	5 % if the beneficial owner of the dividends is a company that holds at least 25% of the capital of the company paying the dividend 8% of the gross amount of the dividends if the beneficial owner is a pension scheme established in the other State. 10% of the gross amount of the dividends in all other cases.	10%	6 % on royalties paid for the use of ICS equipment. 10% in all other cases
Turkey	5 % if the beneficial owner of the dividends is a company that holds at least 20% of the capital of the company paying the dividend 10% in all other cases	10%	10%
Tunisia	10%	16%	0

Transfer pricing documentation and reporting requirements

As part of its campaign against the erosion of tax bases, the Organization for Economic Co-operation and Development (OECD) has launched the "BEPS Project" (Base Erosion Profit Shift), aimed at enabling countries to effectively combat this issue.

The Action Plan is structured around 15 specific Actions, including Action 13 on transfer pricing. This action is designed to require multinational companies to justify the prices applied in transactions between related entities (i.e., belonging to the same group).

Senegal, which is also a member of the Inclusive Framework of the BEPS Project, has adopted some of these measures, as detailed below:

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Obligations	Concerned persons	Submission deadline	Sanction
Transfer pricing documentation	In accordance with the provisions of Article 638 of the SGTC, a legal entity established in Senegal and meeting the criteria outlined below must keep documentation available to the tax administration, at the start of the tax audit, to justify the pricing policy applied in transactions of any kinds carried out with related companies: a) it has an annual turnover excluding taxes or a gross asset of at least XOF 5,000,000,000 (appr. EUR 7,6 million); b) at the end of the financial year, it holds directly or indirectly, more than half of the capital or voting rights of a company established or incorporated in Senegal or outside Senegal, fulfilling the abovementioned condition in the a) above ; or c) more than half of its capital or voting rights is held, at the end of the financial year, directly or indirectly, by a company fulfilling the above-mentioned condition;	TP documentation must be available to the tax authorities at the time the audit is initiated.	Failure to provide the above-mentioned documentation exposes the taxpayer to a tax fine of 0.5% per undocumented transaction and per fiscal year.
Annual transfer pricing declaration	Persons subject to the above TP documentation obligation.	April 30 of the year following the year of taxation	Failure to declare is punishable by a fine of XOF 10.000.000 (appr. EUR 15,000)
Country-by-country reporting (CbCR)	In accordance with the provisions of Article 31 ter of the SGTC, legal entities meeting the criteria below, must file a declaration containing the country-by-country breakdown of the group's profits and economic, accounting and tax aggregates, as well as information on the location and activity of the entities constituting the group : - Prepare consolidated accounts; - own or control, directly or indirectly, one or more legal entities established outside Senegal or have branches there; - achieve a consolidated annual turnover, excluding taxes, greater than or equal to 491 billion CFA francs, during the year preceding that to which the declaration relates; - not be owned by one or more legal entities located in Senegal and required to deposit this declaration, or established outside Senegal and required to deposit a similar declaration pursuant to foreign regulations.	No later than 12 months following the end of the financial year (i.e. no later than December 31st of the year following the end of the financial year).	Failure to file country-by-country reporting exposes the taxpayer to a fine of XOF 25,000,000 (appr. EUR 38,000)

Deductibility of financial expenses

In Senegal, companies can choose to finance their needs with their own funds but also with funds from loans contracted from third parties (in particular partners or credit institutions).

Loans contracted from shareholders take the form of Shareholder Current Accounts (“Compte Courant d’Associé”) governed by the provisions of the OHADA Uniform Act on Commercial Companies and Economic Interest Groupings (“Acte Uniforme OHADA relatif au droit des Sociétés Commerciales et du Groupement d’Intérêt Economique” or “AUSC/GIE”).

Whether it is loans contracted from shareholders or from a bank, the tax treatment of related financial expenses (interests) is regulated by the provisions of the SGTC and detailed below:

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Question	Type of loans	
	Loan from shareholder	**Bank loan**
What are the restrictions on the deductibility of interest from corporate income tax and other corporate entities?	Interest on shareholder loans is deductible from the taxable base of corporate income tax (CIT) subject to the following limitations: a) The interest rate must not exceed the central bank rate plus 3% (the current rate being 5%, the maximum limit at this date is therefore a rate of 8%); b) The share capital must be fully paid up; c) When interest is paid to: ○ Individuals: the remuneration for the funds made available must not exceed the amount of the share capital; ○ Legal entities: the interest is deductible only up to the amount that simultaneously remunerates: ▪ the sums made available which do not exceed one and a half times the share capital social ; ▪ and 15% of profit from ordinary activities plus interest, depreciation and provisions taken into account in determining this same profit (i.e., EBITDA). d) The total amount of deductible net interest payable annually in respect of all debts contracted by a company that is a member of a group of companies must not exceed 15% of the Ordinary Activities Result of the said company increased by the said interest, depreciation, and provisions considered for the determination of the same result (i.e., EBITDA). This is also applicable to all interests (both bank and intragroup). **Note**: The interest paid by a branch to its foreign head office is not deductible for CIT purposes, in accordance with the provisions of Article 17.2 of the SGTC. However, this restriction does not apply to branches of foreign banks.	Interest is deductible from CIT when it meets the deductibility conditions provided for in Article 8.II of the SGTC and set out below: ▪ be exposed in the direct interest of the company or be related to its normal management; ▪ correspond to an actual expense and be supported by sufficient justification; ▪ result in a decrease in the company's net assets; ▪ be included in the expenses of the financial year in which they were incurred; ▪ contribute to the formation of a non-exempt taxable profit. However, the interest rate must not be excessive (exceed the usury rate). In such cases, the tax authority may reject the deductibility of the portion that exceeds the maximum rate. **Note**: Since 2014, the usury rate has been set at 15% per year for banks and 24% per year for other financial institutions (Decision of the WAEMU Council of Ministers No. CM/UMOA/011/06/2013 dated 28/06/2013).
What is the treatment of non-deductible interest expense?	In accordance with the provisions of Article 9.2.J of the SGTC, the non-deductible portion of interest not immediately deductible, in application of the above-mentioned thin-capitalization rules, can be carried forward and deducted in subsequent years, up to a limit of 5 years.	N/A
What is the tax treatment regarding distribution tax ?	As a reminder, pursuant to Article 85.12 of the SGTC, are subject to the Distribution Tax, commonly known as " *Distribution Tax on expenses added-back to CIT taxable base* ",expenses for which the deduction for CIT purposes is prohibited, excluding depreciation and provisions, taxes and duties, fines and penalties, and the non-deductible portion of interest that is carry-forwardable under Article 9.2(i), as well as the reinstatement of rents as a result of the administrative limitation. The Distribution Tax on reinstatement is assessed at a rate of 10/90 (or 11.11%) and must be declared and paid no later than April 30th. In our opinion, and to the extent that the exclusion applies to the non-deductible and carry-forwardable portion of interest expense under the thin-capitalization rules mentioned above, the non-deductible and carry-forwardable interest should not be subject to the Distribution Tax below.	N/A
What are the exceptions to the aforementioned limitations?	With regard to the provisions of Article 9.2.f and following of the SGTC, the aforementioned limitations (thin-capitalization rules) do not apply to: • Interest paid by companies not subject to CIT to their shareholders if the shareholders are subject to income tax in Senegal on such interest. • Interest paid or due by financial institutions defined by the law on banking regulations or by insurance companies covered by the Inter-African Insurance Markets Code (so-calle “Code interafricain des Marchés d'Assurances” or “CIMA”). The aforementioned limitations relating to the deductibility conditions of net interest remunerating all annual debts contracted by a company do not apply when: • the company is a member of a group of companies composed solely of companies resident in Senegal; • the company provides evidence that the net interest expense ratio of the group of companies is equal to or greater than its own net interest expense ratio; • the total net interest paid or due by members of the group of companies resident in Senegal to persons with whom they have no relation of dependence or control is less than XOF 50,000,000 (appr. EUR 76,000), unless such interest is paid or due directly or indirectly to a person established in a State or territory outside Senegal whose tax regime is privileged (i.e., tax haven).	N/A

Tax treatment of research expense incurred by mining companies regarding CIT (corporate income tax)

As a reminder, in Senegal, corporate income tax applies to all profits earned in Senegal by companies. The current CIT applicable rate is 30%.

Profit is determined after deduction of all expenses incurred in the interest of the company and contributing to the generation of income that is not tax-exempt. These expenses must comply with the general conditions for deductibility laid down in Article 8.II of the SGTC:

- be exposed in the direct interest of the company or be related to its normal management;
- correspond to an actual expense and be supported by sufficient justification;
- result in a decrease in the company's net assets;
- be included in the expenses of the financial year in which they were incurred;
- contribute to the formation of a non-exempt taxable profit.

Regarding mining companies, the provisions of Article 80 of the Mining Code authorize the deduction of **research expenditure**. The following should be taken into account as research expenditure:

- salaries, wages and other expenses incurred by personnel actually engaged in research work in Senegal ;
- depreciation of equipment actually used in research work for the period corresponding to their use;
- expenses incurred in Senegal in connection with the actual research work on the perimeter of the mining title, including costs incurred abroad in connection with the establishment of work programs, tests, analyses, studies and training;
- costs relating to subcontractors duly approved by the Minister of Mining;
- general costs incurred in Senegal in connection with the execution of approved research programs;
- Headquarters expenses incurred in the execution of accredited research programs, within the limit set by the SGTC[18].

Note: The total amount of certified research expenses incurred by the research permit holder on the date of incorporation of an operating company to exploit all or part of the research permit perimeter will be discounted to the latter date, in accordance with the relevant tax provisions and with the agreement of the Minister of Finance, and depreciated during the operating phase.

Tax exemptions for mining companies in Senegal

In Senegal, mining activities are governed by both the provisions of the SGTC, and certain tax provisions contained in the Mining Code.

[18] In accordance with the provisions of Article 9.5 of the SGTC, companies operating in Senegal and whose registered office is located abroad, are authorized to deduct a share of the headquarters expenses incumbent on them, calculated, subject to international conventions, in proportion to the total turnover of these same companies without exceeding 20% of the accounting profit made in Senegal before deduction of the share of headquarters expenses.

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Depending on the different phases of the mining project (research phase, investment phase, or operating phase), holders of mining titles benefit from exemptions on certain taxes and duties. The main exemptions are detailed below:

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Taxes	Research phase	Implementation phase of investments	Operating phase
Value Added Tax (VAT)	• In accordance with the provisions of Article 361.25 of the SGTC and 78 of the Mining Code, holders of a mineral substances exploration permit benefit from a VAT exemption on: - Equipment, materials, supplies, machines and utility vehicles included in the Approved Program, as well as spare parts and consumable products and materials not produced or manufactured in Senegal, specifically and permanently intended for mining exploration operations and whose importation is essential for the implementation of the research program. - Fuels and lubricants used for fixed installations, drilling equipment, machinery, and other equipment intended for research operations under the granted permit. - Petroleum products used to produce energy for research operations. - Parts and spare parts intended for machinery and equipment recognized as specifically intended for the Approved Research Program. However, this exemption does not apply to: - Vehicles used for the transportation of people and goods other than extracted mineral products. - Machinery, materials, and equipment for which equivalent alternatives can be found manufactured in Senegal or available under conditions of price, quality, warranty, among others, equal to those of similar goods of foreign origin. **Note** : The VAT exemption also applies to subcontractors of recognized mining title holders.	VAT exemption granted during the research phase is extended to the development phase	No exemption
Customs duties and import taxes	In addition to VAT exemption, the holder of a mineral exploration permit is also exempt from customs duty and **COSEC** fees for the above listed machinery and equipment. During the six (6) months following its establishment in Senegal, foreign workers employed by the holder of a mining title and residing in Senegal also benefit from a customs duty and tax exemption on the importation of their personal belongings and effects. **Note:** The above tax exemption does not apply to statistical fees, WAEMU community solidarity levy, ECOWAS community levy, or any other community-based levy.	Exemption from import duties and taxes (including the COSEC fees) on: - equipment, materials, supplies, machinery and equipment, utility vehicles included in the approved program and equipment definitively intended for mining operations; - Fuels and lubricants used for fixed installations, drilling equipment, machinery, and other equipment intended for mining operations. - Petroleum products used to produce energy for mining operations. - Parts and spare parts intended for machines and equipment specifically designed for mining operations. The value of the parts should not exceed 30% of the overall Cost CIF, (Cost-Insurance-Freight) value of the imported machinery and equipment. **Note:** The investment realization period begins on the date of granting the mining exploitation permit or authorization for small-scale mining until the date of first production (notified to the Ministry of Mining). In all case, it expires at the latest within three (3) years for the exploitation permit and one (1) year for the for small-scale mining authorization .	No exemption
*Flat-rate minimum tax (called **"Impôt Minimum Forfaitaire" or "IMF")***	Exemption granted during the research permit and its renewals	The exemption granted during the research phase is extended to the development phase	Exemption limited to 3 years from first production
*Flat-rate contribution payable by employers (called **"Contribution Forfaitaire à la Charge de l'Employeur'' or "CFCE")***	Exemption during the entire duration of the research permit	Exemption during the entire duration of the research permit	Exemption limited to 3 years from first production
Property taxes (CFPB, CFPNB and SF[1])	Exemption during the entire duration of the research permit **NB** : Regarding the CFPB, the exemption does not apply to residential properti	The exemption granted during the research phase is extended to the development phase	Exemption limited to 3 years from first production
Local Economic Contribution (LEC)	Exemption during the duration of the research permit and its renewals	The exemption granted during the research phase is extended to the development phase	Exemption limited to 3 years from first production

Special levy on mining and quarrying products

The Finance Act for the year 2014 (amended by act No. 2014-29 of November 3, 2014,) introduced a Special Contribution on Mining and Quarry Products ("Contribution Spéciale sur les Produits des Mines et Carrières" or "CSMC"). This parafiscal levy aims to collect resources on the import or export of the targeted products.

However, in practice, for companies that already benefit from mining concessions, the application of this levy is problematic because most of these companies have a tax stability clause included into the agreements concluded with the State of Senegal. These clauses stipulate that the concerned companies should not be subject to taxes and levies instituted after the conclusion of their agreements.

In any case, the modalities of this levy are detailed below:

Scope	The CSMC applies to deliveries on the domestic market, imports and exports of mineral and fossil substances.
	Note: Mineral and fossil substances refer to natural amorphous or crystalline substances, solid, liquid, or gaseous, as well as fossilized organic substances and geothermal deposits.
	However, the following are exempt from the CSMC: - Mining and quarry products when used in the production of goods subject to the same contribution; and, - Cement exports
Taxable base	Depending on the nature of the operation, the taxable base for the CSMC is constituted as follows:
	-**For sales:** by the selling price of the products delivered, including all expenses and taxes, excluding VAT and the CSMC itself.
	-**For imports:** by the customs value (i.e., CIF value) plus all duties and taxes levied by customs, excluding VAT and the CSMC itself.
	-**In all other cases:** by the normal value of the products, including all expenses and taxes, excluding VAT and the CSMC itself**.**
Chargeable Event	The generating event of the CSMC is constituted:
	-**For substances extracted or produced in Senegal:** by the first sale, whether for consideration or free of charge, or by self-delivery for personal consumption.
	- **For imported substances:** by release for material or legal consumption on the territory of Senegal
Calculation, Declaration, and Payment Procedures	The CSMC rate is set as follows:
	- For gold, the rate is fixed annually as follows:
	§ 4% 4% for the year 2014;
	§ 3% for 2015;
	§ 2% from 2016.

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	- For other products, the rate is set at 3%.
	The declaration and payment of CSMC are made under the following conditions:
	- **For deliveries on the domestic market and exports of mineral and fossil substances:** the declaration and payment must be made no later than the 15th of the month following that of the chargeable event (for example, for sales made in March, payment and declaration from the CSMC must be made by 15 April at the latest);
	- **For imports:** the CSMC is payable at the time of the chargeable event (i.e., when the goods cross the customs line for consumption).
Sanctions	It should be noted that the rules regarding the recovery and litigation related to VAT also apply to the CSMC. Therefore, failure to submit the CSMC declaration exposes the taxpayer to the payment of a tax fine XOF 200 000, without prejudice to the legal penalties of 25% (in the case of tax adjustment) and late payment interest of 5% on the unpaid amount (increased by an additional interest of 0.5% per month or portion of a month of delay).

Other levies applicable to the mining sector in Senegal

Companies holding mining titles in Senegal are required to pay a range of fees and royalties to the Senegalese authorities. These include fixed entrance fees, surface royalties, mining royalties and historical costs.

Fixed entrance fee (*''droits fixes d'entrée''*)[19]

Mining titles	Fixed fee amounts (in XOF)
Research Permits	2.500.000
Operating Licence	10.000.000
Permanent quarry licence	2.500.000
Temporary quarry licence	1.000.000
Small Mine Licence	2.500.000
Semi-mechanized mining licence	1.500.000
Artisanal mining permit	50.000

Surface Royalty (''redevance superficiaire'')[20]

Mining titles		Amount (in XOF)
Research permits (at issue and renewal)	*First period of validity*	5,000/Km^2/year
	First renewal period	6,500/Km^2/year

[19] Article 74 of the Mining Code
[20] Article 75 of the Mining Code

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	Second renewal period	8,000/Km²/year
Mining permits, at issue and at each renewal		250,000/Km²/year
Small Mine License, at issue and at each renewal		50,000/ha/year
Permanent quarry license, at issue and at each renewal		50,000/ha/year
Semi-mechanized mining license, at issue and at each renewal		50,000 /ha/year

Mining royalties (''redevances minières'')[21]

Type of mineral substance	**Rate**[22]
Aluminum-calcium phosphate	5%
Lime phosphate	5%
Phosphoric acid	1,5%
Cement	1%
Iron	*Concentrated mineral:* 5% *Mineral for local steel processing*: 2%
Gold	*Raw gold*: 5% *Refined abroad*: 5% *Refined in Senegal*: 3.5%
Zircon, ilmenite and other heavy minerals	5%
Diamonds and other gems	*Raw* : 5% *Refined :* 3%
Quarry substances	Crushed quarry materials: 4% of the market value of the crushed product Quarry substances extracted without crushing and/or collection: royalty proportional to the volume of substances extracted or collected, set as follows: XOF 500/m³ for hard materials ; XOF 300/m³ for soft materials.

[21] Article 77 of the Mining Code

[22] It should be noted that mining royalty rates are set as indicated above for all mining titles concerned (with the exception of mining activities covered by a production sharing contract). The basis of calculation for the mining royalty is the market value of the product sold locally, or the FOB (free on board) value of the product exported. It should be noted that, in accordance with the combined provisions of Articles 77 of the Mining Code and 107 of its Implementing Decree, mining royalty payers must, in the month following each quarter, file a declaration with the mining administration, indicating the volumes extracted and sales made during the previous quarter. This declaration (in 3 copies) must also include a summary of the production volume, the tonnage of processed products, the tonnage and revenue from sales in Senegal, the tonnage and revenue from sales abroad, the tonnage of unsold stocks and the market value of sales.
Mining administration officials then check and verify the quantities extracted and sales declared.
Finally, on the basis of the declaration provided by the taxpayer, the competent Mining Authority draws up an order fixing the amount of the mining royalty, following the above-mentioned verification. The licensee is then required to pay the fixed royalty within 45 days of notification of the above-mentioned order.

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Alkaline salts and other marketable substances	3%

Historical costs[23]

Il It should be noted that regardless of the fees and royalties detailed above, the issuance of a mining title for research and exploitation or the conclusion of a production sharing contract may be subject to reimbursement of historical costs to the State or national legal entity concerned.

Terms of cooperation for exploration and mining operations (joint venture) and key risks

The joint-venture ("co-entreprise") is a mechanism enabling several companies to achieve a common goal. In Senegal, this type of structure is not specifically regulated and therefore remains governed by the rules applicable to commercial companies (when it is incorporated as a company) and contract law (if it is in contractual form).

A Q&A table describes the rules applicable to JVs and the risks associated with these structures as below:

Questions	Answers
Is the use of JVs recurrent in Senegal, particularly in the mining sector?	Generally, JVs are commonly used in projects that involve Foreign Direct Investments (FDI) in Senegal. This is the case in large infrastructure projects in the extractive sectors (mining, hydrocarbons), where the state is obliged to hold a mandatory, often minority, share in the project company (for example, *according to Article 31 of the Mining Code, when a mining exploitation permit is granted, the state has a compulsory free participation of 10% of the capital of the project company).*
	Similarly, and as an example, the Law No. 2019-04 of February 1, 2019, related to local content in the hydrocarbon sector, practically requires the use of JVs to engage in certain activities within the value chain of the said sector. For instance, activities classified under the "mixed regime" the provisions of this law obliged stakeholders in the sector to partner with local enterprises.
	Beyond these cases, the use of JVs may also be motivated by the desire of investors to pool their resources in order to reduce costs (For example, central purchasing groups for companies in the retail and distribution of pharmaceutical products, etc.).
What are the main types of JVs encountered in Senegal?	Two main types of JVs are generally used:
	1. **Contractual JV**
	Its constitution does not entail the creation of a legal entity. The relationship between the parties will essentially arise from a contract which contains, including, the terms, scope and duration of their collaboration.
	2. Corporate JV

[23] Historical costs correspond to all costs relating to research work carried out prior to the granting of a new mining title in a given area on behalf of the State or a publicly owned structure, which have contributed to the identification of mineral deposits and showings

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	In this case, the parties agree to establish a separate legal entity. In general, the most commonly used forms are commercial companies, (such as the Simplified Joint Stock Company (so-called "***Société par Actions Simpliiées***" or "***SAS***") for its flexibility or the Economic Interest Group (so-called "***Groupement d'Intérêts Economique***" or "***GIE***").
	Sometimes, an undeclared partnership (***"Société en Participation"***) or a de facto company is used, and in both cases the corporate structure is not registered with the Trade Register.
What are the rules for the constitution of JVs in Senegal?	In case of contractual JV, no legal formality is required.
	On the other hand, if it is a corporate JV, the formalities of incorporation of a company must be completed (establishment of the by-laws, registration with the Trade Register, publication in a legal gazette ...).
What are the main risks involved in using JVs?	The main risk lies in the disagreement between JV members, which could undermine the group's strategy or even paralyze it, or lead to its disappearance.
	Also, decision-making can sometimes be very long given the plurality of interests involved. This can also lead to risks of interest conflict of.

Exit conditions for mining holders

Senegal has adopted a new Mining Code through Law No. 2016-32 of November 8, 2016 (accompanied by its Implementing Decree No. 2017-459 of 20 March 2017). Replacing the Mining Code of 2003 (Law No. 2003-36 of November 24, 2003), the objective of this reform is to adapt mining legislation to international standards but also to harmonize the provisions of the Mining Code with those of other national and community legislation.

Exit procedures for Mining Title Holder: the procedures for the transfer of a mining authorization or permit are governed by the provisions of the Mining Code, as detailed below.

Authorization / Permit	Period of validity / Renewal	Assignment, transfer, leaseback, pledging
Prospecting authorization	Maximum 6 months, renewable only once for the same duration	Not authorized
Research Permits	Maximum 4 years, renewable twice for periods not exceeding 3 years (i.e., a total of 10 years)	Transferable subject to prior approval by the Minister responsible for mines
Exclusive Exploration Authorisation	The duration is specificto the agreement	Same as that for the transfer of anResearch permit
Mining Permits	Minimum: 5 years Maximum: 20 years Possible renewal (until the deposit is exhausted)	Transferable, assignable and subject to prior approval by the Minister of Mining
Small mine operating permit	Maximum 5 years, renewable for the same duration until the deposit is exhausted	Not authorized

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Semi-mechanized mining authorization	Maximum 3 years, renewable for the same duration until the deposit is exhausted	Not authorized
Artisanal mining license	5 years, renewable one or more times for the same period subject to payment of the related fee	Not authorized

Rules governing the merger and demerger of companies in Senegal: The rules governing the merger or division of companies are essentially defined by the provisions of the OHADA Uniform Act on the Law of Commercial Companies and Management of Economic Interest.

However, when these operations involve companies holding mining titles, they are also subject to prior administrative authorization.

The various steps of a merger operation are detailed in the table below.

Step	Description
Authorization of the Minister of Mining	In accordance with the provisions of Article 109 of the Implementing Decree of the Mining Code, any merger by absorption or creation of a new company, division, leasing, or early dissolution of a legal entity holding a mining title is subject to prior authorization from the Minister of Mining.
Preparatory phase (preparation of a draft of merger/demerger project)	It includes the study and negotiation of restructuring conditions followed by the drafting of the terms of merger or division. The merger project shall include in particular the terms of the proposed transaction and the expected duration.
Stages in the approval of the merger/demerger project by the corporate bodies and formalities prior to the shareholders' decision	From the outset, it should be noted that the steps of approval of the draft terms of merger/demerger may vary depending on the type of company. The steps listed below are for example and concern the case of a Public limited company with a Board of Directors (“société anonyme avec conseil d’administration”). • Convocation of the Board of Directors (BoD) ; • Board meeting to : - approve the merger project; - Convening of the Extraordinary General Meeting of shareholders (EGM); - Preparation of the BoD report destined to the shareholders meeting; - Draft resolutions for the EGM. • Appointment of one or more merger auditors and one or more contribution auditors, if applicable; • Communication of the merger project to the EGM, merger auditors, and contribution auditors; • Filing of the merger project with the Trade Register 30 days before the EGM; • Publication of the proposed merger in a newspaper authorized to carry legal notices 30 days prior to the EGM; • Where applicable, receipt of creditors' objections to the proposed merger within 30 days of insertion in an official newspaper ; • Convocation and making available to shareholders, 15 days before the EGM, the following documents: - The merger/demerger project; - The BoD’s report on the exchange ratio and valuation methods used; - The report of the merger auditors, if applicable; - The financial statements;

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	• Convocation of the statutory auditor(s) to the EGM (at least 15 days before the meeting); • Filing of the contribution auditors' report at the company's registered office and the competent court, if applicable;
Approval and completion of the merger/demerger operation	• EGM for : - Examination of the various reports; - Approval of the merger/demerger operation; - Capital increase, if any; - Modification of the statutes; - Dissolution of the absorbed company.
Formalities subsequent to EGM	• Declaration of compliance of the operation progress to the Trade Register ; • Registration and publication of EGM decisions on a legal gazette ; • Other usual formalities related to the capital increase (if any) and dissolution of the company being acquired without liquidation.

Tax implications of transfers of mining titles: from a tax point of view, the transfer (direct or indirect) of mining titles has implications in terms of Corporate Income Tax (CIT), Capital Gains Tax ("Taxe de Plus-Value Immobilière") and Registration Fees.

The application of these various taxes is detailed in the table below.

Taxes	Methods	Rates	Taxable base	Payment and person liable
CIT	The capital gain realized from the transfer of mining titles held by a company established in Senegal is subject to CIT. **Note** : this rule also applies to capital gains realized abroad that directly or indirectly relate to mining titles held by companies in Senegal (Article 4.5 of the SGTC)	30%	Amount of realized capital gain	In the case of a company established in Senegal and subject to CIT, the realized capital gain is included in its taxable income for CIT purposes. If the company is not established in Senegal, CIT must be paid at the time of registration of the transfer agreement. The CIT must be paid by the transferor under the responsibility of a designated representative. In the absence of a designated representative, CIT is jointly owed by the company holding the mining titles and established in Senegal (Article 31.6 of the SGTC).
Real estate capital gains tax	In addition to CIT, capital gains from the transfer of mining titles are subject to Real Estate Capital Gains Tax, in accordance with the provisions of Article 556 of the SGTC. **Note** : when the transferring company is subject to CIT in Senegal, the amount of the capital gains tax paid can be deducted from its CIT (Circular No. 0039 dated September 17, 2021).	10%	Amount of realized capital gain	The tax is payable by the transferor and must be paid during the registration formalities of the transfer agreement.

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Registration fees	Transfers of mining titles, as well as transfers of shares issued by companies located in Senegal or abroad and holding, directly or indirectly, interests in rights relating to mining titles, are subject to registration fees in Senegal.	5%	Sale price (or market value, if greater than the sale price)	The transfer agreement of the mining titles (or the transfer agreement of the shares issued by the Senegalese company) must be registered with the tax authorities one (1) month after signature. Registration fees are payable by the company holding the mining titles (art. 462 paragraph 3 of the SGTC).

EFE status and Investment Code regime

The Senegalese legislation provides certain special advantages to persons approved under specific incentive schemes. This is the case for the status of Free Export Zone Enterprise ("Entreprise Franche d'Exportation" or "EFE") and the Investment Code regime.

EFE status: the status of EFE was initially established by Law 95-34 of December 29, 1995 and amended by Law No. 2004-11 of January 27, 2004).

Initially set up for a period of twenty-five (25) years, the EFE statute was extended for a further three (3) years by law n°2021-42 of December 20, 2021 relating to the finance act for the year 2022. Therefore, the EFE regime has been extended until December 31, 2024.

Companies under EFE status benefits advantages for a period of 25 years. The conditions of eligibility for the EFE status and the benefits granted for approved companies are set out page 51:

Investment Code Regime: Established by Law No. 2004-06 of February 6, 2004, the Senegalese Investment Code aims to attract local and foreign private investment in specific sectors. It should be noted that certain provisions of the Investment Code (particularly those related to tax benefits) were repealed by Law No. 2012-32 of December 31, 2012. These benefits were incorporated into the General Tax Code.

The Investment Code provides specific incentives to stimulate investment in key sectors such as agriculture and agribusiness, fishing, livestock and related industries, manufacturing industry, tourism, and mining.

It should be noted that a reform of the Investment Code was initiated in 2021 and is ongoing to this day.

The eligibility criteria for this regime, as well as the benefits granted to approve enterprises, are presented page 52.

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Eligibility conditions for EFE status	Approval formalities and procedure	Benefits granted	Period of validity of the approval
- Be an agricultural, industrial and teleservices company established in Senegal	• **For new businesses:**	• **Tax benefits :**	25 years
	- A request addressed to the Minister of Finance, including the detailed nature of the activity and the location(s);	- Payment of CIT at the rate of 15% (instead of the usual 30%)	
- Allocate at least 80% of its production abroad	- A national identity document or a copy of the by-laws;	- Exemption from registration fees and stamp duties, in particular during the incorporation and amendment of the by-laws of the EFE;	
	- A certificate of registration with the Trade Register (RCCM);	- Exemption of CFCE;	
NB : Mining and oil companies cannot benefit from the tax advantages resulting from this regime (Article 253.3 of the SGTC).	- A copy of the Tax ID;	- Exemption from Local Economic Contribution (LEC) ;	
	- A technical sheet in ten (10) copies indicating the details of the project (target markets, distribution of turnover, details of necessary investments, etc.);	• **Customs benefits**	
	- Letter of intent from clients (for teleservices companies);	- Exemption from customs duties and customs stamps;	
	- Copies of contracts signed with customers and related purchase orders ;	- Duty-free export or import of capital goods, materials, raw materials, finished products, semi-finished products;	
	- Copies of invoices issued on behalf of customers;	- Local purchases free of all entry taxes;	
	- Bank credit advices ;	- The period of stay of imported goods is unlimited;	
	- Title of occupation for the site (for agricultural businesses)	- Possibility of selling part of the production on the local market (in this case, taxes are levied on the materials used in the manufacture of these products according to the origin and based on the customs value on importation of the said materials)	
		• **Other benefits**	
	• **For existing businesses:**	- Attribution of authorization to the EFEs allowing them to transfer all necessary funds for their investments, commercial and financial operations to countries outside the Franc Zone.	
	- A valid tax clearance certificate issued within the last six (6) months.	- Granting to their foreign employees, collaborators, shareholders, and lenders of EFEs the authorization to transfer funds to countries outside the Franc Zone in accordance with exchange regulations.	
	- Financial statements for the latest fiscal year.	- The freedom to recruit personnel, whether local or expatriate.	
	- A certified statement from the Customs Administration, including export declarations for the past two (2) years, indicating the exported values and weights.	- The possibility of recourse to international arbitration in the event of a dispute between an EFE and the State of Senegal.	
	- A statement of VAT declarations for the past two (2) years, certified by the Tax Administration.		
	- Certificate of manufacturing or production for each exported product and title of occupation of the land of base (for agricultural companies)		
	NB : The complete file is submitted to the APIX's "guichet unique" against issuance of a receipt.		
	APIX generally has a period of thirty (30) days from the date of submission to accept or reject the application. Failing this, approval shall be deemed to have been granted.		
	However, in practice, the processing time for the approval application may take more than two (2) months.		

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Sectors of activity eligible under the Investment Code	In accordance with Article 2 of the Investment Code, companies operating in one of the following sectors are eligible for the regime provided for in the said Code: • agriculture, fisheries, livestock and storage activities of plant, animal or fisheries origin; • manufacturing activities of production or processing; • extraction or processing of mineral substances; • tourism, tourism facilities and industries, other hotel activities; • cultural industries (books, cinema, documentation centers, audio-visual production centers, etc.); • Services in the following subsectors - health - education and training, - assembly and maintenance of industrial equipment, - teleservices, - Air and maritime transport • port, airport and rail infrastructure; • development of commercial complexes, industrial parks, tourist zones, cyber villages, and craft centers.. **Note** : Trading activities (resale as is) are expressly excluded from the scope of the Investment Code regime. Similarly, activities eligible for specific codes or the status of EFE (as described below in section 17.1 above) also fall under the benefits of the Investment Code.
Minimum investment amount	The minimum investment amount required for the projected investment is XOF 100,000,000 XO. However, for small and medium-sized enterprises (SMEs)[1], the minimum amount of investment is reduced to XOF 15,000,000 CFA provided that the investment is made in the following sectors considered as priorities : - the primary sector and related activities: agriculture, fishing, livestock, storage, packaging and processing of local products of plant, animal or fisheries origin, agri-food industry; - social sectors: health, education and training; - services: assembly, maintenance of industrial equipment and teleservices;
Investment forms	The investment must take the form of a new business or an expansion project - A new enterprise refers to any newly created economic entity in the process of implementing an eligible investment program for the start of its activities. - An expansion refers to an approved investment program initiated by an existing company that results in : ○ An increase of at least 25% in production capacity or the value of acquired fixed assets ○ An investment in production equipment of at least XOF 100,000,000.
Approval terms and conditions	An application for approval must be compeled by the applicant and submitted to APIX, which issues a deposit receipt to the applicant. The approval application file must include the following documents: • **For all sectors** - a letter for approval addressed to the Ministry of Finance. - A certificate of incorporation issued by the Trade Register, legalized by-laws, Tax ID (in the case of a sole proprietorship); - Ten (10) copies of a technical sheet indicating the investment's location, investment origins, description and process of the goods and services to be produced, current and planned production capacities, expected launch date, etc... • **For the education, healthcare, tourism, mineral extraction, and infrastructure sectors:** - Required authorizations for the healthcare or education sectors. - Architectural plans for the proposed works and execution plans for infrastructure projects. - A contract to attach the project to an existing reception facility or, failing that, a base, for leisure projects; - The authorization of opening and operation if the tourist facility includes a casino and gaming rooms. - An exploitation permits as provided by the Mining Code for mineral extraction projects. • **For expansion projects** - The aforementioned documents. - A tax clearance less than three (3) months old; - Financial statements from the latest accounting period.
Approval procedure	The application for approval is processed by APIX and forwarded to the Approval Committee for review. The instruction must be made by APIX within ten (10) working days from the date of issue of the deposit receipt. If, at the end of this period, no reply is given, **the approval is deemed to have been granted.** However, APIX may request additional information for a better examination of the application. The approval is issued by the Minister of finance through a letter. It is issued in two (2) phases: • Approval including the advantages granted during the implementation phase, • Approval including the advantages granted during the operation phase.
Benefits granted	The benefits granted to beneficiaries vary depending on the project phase. • **Benefits granted during the investment phase** - Exemption from customs duties on the importation of equipment and materials that are neither produced nor manufactured in Senegal and are specifically intended for production or operation within the Approved Investment Program. - Suspension of VAT on imports and local purchases of goods and services. **Note:** The investment phase refers to the implementation phase of investments, which lasts until the date of first production. In any case, the investment phase cannot exceed three (3) years. • **Benefits granted during the operational phase** - **CFCE** Exemption for a period of five (5) years. This duration can be extended to eight (8) years if the approved company creates at least 200 jobs or if at least 90% of the created jobs are outside Dakar; - Possibility to enter into fixed-term contracts for a maximum duration of five (5) years from the date of approval, provided that the employment contract references the Investment Code as well as the reference to the approval letter; - Tax credit: For five (5) consecutive years starting from the year following the completion of the investment program, the approved company is authorized to deduct 40% of the amount invested, without exceeding 50% of the taxable profit. Beyond these five (5) years, the remaining tax credit is lost.

Rules relating to imports and exports of goods in Senegal

Overview of customs duty and import taxes applicable when goods are imported into Senegal: imports of goods or equipment are subject to customs duties and import taxes. Some of these levies apply to goods imported from third countries (i.e. outside WAEMU and ECOWAS), detailed below:

- Customs duties ("**Droits de douanes**"), the rate of which varies between **0%, 1%, 5%, 10%, 20% and 35%** depending on the customs position of the imported products (i.e. HSN Code) ;
- Statistical fees ("**Redevance statistique**") at a rate of 1% of the CIF value (CIF includes Cost, Insurance and Freight)
- The ECOWAS community fees ("**Prélèvement communautaire CEDEAO**") at a rate of **0.5%** of the CIF value;
- The WAEMU community solidarity fees ("**Prélèvement communaire de solidarité**") at the rate of **0.8%** of the CIF value;
- COSEC fees at the rate of **0.4%** of the CIF value;
- PROMAD fees at the rate of **1,5%** of the CIF value;
- VAT at a rate of **18%** of the CIF value plus customs duties and statistical fees.

Note : The importation of certain goods (e.g., tobacco, coffee, hydrocarbons, etc…) is subject to specific taxes. In such cases, these taxes must also be paid by the importer to the customs authorities, along with the customs duties and other levies mentioned above.

Formalities and documents prior to the import or export of products (common regime): the formalities set out in **the table below** are general and apply to import or export operations carried out in Senegal.

	Import	Export
Prior formalities	• Apply for a trader's card. • Apply for an import/export card.	
Procédure	• **Pre-clearance** - Collection and production mandatory documents from abroad related to importation through the customs administration system. - Submitting a prior import declaration.. • **Customs clearance** - Subscribe to a declaration including: ○ the commercial invoice; ○ the transport document (bill of lading or air waybill, as applicable); ○ the certificate of origin; ○ the certificate of insurance; ○ the sanitary or phytosanitary certificate (depending on whether they are products of animal or plant origin); ○ the prior import declaration; ○ the check certificate; ○ Food Import Declaration (so-called in French ***"Déclaration d'Importation de Produits Alimentaires"*** *or* **"DIPA"),** if applicable ; ○ the declaration of value elements ; ○ other documents related to importation.	• □Submit a declaration including the following documents : - the commercial invoice; - the customs declaration; - the export certificate; - sanitary and phytosanitary certificates, where applicable; - foreign exchange commitment; - the certificate of insurance; - Bill of Lading ; - a certificate of origin. • Use the services of an authorized customs broker when the value of the goods exceeds XOF 200,000.
Special restrictions	The import of the products listed below is subject to specific conditions (non-exhaustive list): • **Hydrocarbons**: Prior authorization from the Ministry of Energy · Gold: Prior authorization from the Ministry of Economy and Finance • **Weapons and ammunition, transmitting and receiving devices**: Ministry of Security • **Meat and offal**: Ministry of Livestock **Note**: Obscene publications in any form (cassettes, videos, newspapers, and any other objects contrary to public decency), narcotics, and subversive publications likely to disturb public order are prohibited from import	The export of the products listed below is subject to specific conditions (non-exhaustive list): • **Gold**: Prior authorization from the Ministry of Finance • **Salt :** Trade Ministry ; • **Leather and skins:** Ministry of Livestock

Temporary Admission Scheme for Mining Permit Holders: in accordance with the provisions of article 79 of the Mining Code, companies holding mining titles benefit from a special regime for the import and export of certain materials and equipment. This regime consists of an exemption from customs duty and import taxes during the research phase (see our comments above in section 12) and temporary admission for customs purposes.

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Regarding temporary admission, please note that in accordance with the provisions of Article 79 of the Mining Code, upon simple certified presentation of a research permit, benefit from temporary admission, with total suspension of import duties and taxes:

- Materials, supplies, machinery, equipment, and utility vehicles directly intended for mining exploration operations.
- Construction machinery and vehicles that can be re-exported or transfer after use.

Note: In the case of release for consumption following temporary admission, the duties and taxes payable are those in force on the date of filing of the declaration of release for consumption. The basis for collecting those duties is the market value of the products on that date.

3.2. Macroeconomic context for in-country financings

Gross domestic product (GDP) analysis

Historical GDP growth (The World Bank, 2022)

Senegal's GDP in 2020 stood at $24.9 billion in current terms. Its per capita gross national income (GNI) was $1,430 in 2020, making it a lower-middle-income country (Figure 9, Figure 10, Figure 11, Figure 12).

Senegal's economy grew by more than 6% per year between 2014 and 2018. Real GDP growth stood at 0.87% in 2020, down from 4.4% in 2019, and 6.2% in 2018.

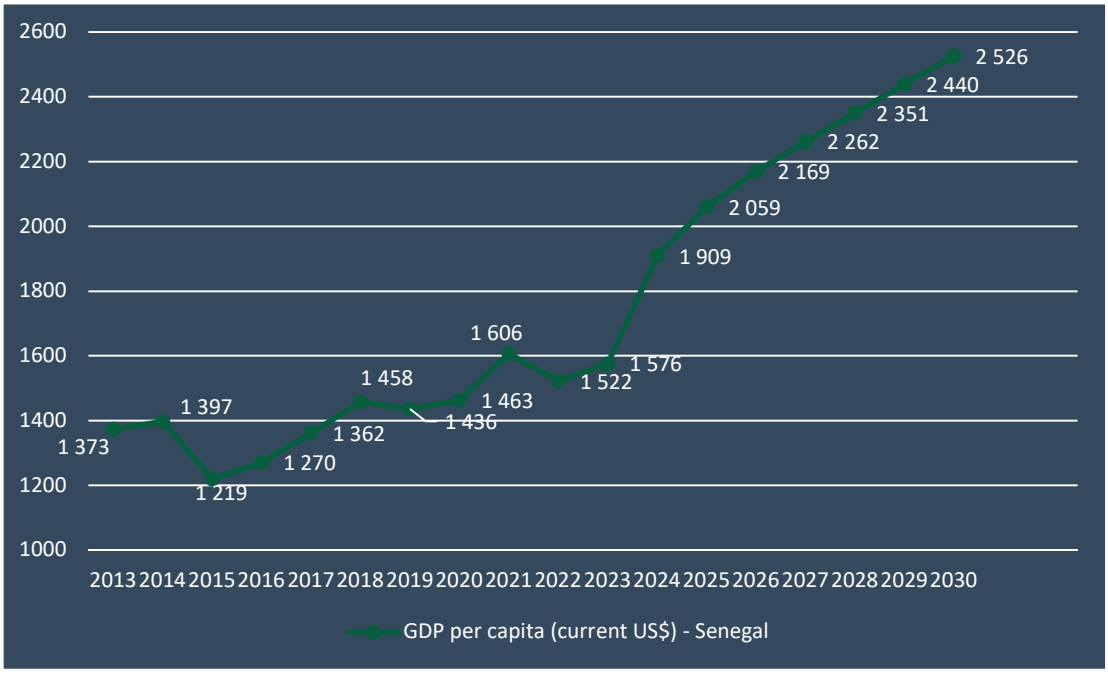

Figure 9. Historical gross domestic product (GDP) per capita from 2011 to 2021 for Senegal & projected estimations from 2022 to 2030 (Sources: World Data Bank, S&P)

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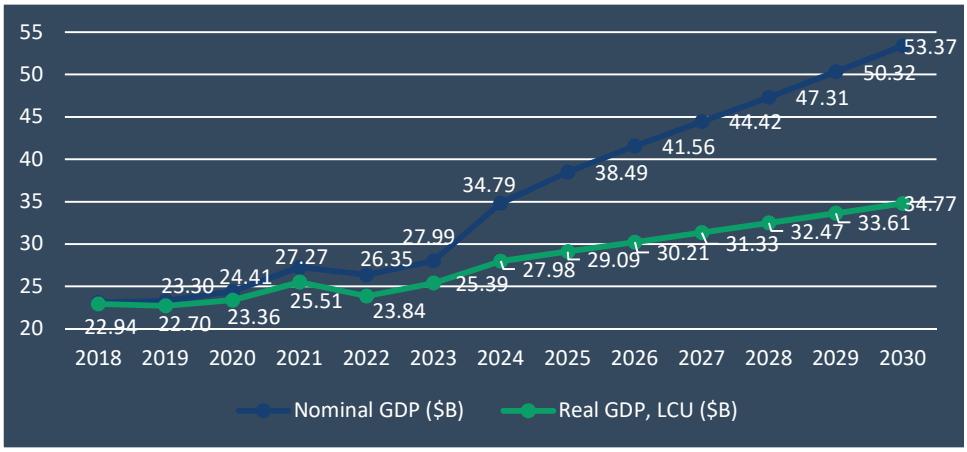


Figure 10. Historical and projected nominal GDP and real GDP growth for Senegal (Sources: S&P)

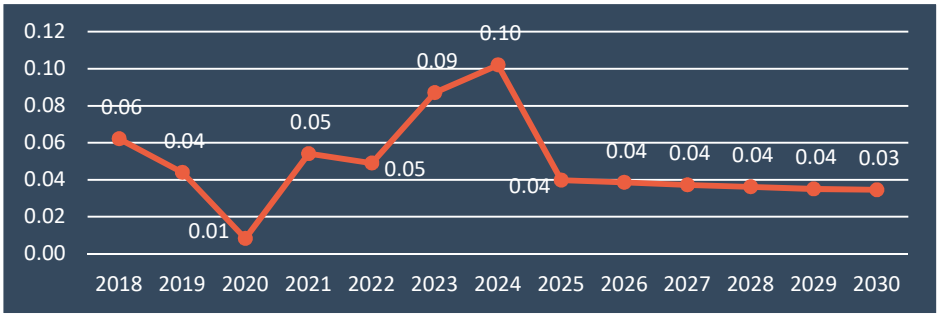
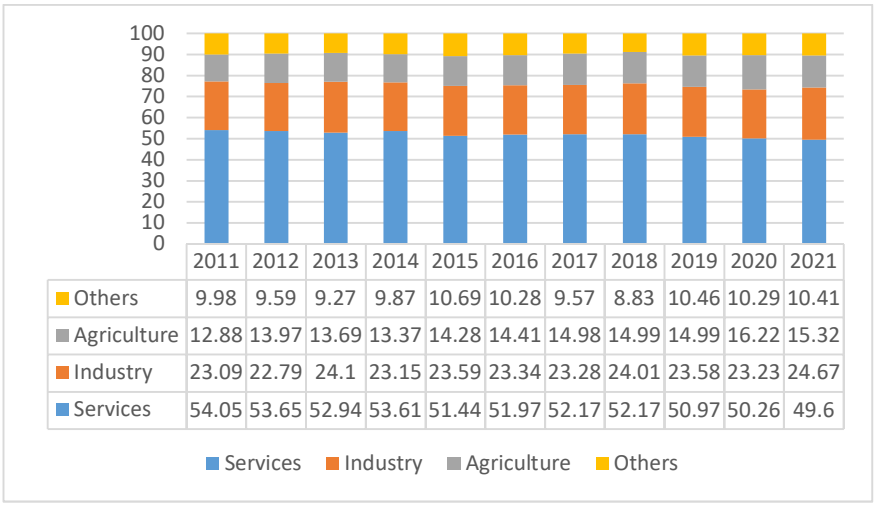


Figure 11. Historical and projected real GDP growth of Senegal [%]



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Others	9.98	9.59	9.27	9.87	10.69	10.28	9.57	8.83	10.46	10.29	10.41
Agriculture	12.88	13.97	13.69	13.37	14.28	14.41	14.98	14.99	14.99	16.22	15.32
Industry	23.09	22.79	24.1	23.15	23.59	23.34	23.28	24.01	23.58	23.23	24.67
Services	54.05	53.65	52.94	53.61	51.44	51.97	52.17	52.17	50.97	50.26	49.6

Figure 12. Distribution of gross domestic product (GDP) of Senegal across economic sectors from 2011 to 2021 [%] (Source: Statista)

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Projected economic growth driven by public investment and hydrocarbons production (The World Bank, 2022), (Coface, 2022)

The economic recovery in Senegal is facing challenges, primarily due to the conflict in Ukraine. Real economic growth is projected to decline from 6.1% in 2021 to 5% in 2022. This decline is attributed to reduced private consumption and investment, driven by higher food and energy prices and increased uncertainty. The COVID-19 pandemic has significantly impacted sectors like tourism, transport, and exports. Senegal has responded with containment measures and an Economic and Social Resilience Program (PRES). However, challenges include limited fiscal reserves, a vulnerable healthcare system, and a substantial informal sector.

The economic recovery is expected to be gradual, requiring deeper reforms outlined in the Emerging Senegal Plan (PSE). Public investment remains essential for growth, with the "Emerging Senegal" Plan supporting infrastructure improvements that boosted average growth to approximately 5% between 2014 and 2019.

Infrastructure projects, including the regional express train, a deep-water port, and energy projects, are set to enhance economic development. However, oil and gas projects have been delayed due to the pandemic and are not expected to contribute to revenue and exports until 2024. The current-account deficit will widen in 2022 but is expected to shrink as oil and gas exports ramp up in 2024-26.

The recovery, along with the resumption of tourism and reduced imports linked to resource extraction, is expected to boost growth from 2023. Nevertheless, potential global economic slowdown and deteriorating terms of trade, particularly in gold, may impact trade expansion negatively.

GDP and its breakdown by major sector of GDP: services, industry and agriculture (Coface, 2022)

The government is continuing to engage in numerous development agreements, for instance in agriculture with a loan from the African Development Bank for EUR 121 million in June 2022. While the structure of GDP is relatively balanced, the workforce remains concentrated in agriculture (16% of GDP for 80% of the workforce in 2020), highlighting the low productivity of the sector. Tourism (6% of GDP and 9% of employment before COVID-19) and mineral prices subject to the health and economic situation are all signs of fragile fundamentals before the discovery of offshore deposits.

The IHS Markit real GDP growth forecast for Senegal stands at 5.0% in 2022 and 8.8% in 2023 despite continuing pandemic-related challenges, including new spending priorities such as youth employment creation and health services. The projected impact of oil and gas production on real GDP is driving the higher rate for 2023. The manufacturing, construction, trade and transport sectors should provide sustained support to the economy.

Stable institutions but simmering tensions with impacts on GDP (Coface, 2022), (S&P Global)

Regional instability poses risks to the economy, particularly in the south-east of the country, where armed groups operate near the goldfields, while the Islamist threat spreads from neighbouring Mali. Artisanal and informal gold mining provides opportunities for these groups and represent a leak for GDP: money

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laundering, recruitment of poor people, smuggling, supply of explosives, etc. The structuring of the sector by the state, including the local population, should prevent the fight against the underground economy from becoming unpopular. Internally, the opposition made progress in the July 2022 legislative elections, benefiting from frustrations linked to youth unemployment, corruption fuelled by major construction projects and growth that does not benefit everyone equally. Despite strong support from rural areas, President Sall's short majority is unlikely to have much room for manoeuvre, which rules out a third term in 2024, provided the constitution can be amended.

Despite now tougher challenges in the National Assembly, President Sall is likely to accelerate the passage of subsidiary legislation relating to local content in the oil and gas sector as a vote-winning measure ahead of the next presidential poll. Senegal has set an ultimate target of 50% local content by 2030, an aim inhibited by a current shortage of skilled local labour, but Sall is likely to enforce more stringent adherence to using local suppliers and subcontractors as the industry heads towards the start of oil and gas production in late 2023.

Foreign direct investment (FDI) analysis

The foreign direct investment in Senegal can be found below (Figure 13).

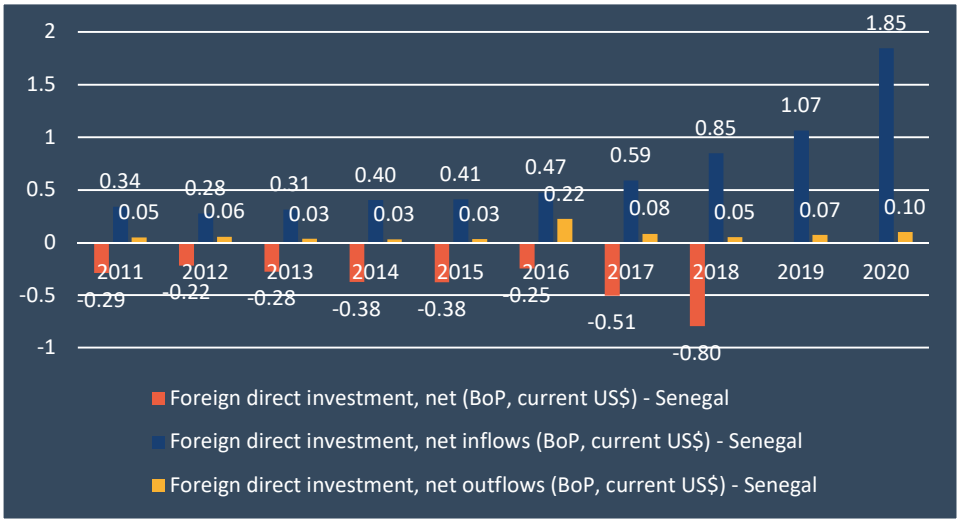

Figure 13. Foreign direct investment net, net inflows, net outflows from 2013 to 2020 in Senegal (Source: World Data Bank)

Net FDI analysis (IMF - International Monetary Fund, 2022)

The current account deficit has been financed in part by a significant increase in foreign direct investment in recent years. Net FDI was estimated to be 5.8 percent of GDP in 2020—up from 4.3 percent in 2019 and 3.4 percent in 2018—largely associated with foreign participation in the SNE and GTA hydrocarbon projects, which are largely externally-financed. Net portfolio investment flows were estimated to be 1.1 percent in 2020, down from the elevated levels seen in 2017-18 associated with Senegal's Eurobond issuances in those years. In 2020, the authorities have relied on concessional financing from IFIs and bilateral partners to finance additional spending in response to COVID-19. Staff believe there are

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moderate risks from a financial account perspective. The increase in FDI poses a low level of risk to external stability given their strong link to future output from the oil and gas projects. The use of concessional financing to fund the government's response to COVID-19 has further reduced financing risks. However, while spreads are currently low, Senegal's capacity to access financing on capital markets at reasonable rates is contingent on the highly uncertain path for global interest rates. The authorities should prioritize concessional financing in the near term, alongside a gradual increase in domestic financing over the medium term, taking advantage of favorable global market conditions where possible.

FDI inflows analysis (LLOYDS BANK, 2022)

Senegal hosts a large stock of FDI compared to its region. The government is leading an active policy to encourage FDI inflows. According to the UNCTAD 2021 World Investment Report, Senegal was among the few economies on the continent that received more FDI inflows in 2020, up 39% to USD 1.5 billion, compared to USD 1.1 billion in 2019, despite the global economic crisis triggered by the Covid-19 pandemic. The total stock of FDI stood at USD 8.7 billion at the end of 2020. This increase in FDI is the result of investments in energy, both in the traditional oil and gas and renewable energy sectors. According to UNCTAD' Investment Trends Monitor, global FDI flows rebounded strongly in 2021, but FDI flows to African countries (excluding South Africa) rose only moderately. Work on offshore oil and gas fields first began in Senegal in 2020, the largest project being the SNE Oil Field, which is being developed 100km south of the capital, Dakar, by a consortium including Woodside Petroleum (Australia), Cairn Energy (UK), FAR (Australia) and Petrosen (Senegal).

Since 2014, FDI inflows have been linked to the Emerging Senegal Plan for the development of infrastructure, electricity, agriculture, drinking water and health. Senegal is looking to develop new industries that are linked to hydrocarbons such as petrochemicals, pharmaceuticals, fertilizers as well as a broad utilization of gas-to-power projects linked to the automotive manufacturing and mining (Energy Capital Power). Foreign investors have secured contracts to exploit mineral resources, provide garbage services, and manage Dakar's maritime port. Port Operator DP World (a Dubai-based company) plans to build a massive USD 1.1 billion deep-water port located 50km away from Dakar. France is the largest investor in Senegal, but recently there have been important investments from China, Turkey and the United Arab Emirates. Some other key investors are Morocco, Indonesia, and the United States.

Foreign Exchange (FX) and inflation

Exchange rate

Currently the founding principles that act on the Franc Zone are those recalled in the conventions of 1972 and 1973.

- Fixed parities with the anchor currency
    - The rate of the CFA franc is pegged to that of the euro with a fixed parity rate. Nowadays 1 EUR = 655.957 CFA francs.
- Free transferability

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- Transfers are free within the Franc Zone, whether they are current transactions or capital movements.

- Guarantee of convertibility by the French Treasury and centralization of foreign exchange reserves
  - The Treasury undertakes to ensure the convertibility of the currencies issued by the issuing institutions of the zone (the BCEAO, the BEAC and the Central Bank of the Comoros). In return, the African central banks must deposit a portion of their foreign exchange reserves there (excluding current cash and transactions with the IMF) up to 50% for the BCEAO and the BEAC. Since 1975 these assets have also had an exchange guarantee with the SDR. The centralization of foreign exchange reserves is also done at the regional level with the central banks of the states in the zone.

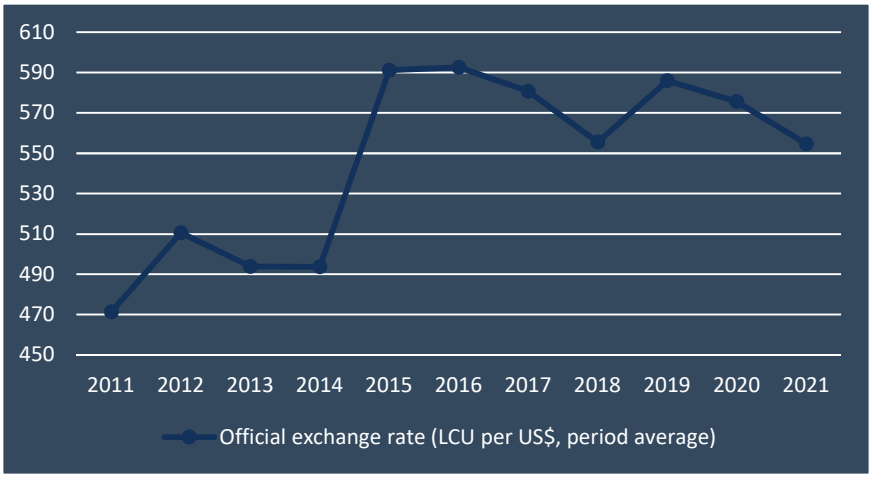

Figure 14. Historical official exchange rate in Senegal (CFA per US$, period average)

Therefore and according to Figure 14, the average annual exchange rate generally decreased between 2019 and 2021 but it decreased sharply since May 2021 and this downward trend should not be reversed in 2023 according to the (Trading Economics, 2022) due to the high inflation in 2022 and likely in 2023.

Inflation

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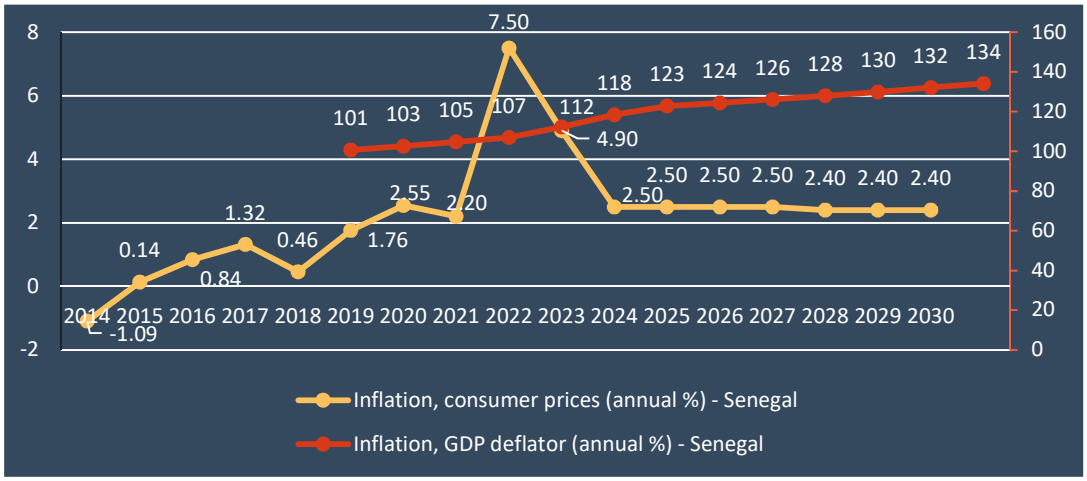

Figure 15. Historical and projected data on inflation indicators in Senegal (S&P Global, 2022)

First, Consumer Price Index (CPI) is based on the prices of goods and services consumers buy from a fixed basket of goods. On the other hand, the GDP deflator covers all domestic products and services produced in an economy. CPI includes foreign or imported goods, while the GDP deflator is exclusively for domestically produced goods. This is why the evolutions of these two indicators are different. However, inflation has generally been on the rise since 2014 (Figure 15).

Having weathered the pandemic relatively well, the economy has been hit hard by the consequences of the war in Ukraine. The country is heavily dependent on external food and energy supplies, resulting in high imported inflation in 2022. Inflation actually reached a multi-decade high of 11.2% in August, driven by rising food prices (17.3%), negatively impacting the level of household life. Average inflation in 2022 is now expected to reach 7.5%. In 2023 and 2024, the energy sources of inflation are expected to diminish, but the degree of decline will depend on the Ukraine war and the climatic hazards affecting agriculture.After 2024, inflation should hover around an average value of 2.4 to 2.5.

Sovereign debt[24]

The evolution of sovereign debt in Senegal can be found below (Figure 16, Figure 17).

[24] (Countryeconomy.com, 2021) (The World Bank, 2022)

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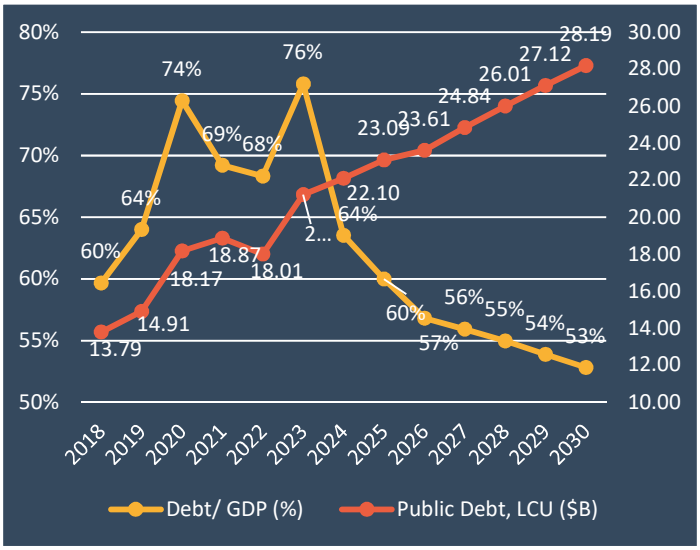

Figure 16. Historical and projected data on public debt and debt/GDP of Senegal (S&P Global, 2022)

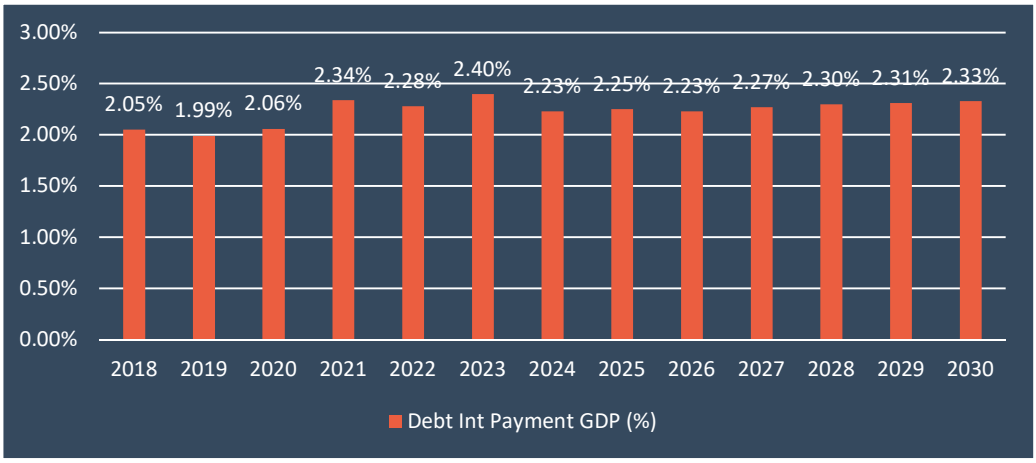

Figure 17. Historical and projected data on public debt interest payment of Senegal (S&P Global, 2022)

In 2021, Senegal's public debt reached 20.221 million dollars, a rise of 3.252 million dollars compared to 2020, representing 69% of the country's GDP. Over the years, Senegal's debt has been steadily increasing, both in absolute terms and as a percentage of GDP. In 2021, the per capita debt stood at $1,176, up from $1,013 in 2020 and $449 in 2011. Senegal's global debt position in terms of GDP percentage has worsened in 2021, ranking 129th out of 190 countries. The exploitation of hydrocarbons is expected to help reduce the current deficit, but challenges remain due to the Ukraine war's impact on energy and agricultural products. Debt forecasts indicate an annual increase in public debt, though the debt-to-GDP ratio is expected to improve from 2024, contingent on the successful start of Senegalese oil projects, delayed by the COVID-19 pandemic.

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Regional economic alliances/uniform regulatory, accounting, legal frameworks as these may facilitate trade and foster a business-friendly environment[25]

Senegal is a member of ECOWAS, aiming to establish a regional free trade zone for 300 million inhabitants, although the full implementation of the ECOWAS Trade Liberalization System (ETLS) remains pending. The country has embraced the ECOWAS Common External Tariff (CET) System and generally enforces tariffs transparently. Senegal signed the African Continental Free Trade Area (AfCFTA) agreement in 2018, which came into effect in 2019, with ongoing negotiations for full implementation.

Senegal lacks a bilateral taxation treaty with the United States but has double taxation avoidance agreements with 15 partners. In the World Bank's 2020 Doing Business report, Senegal improved its ease of doing business ranking, moving from 141st to 123rd worldwide. The country has expanded access to credit information, streamlined tax collection through electronic systems, and initiated reforms in the labor market, land access, and commercial justice.

Senegal offers no legal discrimination against foreign-owned businesses and allows full foreign ownership in most sectors. Its advantages include competitive production costs, a skilled workforce, strategic location, positive political relations, and a competitive economy. However, challenges include economic vulnerability, limited diversity, infrastructure underdevelopment, bureaucratic hurdles, high costs, and security concerns.

Senegal has close relations with France and the U.S. on military issues, with the EU on migration issues, with China on trade issues and with Russia for agricultural inputs. This dependence on products of Russion agriculture, the lifting of sanctions on Mali by ECOWAS and increased links with Turkey and the Gulf States are the main recent developments to watch.

Restrictions on imports/exports and overview of time and costs relating to customs clearance[26]

Overview

Senegal is a member of the West African Economic and Monetary Union (WAEMU) as well as the Economic Community of West African States (ECOWAS). Through these organizations, Senegal has adopted broad economic, import, customs, tariffs, and export regulations.

Senegal abides by the ECOWAS Common External Tariff (CET) with a special import tax (TCI) on selected food products whose prices drop below a certain threshold. Import duties and customs fees are one of the GOS's main sources of revenue. The GOS has contracted with Swiss-based Cotecna for Senegal's pre-shipment inspection (PSI). PSI applies to all imported goods valued at three million CFAF ($6,000) and higher.

The Senegalese Single Window, called ORBUS, was established in order to achieve the following objectives:

- Reduction of customs clearance time-limits

[25] International trade administration, 2020
[26] International trade administration, 2020, PWC, 2022

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- Reduction of customs clearance costs
- To improve the quality of the service offered to importers and exporters
- Elimination of red tape

Some rates and dates for corporate taxes

- Value-added tax (VAT)

Subject to certain exclusions, most commercial operations are subject to an 18% VAT.
VAT on tourism activities is 10%.
A 17% special tax on financial activities (mainly banking, money transfers, interest, premiums and other remunerations received on loans, keeping of bank accounts or equivalent, financial intermediation and change operations) is applicable instead of VAT.
VAT returns must be filed monthly.

- Customs duties/Import tariffs

In the case of import of goods, the following tariffs apply:

  - Customs duties: 0%, 5%, 10%, or 20%, depending on the nature of the goods.
  - Statistical import charge: 1%.
  - Community solidarity levy: 0.8% since 1 July 2017 (1% before July 2017).
  - Economic Community of West African States (ECOWAS) levy: 0.5% (only applicable to products originating from non-ECOWAS countries).
  - Senegalese Shippers Council (COSEC) royalty: 0.4% (only applicable on importation by sea).
  - A 1.5% levy for the Customs Modernisation Program was introduced by the 2022 Finance Act. It is applicable to the customs value of eligible goods, excluding those placed under customs and tax regimes promoting investment.
  - A 0.5% levy is added to the fees due for commercial operations carried out outside the legally prescribed hours and for customs computer services (Finance Act 2022). It is applicable to the customs value of eligible goods, excluding those placed under customs and tax regimes promoting investment.

- Export duties on non-monetary gold
  - The rate is fixed at 4% on the customs value of non-monetary gold and is paid at the point of exit from the national territory.

3.3. Political context for in-country financings

Introduction

Senegal has a rich mineral resource base, including precious metals, base metals, industrial minerals, and heavy minerals, but the country's resources remain under-exploited. President Macky Sall has prioritized the development of the mining sector and has attracted foreign investments. The country's political stability and democratic credentials have played a key role in attracting investors. The exploitation of oil and gas at the Greater Tortue Ahmeyim discovery will further boost Senegal's economic development. However, political tensions and socio-economic grievances pose challenges for businesses operating in Senegal. Regulatory risks are limited, with a focus on streamlining regulatory procedures. The government

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is also conducting assessments to ensure compliance with social and environmental obligations as required by the Mining Code. Overall, Senegal presents attractive opportunities for investors in the mining sector.

Political environment

Background: Senegal is a politically stable country with a strong democratic reputation. It has never experienced a coup d'état and has undergone two peaceful alternations of power. The army is professional and not involved in politics. Political parties can form freely and there is respect for freedom of assembly and expression. However, power remains heavily concentrated in the president's office and the independence of the judiciary has been called into question. This has led to unrest and undermined Senegal's reputation as a democratic exception in West Africa.

Current dynamics: Tensions have been mounting between the ruling camp and opposition party in recent years. Opposition leader Ousmane Sonko has faced multiple legal cases and was sentenced in May and June respectively on defamation and “corrupting the youth” charges. The latest convictions could make him ineligible to run in the 2024 elections. Moreover, on 31 July, a judge placed Sonko under a warrant of deposit for eight new charges related to national security. Sonko is likely to remain in prison until at least early February 2024 and to face a new trial. This is likely to further prevent him from running in 2024.

Some challenges are faced in Senegal, including issues like deficiencies in public services, rising living costs, and corruption allegations against the ruling camp. These grievances have led to a decline in popularity for President Sall and his party. While the ruling coalition managed to retain a narrow majority in the legislative elections, they lost a significant number of seats compared to previous elections.

The opposition coalition Yewwi Askan Wi remained united for the 2022 legislative election. However, it is expected that these divisions will grow as various coalition members, such as Khalifa Sall, Déthié Fall, and Ousmane Sonko, have their own political ambitions for the 2024 presidential elections. Additionally, a new bill passed in August 2024 will allow previously ineligible candidates, like Khalifa Sall and Karim Wade, to run.

Civil unrest and political stability: Ongoing political tensions (due to Sonko’s detention) are likely to create risks for political stability in the upcoming year, with potential triggers. The overall political stability is nevertheless unlikely to deteriorate.

Civil war: The risk of civil war in Senegal is low, but the secessionist MFDC group still poses security challenges in the Casamance region. The Senegalese army has conducted operations against the group and weakened its southern front. However, clashes with the MFDC's northern faction and periodic confrontations are expected to continue, making the security situation in northern Casamance volatile. Businesses, foreign personnel, and mining operators in Casamance may be at risk of robberies, abductions, and potential attacks.

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Attitudes towards foreign investment in the mining sector

Under President Macky Sall, the government of Senegal has shown a positive attitude towards the mining sector. They are actively working to increase foreign direct investment and consider mining a priority sector in their development plans. Sall's administration has also implemented stronger regulations regarding local development, social responsibility, and environmental protection in the mining industry. This is a significant departure from the previous government under President Abdoulaye Wade, which had lax enforcement of regulations and offered tax exemptions to mining companies. Changes to mining regulations have been made, including the requirement for companies to publish their revenues and contribute to local development funds. Sall's commitment to the mining sector is expected to continue, even if there are potential changes in leadership after the upcoming presidential elections.

The 25 February 2024 presidential elections are unlikely to lead to major changes in the government's attitude towards the mining sector. In our most likely scenario, the BBY candidate secures victory in the first round of elections and maintains Sall's economically liberal, pro-business orientation. He seeks to develop the mining sector and encourage foreign investments. In a credible alternative scenario, an opposition candidate secures victory in a second round of elections. Although the new president may push for further scrutiny and review of contracts previously reached under Sall administration, he remains committed to a pro-business orientation, and seeks to develop the mining sector and foreign investments.

Civil society activism

Senegal's civil society organizations, such as Y'en a Marre and FRAPP-France Dégage, have been actively protesting against various political and socio-economic issues in recent years. These include deficiencies in public services, low purchasing power, flood management, power cuts, and water supply disruptions. FRAPP has also targeted foreign interests, criticizing the presence of foreign investors and the opening of a Chinese mall and French supermarkets. The movement also supports trade unions and workers who denounce precarious working conditions, especially in the growing mining sector, where they will continue to advocate for respect of labor and environmental regulations.

Local communities, civil unrest, and labour activism in Eastern Senegal (Kedougou and Tambacounda regions): Socio-economic grievances in the Kedougou and Tambacounda mining regions in Senegal will continue to drive civil unrest, creating challenges for mining operators in the area. These regions are among the poorest in Senegal, with a high percentage of people living below the poverty line. Local communities have expressed frustration over political exclusion, lack of economic development, and inadequate public services. Incidents such as protests over lack of electrification and deficiencies in the healthcare system have further fueled these grievances. The local population also holds gold-mining companies accountable for the lack of progress in the region.

Certain companies have faced criticism for their inadequate efforts in reducing their environmental impact. In particular, during the Mako demonstrations, the mining company in eastern Senegal was accused of polluting the Falémé river and neglecting its social and environmental responsibilities. This

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issue was previously raised in an article by a local newspaper in November 2020. While gold mining companies have mainly been targeted, other projects in Senegal could also face similar complaints. Therefore, mining operators need to carefully manage labor and community relations to prevent unrest and disruptions.

External environment

International regulations: Senegal has been praised for its high scores in implementing transparency and stakeholder engagement measures in the mining sector, as required by the International Extractives Transparency Initiative (EITI). However, the EITI report pointed out that there are still challenges related to the transparency of revenue collection in the mining sector, as cash payments hinder transparency. It is expected that the government will continue to work on adopting transparency policies to make Senegal a leading mining jurisdiction in the future.

Senegal has ratified international conventions on natural resources management and environmental protection, such as climate change and hazardous waste disposal, but implementation is lacking. Artisanal miners in Eastern Senegal continue to use over 5.2 tons of mercury each year, polluting rivers and soils. While industrial mining companies comply with labor rights regulations, the artisanal mining sector still faces challenges, including child labor practices in gold mining exploitation.

At the regional level, the Senegalese government has ratified the West African Economic and Monetary Union (WAEMU) 2003 Mining Code and the Economic Community of West African States (ECOWAS) Mining Directive. These codes aim to harmonize and improve regulatory frameworks, promote human rights and social equity, and protect local communities and the environment in mining areas.

Threat in regional countries: The presence of Islamist militancy in Mali will continue to pose security challenges for Senegal, particularly in its eastern mining regions. Although Senegal has never been targeted by a terrorist attack, it remains an attractive target due to its close relations with France, its previous involvement in the military intervention in northern Mali, and Dakar's role as a diplomatic hub. Concerns of potential attacks in Senegal have been heightened by precedents in neighboring countries and the arrest of Senegalese individuals reportedly linked to Boko Haram. In February 2021, a dormant Salafi-Jihadist cell was dismantled in the Tambacounda region.

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4. Assessment of social, environmental, and governance challenges[27]

4.1. Country-level assessment and context

4.1.1. Mineral/mining policies, industry policies

Senegal joined EITI in October 2013 and the government has made efforts in reforming the legislative and regulatory framework of the mining sector with the aim of improving the governance of mineral resources and securing its interests with a strong national private sector. The New Mining Code has been adopted the 8 November 2016. It implements many important changes that follow those introduced elsewhere in Africa during recent years, such as the introduction of a production sharing agreement, local development provisions, increased transparency obligations, and changes to royalties and taxes calculations. The former code will continue to govern existing mining titles, while **the New Code only applies to those acquired after 8 November 2016** (once the implementation decree has been published).

The new mining code has brought major innovations:

- **Increased Benefit from Mining through** (A variable substance-dependant mining royalty rate, reintroduction of the surface tax, introduction of the principle of production sharing applicable in special government, strengthening control, promotion of local content;
- **Redistribution of Mining Revenues** between the communities impacted by mining (through the Local Development Support Fund (LDSF) and Equalization Fund for Local Authorities), the State and the mining administration. Mining title holders must now contribute annually to the LDSF, levied at levied at 0.5% of sales after tax.
- The LDSF promotes the economic and social development of local communities residing near mining areas and must include women's empowerment projects.
- **Environmental Management through**: clarification of the requirement to conduct environmental assessments and the extension of the rehabilitation obligation to all holders of mining titles.

The Mining Sector Development Policy of Senegal is based on two levers (**the Emerging Senegal Plan** for the period 2014-2023 and **the Sectoral Policy Letter** for the period 2021-2025) and its objectives are:

- Proposal of strategies for the development of the gold, phosphate, zircon, and iron sectors with a view to achieving annual production objectives and, above all, promoting local processing, a source of wealth creation and employment.
- Development and validation of a national strategy for the development of local content in mining sector for an increase in local added value and job creation throughout the mining value chain
- Optimization of monitoring and control of mining operations by modernized tools.

[27] Most of this section is from AfricaMaVal deliverable 4.1 by AWIMA

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When regarding ECRMs, a strategy for the development of the phosphate sector is being developed, as it gives high probability of contributing to the national economy through local processing as well as wealth and job creation.

4.1.2. Mining regulations

In order to conduct mining activities in Senegal, either a Small Mine Permit or Mining Permit is required. Mining companies must enter into a mining agreement with the State, detailing the terms and conditions of their activities and guaranteeing the stability of the legal conditions. The mining agreement must:

- Be published on the Official Gazette
- Not derogate from the New Mining Code (but may supplement its provisions)

Foreign Investment in a Senegalese company is encouraged, provided that the mining title is held by a locally registered Senegalese company. Licences and Permits are issued by the Government, through the Ministry of Mines and Geology.

4.1.3. Taxation and royalties

The Mining title holder is exempted from most taxes and fees including VAT and the Senegalese Shippers Authority named "COSEC" port charge during the "investment period".

Revenue sharing was introduced in the sector to mark the State's desire to better distribute revenues between itself, local authorities and local communities living in the places where the resource is exploited. The different revenues are briefly defined below:

- **Mining royalties**: compulsory, but there can be some exemptions, as in the case where there is a production sharing agreement with the State. Royalties are calculated quarterly, and for domestic products it is calculated on the market value and for exports calculation is on the free on-board values.
- **Stability clause:** guarantee granted to the investor to protect him against a possible increase in the tax burden after that the mining agreement was signed or the exploitation permit was granted
- **Fixed fees:** taxes generally due when a mining title is granted or renewed (10 million FCFA)
- **Rent:** the amount, by which revenues exceed all production costs, including those of discovery and exploitation, as well as the return on capital
- **Others taxations:**
    - The state has a 10% free participation in the mining company at the exploitation stage and may negotiate for itself additional participation in the capital of the mining company.
    - Tax on corporate profits of up to 30%.
    - VAT is 18% for all products and services.
    - Fixed payroll (personnel) tax of 3% of taxable gross salary.
    - The local development fund (0.5% of the turnover before taxation) in accordance with the mining code.
- **Foreign Direct Investment:** Foreigners can invest just like Senegalese natural or legal persons, and are subject to the same duties and obligations under the laws of Senegal, subject to reciprocity and without prejudice to measures that may concern all foreign nationals or result from the provisions of treaties or agreements to which the Republic of Senegal is a party. Any liquidation of foreign investments, direct or otherwise, which is between non-residents and residents, must

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be reported to the authorizeised intermediary in charge of the settlement, with the supporting documents of the liquidation.

4.1.4. Land-use and mineral rights

Land related rights and regulations are set out in the requirements of their relevant permit/licence. The permit holders are required to:

- Respect, protect and implement human rights in areas affected by mining operations.
- Respect all the EITI principles and obligations.

The permit holder must pay compensation for any damages caused to the landowner and/or the occupants of the land:

- For Titled Land, the compensation is agreed between the landowner and the permit holder. If that fails, the compensation is set by the competent court in accordance with the law on expropriation.
- For Public Land, the compensation is agreed between the permit holder and the local community. If that fails, the compensation is set by a committee made of the local authorities and representatives of the ministries at the regional level.

The construction of infrastructure is subject to the issue of building permits. The state assists the mining permit holder with paper work when applying for such permits.

4.1.5. Environment

The Ministry of Environment of Senegal is responsible for regulating the environment, which is recognized as a national and international patrimony. The mining sector is regulated by Law 15-1-2001 on the Environmental Code and Decree No 2001-282 of 12 April 2001 on the application of the Environmental Code, as well as Law No 2016-32 of 8 November 2016 on the Mining Code and its implementing decree – Decree No 2017-459 of 20 March 2017 the Law 2001- 01. Thus, mining operators must obtain authorization from the Ministry of Environment to operate on a mining site, in addition to the mining title granted by the Mines Ministry.

All applications for exploration and mining permits in Senegal require an environmental impact assessment and an environmental management plan (Environmental and Social Impact Study, ESIA). The assessment must be conducted by an approved research firm, paid for by the mining permit holder. After approval from Department of the Environment and Classified Establishments (DEEC), which is responsible for the prevention and control of all environmental pollution, the ME issues an environment certificate of conformity (accessible at the DEEC). The public consultation are organized before the implementation of mining projects in the form of public hearings for consultation and validation of ESIAs. This process helps in the societal acceptance of the mining project, and it is regulated in Senegal through Ministerial Order No. 9468 MJEHP-DEEC dated November 28, 2001, regulating public participation in the impact study aimed at the adoption of a participatory approach in the decision-making processes of operations. Mining operations in classified forests must also adhere to provisions of the Forest Code

Other regulations and conventions that regulates the mining sector include:

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- International protection (ex IUCN Conventions)
- Community Protection (ICCA, Sacred Forest)
- In situ conservation
- Biodiversity Act (Ongoing)

Senegal has a Country Environmental Analysis (CEA), which aims to reinforce the ongoing dialogue on environmental issues between the World Bank and the Government of Senegal.

According to a World Bank report[28], Senegal is already water stressed and current water withdrawals are projected to increase by 30 to 60% by 2035. Water-related extreme events and pollution already cost Senegal over 10% of GDP every year, threatening the country's ambition to become an emerging country.

Senegal urgently needs to prioritize water security to achieve and sustain its development objectives as outlined in the "Plan Senegal Emergent" (PSE 2019 – 2023). Transboundary cooperation is vital to Senegal's water security, as 34% of the country's water originates outside the country. International agreements governing the Senegal and Gambia Rivers provide a basis for countries to address water allocation, environmental preservation, and hydraulic and energy infrastructure[29].

4.1.6. Societal and community aspects, cultural heritage

In Senegal, mining title holders have to (i) contribute annually to a local development fund with an amount of 0.5% of their sales in order to promote the economic and social development of host communities and (ii) include women's empowerment projects. Compliance with employment regulations, prioritizing the recruitment of Senegalese personnel, developing training plans for local staff, and promoting gender equality are also required

Communities developed mechanisms of resilience by setting up more or less structured associated networks, including the national network of People Affected by Mining Operations (PAPOM) who actively participate in negotiations with the mining companies.

Senegal is working with UNESCO to inventory its intangible cultural heritage and propose safeguarding measures to preserve its heritage. There are seven heritage sites[30] in Senegal: the Bassari, Fula and Bedik cultural landscapes, the Island of Goree, the island of Saint Louis, the Saloum Delta, the Stone circles of Senegambia, the Djoudj National Bird Sanctuary and the Niokolo-Koba National Park. Special dispensation is needed for working in protected areas.

28 https://documents1.worldbank.org/curated/en/099625203082232347/pdf/P17223301605d00ed0af590aabc6bf858c8.pdf

29 https://winrock.org/wp-content/uploads/2021/08/Senegal_Country_Profile-Final.pdf

30 https://whc.unesco.org/fr/etatsparties/sn

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4.1.7. Public health and safety

In 1989, Senegal adopted The National Health Policy[31]. The Country's Ministry of health was in charge of the ground work, and developed a national health sector development plan. In 2019, a term plan for ten years (up to 2028) was launched. The major pillars for this plan are financing and governance, provision of health and social action services and social protection.

4.2. Mining practices *vs.* Environmental, Social and Governance (ESG) goals

4.2.1 Environmental challenges

In this section, information about environmental challenges posed by the mining activity in Senegal can be found. Challenges frequently subject to risks are the tailings and waste management, the site rehabilitation, the biodiversity (agriculture, plants and animals), and the quality of water, soil and air. A brief summary of mains issues can be found below (for more details, readers are invited to refer to the "*Trousse d'informations pour un secteur minier responsable au Sénégal*"[32].

The tailings and waste management and site rehabilitation: tailings are frequently stored in the operating areas (e.g., Chemical Industries of Senegal (ICS) or SOMIVA). They are recycled in agriculture as fertilizers (tailings from phosphate). However, most of these tailings are deposited in the form of heaps (mountains) exposed to the wind, which generates enormous levees of dust. This affects vegetation, water bodies, but also populations, which can be affected by lung diseases. The management of the tailings in certain mining regions is not always adequately taken care of by the companies. For example, excavation residue should not end up along roads. Note that some companies gradually rehabilitate the mining site. However, the problem of environmental degradation resulting from the lack of rehabilitation of sites exploited in the past seems to arise more at the level of ASM areas. Companies are invited to develop expertise that will positively influence the entire mining sector and consider new global technologies and innovations to incorporate best practices.

Biodiversity: In Senegal, in the main mining regions (i.e., Thiès and Kédougou), the impacts of mining on biodiversity are very noticeable. Illicit artisanal mining in the protected Niokolo-Koba National Park (a UNESCO World Heritage biosphere reserve) is the best illustration of the damage caused by artisanal and semi-mechanized mining to biodiversity, as it degrades natural habitats. A decrease in the reproduction of bees linked to the dust and noise pollution have been detected in the region of Thiès. Companies are responsible for the revegetation of their sites already exploited. No spills of chemicals and/or tailings in sea, river and land should be accepted in Senegal.

[31] https://www.sante.gouv.sn/Actualites/une-loi-pour-rendre-effectif-le-droit-constitutionnel-à-la-santé-en-gestation
[32] https://www.comite21quebec.org/trousse/

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The quality of water, soil and air: With the new mining code adoption in 2016, an improvement in practices relating to the management of water, air or soil quality at mining sites has been noted. However, some environmental issues remain. In the region of Thiès, it has been noted that the discontinuation of use of water well and the low profitability of crops was both linked to the degradation of water and soil by industrial mines. In addition, the problems of progressive salinization of groundwater make this water unsuitable for drinking and irrigation.

Environmental challenges posed by the mining activity and the assessment of the mining regime of Senegal in respect to the environment objectives.

- Environmental regulations need to be dynamic and communication lines between all parties should be maintained to allow for quick resolutions of issues. With the large production of phosphate, quarry and other bulk products, a large number of the population are exposed to both production and transportation impacts of this sector. And regulators need to keep an eye on this to prevent future unprecedented public issues.
- Activities of the ASM sector that involve the destruction of vegetation cover and the excessive cutting of wood also cause enormous difficulties. The sector needs be rigorously supervised to make it responsible, and its regulatory framework updated by integrating internal operational plans to secure communities' habitats and livelihoods.
- The indiscriminate use of chemicals and their discharge into the environment should be closely monitored and the introduction of the dedicated small-scale processing centres would go a long way to control this phenomenon.
- Wildlife crime also deserves to be highlighted, especially since there is no provision in the ASM regulations in Senegal for the rehabilitation of ASM gold panning sites.
- In the quarrying areas, road insecurity is very frequent with the passage of lorries, for example in Ngoundiane in the Thiès region where the quarries are located, loaded lorry buckets, are sometimes not adequately contained, leading to content exposure to the elements posing a danger to wildlife and other road users.
- Water is a critical issue for the country as a whole and the mining sector needs to put in place specific solutions to help alleviate the issues.

4.2.2 Socio-economic issues

In this section, information about socio-economic issues in Senegal highlighted during the project can be found. The identified issues were briefly summarize below (for more details, readers are invited to refer to the "*Trousse d'informations pour un secteur minier responsable au Sénégal*").

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Indemnification and compensation: Approximately 70% of the working population of Senegal are in agriculture. Hence the destruction of farming and forest gatherers livelihoods with the issue of resettlements can have negative effects on communities such as the loss of agricultural areas and grazing corridors.

Public health and safety: Most international mining companies have fairly high health and safety requirements. Compliance with health and safety procedures is supported by qualified teams who carry out the implementation and training, but it is not the case for ASM sector, where health and safety precautions are just not applied. Artisanal miners work with no personal protective equipment. In addition with the use of hazardous chemicals, diesel generator emit gases and fumes, which may have impact on the health of worker and local population.

Immigration: An influx of migrants from neighbouring countries working in the ASM sector puts a strain on the limited social amenities and habitats. It also exacerbates other social vices and public health issues and this is a situation that should be closely monitored and could be mitigated with the current plans by the State to enforce formalisation of the small-scale mining sector.

Labor and skills: Despite the labor code prescribing the working age in Senegal as 18+, **child labor** have been reported in the informal ASM sector and **needs to be controlled**.

Local community involvement and knowledge: ESIA studies report that are submitted to the authorities could also be made accessible online in an abridged and with a summarized version to make it easily accessible and understood by a vast majority of people. Moreover, public participation is only guaranteed at the ESIA stage. Communities are often excluded during prospecting, while the areas of access often include their land resources from which they derive their income through agriculture, livestock or gold panning activities. The principle of free, prior and informed consent is poorly considered. Traditional authorities and opinion leaders from host communities should have access to reports and information concerning permits in their localities to assist in dissemination to host communities.

Gender equality: Although some advances since the Senegal Parity Law in 2010, women continue to bear the disproportionate burden of poverty and illiteracy; they are still victims of serious violations of their human rights and their sexual and reproductive rights; they are the first victims of the HIV/AIDS pandemic and many are still at risk today of dying giving birth. Despite the real progress made, much remains to be done to achieve equal rights and opportunities for men and women. In 2020, according to "*Trousse d'informations pour un secteur minier responsable au Sénégal*", only 6.5 % of employees from the mining sector was women.

The introduction of a social impact assessment, that includes gender and youth as part of the permitting process could be beneficial in safeguarding the rights and opportunities for youth and women.

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4.2.3 What would be the best practices for a responsible mining?

ESG (Environmental, Social and Governance) practices are increasingly expected by stakeholders, including investors, customers, civil society, etc. In Senegal, there are initiatives and projects that illustrate good ESG practices in the mining sector. Examples include the Mako project by Petowal Mining Company, the Sabodala project and Grande Côte Opérations.

- **The Mako project** is a gold mine located in the Kédougou region of south-eastern Senegal. It is operated by the mining company Resolute, which obtained a 15-year concession from the Senegalese government in 2016. The project began production in January 2018 and has become one of the company's two flagship assets along with the Syama project in Mali. The project is considered to be an exceptional gold mine, which could further increase its potential through future exploration programmes in the region. It is also helping to strengthen Senegal's mining sector. Mako is one of the examples of a gold mine that incorporates good environmental, social and governance practices.

On the environmental front, the Mako project uses a hybrid solar power plant, which reduces diesel consumption and CO2 emissions. Resolute is committed to achieving carbon neutrality by 2030. The Mako project also has a water and waste management system that aims to minimise the impact on natural resources and biodiversity, notably by modifying the route of its access road so as not to affect the water sources of chimpanzees, leopards and baboons.

On a social level, the project contributes to the economic and social development of local communities by setting up socio-economic programmes (Local Consultative Committee, Technical Working Group for Employment, Vigilance Committee, Negotiating Forum, Local Purchasing Technical Group), creating jobs with over 90% of employees Senegalese, supporting infrastructure projects, education with the creation of access for local and regional students to follow a paid professional apprenticeship programme, health and agricultural development. Resolute respects human rights and international labour standards, and promotes diversity and inclusion within its teams.

In terms of governance, the Mako project complies with Senegal's laws and regulations, as well as the principles of the IFC (International Finance Corporation) in terms of environmental and social performance. In addition, the company has had an informal complaints management mechanism in place since the exploration phase of the project. The effectiveness of their complaints management process is measured on a quarterly basis, by examining records to note the time taken to resolve complaints and the number of complaints that have had to be dealt with by the 3rd and 4th levels of the process. The company also reports on complaints received by level of seriousness in its corporate responsibility report.

- The **Sabodala project** is a large-scale gold mine located near Kédougou, around 650 km east of Dakar. The mine is operated and 90% owned by Endeavour Mining, a Canadian company. The remaining interest is held by the government of the Republic of Senegal. The Sabodala project began production in 2009 and was merged with the Massawa project in 2020, creating

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Senegal's largest gold complex. The project incorporates numerous ESG best practices into its organisation:

On the environmental front, the Sabodala project has a water and solid waste management system that aims to minimise the impact on natural resources and biodiversity, and is progressively rehabilitating the Gora site.

On the social front, the company is promoting skills development for various stakeholder groups and implementing a number of income-generating activities. The mining activity also promotes job creation and the improvement of livelihoods and supplies, as well as employee education and training.

In terms of governance, the Sabodala project complies with Senegal's laws and regulations, as well as the International Finance Corporation's (IFC) environmental and social performance principles. The project also publishes regular reports on its ESG performance, and engages in dialogue with its stakeholders to identify and manage the risks and opportunities associated with its activity.

- Senegalese company **Grande Côte Opérations**, a subsidiary of the Eramet group, specialises in the beneficiation of ilmenite, rutile, leucoxene and zircon. The mine and two processing plants have been in operation since 2014. The project has succeeded in meeting a succession of human, technical and societal challenges that have made it possible to develop natural resources, in partnership with the country's authorities and local communities. It incorporates many ESG best practices into its activities, as shown by the examples below:

On the environmental front, the company submits periodic reports to the DGPRE on operations and changes in water quality, and also progressively rehabilitates and greenens the sites it operates before handing them back to the former users.

On the social front, when the displacement of a local population is unavoidable, involuntary resettlement in a community is managed in accordance with IFC and World Bank standards and guidelines, in collaboration with the Senegalese authorities. In addition, a training programme has been set up to encourage the employment of women on the site, as well as a partnership with the Office National de la Formation Professionnelle (ONFP) to raise the skills level of the people of Diogo and thus give them the skills to be recruited.

The projects presented above are therefore models of social and environmental responsibility in the mining sector, which could inspire other similar initiatives. It shows that mining can be compatible with respect for the environment and the well-being of local communities.

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5. Business network between the European Union and Senegal

5.1. Assessment of the upstream and downstream business ecosystem

5.1.1 Context, formal and informal players

The Senegalese's mining sector encompasses both formal and informal players across the upstream and downstream segments of the business ecosystem. The following presents an overview of these players. Formal upstream players first of all include Government Ministries such as the Department of Mines and Geology (DMG). In 2021, The Ministry of Mines and Geology had been redefined, heading to a new organizational system able to cope with the ambitious issues and challenges assigned to the mining administration: therefore, four directorates had been created, within the DMG: Directorate of Mines, Directorate of Quarries, Directorate of Artisanal and Small-scale Mining and Directorate of Regulations, Mining Production and Statistics.

- The **Geological Directorate** will define and monitor the implementation of a new national policy, embodied by the creation of a national geological service (EPIC);
- The **Directorate of Mining Operations Control and Surveillance** (DCSOM) will optimize the monitoring and control framework for mining operations;
- A **Monitoring Cell for Funds** dedicated to the mining and geological sector will improve the operationalization of these funds and support all initiatives for territorial development;
- A **Coordination Cell for Management Control** will facilitate the management of program performance;
- A **Local Content Monitoring Cell** will further optimize the participation of the national private sector throughout the value chain of the mining industry.
- **Regional Mines and Geological Services**, in the fourteen regions of Senegal, are responsible for implementing and monitoring the interventions of the Ministry.

Moreover, a national company named **Société des Mines du Sénégal** (SOMISEN SA) was examined and approved on October 27, 2020, by the National Assembly. The Société des Mines du Senegal's missions are:

- Management of State participation in mining operations
- The marketing of mining products belonging to the State;
- Holding, alone or in association, mining titles

Formal downstream players are very limited to Phosphoric acid such as "Industries Chimiques Du Senegal"

Informal upstream players first of all include ASM engaged in manual or semi-mechanised mining activities, but most of them are dedicated to gold.

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5.1.2 Relationships at local or regional levels

Senegal is a member of the Economic Community of West African States (ECOWAS), which includes 15 countries in West Africa, the WAEMU (West African Economic and Monetary Union) or UEMOA (West African Economic and Monetary Union), the Cotonou Convention and the World Trade Organization. Senegal is also currently eligible for U.S. market access benefits under the African Growth and Opportunity Act (AGOA), set to expire in 2025.

Since May 30, 2020, the African Continental Free Trade Area (AfCFTA) agreement officially entered into force with Senegal as member state. Its architects hope to encourage inter-African trade by eliminating complex and disjointed trade agreements and reducing tariffs.

5.2. Building new B2B relations

In order to build new business-to-business (B2B) relations between EU and the Senegal, a workshop might be organized after the presidential election (i.e. probably between March and May 2024). This workshop will gather all the stakeholders directly or indirectly related to mining field, such as EU delegations, Embassies, Chamber & Ministry of Mines and private operators.

5.3. Promoting local content and enabling mining cluster actors

In order to improve the framework conditions for European and African companies and organisations to co-create new value, businesses, products and services by transforming the ways they interact, this section synthetize available information about relevant institutions and organization related to critical minerals network, geosciences/mining education and training programmes, as listed below.

Relevant institutions for the development of a Senegal-focused critical minerals network

State institutions:

- **Ministry of Economy, Planning and Cooperation**, *it conducts and promotes, in collaboration with the structures concerned, the development of the private sector and productive investments that create jobs*
- **Economic, Social and Environmental Council (CESE)**, *key institution that can help with strategic thinking for developing partnerships between EU and Senegalese companies, taking into account the country's strategic priorities*
- **Ministry in charge of Mines and Geology**

Private or consular institutions:

- **Chambers of Mines**, *non-profit association that brings together some fifty mining companies, subcontractors and other actors active in the fields of exploration and mining in Senegal*
- **Chamber of Commerce, Industry and Agriculture of Dakar (CCIAD)**, *it represents all economic operators and defends the general interests of industrial, commercial and agricultural companies*

Academic institutions and other training establishments in the field of geosciences and mining

- **Department of geology from Cheikh Anta Diop University of Dakar (UCAD)**, *it offers the following courses:*

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- A Biology-Chemistry-Geosciences License (BCGS);
- A Master in Geosciences:
  - Hydrogeology option;
  - Sedimentary environment option;
  - Deep crustal zone option

FST - Faculté des Sciences et Techniques
Université Cheikh Anta Diop,
BP 5005 Dakar, Sénégal
Website: https://fst.ucad.sn/content/d%C3%A9partement-de-g%C3%A9ologie

- **Polytechnic Superior School (ESP)**, *it trains higher technicians, working engineers, managers, design engineers in the following field of expertise*:
  - Chemical Engineering
  - Civil Engineering
  - Computer Engineering
  - Mechanical Engineering

Ecole Supérieure Polytechnique
Website: https://esp.sn/
Université Cheikh Anta Diop de Dakar,Corniche Ouest BP : 5085 Dakar-Fann

- **Polytechnic School of Thiès (EPT)**, *it offers engineering and masters training through its following three departments and masters*:
  - Department of Computer Engineering and Telecommunications
  - Electromechanical Engineering Department
  - Civil Engineering Department

ECOLE POLYTECHNIQUE DE THIES
Entrée de Thiès - BP A10
Website:https://ept.sn/

- **UFR-Engineering Sciences of Thiès (UFR-SI)**, *it specializes in training engineers in research, innovations and development*:
  - Engineering in Civil Engineering
  - Engineering in Geotechnics
  - Engineering in Design Surveyor Topographer
  - Professional License in Hydrogeology
  - Masters in Architecture

Université Iba Der THIAM de Thiès
Grand Standing, derrière C3S Thiès
BP: A967 Thiès
Website: https://www.univ-thies.sn/index.php/70-presentation/etablissements/ufr-si

- **National School of Mines and Geology (ENSMG ex-IST)**, *training of senior executives from Senegal and countries of the African sub-region in engineering and senior technician jobs in geology: mineral exploration, mining, hydrogeology, geotechnics, geochemistry, economic geology, remote sensing, GIS*

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Ecole Nationale Supérieure des Mines et de la Géologie (ENSMG)
Bâtiment BRGM, Route de Université
BP 5396 Dakar-Fann Sénégal
Website: https://ensmg.ucad.sn/

- **Graduate School of Mines, Geology and Environment (ESMGE-UAM)***, the training offer is based on the expressed needs of the labor market and the country's development objectives. It is resolutely oriented towards offering fully professional training courses that guarantee its graduates to be immediately operational in their fields: mining and geology, environment, geomatic, hydraulics and sanitation.*
  Research axes are:
  - Mines, Mining Environment and Geomaterials,
  - Geology, Metallogeny and Structural Geology,
  - Sustainable Development, Environment and Geomatics,
  - Water dynamics and its different treatment methods.

  École supérieure des Mines, de la Géologie et de l'Environnement (ESMGE)
  Campus de Dakar - Cité Keur Gorgui Lot N°75R VDN
  Website:https://uam.sn/formation/ecole-superieure-des-mines-de-la-geologie-et-de-lenvironnement-esmge

- **Dakar Geoscience Institute (IGDK)**, *it carries out missions of teaching, research, observation and dissemination of knowledge in Geosciences*:
  - Training of senior technician in geology;
  - Professional license training in geosciences and hydrogeology;
  - Professional master's training:
    - Georesources, mines and civil engineering option;
    - Water sciences, environment and marine geology option

  Institut Géosciences de Dakar
  Villa N°16 Mermoz Pyrotechnie, Dakar
  Website: http://igdk.sn/

- **Technical, industrial and mining high school of Kédougou**, *it offers Technical Certificate (BT) programs in electrical and mechanical maintenance for mines, design and manufacture of ore crushing or grinding units, etc. It has established a partnership with foreign institutions such as the College of General and Professional Education (CEGEP) of Sherbrooke and soon with the CEGEP of Abitibi Témiscamingue (Quebec, Canada). The capacities of teachers have been strengthened and equipment for development research has been acquired*

  Lycée Technique Industriel et Minier de Kédougou
  Quartier Dinguessou
  Kédougou – Sénégal
  Website: https://www.campus-teranga.com/etablissement-492/lycee-technique-industriel-et-minier-de-kedougou

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6. Energy and digital transition: develop a strategy for the EU and Africa Partnership

Existing partnerships/projects dealing with responsible sourcing, CRM, with synergies to the AfricaMaVal objectives

There is not yet any EU-Senegal partnership focusing on energy and digital transition linked to CRM.

Senegal and the EU have enjoyed a close relationship for more than 50 years, with political dialogue, strong trade relations, a fisheries agreement, and technical and financial cooperation in support of the country's populations. Team Europe (notably France, the Netherlands and Belgium) is Senegal's leading trading partner with 32% of its imports, but only 12% of Senegalese exports (2021), but none of the commodities targeted within the framework of this project are part of these exchanges.

Anyway, it should be highlighted that Senegal currently benefits from a preferential trade regime with the EU, as well as specific **trade facilitati**on and **trade integration programmes**. Following the non-implementation of the Economic Partnership Agreements, Senegal sees itself applying the "Everything But Arms" System - TSA, **the most favorable of all the European Generalized System of Preferences (GSP+) regimes**: exports of its products to the EU at zero duty, without limitation of volume. It should be noted that to date, Senegal is the second largest beneficiary of TSA on the African continent and benefits considerably from these preferences with approximately 98%.

One of the major objectives of Team Europe's interventions in Senegal is to enable it to take advantage of the integration of the economies of the West African region, and gradually continental after the creation of the African Continental Free Trade Area (AfCFTA), launched on March 21, 2018. The African Heads of State have indeed decided to pursue continental integration (gradual elimination of customs and monetary barriers and harmonization of legislation) to better exploit the advantages of the trade and integration, and strengthen the modernization of infrastructure (transport and digitalization), to reduce the weakness of the industrial fabric due to the non-processing of raw materials produced by African countries on site[33]

In 2016, Senegal underwent a revision of its mining regulatory frameworks following the adoption of the African Mining Vision (AMV). Throughout West Africa, the formulation of new mining codes involved multi-stakeholder dialogues and consultations to address sector challenges. National chambers of mines, representing industrial operators and investors, played key roles in reform processes across many countries. In Senegal, during the 2003 mining code revision, the Chamber of Mines actively participated, producing advisory documents and engaging decision-makers. However, civil society groups expressed dissatisfaction, claiming limited advisory roles and late involvement in the process. Mining code in Senegal miners (Sénégal 2016 art. 54–55) designated areas for artisanal miners but did not challenge the dominance of industrial mining. Exclusive rights for artisanal miners were not granted,

[33] https://www.eeas.europa.eu/senegal/european-union-and-senegal_en?s=117

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leaving these areas open to industrial permits. In Senegal, of the twenty-eight contracts publicly accessible on the Extractive Industries Transparency Initiative (EITI) website, none fall under the 2016 Mining Code (EITI Senegal, 2020). For the duration of these agreements (25 years), companies still operate under the 2003 Mining Code and are protected from any changes to the contractual provisions, highlighting the influence of transnational private actors in formulating and exempting their activities from new regulatory frameworks[34].

Existing platforms and networks in Senegal

In Senegal, we can contact and establish partnerships with several platforms and networks such as:

- Agence Française de développement (AFD). 15 Av. Nelson Mandela, Dakar, Senegal. +221 33 849 19 99
- Business France. 1, rue El Hadji, Rue Amadou Assane Ndoye, Dakar, Senegal. +221 33 839 51 00
- BPI France
- Eurocham : chamber of European investors in Senegal. 3 place de l'indépendance. Immeuble SDIH (CBAO) 7ème étage. Dakar, Senegal. +221 33 823 62 72
- European delegation. 12, avenue Hassan II BP 3345-Dakar, Senegal. +221 33 889 11 00

Senegal's strategy to consider for a lasting partnership between Senegal-EU partnership

The Emerging Senegal Plan (PSE) is a ten-year strategy over the period 2014-2023, backed by a vision of an emerging Senegal by 2035 through three strategic axes which are (i) the structural transformation of the economic and growth, (ii) human capital, social protection and sustainable development and (iii) governance, institutions, peace and security. The PSE is supported by a Priority Action Plan (PAP), itself split into two phases. Phase 1 (2014-2018) made it possible to record satisfactory results in all sectors and phase 2 (2019-2023), which was a continuation but with stronger involvement of the private sector, was reviewed and adapted to new priorities born from the global health crisis.

Phase 1: a disruptive strategy aimed at accessing emergence

The implementation of the PSE is structured around 3 strategic axes broken down into sectoral objectives, the main of which are (i) transport infrastructure and services, (ii) energy infrastructure and services, (iii) agriculture and agri-food, (iv) water and sanitation, (v) education and training, (vi) health and nutrition, making up the PAP (Priority Action Plan). The latter brings together 27 major investment projects and 17 reforms over the period 2014-2018. This priority action plan covered an amount of XOF 9,686 billion (EUR 14.8 billion) over the period 2014-2018.

Phase 2: An adjusted and accelerated priority action plan for the revival of the Senegalese economy

The relaunch of economic activity, after the pandemic, leads to the revision of phase II of the Emerging Senegal Plan (PSE). With a view to more endogenous development, the Senegalese government has put in place an adjusted and accelerated Priority Action Plan over the period 2021-2023. This plan is based on

[34] https://www.tandfonline.com/doi/full/10.1080/00083968.2021.1886955

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the effects of the Economic and Social Resilience Program (PRES) presented by President Macky Sall in response to the health crisis. Its main objective is to stimulate private investment, diversify growth drivers and strengthen economic resilience in order to achieve an average growth rate of 8.7% over the period 2021-2023. The crisis has brought out new challenges for the country, which would be: (i) the promotion of intensive, abundant, quality and resilient agriculture, (ii) inclusive health, (iii) an efficient education system, (iv) the development of a strong national private sector, (v) the strengthening of social protection and (vi) industrial and digital transformation.

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7. Opportunities for responsible investments

7.1. Identification of individual exploration, mining and refining projects

The following projects (Table 2) related to exploration, mining and refining of ECRM were identified and are proposed for presentation as fact sheets in AfricaMaVal WP7. This is a non-exhaustive list subject to change while the BGR is implementing AfricaMaVal project Task 7.2. The political appropriateness of these projects (e.g. exclusion of highly controversial projects or controversial stakeholders and owners) have been verified as of November 2023.

Each project fulfils the following minimum requirements:

- Credible ECRM resource estimate available (for mining projects);
- Sufficient availability of project-specific information;
- The project operator is seeking investment or financing related to project development, project expansion, or optimising certain aspects of a project (e.g. to improve ESG performance) or, alternatively, the project could be of interest for European industry off takers;
- Part of the project's current or anticipated future ECRM production is potentially available to the EU industry, which excludes projects where owners or offtake partners exclusively direct the large majority of project ECRM production to third countries outside of the EU.

Project	Operator	Com-modity	Address/contact	Status	Reserves/ Resources
Kebemer	Cayor Phosphates (Africa Investment Group)	P_2O_5	M. Joseph DIOUF, DGA ; Tel : +221 77 099 04 92 ; Email : jdiouf@cpm.sn	Exploration project *Feasibility and environmental study in progress*	89.8 Mt @ 17.67 % P_2O_5
Begal-Baïti	G-PHOS	P_2O_5	Tel : (+ 221) 77 382 32 85 https://sephossenegal.com	Unknown	800000 m^3 @ 20 % P_2O_5

Table 3. Proposal of projects to be presented as opportunities for investments in Senegal

7.2. ASM sector country profiles

Country profiles on ASM sector developments and investment

One of the core objectives of the AfricaMaVal is to identify investment opportunities in a number of commodities considered critical by the European Union, and there is a clear interest to include the ASM sector in the identification of such opportunities. The emphasis should be on identifying responsible

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investment opportunities that strengthen the artisanal sector's supply potential and address ESG impacts while also contributing to higher value addition and economic development.

To ease identification of opportunities, the following categories should be considered.

- **Governance**: focusing on the needs of the sector to strengthen its governance to ensure it contributes to socio-economic development. This could include support to government, knowledge sharing programmes, extension services to the ASM sector, etc.
- **Support to existing initiatives**: existing initiatives which focus on supporting the ASM sector to improve its social and economic impacts, and that could benefit from stronger / continued financing.
- **Value chain projects** (processing, trading, etc.): opportunities to support value addition projects which directly support and benefit the ASM sector.
- **Small-scale mining projects**: specific small-scale mining projects which might benefit from financing opportunities and investment (e.g., to improve mining techniques, production, environmental and social impact management.).

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Conclusion

Thanks to its geology, a sedimentary basin and a Paleoproterozoic-Palaeozoic basement, Senegal is endowed with 13 out of the 34 ECRMs AfricaMaVal's list. Except Phosphate and Titanium commodities, these ECRMs are all located in the eastern part of Senegal in the Paleoproterozoic-Palaeozoic basement.

Most of the biggest mining project in Senegal are related to the Birimian craton and dedicated to gold deposits. However, one of the biggest project dedicated to HMS is located on the western coast (Grande Côte Mineral Sands Project for mineral sands, including ilmenite, rutile, and zircon).

The development of the ECRM value chain in Senegal is very limited due to the historical preference of exporting raw materials. Very few factories and industries are able to process or refine local ECRMs due to the limited number of mines. Therefore, processing and refining units in Senegal are very limited and only focus on Phosphate rocks dedicated to phosphoric acid. Only one recycling company had been identified within this project and is dedicated to WEEE (SetTIC). Furthermore, the development of the ECRM value chain is inextricably linked to the infrastructures and government effectiveness. The main bottlenecks in Senegal are the quality of the geological database, the lack of labor/skills and the logistic performance (especially, the infrastructures).

Regarding the fiscal, legislative and regulatory context, the Senegalese authorities have made a priority of improving the business climate. This has resulted in a number of reforms designed to facilitate business creation, the simplification and digitization of customs procedures, the creation of organizations to support entrepreneurs, and the establishment of tax incentives and Special Economic Zones (ZES).

The economic recovery in Senegal is facing challenges, primarily due to the conflict in Ukraine. Real economic growth is projected to decline from 6.1% in 2021 to 5% in 2022. The economic recovery is expected to be gradual, requiring deeper reforms outlined in the Emerging Senegal Plan (PSE). Public investment remains essential for growth, with the "Emerging Senegal" Plan supporting infrastructure improvements that boosted average growth to approximately 5% between 2014 and 2019. Infrastructure projects, including the regional express train, a deep-water port, and energy projects, are set to enhance economic development.

Attitude towards foreign investment in the mining sector is positive. Under President Macky Sall, the government of Senegal has shown a positive attitude towards the mining sector. They are actively working to increase foreign direct investment and consider mining a priority sector in their development plans.

Regarding ESG challenges and regulation, Senegal joined EITI in October 2013 and the government has made efforts in reforming the legislative and regulatory framework of the mining sector with the aim of improving the governance of mineral resources and securing its interests with a strong national private sector.

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The Senegalese's mining sector encompasses both formal and informal players across the upstream and downstream segments of the business ecosystem. Formal upstream players first of all include Government Ministries. A national company named Société des Mines du Sénégal (SOMISEN SA) was launched in 2020. Formal downstream players are very limited to Phosphoric acid such as "Industries Chimiques Du Senegal". Informal upstream players first of all include ASM engaged in manual or semi-mechanised mining activities, but most of them are dedicated to gold.

As for now, there is not yet any EU-Senegal partnership focusing on energy and digital transition linked to CRM. Anyway, In the meanwhile, it should be highlighted that Senegal currently benefits from a preferential trade regime with the EU, as well as specific trade facilitation and trade integration programmes.

Even though few mining project opportunities had been proposed in this report, improving the knowledge of the geological context dedicated to critical metals is an evidence and should be highlighted: geological mapping projects associated to airborne geophysics and geochemical campaign and mineral resources assessment should be prioritise in the next coming years, in association with the new-born Senegalese Geological Survey.

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References

AICD, 2011 (Torres C., Briceño-Garmendia C.M., Dominguez C.). Senegal's Infrastructure: A Continental Perspective. 49p.

Arvis et al., 2018. Connecting to Compete 2018. Trade Logistics in the Global Economy. The Logistics Performance Index and Its Indicators. The International Bank for Reconstruction and Development/The World Bank, 82 p.

AWIMA (2023). AfricaMaVal Deliverable 4.1 Report on mining regimes with respect to ESG objectives

Buscail, F., Fullgraf T., Ndiaye, P.M., Diallo, D.P., Caby, R., Le Métour, J., Lahondère, D., Goujou, J.C., Martelet, G., et Villeneuve, M., 2010. Carte géologique à 1/200 000 du Sénégal, feuille Tambacounda-Dalafi Ouest. Ministère des Mines, de l'Industrie, de l'Agro-Industrie et des PME, Direction des Mines et de la Géologie, Dakar.

Carranza E. J. M., 2017. Natural resources research publications on geochemical anomaly and mineral potential mapping, and introduction to the special issue of papers in these fields. Natural Resources Research, 26(4), 379-410.

Control Risk, June 2023. Assessment: Senegal. Confidential. 9p.

Delor, C., Couëffé, R., Goujou, J.C., Diallo, D.P., Théveniaut, H., Fullgraf, T., Ndiaye, P.M., Dioh, E., Barry, T.M.M., Le Métour, J. Martelet, G., 2010. Carte géologique à 1/200 000 du Sénégal, feuille Saraya-Kédougou Est. Ministère des Mines, de l'Industrie, de l'Agro-Industrie et des PME, Direction des Mines et de la Géologie, Dakar.

Diene, M., Fullgraf, T., Diatta, F., Gloaguen, E., Gueye, M., Ndiaye, P.M., 2015. Review of the Senegalo-Malian shear zone system – Timing, kinematics and implications for possible Au mineralisation styles. Journal of African Earth Sciences, 112, 485-504.

Duvail, C., Roger, J., Barusseau, J.P., Noël, B.J., Serrano, O., 2009. Carte géologique à 1/200 000 du Sénégal, feuilles Saint-Louis – Dagana and Podor – Saldé. Ministère des Mines, de l'Industrie et des PME, Direction des Mines et de la Géologie, Dakar, 2 coupures couvrant chacune 2 feuilles topographiques.

FFA (Member of Ernst & Young), June 2023. Study report on mining related topics in Senegal. Confidential. 40p.

Fullgraf, T., Ndiaye, P.M., Buscail, F., Caby, R., Lahondère, D., Le Métour, J., Martelet, G., et Villeneuve, M., 2010a. Carte géologique à 1/200 000 du Sénégal, feuille Linkering/Kolda-Kédougou Ouest. Ministère des Mines, de l'Industrie, de l'Agro-Industrie et des PME, Direction des Mines et de la Géologie, Dakar.

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Fullgraf T., Ndiaye P.M., Théveniaut, H., Lahondère, D., Caby, R., Delor, C., Diallo, D.P., Dioh, E., Goujou, J.C., Buscail, F., Le Métour, J., Martelet, G. et Villeneuve, M., 2010b. Carte géologique à 1/200 000 du Sénégal, feuille Bakel-Semme Sud-Ouest. Ministère des Mines, de l'Industrie, de l'Agro-Industrie et des PME, Direction des Mines et de la Géologie, Dakar.

GéoMin, Juin 2023 : Inventaire de la chaine de valeur des minéraux critiques : cas du Sénégal. 304p.

Guha-Khasnobis, B., R. Kanbur, E. Ostrom, 2007. Linking the Formal and Informal Economy. Oxford University Press. Pondicherry, India

Goujou, J.C., Buscail, F., Théveniaut, H., Dioh, E., Delor, C., Diallo, D.P., Ndiaye, P.M., Le Métour, J., Fullgraf T., Caby, R., Couëffé, R., Martelet, G., et Villeneuve, M., 2010. Carte géologique à 1/200 000 du Sénégal, feuille Kossanto-Dalafi Est. Ministère des Mines, de l'Industrie, de l'Agro-Industrie et des PME, Direction des Mines et de la Géologie, Dakar.

Kaufmann D., Kraay A., Mastruzzi M., 2010. The Worldwide Governance Indicators: Methodology and Analytical Issues. World Bank Policy Research Working Paper 5430.

Roger, J., Duvail, C., Barusseau, J.P., Noël, B.J., Serrano, O., 2009. Carte géologique à 1/200 000 du Sénégal, feuille Matam – Semmé. Ministère des Mines, de l'Industrie et des PME, Direction des Mines et de la Géologie, Dakar, 1 coupure couvrant chacune 2 feuilles topographiques.

Sigrid Colnerud Granström, The Informal Sector and Formal Competitiveness in Senegal. Lund University. 47p.

Vella, A., 2022. Mise en évidence des environnements géologiques minéralisés par une nouvelle approche de cartographie prédictive Data-driven. PhD dissertation, Université d'Orléans.

Yunis, J., Aliakbari, E., 2021. Fraser Institute Annual Survey of Mining Companies 2021. Report, p. 84.

Sources for Chapter 3:

Coface. (2022). Economic studies and country risks - Senegal. Retrieved from Coface for trade: https://www.coface.com/Economic-Studies-and-Country-Risks/Senegal

Countryeconomy.com. (2021). Senegal national debt goes up. Retrieved from Countryeconomy.com: https://countryeconomy.com/national-debt/senegal

IMF - International Monetary Fund. (2022). SENEGAL - 2021 ARTICLE IV CONSULTATION, FOURTH REVIEW UNDER THE POLICY COORDINATION INSTRUMENT, FIRST REVIEWS UNDER THE STAND-BY ARRANGEMENT AND THE ARRANGEMENT UNDER THE STANDBY CREDIT FACILITY, AND REQUEST FOR MODIFICATION OF PERFORMANCE CRITERIA AND QU.

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International trade administration. (2020). Senegal - Country Commercial Guide - Trade Barriers. Retrieved from International trade administration: https://www.trade.gov/country-commercial-guides/senegal-trade-barriers

LLOYDS BANK. (2022). Foreign direct investment (FDI) in Senegal. Retrieved from LLOYDS BANK: https://www.lloydsbanktrade.com/en/market-potential/senegal/investment

PWC. (2022). Senegal - Corporate - Other taxes. Retrieved from PWC: https://taxsummaries.pwc.com/senegal/corporate/other-taxes

The World Bank. (2022). The World Bank in Senegal. Retrieved from The World Bank: https://www.worldbank.org/en/country/senegal/overview

Trading Economics. (2022). Senegal currency. Retrieved from Trading Economics: https://tradingeconomics.com/senegal/currency

Websites for Chapter 4 :

https://www.endeavourmining.com/our-business/sabodala-massawa-mine

https://www.mining-technology.com/projects/sabodala-gold-mine-senegal-africa/?cf-view

https://www.comite21quebec.org/trousse/

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APPENDICES

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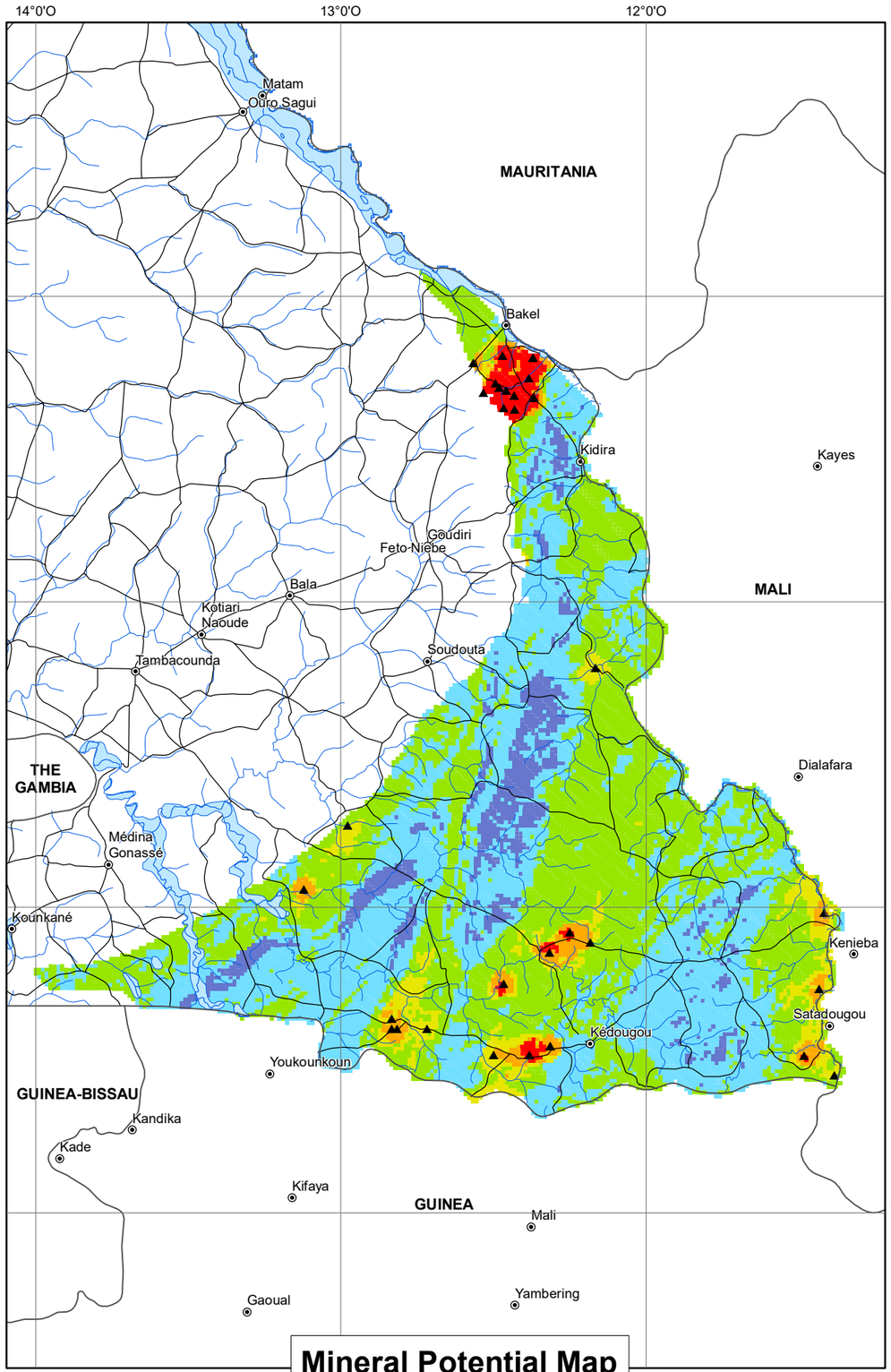
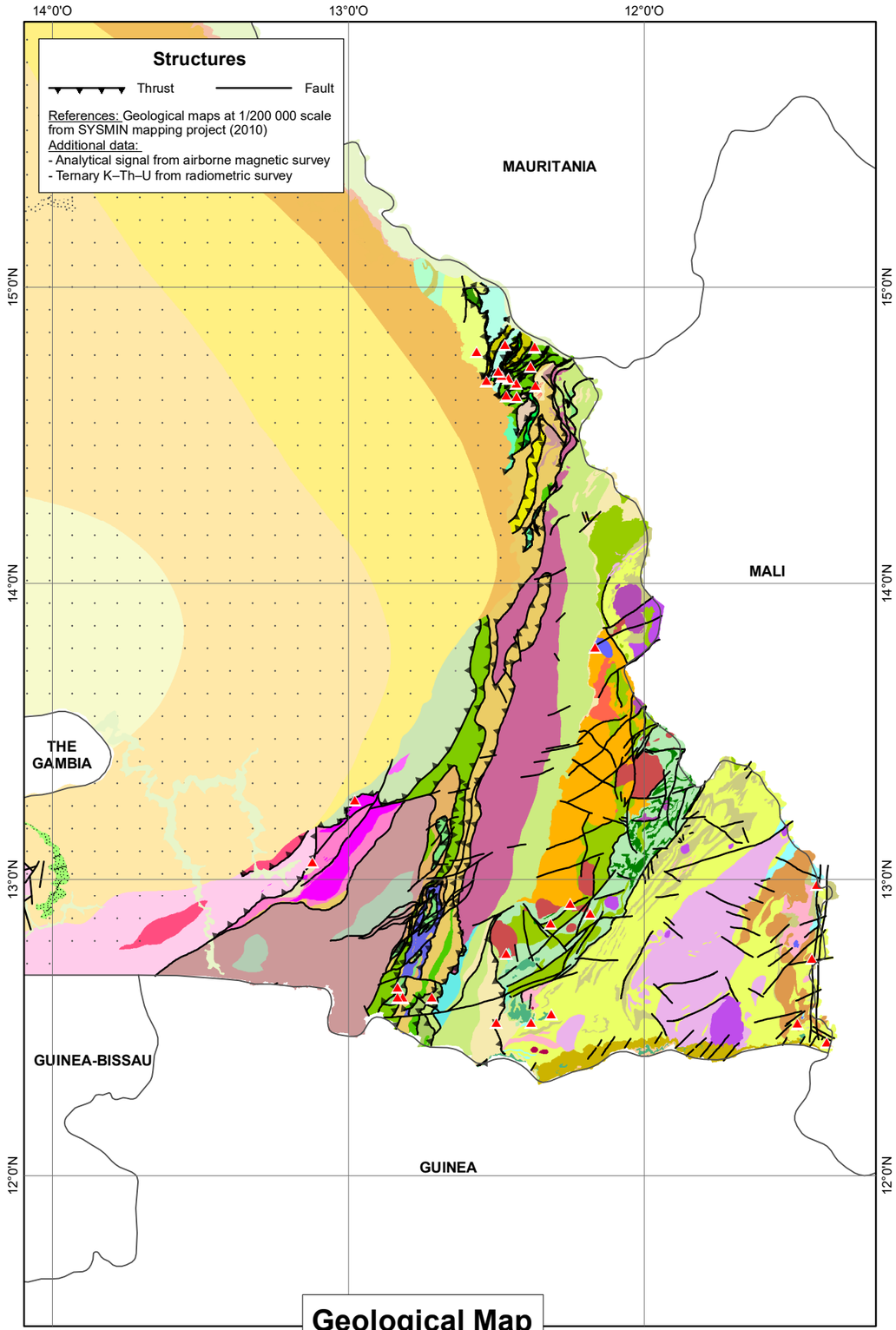
Country: SENEGAL (Oriental)

MINERAL POTENTIAL MAP - *COPPER (Cu)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

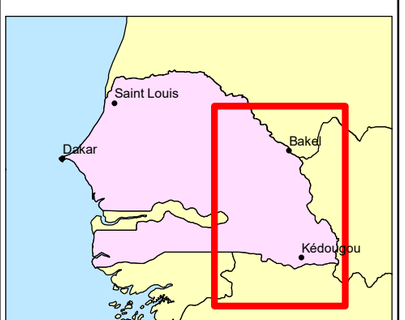
Known occurrences

Copper (Cu)
SIG Afrique - © BRGM 2018
SYSMIN and SPGlobal database

Confusion matrix

True negative Cells: 15595 90.08% Non-occurrence in database Non-occurrence predicted	False positive Cells: 1036 5.98% Non-occurrence in database Occurrence predicted
False negative Cells: 37 0.21% Occurrence in database Non-occurrence predicted	True positive Cells: 646 3.73% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.44
Cell size: 1333 m



0 20 40 80 Km

Datum : WGS84 (World Geodetic System 1984)

January 2024

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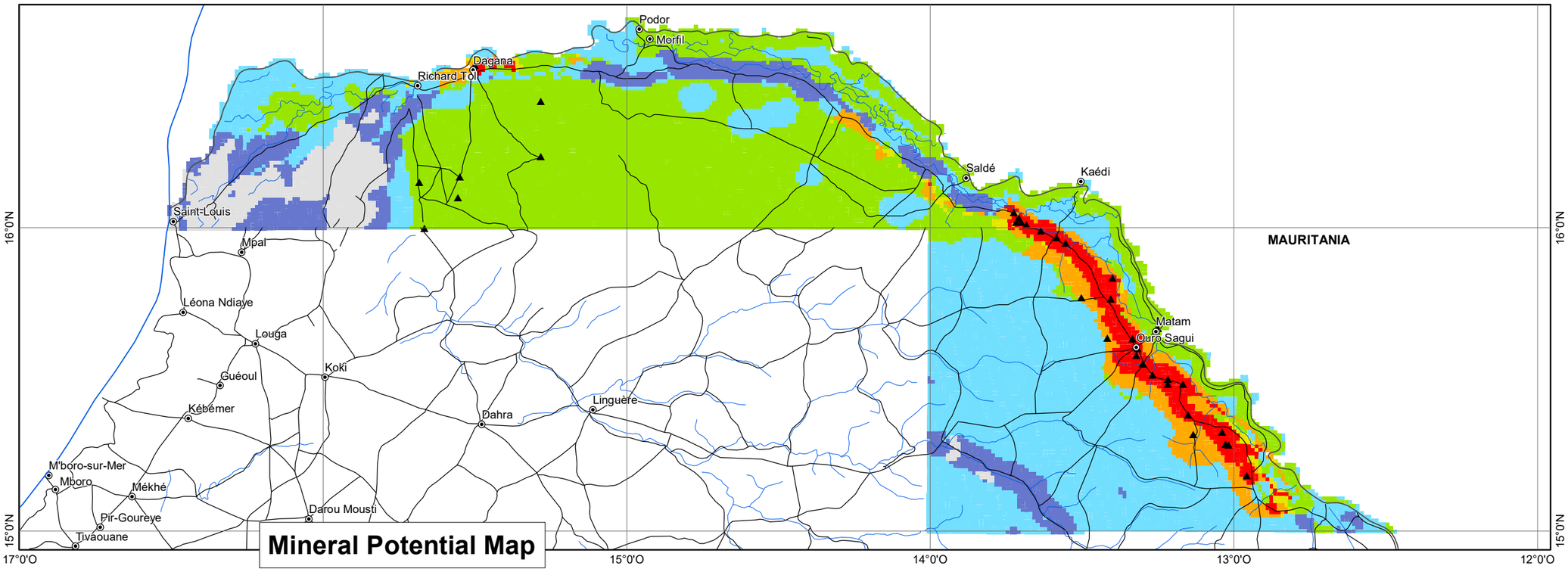
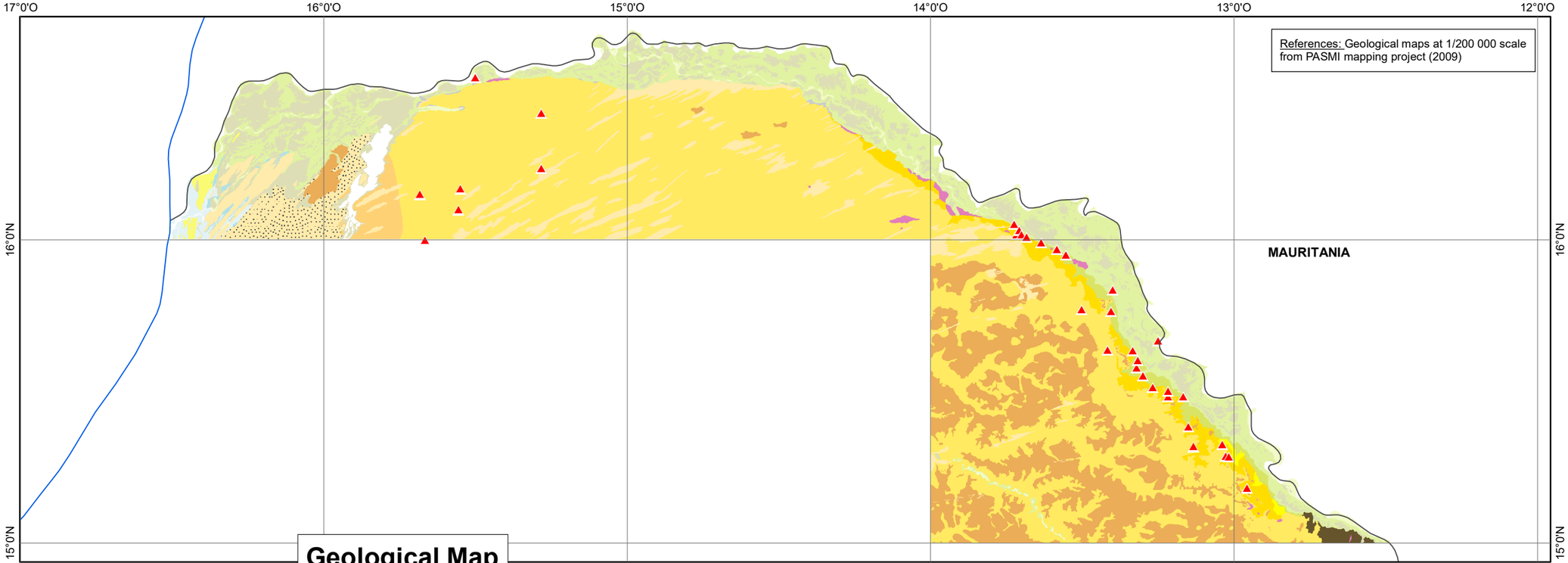
Country: SENEGAL (Occidental)

MINERAL POTENTIAL MAP - *PHOSPHATE ROCK (P)*

Africa MaVal



Mineral Potential Map



Geological Map

References: Geological maps at 1/200 000 scale from PASMI mapping project (2009)

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

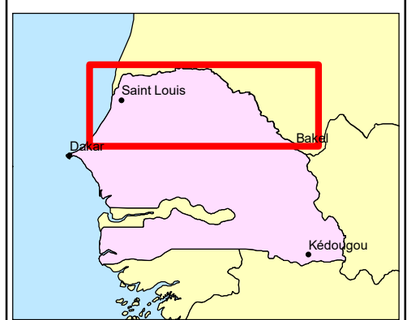
Known occurrences

Phosphate rock(P)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 13182 79.41% Non-occurrence in database Non-occurrence predicted	False positive Cells: 2690 16.21% Non-occurrence in database Occurrence predicted
False negative Cells: 120 0.72% Occurrence in database Non-occurrence predicted	True positive Cells: 607 3.66% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.43
Cell size: 1333 m



0 20 40 80 Km

Datum : WGS84 (World Geodetic System 1984)

January 2024

Géosciences pour une Terre durable
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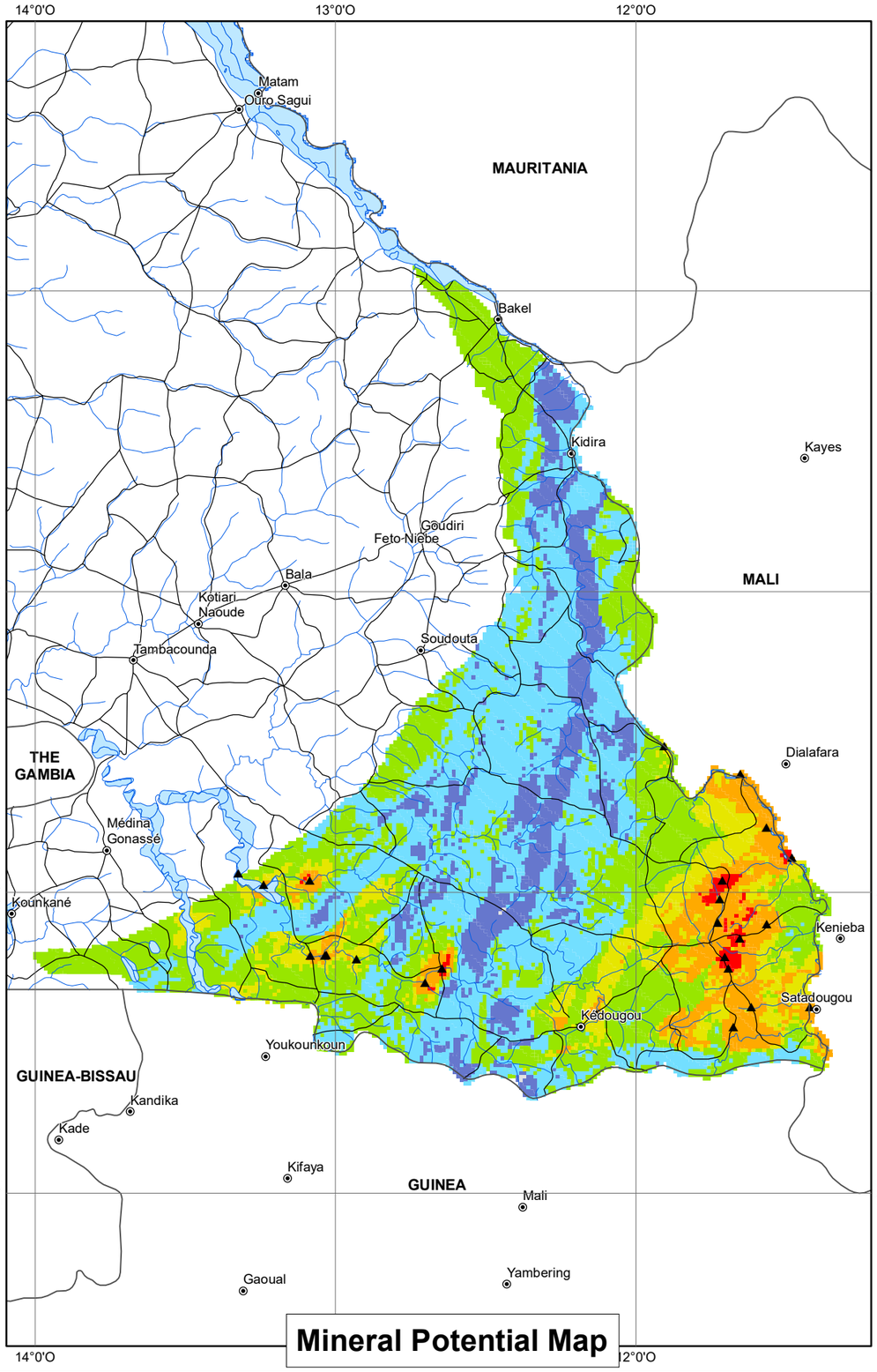
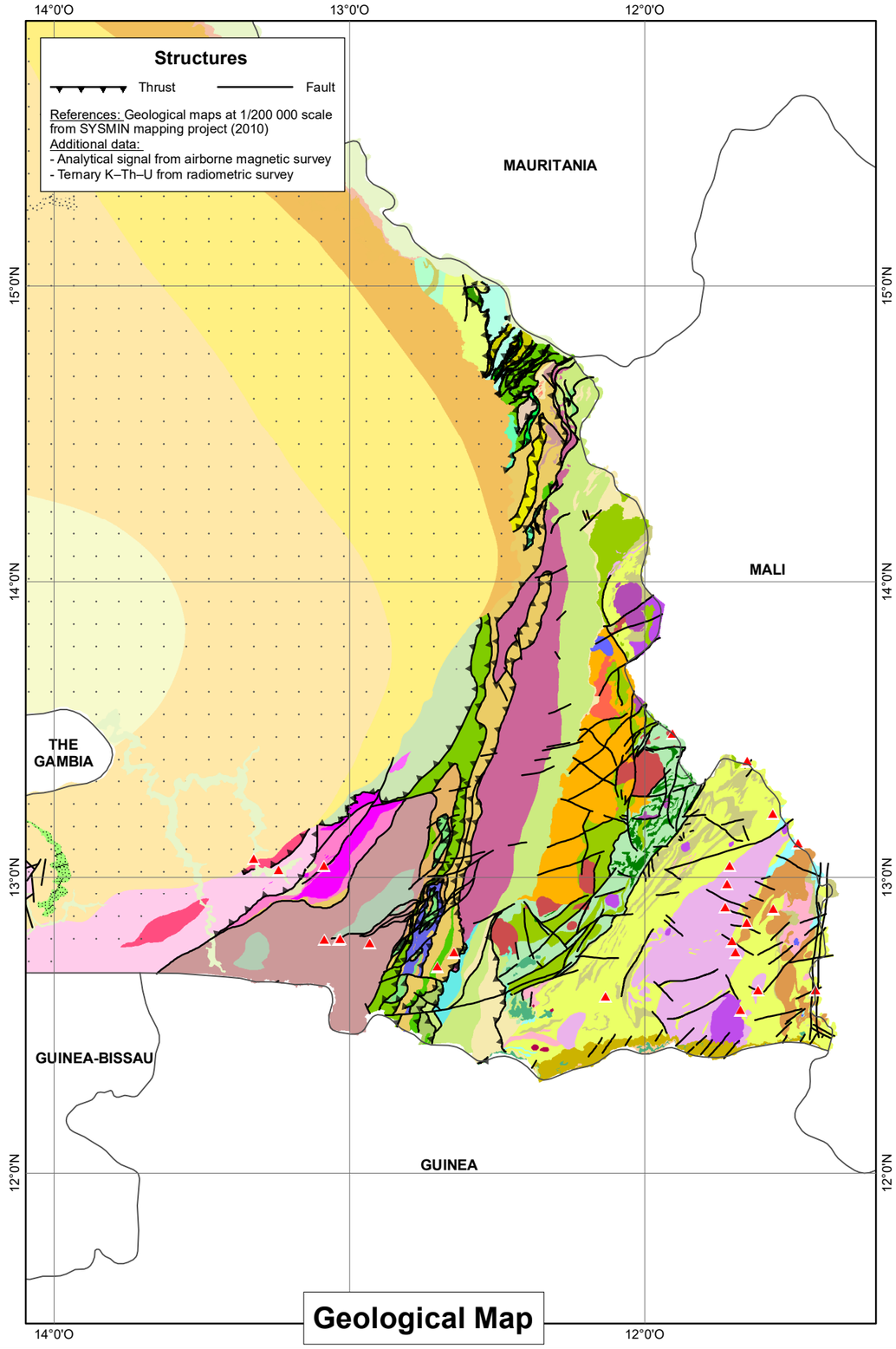
Country: SENEGAL (Oriental)

MINERAL POTENTIAL MAP - *TIN (Sn)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

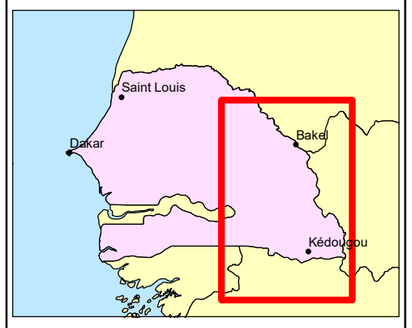
Known occurrences

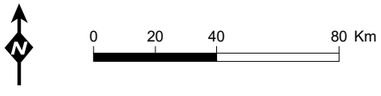
▲ Tin (Sn)
SIG Afrique - © BRGM 2018
SYSMIN and SPGlobal database

Confusion matrix

True negative Cells: 13840 79.93% Non-occurrence in database Non-occurrence predicted	False positive Cells: 2908 16.80% Non-occurrence in database Occurrence predicted
False negative Cells: 15 0.09% Occurrence in database Non-occurrence predicted	True positive Cells: 551 3.18% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.43
Cell size: 1333 m





Datum : WGS84 (World Geodetic System 1984)

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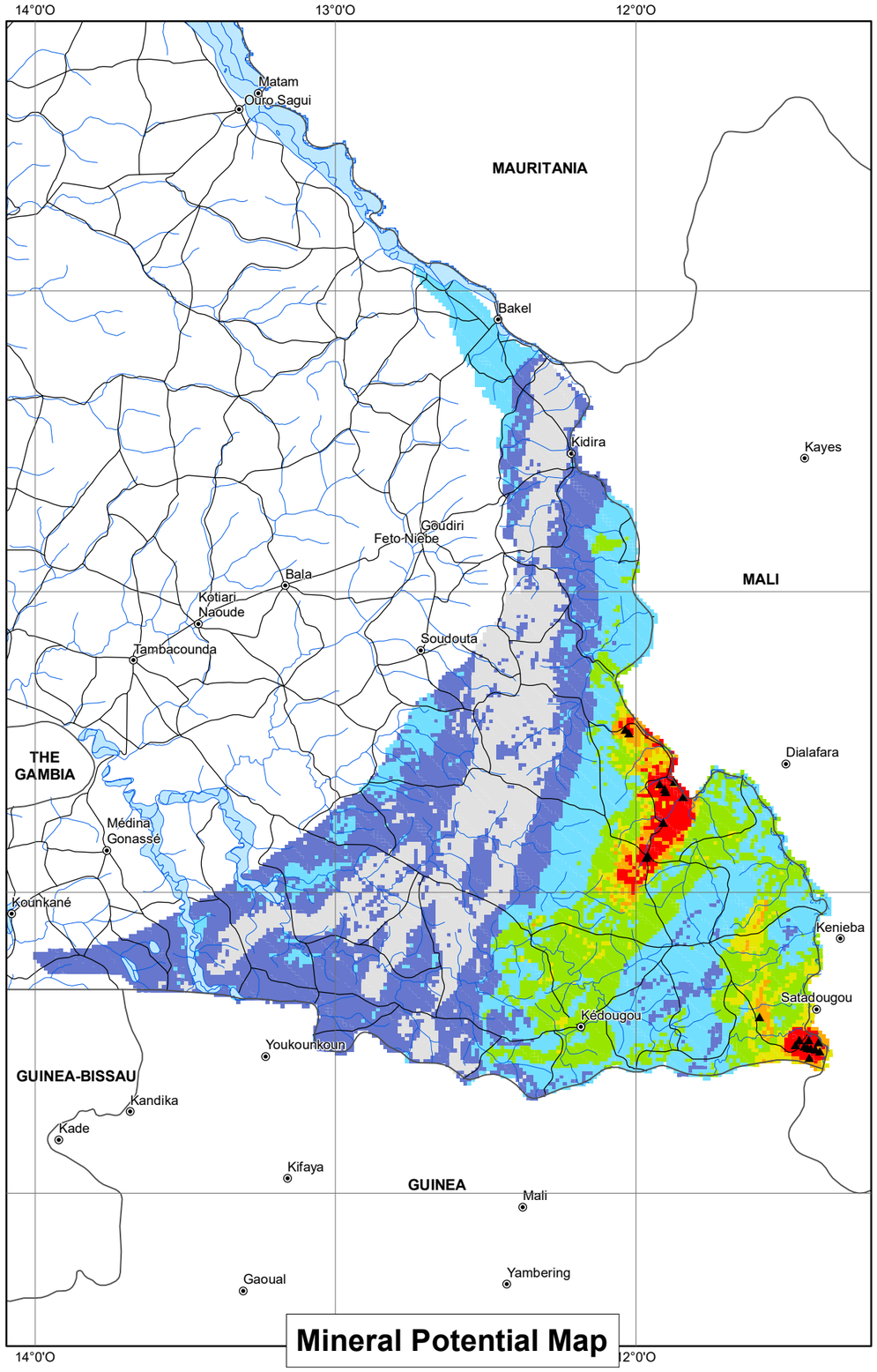
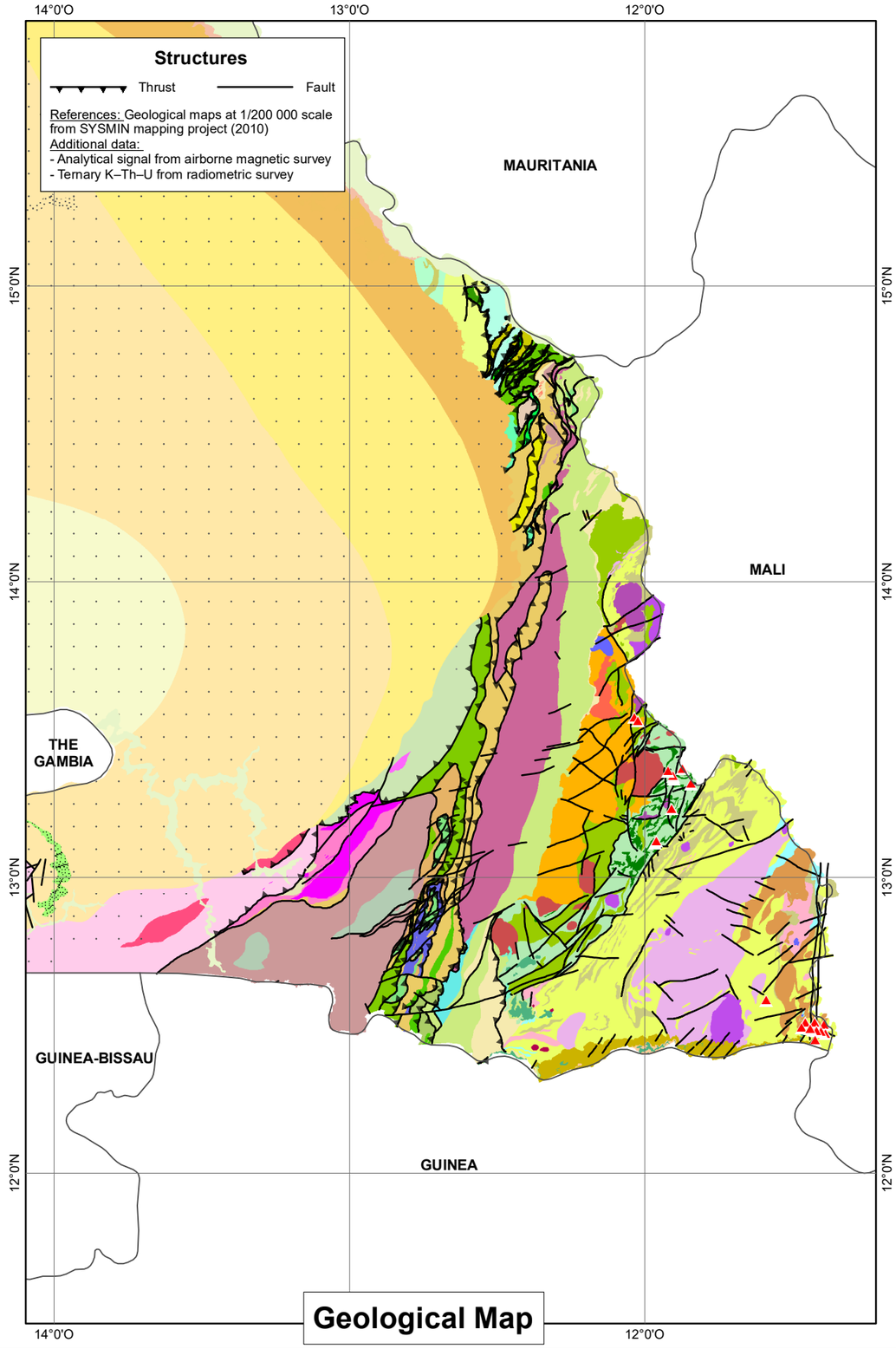
Country: SENEGAL (Oriental)

MINERAL POTENTIAL MAP - *TITANIUM (Ti)*

Africa MaVal





Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

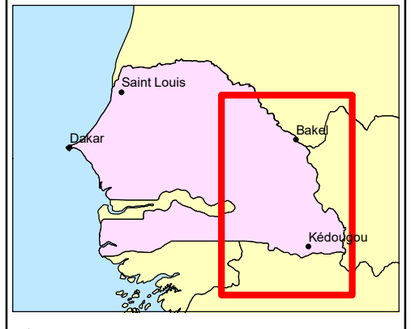
Known occurrences

Titanium (Ti)
SIG Afrique - © BRGM 2018
SYSMIN and SPGlobal database

Confusion matrix

True negative Cells: 16162 93.34% Non-occurrence in database Non-occurrence predicted	False positive Cells: 858 4.96% Non-occurrence in database Occurrence predicted
False negative Cells: 3 0.02% Occurrence in database Non-occurrence predicted	True positive Cells: 291 1.68% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.45
Cell size: 1333 m



0 20 40 80 Km

Datum : WGS84 (World Geodetic System 1984)

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Horizon Europe Framework Programme (HORIZON)

D9.3 –Tanzania Case Study

WP9 - Task 9.4

Date [19/01/2024]

Mrs T. Ramsaroop[1], Mrs N. Hoosen-Bally[1], Dr Hudson Mtegha[1], Mr Royston Lobow[1], Mr Mahlodi Kolomela[1], Dr D.P. Kafumu[2], Dr Willison Mutagwaba[3], Dr Silas O'lang, Mr David Perkins, Thomas Fullgraf[4]

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[3]MTL Consulting
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Related Task(s)	Task 9.4
Lead Organisation	BRGM
Contributing Partner(s)	DMT-KB
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Table of Contents

1. Extended Critical Raw Materials (ECRM) supply potential of Tanzania 13
1.1. Inventory of the ECRMs 13
1.1.1. Geological setting 13
1.1.2. Known ore deposits and occurrences 17
1.2. Prospectivity and mineral high potential mapping 20
1.2.1. Selection of the ECRM for mineral prospectivity 20
1.2.2. Mineral potential maps for the ECRM's Be, Gr, Ni, Nb, P and Sn 23
1.2.3. Mineral high potential areas 32
1.3. Ore processing and refining capacities in Tanzania 33
2. Assessment of the ECRM value chain 35
2.1. Characterisation of the value chain for primary and secondary raw materials ... 35
2.1.1. List of the mining and recycling projects 37
2.1.2. Status of economic links between the formal and informal sectors 37
2.2. Identification of the bottlenecks along the value chain 40
2.2.1. List of the main bottlenecks and the links between them 40
3. Investment/financing prospects for ECRM projects in Tanzania 46
3.1. Fiscal, legislative, and regulatory context for in-country financings 46
3.2. Macroeconomic context for in-country financings 52
3.2.1. Taxation and royalties 57
3.3. Political context for in-country financings 59
4. Assessment of environmental, social, and governance challenges 62
4.1. Country-level assessment and context 62
4.1.1. Context 62
4.1.2. Mineral and mining policies, industry policies 64
4.1.3. Mining regulations 68
4.1.4. Land-use and mineral rights 69

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4.1.5. Environment 70
4.1.6. Societal and community aspects, cultural heritage 72
4.1.7. Public health and safety 73
4.2. Mining practices *vs.* Environmental, Social and Governance (ESG) goals 73
4.2.1. Environmental challenges 73
4.2.2. Socio-economic issues 74
4.2.3. What would be the best practices for responsible mining? 75
5. Business network between the EU and Tanzania 76
5.1. Assessment of the upstream and downstream business ecosystem 76
5.1.1. Context, formal and informal players 76
5.1.2. Relationships at local or regional levels 79
5.1.3. Overview of the local or regional clusters 82
5.2. Building new B2B relations 83
5.2.1. Promoting local content and enabling mining cluster actors 83
5.2.2. Strengthening African Mining Clusters 87
6. Energy and digital transition: a strategy for the EU and Africa Partnership 89
7. Opportunities for responsible investments 99
7.1. Proposal of projects 102
7.1.1. Identification of individual exploration, mining, and refining projects 102
7.2. ASM sector country profiles 104
7.2.1. Country profiles on ASM sector developments and investment 104
8. Conclusion 105
References 106
Appendix 112
A. Mining operations, ore deposits and occurrences of ECRMs in Tanzania 112
B. Minerals Administration under the Mining Act 119

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List of Figures

Figure 1: General geology of Tanzania and the ECRM occurrences recorded in the SIG-Afrique of BRGM. 14
Figure 2: Database for the MPM of Tanzania A) 1:2M geological map/structural data; B) 1:500k SOTER Soil map; C) SRTM/slope; D) K and U radiometric data 21
Figure 3: Mineral Potential Map of Tanzania for beryllium (Be) of test 1. The known occurrences (19) are indicated as red star. 25
Figure 4: Mineral Potential Map of Tanzania for graphite (gr). Known occurrences (9) are indicated as red stars. 26
Figure 5: Airborne radiometric data (here potassium) for the graphite study in the AOI of eastern Tanzania 27
Figure 6: Mineral Potential Map of eastern Tanzania for graphite; known occurrences (4) are shown as red stars 28
Figure 7: Mineral Potential Map of Tanzania for nickel sulphides (Ni); known occurrences are shown as red stars 29
Figure 8: Mineral Potential Map of Tanzania for Niobium (Nb); known occurrences (17) are shown as red stars 30
Figure 9: Mineral Potential Map of Tanzania for phosphate (P); known occurrences are shown as red stars. 31
Figure 10: Mineral Potential Map of Tanzania for tin (Sn); known occurrences are shown as red stars. 32
Figure 12: Mining Projects Maturity Model 36
Figure 13: Share of GDP by main economic activity 2015-2021 (at current prices) (Source: Tanzania Bureau of National Statistics) 53
Figure 14: Foreign Direct Investment inflows and stock at current prices (1995-2021), (UNCTAD). 54
Figure 15: ECRM Value Chain Diagram (FMF, 2023). 80
Figure 16: Localities of shortlisted graphite projects in Tanzania. 103

List of Tables

Table 1: Mineral occurrences and potential (*high potential opportunities) in Tanzania. 17
Table 2: Tanzania ECRM checklist based on the Eu ECRM 2020's List 19
Table 3: The applied parameters for the MPM's of Tanzania; "yes/no" = data used/not used for the analysis 22
Table 4: Results of data driven mineral potential mapping in Tanzania applying the FAMME algorithm 23
Table 5: Favourable factors (in decreasing importance) for the exploration of the selected ECRM's. The meaning of the codes is given below. 24

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Table 6: Mine Processing and refining capacities 34
Table 7: Main bottlenecks and the links between them 43
Table 8. 2022 WGI indicators and their impacts on the CRM value chain 44
Table 9: Financing institutions in Tanzania 48
Table 10: Key provisions on taxes and royalties 59
Table 11: Issues related to land use and mineral rights ownership 70
Table 12: Key provisions of the environmental legislation that are relevant to mining 72
Table 13: Key Tanzanian stakeholders in the Tanzanian-EU Business network 78
Table 14: Institutions for the development of an Africa-focused critical minerals network 79
Table 15: Integrated Mining Technical Training (IMTT) Program Education and training programmes 85
Table 16: Some organisations across the African continent and in Europe that may host interns and apprentices with upstream and downstream players in the extractive industry 87
Table 17: Tanzania's roadmaps, plans, and strategies 95
Table 18: Investment opportunities in exploration and mining 99
Table 19: Investment opportunities in processing and manufacturing of goods and components (Priority ECRM readily available in the near future (when graphite, copper, nickel and cobalt mines will come on stream) 101
Table 20: Shortlisted exploration, mining, and refining projects in Tanzania. 102

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Abbreviations and Acronyms

Acronym	Description
ACP	African, Caribbean, and Pacific
AfCFTA	African Continental Free Trade Agreement
AGOA	African Growth and Opportunity Act
AMGC	African Minerals and Geosciences Centre
ASM	Artisanal and Small-scale Mining
CHADEMA	The Party for Democracy and Progress
CET	Common External Tariff
CHRAGG	Commission for Human Rights and Good Governance
CIT	Corporate Income Tax
COMESA	Common Market for Eastern and Southern Africa
CPI	Consumer Price Index
CSR	Corporate Social Responsibility
CUF	Civic United Front
DIArb	Dar es Salaam Centre for International Arbitration
DSA	Debt Sustainability Analysis
DTA	Double Taxation Agreements
DWHTR	Domestic Withholding Tax Rate
EAC	East African Community
EARS	East African Rift System
EBA	Everything But Arms
ECRM	Extended Critical Raw Materials
EFG	European Federation of Geologists
EITI	Extractive Industries Transparency Initiative
EIU	Economist Intelligence Unit
EMP	Electro Magnetic Pulse
EPA	Economic Partnership Agreement
ESG	Environmental, Social and Governance
EU	European Union
EV	Electric Vehicle
FDI	Foreign Direct Investment
FEMATA	Federation of Miners Association of Tanzania
GDP	Gross Domestic Product

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GSP	Generalized System of Preferences
GRI	Global Reporting Initiative
GSSB	Global Sustainability Standards Board
HIPC	Heavily Indebted Poor Country
HIV/AIDS	Human Immunodeficiency Virus
HDI	Human Development Index
IASB	The International Accounting Standards Board
IAT	The Institute of Arbitrators Tanzania
ICT	Information and Communication Technology
ILO	International Labour Organisation
IMF	International Monetary Fund
IMTT	Integrated Mining Technical Training
IFEM	Interbank Foreign Exchange Market
ISSB	International Sustainability Standards Board
ITC	International Trade Centre
JORC	Joing Ore Reserve Committee
LoM	Life of Mine
LREE	Light Rare Earth Elements
MoLEYD	Ministry of Labour, Youth and Employment Development
MIGA	Multilateral Investment Guarantee Agency
NAM	Non-Aligned Movement
NEC	National Electoral Commission
NEER	Nominal Effective Exchange Rate
NEMC	National Environment Management Council
NHRAP	National Human Rights Action Plan
NGOs	Non-governmental Organisations
NISC	National Investment Steering Committee
NSSF	National Social Security Fund
NSGRP	National Strategy for Growth and Reduction of Poverty
NTB	Non-Tariff Barriers
OACPS	Organisation of African, Caribbean and Pacific States
OECD	Organisation for Economic Cooperation and Development
PAYE	Pay as You Earn
PGM	Platinum Group Metals
PPG	Public and Publicly Guaranteed

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PPPs	Public-Private Partnerships
REE	Rare Earth Elements
REER	Real Effective Exchange Rate
RISDP	Regional Indicative Strategic Development Plan
SADC	Southern African Development Community
SAGCOT	Southern Agricultural Growth Corridor of Tanzania
SASB	Sustainability Accounting Standards Board
SDL	Skills Development Levy
SEAMIC	Southern & Eastern African Mineral Centre
SEZ	Special Economic Zones
STAMICO	State Mining Corporation
TAC	Tanzania Arbitration Centre
TANALEC	Tanzania Electrical Company
TIC	Tanzania Investment Centre
TNBC	Tanzania National Business Council
TRA	Tanzania Revenue Authority
TZS	Tanzanian Shillings
UN	United Nations
UNCITRAL	United Nations Commission on International Trade Law
UNECA	United Nations Economic Commission for Africa
VAT	Value-Added Tax
WHT	Withholding Taxes
WTO	World Trade Organization
WP	Work Package
ZEC	Zanzibar Electoral Commission

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Executive Summary

This report provides the reader with an overview of the key aspects regarding mineral resources, supporting regulations and institutions, as well as any related provisions in the prospecting and developing of Critical Raw Materials (CRMs) in Tanzania. The report is an integral part of the larger AfricaMaVal project and, in that context, provides this country overview specifically aimed at European Union (EU) investors and decision-makers. The report demonstrates Tanzania's suitability as a choice for stable future CRM supply to the EU and has been developed through a network of Tanzanian and African consultants familiar with the operational environment of the country under consideration. The outcomes of the case study are highlighted in this section and further detailed within the chapters that follow.

CH.1 - Extended Critical Raw Materials (ECRM) supply potential of Tanzania

Tanzania is endowed in various minerals, including Extended-CRMs (ECRMs). The focus of this report will be ECRMs, including aluminium (bauxite), beryllium, cobalt, copper, lithium, natural graphite, nickel, niobium, magnesium, manganese, tantalum, tin, titanium, tungsten, and vanadium. Other minerals are barite, borate, fluorspar, rock phosphate, Rare Earth Elements (REE) i.e. scandium, yttrium, lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium (particularly Light Rare Earth Elements (LREE) and PGMs (Platinum Group Metals) i.e. platinum, palladium, rhodium, iridium, ruthenium and osmium. The mineral resource endowment of Tanzania is favoured by the Archaean Tanzania Craton, Palaeoproterozoic Ubendian, Neoproterozoic Usagaran, Mozambican mobile belts, Mesoproterozic Karagwe–Ankolean, Phanerozoic sediments (Karoo), Coastal basin and Cenozoic volcanics.

Upon assessment, at present, graphite is targeted to have a higher potential than other ECRMs shortlisted for Tanzania. Graphite has been selected due to geological conditions conducive to:

(1) the formation of graphite deposits;

(2) substantial known graphite deposits with large-scale and high-quality graphite resources in various regions of the country; and

(3) an increasing demand for graphite, which is a critical component in various industries, including electric vehicles (EVs) energy storage, and the production of lithium-ion batteries. Here it represents almost 50% of the materials needed by weight.

Copper concentrate and phosphate are the only ECRMs currently produced at a large-scale mining level in the country. The rest of the ECRMs are produced by Artisanal and Small-scale Miner (ASM) activities spread across the country. Most of the ECRMs are exported in

unprocessed raw product to China, India, Europe, Japan, and some in the East African region. The only mine that has the capacity to process ore, is the Minjingu Phosphate Mine. There are however plans for expansion programmes to reach a market beyond the East African Community (EAC) (MFFL, 2023), with no other smelting or refining capabilities of ECRMs in Tanzania.

CH.2 - Assessment of the ECRM value chain

The development of the ECRM value chain in Tanzania is very limited due to the historical preference of exporting raw materials. Very few factories and industries can utilize local ECRMs due to the limited number of mines that produce them, particularly for the local market. ECRM-based manufacturers identified are therefore propelled into importing ECRMs rather than obtaining them from within the country.

While phosphate has a recognizable value chain network, copper is exported as a concentrate to Japan and China. There is also some other production of copper ore, natural graphite, tin ore (cassiterite), lithium, cobalt, tantalum, tungsten, magnesium ore (magnesite), manganese and aluminium ore (bauxite) from ASM activities that are exported to Kenya, Rwanda, India, and China. No ECRM recycling projects have been identified for Tanzania during the period of writing this case study report.

It is important to note the fluidity of the distinction between the formal and the informal mining; for mining activities range from fully formalized to fully informal. Like other countries, Tanzania has been working on formalizing mining by regulating the sector and operating in a transparent, legal, and environmentally responsible manner. However, complicating the process is the presence of ASM activities which are difficult to regulate. The dominance of ASM activities in Tanzania is linked to adverse environmental and social impacts due to the informal and unregulated nature typified by these operations.

Tanzania has been attempting to strengthen the economic ties between the formal and artisanal sectors. For Tanzania's mining sector to grow sustainably, bottlenecks must be addressed, and the links between the various phases of the mining value chain must be strengthened. Reforming policies, building infrastructure, involving the community, and promoting ethical mining methods, among other things, may be necessary to achieve this. The promotion of value addition activities related to ECRMs in Tanzania provides the country a unique opportunity to act as a catalyst for developing and sustaining value chain activities. This can be done by supporting the direct mining operations and businesses and developing downstream activities.

CH.3 - Investment/financing prospects for ECRM projects in Tanzania

Tanzania initially underperformed economically after gaining independence, leading to severe economic distress by the 1980s. Subsequent structural adjustments and policy reforms allowed

Tanzania to establish macroeconomic stability. This stability created an environment conducive to Foreign Direct Investment (FDI), leading to sustained high economic growth, often ranking among Africa's fastest-growing economies. In 2021, Tanzania had a Gross Domestic Product (GDP) of $64.16 billion (in constant 2015 prices), making it the second-largest economy in East Africa and ranking among the top 10 economies in sub-Saharan Africa (Statista, 2023). The mining sector accounts for just 4.5% of total GDP showing a low reliance to minerals. However, it is comparatively a high contributor to FDI in the country.

CH.4 - Assessment of environmental, social, and governance challenges

Generally, the Mining Industry in Tanzania uses the Global Reporting Initiative (GRI) guidelines as per the Global Sustainability Standards Board (GSSB) for Environmental, Social and Governance (ESG) compliance. ESG reporting compliance in Tanzania is still voluntary and mostly implemented by foreign mining companies. In 2017, several legislations aimed at protecting the country's natural resources and employment opportunities for Tanzanian citizens were introduced by parliament. These new Acts introduced new conditions for exploration and mining companies, such as the following, but not limited to: restrictions on export of raw materials; sourcing of goods and services to give preference to indigenous Tanzanian companies; and incentivising contractors, subcontractors and licenses undertaking mining activities that employ and train local citizens.

Following a change in Government in 2020 and subsequent reviews of the mining regulations, issues which had stagnated growth of the sector were somewhat resolved. This has prompted positive feedback from foreign investors. Whilst modern mining in Tanzania dates to the late 1990s, the current principal legislation for the governance of the mining sector is the Mining Act CAP 123, (R.E.2019). The latest amendments were made in 2022 (The Miscellaneous Amendments (No.3) Act, 2022). The Environmental Management Act (EMA) (No.20), 2004, is the principal legislation in Tanzania, providing the legal and institutional framework for sustainable management of the environment.

CH.5 - Business network between the EU and Tanzania

Tanzania is a member of several international organizations, including the United Nations, the Commonwealth, the World Trade Organization, the African Union, the East African Community, and the Southern African Development Community. Ownership requirements for businesses and mining operations in Tanzania are established to promote local participation and ensure that Tanzanian citizens benefit from the mining industry.

The local content policy in Tanzania (Ministry of Minerals, 2018) relating to mining is robust and rigid, in its requirements and through its implementation. Miners in Tanzania have the option and are encouraged to beneficiate and undertake fabrication. The local content model is viewed

as a mine to market integrated model with the purpose of growing Tanzanian business into downstream activities.

CH.6 - Energy and digital transition: a strategy for the EU and Africa Partnership

Tanzania is one of the four countries poised to benefit from the 111.5 million Euros in funding provided by the EU (European Commission, 2023b). This funding has been earmarked to target the mining sector, and it is part of the broader Organisation of African, Caribbean and Pacific States (OACPS)-EU Development Mineral Programme. This initiative is pivotal for Tanzania as it aligns with the broader objectives of the AfricaMaVal project initiated by the EU. Tanzania's plans and strategies related to the mining sector align well with the EU's twin transition (which aims to transform the EU economy to a combination of green and digital model) and responsible sourcing of critical minerals. They emphasize economic growth, job creation, sustainability, good governance, and value addition, which are all in line with the EU's broader objectives. These plans demonstrate Tanzania's commitment to responsible mineral sourcing and its contribution to regional economic development.

CH.7 - Opportunities for responsible investments

Eight investment opportunities or projects were identified in Tanzania for consideration. The details of these projects are presented in Table 22 and include: 1) Bunyu Project, 2) Grafica Graphite Project, 3) Mahenge Graphite Project, 4) Nachu Graphite Project (NGP), 5) Pula Graphite Partners, 6) Changube Copper Project, 7) Bahi (Sedimentary) and Sengeri (Igneous) Phosphate projects, and 8) Kyerwa Tin Project.

1. Extended Critical Raw Materials (ECRM) supply potential of Tanzania

Tanzania is endowed with various minerals, including ECRMs. The focus of this report will be ECRMs, including *aluminium (bauxite), beryllium, cobalt, copper, lithium, natural graphite, nickel, niobium, magnesium, manganese, tantalum, tin, titanium, tungsten, and vanadium. Other minerals are barite, borate, fluorspar, rock phosphate, REE (particularly LREE) and PGM.*

The global green energy transition and subsequent demand for ECRMs has prompted a mineral exploration boom in Tanzania. Some key statistics include:

- Between 2019/2020 - 70% of all issued exploration licences were on ECRMs and gold and other minerals were the remaining 30% (MC 2022, 2023a & 2023b).
- In 2021 - estimated graphite reserves of 18 Mmt ranked 5th in the world (Statist, 2020). These reserves are growing with an increase in JORC certified projects on the rise.
- Kabanga Nickel project resource (58 Mmt) is about 19% of the world reserves and may begin producing for the global market by 2025 (Bhadare, 2021).

1.1. Inventory of the ECRMs

1.1.1. Geological setting

The mineral resource endowment of Tanzania is favoured by the Archaean Tanzania Craton, Palaeoproterozoic Ubendian, Neoproterozoic Usagaran, Mozambican mobile belts, Mesoproterozic Karagwe–Ankolean, Phanerozoic sediments (Karoo), Coastal basin and Cenozoic volcanics (URT, 2005; GST, 2015; MMa, 2021), as shown in Figure 1.

The presence of widespread ultramafic layered intrusive complexes within the Ubendian Rock System (western Tanzania) provides great opportunity for the discovery of PGM polymetallic mineralization (PGM, Co, Ni-Cu rich massive sulphides (Njombe, Mpanda and Kigoma mineral fields)). The Nyanzian rock system (Nzga, Kahama and Musoma districts) and Karagwe-Ankolean Rock Systems (Karagwe and Ngara districts) occur in the south-east and western sides of the Lake Victoria.

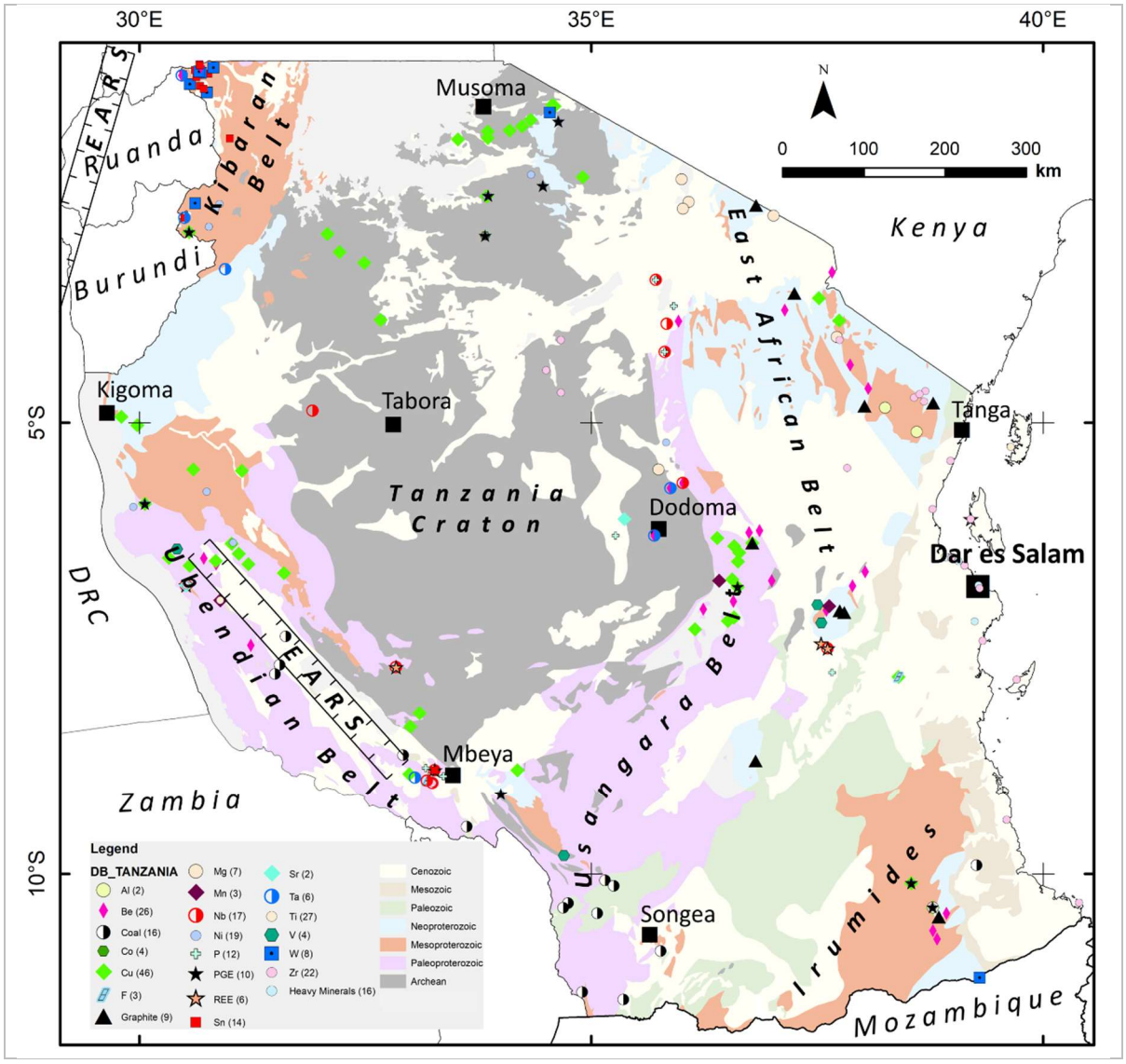

Figure 1: General geology of Tanzania and the ECRM occurrences recorded in the SIG-Afrique of BRGM.

Different types of minerals occur in a diverse geological terrain in Tanzania, but of importance in this report are the ECRMs that include aluminium (bauxite), beryllium, cobalt, copper, lithium, natural graphite, nickel, niobium, magnesium, manganese, tantalum, tin, titanium, tungsten, and vanadium. Other minerals are barite, borate, fluorspar, rock phosphate, REE (particularly LREE) and PGMs (MMa, 2021).

Table 1 provides an indication of the specific occurrences of ECRMs in the country. High potential opportunities are also identified, and criteria for selection are discussed in Section 1.2.1.

Commodity	Description
Barite	Occurs in places such as the North Mara goldfields, Ilagala area in Kigoma region (Western rift), Sikitko Kapapa and Kalamba river (in the Mpanda mineral fields, Kingorowira in Morogoro region, Lupa goldfield in Ntumbi area and Lupa river, Matumbi hills and Wingoyongo areas (in the Karroo coalfields); the Gowelela area

Commodity	Description
	in the Karoo coalfields (GST, 2015) and the Western arm of the Eastern African Rift Valley of Tanzania carbonatites like Ngualla, Panda Hil and Wigu (URT, 2008b; GST, 2015).
Bauxite	Deposits in North-eastern Tanzania occur as residual deposits on two geomorphologic related plateaus of Mabughai-Mlomboza and Kidundai at Magamba in Lushoto, Usambara Mountains. The bauxite deposits contain Al_2O_3 (40–69 wt. %), Fe_2O_3 (3–10 wt.) (Mutakyahwa et al., 2003).
Beryllium	Granulites on the Usagaran, Mozambican and Ubendian mobile belts systems host beryl and subsequently, ore for beryllium. Beryl has been found in Mang'ola area in Mbulu district and in Ponda near Sumbaanga town (URT, 2005).
Borates	Occur in the lustrine playa lakes and paleo-lakes brines of Central Tanzania (Bahi, Manyoni and Singida districts), as well as in the EARS in Lake Eyasi, Lake Manyara, Lake Natron and Engaruka basin depressions in association with gypsum and diatomite deposits (URT 2005).
Cobalt	Found mainly in the Mesopalaeozoic Kibaran Belt (Karagwe-Ankolean rocks) associated with (ultra)mafic intrusions mineralized as massive Ni-Co Sulphides. Cobalt also occurs in Ni-Co bearing weathering products of ultramafic rocks to form Co-rich laterites in the Nyanzian rock systems and high-grade rocks of the Dodoman Craton (URT, 2005; GST, 2015). Cobalt ore sometimes occurs within layered ultramafic complexes of multi-element deposits in association with PGM. Such occurrences are known in the Zanzui area, Simiyu region; Kapalagulu PGM deposits in Kigoma regions and Luwumbu area, Makete district (GST, 2015 and URT, 2005).
***Copper**	Found in the extensive Nyanzian meta-sediments goldfields (Lake Victoria basin) that hosts massive Cu-Ni-Co sulphides and mafic to ultramafic lithologies in the Ubendian, Usagaran and Mozambican mobile belts (North-eastern, Eastern and South-western Tanzania). These are ideal locations for Cu-Ni sulphide mineralization that can yield economic copper metals.
Fluorspar	Fluorspar (fluorite ore) deposits are found in association with niobium deposits of Panda Hill in Mbozi district and REE Deposits of Ngualla in Songwe Region. Both these deposits are JORC compliant projects but do not take into consideration the mining of fluorspar.
***HREE and LREE**	REE are found within the EARS (Western Arm that stretches from lake Nyasa in the south to Kigoma in the north and the Eastern Arm that stretches from Lake Nyasa in the south to Lake Natron in the north). The EARS carbonatite intrusions host all the REE, niobium, phosphate, and fluorspar minerals in Tanzania (GST, 2015 and URT, 2005; Boniface, 2017).
***Lithium**	Occur in three places in pegmatites of the Dodoman Craton (two places) and in the intrusive pegmatites in the Karagwe Ankolean (one place) (URT, 2005; URT, 2015). Lithium (and borates) from salt brines in the rift valley systems also present an exploration opportunity in Tanzania (Saltworks Consultants Pty Ltd, 2017)).

Commodity	Description
Magnesium	Magnesite, a magnesium ore, is formed in hydrothermal veins in high grade metamorphic rocks of the Usagaran System.
Manganese	High-grade metamorphic rocks of the Usagaran and Ubendian mobile belts host most of the manganese deposits (GST, 2015).
***Natural graphite**	Found in the high grade graphitic-gneisses metamorphic rocks within the Usagaran and Mozambican belts (The East African Orogeny) covering an entire mobile belt strip of over 300km wide extending from Indian Ocean coastline to Morogoro and stretching from Tanga in the north to the Mozambican border in the south (Ruvuma River). The East Africa Orogeny contain among the best qualities of graphite in the world (Moye et al., 2021) and have ignited a graphite exploration projects wave along the mobile belt into Mozambique.
Nickel	Found in a variety of geological terrains including the following: mafic/ultramafic intrusions in a meta-sedimentary complex of the Mesopalaeozoic Kibaran Belt; massive sulphide mafic/ultramafic intrusions in a meta-sedimentary complex of the Nyanzina system. Ultramafic massive sulphide intrusive in high grade metamorphic rocks; and in sheared serpentinised of the Mozambican mobile belt. Nickel also occurs in layered ultramafic intrusives composed of norite, dunite, harzburgite, and gabbro rocks; and layered ultramafic meta-anorthositic complex Intrusives of the Ubendian system.
Niobium	Occurs in Carbonate intrusions in fenitised Proterozoic gneiss and granulite rocks and in Mid-Cretaceous volcanic carbonatite intrusion which has intruded into gneisses and amphibolite (Boniface, 2017).
PGMs	The Kapalagulu and Luwumbu PGM deposits in Tanzania are typical examples of ultramafic intrusions containing a massive sulphide succession within the Ubendian mobile Belt rock system of Tanzania. (URT, 2005 & GST, 2015).
***Phosphate Rock**	Phosphates occur in different geological environments that are young biogenic sedimentary sediments and in REE and niobium bearing carbonatites within the EARS (Boniface, 2017; Figures 3 & 4). The young sedimentary phosphates originate from birds and bats guano cerements. The Minjingu Rock Phosphate is in the proto-lake Manyara Island in which migratory birds may have come annually from Europe to breed for hundreds of years during the Pleistocene thus depositing a huge amount of guano that overtime geological processes turned it into rock phosphate (Szilas, et al. 2008). Other guano deposits are in the Sukumawera Songwe travertine caves and rock phosphate deposits occurring as apatite minerals in carbonatite rocks at ZiZi and Mbalizi areas (Boniface, 2017; Szilas, et al. 2008; URT, 2005, 2008; Chesworth, et al. 1988).
Tantalite	Tantalum ore is found in association with tin and tungsten polymetallic mineralization at Kyerwa cassiterite (tin) deposit.
***Tin**	Deposits are found in the Kibaran rock system in the Kagera region (URT, 2005; GST, 2015).

Commodity	Description
***Titanium**	Pleistocene to Holocene placer beach sands in a 100 km wide Indian Ocean coastline stretching from Tanga to Mtwara hosts heavy mineral sands that contain titanium in rutile (TiO_2) and ilmenite ($FeTiO_3$) resistant mineral.
Tungsten	Found in association with tin deposits of Kyerwa in the Kagera region.
Vanadium	Found in association with titanium of iron ore deposits at Liganga and Maganga Matitu in Rudewa Njombe region.

Table 1: Mineral occurrences and potential (*high potential opportunities) in Tanzania.

1.1.2. Known ore deposits and occurrences

This section introduces some of the known mineral deposits or occurrences in Tanzania, in accordance with the current EU ECRM list. Most of these deposits are classified under the exploration stage, with few having reached the stage of mining. Table 2 shows a list of the main deposits or occurrences and their development stage, for each ECRM. For more details, please refer to Appendix A.

No	EU List of ECRM	Name of Deposit or Occurrence	Development Stage
1	Barite	In various locations in hydrothermal infillings of goldfields	Geological occurrences
2	Bauxite (Aluminium)	Magamba - Lushoto, and Amani - Muheza Tanga region	Initial Exploration
3	Beryllium	Various geological occurrences in metamorphic terrains	Geological occurrence
4	Borate	In playa lacustrine lake brines in central Tanzania and in the East Africa Rift System Lake depressions.	Geological occurrence
5	Cobalt	Kabanga - Ngara, Kagera	JORC compliant Feasibility study ready for mine construction
		Zanzui - Bariadi, Simiyu	Advanced exploration stage
		Haneti - Kondoa, Dodoma	Initial Exploration
6	Copper	Bulyanhulu - Kahama, Shinyanga	Mining
		Buzwagi - Kahama, Shinyanga	Mining (Mine closed in 2019)
		Tambi and Kinusi - Mpwapwa, Dodoma	ASM mining
		Several other occurrences	Geological occurrences
7	Fluorspar	Panda Hill- Mbozi, Songwe	Initial Exploration
		Ngualla - Songwe	Initial Exploration
8	REE (HREE's and LREE's)	Ngualla - Songwe,	JORC compliant Feasibility study ready for mine construction
		Sengeri - Tunduma, Songwe	Initial Exploration
		Nakonde - Songwe	Initial Exploration
		Wigu Hill - Morogoro	Initial Exploration

No	EU List of ECRM	Name of Deposit or Occurrence	Development Stage
		Lihogosa Swamp - Njombe	Occurrence
		Zizi - Mbeya region	Occurrence
9	Lithium	Hombolo - Chamwino, Dodoma	Initial Exploration
		Mohanga - Dodoma Rural District	Initial Exploration
		Karagwe – Kagera Region	Occurrence
		Possible deposits to be determined	Possible target occurrences areas in lake brines of the EARS
10	Magnesite (Magnesium)	Chambogo - Same, Kilimanjaro	Old Mine (Reopened in the 1980s)
11	Manganese	Several occurrences	Geological occurrence
12	Natural Graphite	Nachu, Ruangwa - Lindi	JORC compliant Feasibility study ready for mine construction
		Nguema, Chilalo -Lindi	JORC compliant Feasibility study ready for mine construction
		Volt, Mbunyu -Masasi, Lindi	JORC compliant Feasibility study ready for mine construction
		Tanzgraphite Epanko - Morogoro	JORC compliant Feasibility study ready for mine construction
		Faru Minerals, Mahenge - Morogoro	JORC compliant Feasibility study ready for mine construction
		Jumbo, Ruangwa - Lindi	JORC compliant Feasibility study ready for mine construction
		Mererani Tanzanite -Simamnjiro	A tanzanite mine being re-evaluated
		Several (11 sites) other occurrences in the metamorphic terrains are at initial exploration stages under different Exploration Companies	Advancement, Mahenge - Morogoro Pula, Ruangwa – Lindi Nazareth, Ruangwa – Lindi Dayou, Handeni – Tanga PACCO, Ruangwa – Lindi United, Handeni – Tanga East Africa, Handeni – Tanga Tanzanagraph, Ulanga – Morogoro Kilimanjaro, Simanjiro – Manyara Grafica, Mahenge – Morogoro Gemini, Ruangwa- Lindi
13	Nickel and Cobalt	Kabanga - Ngara, Kagera	JORC compliant Feasibility study ready for mine construction
		Dutwa - Bariadi, Simiyu	Advanced exploration stage

No	EU List of ECRM	Name of Deposit or Occurrence	Development Stage
		Ntaka – Nachingweya, Lindi	Advanced exploration stage
		Haneti - Kondoa, Dododma	Advanced exploration stage
	Nickel and Platinum Group Metals	Kapalagulu - Uvinza, Kigoma	Advanced exploration stage
	Nickel and Cobalt	Zanzui - Bariadi, Simiyu	Advanced exploration stage
14	Niobium	Pandahill – Mbozi, Songwe	JORC compliant Feasibility study ready for mine construction
		Nachendazwae - Tunduma, Songwe	Initial Exploration
		Gallapo - Mbulu, Manyara	Initial Exploration
15	Platinum Group Metals	Kapalagulu -Uvinza, Kigoma	Initial Exploration
		Luwumbu - Makete, Njombe	Initial Exploration
		Mibango -	Initial Exploration
16	Phosphate rock (P2O5)	Phosphate Mine - Minjingu, Arusha	Mining
		Zizi Carbonatite – Zizi Mbeya	Geological Occurrence
		Songwe Scarp - Mkwajuni, Songwe	Geological Occurrence
		Mbalizi Carbonatite – Mbalizi, Mbeya Urban	Geological Occurrence
		Sukumawera Caves – Songwe river Songwe Region	Bat Guano phosphate
17	Tantalum	Several occurrences to be determined	Geological occurrence
18	Tin (Cassiterite) and Tungsten (Ferberite)	Kayanga - Kyerwa, Kagera	Initial exploration and presence of Artisanal and small-scale mining activities
19	Titanium and Vanadium	Liganga - Ludewa, Njombe	JORC compliant Feasibility study ready for mine construction
20	Titanium (Heavy sands with rutile and ilmenite)	Fungoni Heavy Sands- Dar es Salaam	JORC compliant Feasibility study ready for mine construction
21	Titanium and Vanadium	Maganga Matitu - Ludewa, Njombe	Advanced exploration
22	Tungsten (Ferberite)	Found in association with tin deposits of Kyerwa in the Kagera region.	Geological occurrence

Table 2: Tanzania ECRM checklist based on the Eu ECRM 2020's List1

Refer to Appendix A for a detailed list of known mines, ore deposits and occurrences.

[1] Source: (DMT, 2022; MMa, 2021; MC 2022, 2023; URT, 2005, 2008a&b; GST 2015; Chesworth, et al. 1988; Hatibu et al. 2021)

1.2. Prospectivity and mineral high potential mapping

The selection of ECRMs for mineral prospectivity is a crucial step in the field of mineral resource exploration and development. ECRMs, as minerals of high economic importance due to their various industrial, technological, and geopolitical significance; are minerals essential for the manufacturing of a wide range of products, including electronics, renewable energy technologies, aerospace components, and more. As a result, identifying areas with high prospectivity in Tanzania is a priority for government, mining companies, and the geological survey.

1.2.1. Selection of the ECRM for mineral prospectivity

Among the 36 ECRMs present in Tanzania, six were selected, due to the favourable geological setting for their mineralisation for mineral potential mapping (MPM) to demonstrate the principle of the method (**Be, Graphite (Gr), Ni**, **Nb, P** and **Sn**). A special study was performed on graphite occurrences in eastern Tanzania considering additional airborne radiometric data (potassium, uranium) although being of poor quality. The lack of important geoscientific data (e.g. aerial and ground geophysics, satellite data, soil, and stream geochemistry) and the relatively low resolution of the geological map used for this study (1:2M) implies only limited interest of the weakly constrained mineral potential maps for exploration. There was no use to illustrate this for the whole range of ECRM's. Only ECRM's with more than 10 occurrences were preselected and out of these those, which are representative for different types of deposits (magmatic, sedimentary).

The MPM was carried out using the disc-based association (DBA) grid method coupled with Random Forest (RF) method (*Vella, 2023*); the algorithm applying these principles has been labelled "FAMME" by the author. The method is based on the analysis of the local spatial associations of geological variables and features of various nature to describe the relationships between the predictors and the mineralization. This allows the identification of geological environments in the study area around each node of the DBA grid, and the integration of both quantitative and non-quantitative spatial data, such as geophysical anomaly maps and location of geological map units, respectively. In a second step, the RF classification method is used to perform a generalization of complex geological environments and features and evaluate their likelihood to host potential mineralization occurrences by giving a score between 0 (low potential) and 1 (high potential).

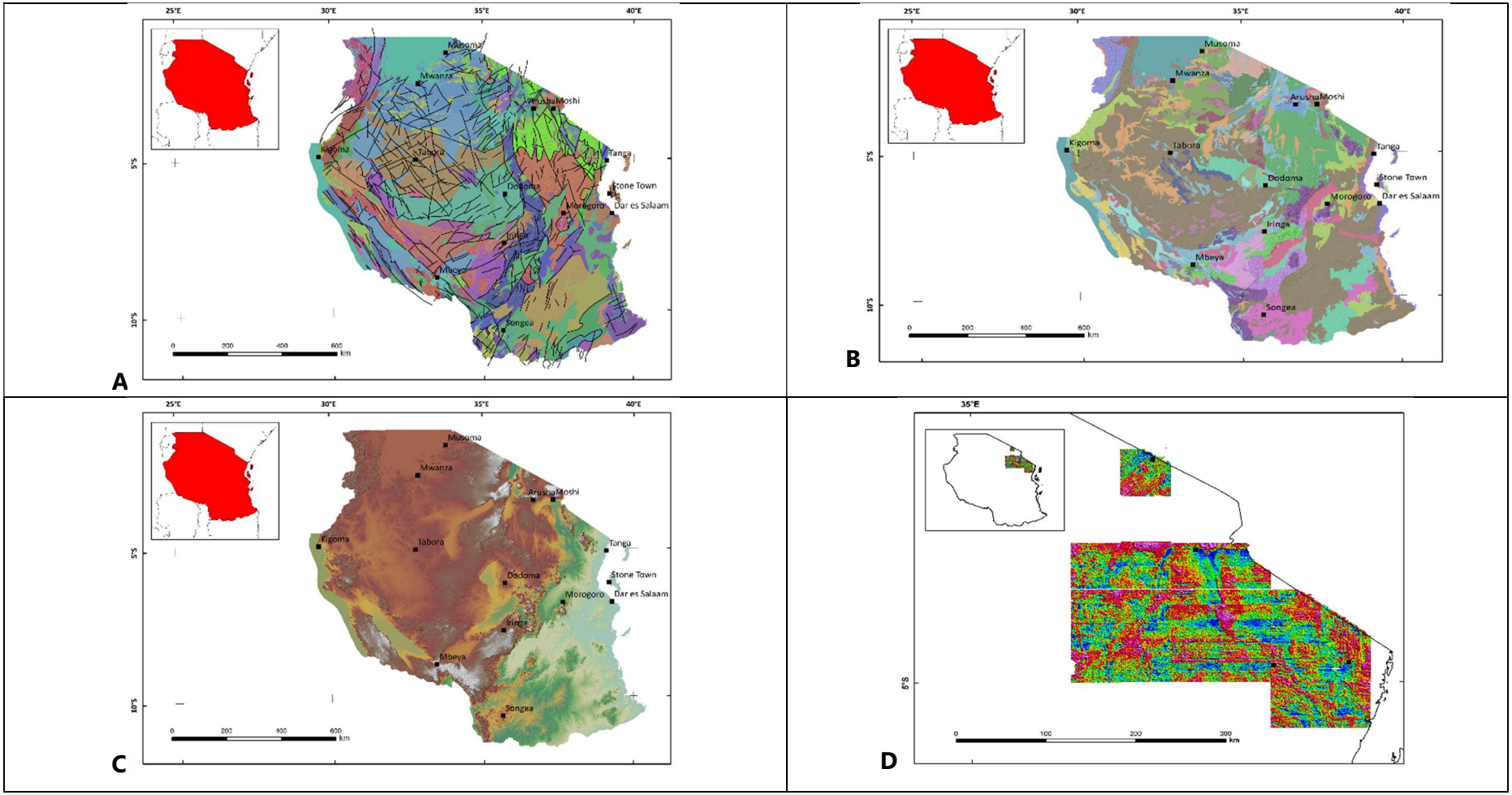

Figure 2: Database for the MPM of Tanzania A) 1:2M geological map/structural data; B) 1:500k SOTER Soil map; C) SRTM/slope; D) K and U radiometric data

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The data for the MPM Tanzania comprised the following (Figure 2):

- SIG-Afrique mineral resources database – BRGM
- SIG-Afrique 1:2M geology - BRGM
- SIG-Afrique 1:2M structural data (faults, thrusts) – BRGM
- UNCCD 1:500k SOTER – soil map of southern Africa
- SRTM
- Slope
- For the graphite study in eastern Tanzania: degraded U, K data of the AOI in eastern Tanzania which were purchased in png format (RGB)

The DBA grid for predictive modelling is mainly defined by **five parameters**:

- Size of cell – d;
- Buffer for lithologies – R;
- Buffer for mineral occurrences – R1. It can be null (= false), in this case the search radius will be restricted to the cell size (d)
- Buffer for faults – R2. It can be null (= false), in this case the search radius will be restricted to the cell size; it can also take into account the distance of the cell to the neighbouring faults (distance)
- Buffer for soils – R3. It can be null (= false), in this case the search radius will be restricted to the cell size

In order to maximize the grid resolution while minimizing overlaps and cells with only one lithology, the parameters of DBA grid for the four selected commodities in individual areas of interest (AOI) used in this study are as indicated in Table 3.

Parameter/ECRM	Be	Gr_all	Gr_AOI	Ni	Nb	P	Sn
d [m]	2000	2000	800	2000	2000	2000	2000
R [m]	10000	10000	4000	10000	10000	10000	10000
R/d	5	5	5	5	5	5	5
Total cells	220970	220970	12364	220970	220970	220970	220970
R_1 [m]	2000	2000		2000	1000	2000	2000
R_2 [m]	750	750	750	750	750	750	750
R_3 [m]	false	false	false	false	false	false	false
srtm	yes	yes	yes	yes	yes	yes	yes
slope	yes	yes	yes	yes	yes	yes	yes
K	no	no	yes	no	no	no	no
U	no	no	yes	no	no	no	no

Table 3: The applied parameters for the MPM's of Tanzania; "yes/no" = data used/not used for the analysis

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1.2.2. Mineral potential maps for the ECRM's Be, Gr, Ni, Nb, P and Sn

Seven mineral potential maps were produced for the six ECRM's **Be, Gr, Ni, Nb, P**, and **Sn**. The results of the DBA-RF (TN, FN, FP, TP = confusion matrix) together with the critical parameter for the assessment of the model are shown in Table 4.

	TN	FN	FP	TP	TPR	FPR	PPA [%]	Prec. [%]	Acc. [%]	J-score	Thresh.
Be	219950	1	956	63	0.98	0.00	0.5	6.18	99.6	0.98	0.54
Gr_all_T1	219357	1	1588	24	0.96	0.01	0.7	1.49	99.3	0.95	0.55
Gr_all_T2	220877	0	68	25	1.00	0.00	0.04	26.88	100.0	1.00	0.65
Gr_AOI	55398	0	39	48	1.00	0.00	0.16	55.17	99.9	1.00	0.60
Ni	220333	0	573	64	1.00	0.00	0.3	10.05	99.7	1.00	0.50
Nb	220157	0	763	50	1.00	0.00	0.37	6.15	99.7	1.00	0.43
P	220846	1	92	31	0.97	0.00	0.1	25.20	100.0	0.97	0.64
Sn	219903	1	1029	37	0.97	0.00	0.5	3.47	99.5	0.97	0.66

	TN	FN	FP	TP	TPR	FPR	PPA [%]	Prec. [%]	Acc. [%]	J-score	Thresh.
Be	219950	1	956	63	0.98	0.00	0.5	6.18	99.6	0.98	0.54
Gr_all_T1	219357	1	1588	24	0.96	0.01	0.7	1.49	99.3	0.95	0.55
Gr_all_T2	220877	0	68	25	1.00	0.00	0.04	26.88	100.0	1.00	0.65
Gr_AOI	55398	0	39	48	1.00	0.00	0.16	55.17	99.9	1.00	0.60
Ni	220333	0	573	64	1.00	0.00	0.3	10.05	99.7	1.00	0.50
Nb	220157	0	763	50	1.00	0.00	0.37	6.15	99.7	1.00	0.43
P	220846	1	92	31	0.97	0.00	0.1	25.20	100.0	0.97	0.64
Sn	219903	1	1029	37	0.97	0.00	0.5	3.47	99.5	0.97	0.66

Table 4: Results of data driven mineral potential mapping in Tanzania applying the FAMME algorithm

Note: *True Positive (TP) and True Negative (TN) correspond to the number of grid cells, which are correctly predicted by the RF model (i.e. mineralized and non-mineralized cells, respectively). Inversely, False Positive (FP) and False Negative (FN) correspond to the number of grid cells, which are incorrectly predicted by the RF model (i.e. mineralized instead of non-mineralized cells and non-mineralized instead of mineralized cells, respectively).* ***FP indicate cells with high mineral potential****, which so far are not indicated in the mineral occurrence data base. From these data the following useful parameters are calculated: True positive rate (TPR, also "recall") = TP/(TP+FN), False positive rate (FPR) = FP/(FP+TN), Percentage of prospective area (PPA) = (TP+FP)/All, Precision = TP/(TP+FP), Accuracy = (TP+TN)/All and J-score = TPR – FPR.*

The statistically seven most favourable factors (in decreasing importance) for exploration of each commodity are shown in Table 5.

	F1	F2	F3	F4	F5	F6	F7	F7
Beryllium	slope	srtm	Nb	ACu	CMe	LVx	20	514
Graphite_T1	srtm	1049	FRr	509	slope	CMo	501	LVx
Graphite_T2	1049	FRr	srtm	slope	509	CMo	501	LVx
Graphite_AOI	slope	fault	1041	srtm	501	LPe	potassium	1046
Nickel	Cu	srtm	slope	411	103	213	215	CMo
Niobium	srtm	slope	P	Be	8	21	384	999
Phosphate	8	Nb	srtm	CMo	slope	21	521	SNg
Tin	LPu	192	300	srtm	slope	3	Nb	CMo

Geological units	
3	Cenozoic lacustrine sediments
8	Neogene alkaline volcanism
20	Usagaran mixed metasedimentary rocks (..., graphite schist, ...), mafic
21	Ubendian - various metasedimentary rocks
103	post-Pan-African Ikorongo Group: sedimentary rocks
192	Kibaran metasediments
213	Ubendian ortho- and paragneiss I
215	Ubendian ortho- and paragneiss II
300	Tonian Tin granite
384	Neoarchaean western granite complex
411	Kibaran mafic and ultramafic rocks
501	EAO - mafic and felsic 2-pyroxene granulite
509	Neoproterozoic Furua Complex: marble with intercalated metabasalts
514	Pan-African mylonite
521	Mixed gneiss (with Archean relics)
1041	EAO - quartzite
1046	Neoproterozoic dolomitic marble (upper nappe of the EAO)
1049	Kurase Group: migmatitic gneiss, granite, schist

Soils	
ACu	Humi-Umbric Acrisols
CMe	Eutric Cambisols
CMo	Chromi-Ferralic Cambisols
FRr	Rhodic Ferralsols
LPe	Eutric Leptosols
LPu	Humi-Umbric Leptosols
LVx	Humi-Rhodic Luvisols
SNg	Calci-Gleyic Solonetz
Mineral occurrences	
Be	Beryllium occurrence
Cu	Copper occurrence
Nb	niobium occurrence
P	Phosphate occurrence

Table 5: Favourable factors (in decreasing importance) for the exploration of the selected ECRM's. The meaning of the codes is given below.

Beryllium (Be)

The *SIG-Afrique* database of BRGM indicates 19 beryl occurrences in Tanzania, which are widely distributed in areas off the central Tanzania Craton, whereas in the craton they have not been identified so far. Most of them are in the eastern part of the country, which is underlain by Meso to Neoproterozoic basement rocks.

The resulting MPM shows, besides locations with known beryl occurrences, high potential in the continuation of these localities. However, because of low resolution maps without pegmatite occurrences and random occurrences, the result is considered as rather poorly constrained (Figure 3).

The DBA-RF model of test 1, taking all parameters into account, has an accuracy of ~99.6 % and indicates that about 0.5 % of Tanzania has potential for beryllium. The statistically most favourable factors are, in decreasing order: **slope**, **srtm**, **Nb** (niobium), **ACu** (Humi-Umbric Acrisols), **CMe** (Eutric Cambisols), **LVx** (Humi-Rhodic Luvisols), **20** (Usagaran mixed metasedimentary rocks, mafic rocks) and **514** (Pan-African mylonite). The parameters slope, srtm and soils are generally only loosely related to the presence of pegmatites (if at all) and therefore considered as inadequate tools for their targeting.

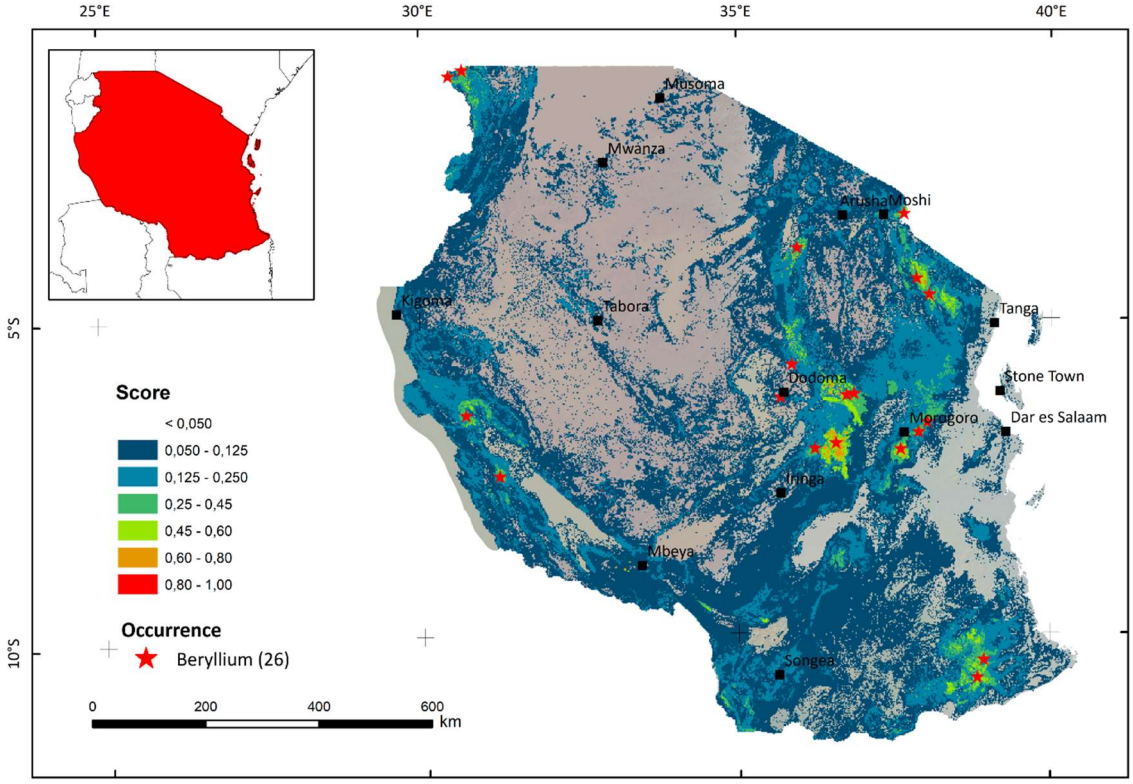

Figure 3: Mineral Potential Map of Tanzania for beryllium (Be) of test 1. The known occurrences (19) are indicated as red star.

Graphite (Gr)

Two DBA-RF tests were performed with slightly varying hyperparameters (Figure 4). The DBA-RF model of Test 1 has an accuracy of 99.3 % and indicates that about 0.7% of Tanzania is prospective for graphite applying the optimized threshold of 0.55. The statistically most favourable factors are, in decreasing order: **srtm, 1049** (Kurase Group: migmatitic gneiss, granite, schist), **FRr** (Rhodic Ferralsols), **509** (Neoproterozoic Furua Complex: marble with intercalated metabasalts), **slope, CMo** (Chromi-Ferralic Cambisols), **501** (EAO - mafic and felsic 2-pyroxene granulite), and **LVx (**Humi-Rhodic Luvisols).

In Test 2, the DBA-RF model has an accuracy of 100 % (i.e. it is over fitted) and indicates that only about 0.04% of Tanzania is prospective for graphite applying an optimized threshold of 0.65. The statistically most favourable factors are, in decreasing order, **1049** (Kurase Group: migmatitic gneiss, granite, schist), **FRr** (Rhodic Ferralsols), **srtm**, **slope**, **509** (Neoproterozoic Furua Complex: marble with intercalated metabasalts), CMo **CMo** (Chromi-Ferralic Cambisols), **501** (EAO - mafic and felsic 2-pyroxene granulite), and **LVx (**Humi-Rhodic Luvisols).

The favourable factors for graphite remain therefore the same but their relative importance (or ranking) changes between the two tests.

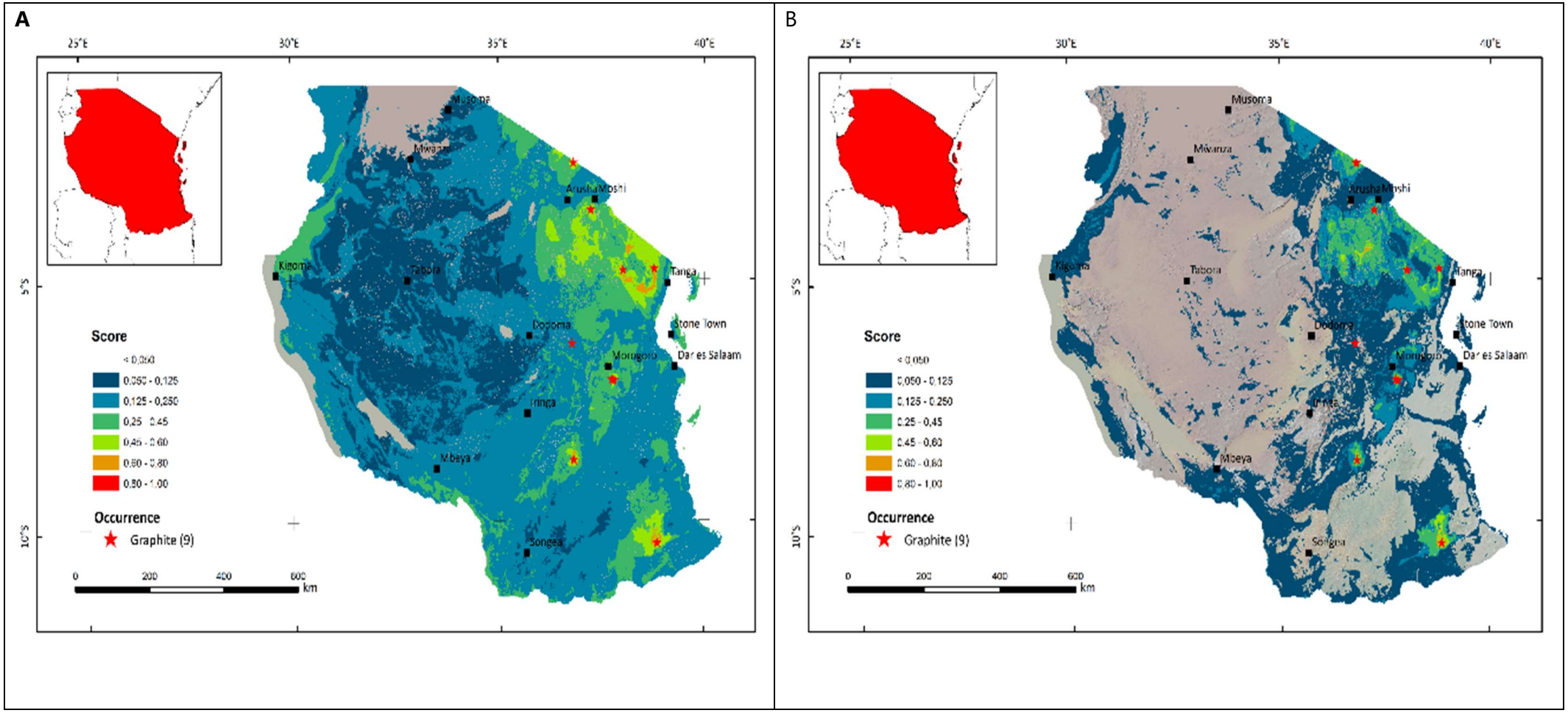

Figure 4: Mineral Potential Map of Tanzania for graphite (gr). Known occurrences (9) are indicated as red stars.

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A third test has been carried out in a smaller area in eastern Tanzania, for which airborne geophysics uranium and potassium data were purchased through the Tanzania Geological Survey. The data were degraded, provided as quarter sheets in RGB format, and remained unbalanced after merging them into one layer and therefore are of poor quality (Figure 5).

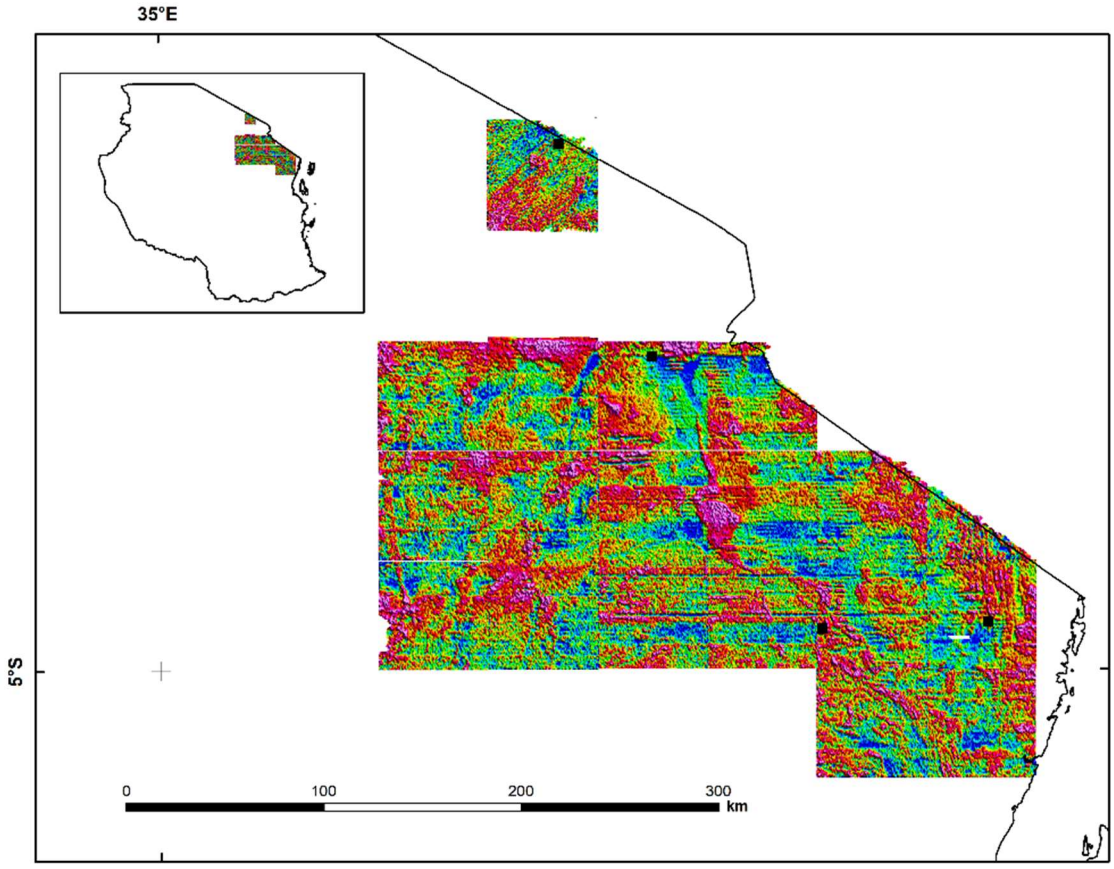

Figure 5: Airborne radiometric data (here potassium) for the graphite study in the AOI of eastern Tanzania

The additional test serves to demonstrate the change in the MPM by adding these supplementary data. The resulting mineral potential map is shown in Figure 6.

In comparison with the countrywide map (using less data), the AOI displays a reduced surface for graphite potential in the area of interest, which is of cost saving in exploration. The DBA – RF model has an accuracy of 99.9% and indicates that 0.16% of the AOI prospective for graphite using a threshold of 0.6. The favourable parameters for exploration of the commodity are, in decreasing order, **slope**, **fault**, **1041** (EAO – quartzite), **srtm**, **501** (EAO - mafic and felsic 2-pyroxene granulite), **LPe** (Eutric Leptosols), **potassium**, **1046** (Neoproterozoic dolomitic marble (upper nappe of the EAO).

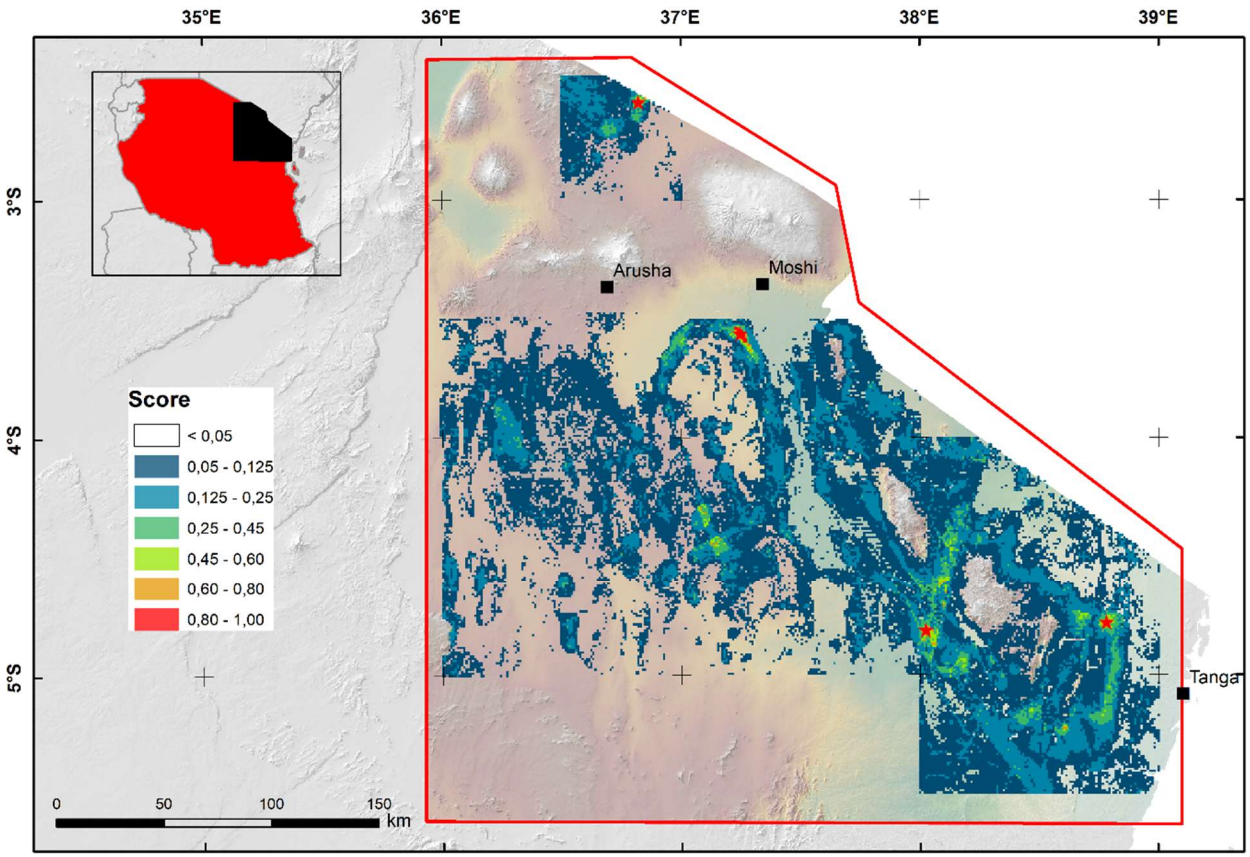

Figure 6: Mineral Potential Map of eastern Tanzania for graphite; known occurrences (4) are shown as red stars.

Nickel sulphides (Ni)

The data to produce the MPM comprised the BRGM 1:2M scale geological map and structural data of Tanzania, the mineral occurrence database (SIG-Afrique), the UN-CCD 500k SOTER soil map of southern Africa, the SRTM and the slope.

The resulting MPM shows high potential around most of the known occurrences in the north of the Tanzania Craton, the western and southern parts of the Kibaran Belt, in the NW part of the Ubendian Belt and in the area southeast of Mbeya with underlying Archaean and Palaeoproterozoic rocks (Figure 7). Two occurrences in the Kibaran Belt are marked by low scores only and for unknown reasons. Low to medium potential is shown in a wide network covering the Tanzania Craton and the Palaeoproterozoic Ubendian and Usagara belts whereas the East African Belt and Irumides in eastern Tanzania have very low or no potential for the commodity.

The DBA-RF model has an accuracy of ~99.7% and suggests that about 0.3% of Tanzania is prospective for nickel, applying the optimised threshold of 0.5. The statistically most favourable factors are, in decreasing order: **Cu** (copper), **srtm**, **slope**, **411** (Kibaran mafic and ultramafic rocks), **103** (sedimentary rocks of the post-Pan-African Ikorongo Group), **213**, and **215** (Ubendian ortho- and paragneiss I and II).

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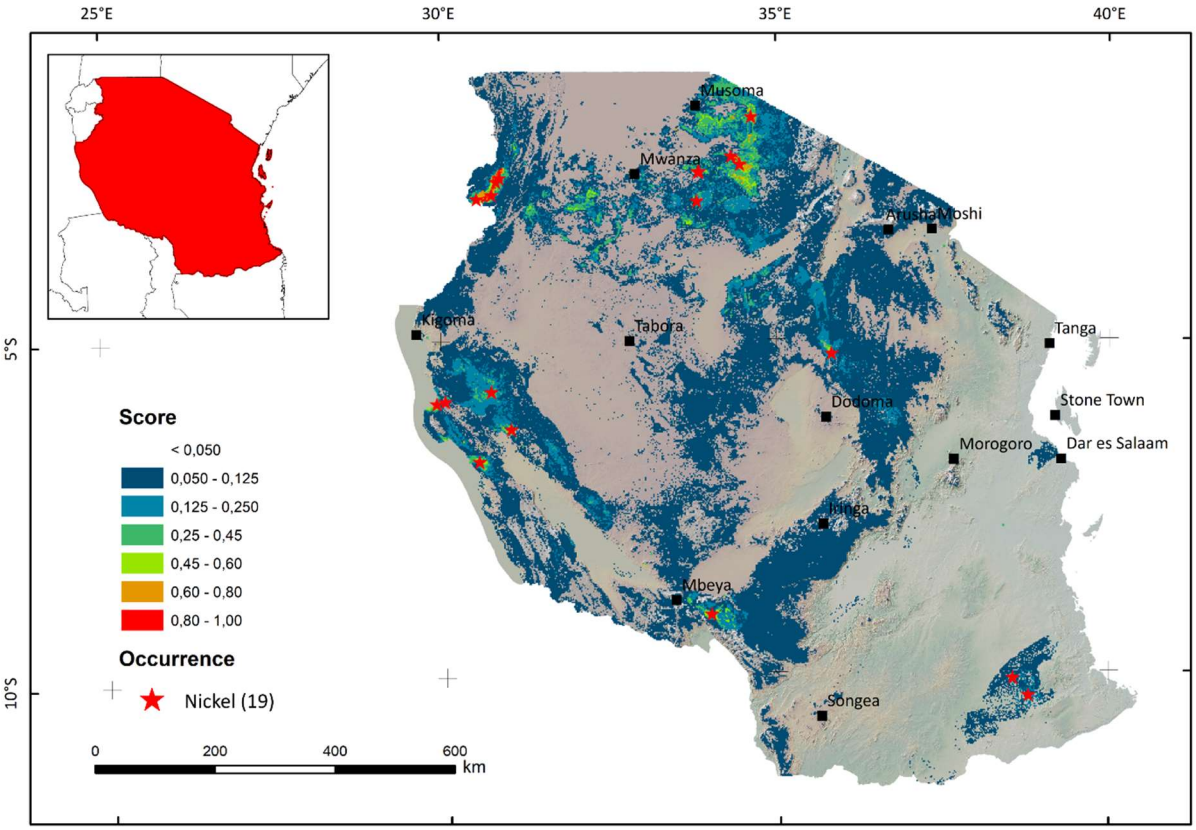

Figure 7: Mineral Potential Map of Tanzania for nickel sulphides (Ni); known occurrences are shown as red stars.

Niobium (Nb)

Tanzania, 17 Nb and 8 Ta occurrences are recorded in the BRGM database (SIG Afrique), which like Li and Be are located principally in the central Tanzania Craton. The same problems of statistical treatment and mineral predictivity apply as for other pegmatite hosted commodities.

The MPM shows that areas with medium to high Nb-potential are located mainly around the known occurrences in the Kibaran Belt of NW Tanzania (Figure 8). A smaller field is shown east of Mbeya and probably associated with Neoproterozoic rift-related alkaline intrusions that occur across Malawi (Bailly et al. 2022) from where they straddle into southern Tanzania. A third field 50 km north of Dodoma and a fourth ca 150km west of Arusha are located in the East African Rift System and may be associated with the alkaline volcanism therein. Some mineral potential is indicated also the central part of the Zimbabwe Craton, largely due to one isolated mineral occurrence. No mineral potential is shown in the southeast of Tanzania, underlain by the Irumide Belt and East African orogen, and in the northern part of the Tanzania Craton.

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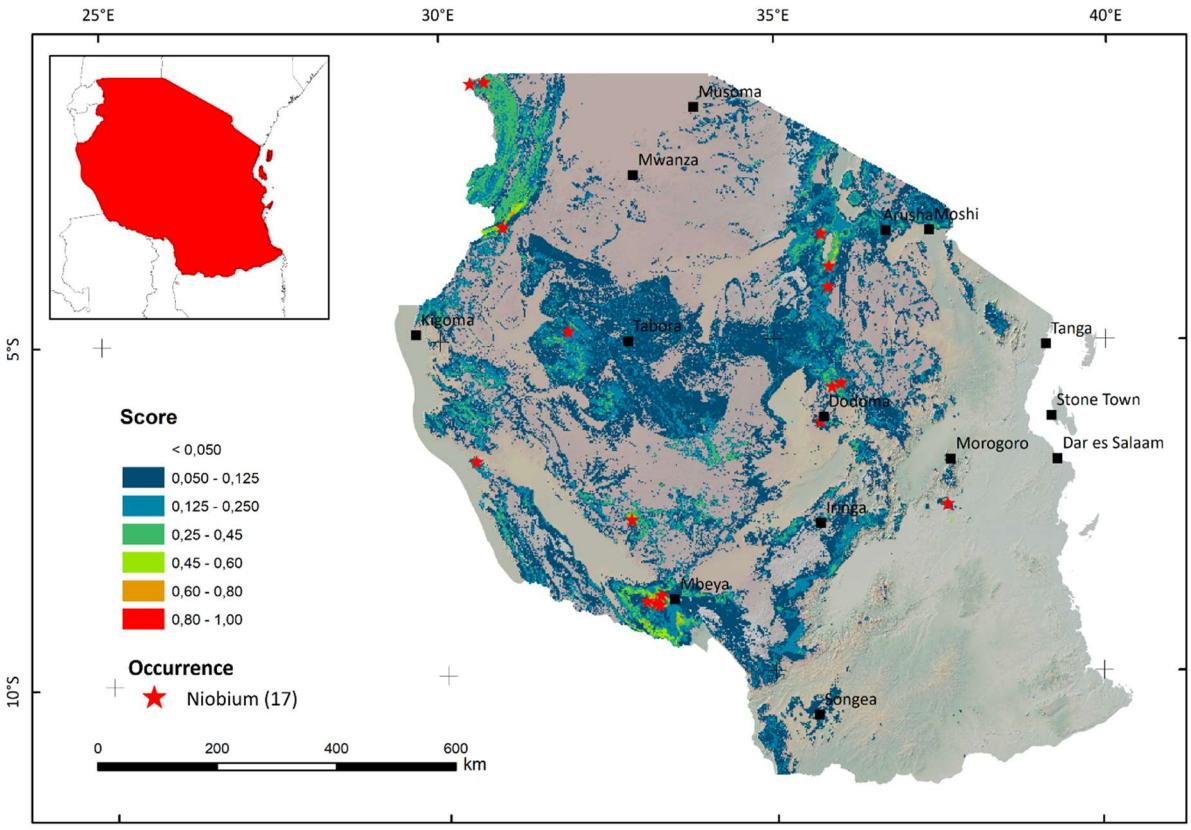

Figure 8: Mineral Potential Map of Tanzania for Niobium (Nb); known occurrences (17) are shown as red stars.

The DBA-RF model has an accuracy of ~99.7% and indicates that about 0.37% of Tanzania is prospective for niobium, applying the optimized threshold of 0.43. The statistically most favourable factors are, in decreasing order: **srtm**, **slope**, **P** (Phosphate), **Be** (Beryllium), **8** (Neogene alkaline volcanism), **21** (Ubendian - various metasedimentary rocks), **384** (Neoarchaean western granite complex), **999** (no label). Structures have no influence which is probably due to poor data. This indicates the close relationship of Niobium with other minerals that are often associated with pegmatites or alkaline igneous rocks (apatite, beryl) but on the other hand also indicates parameters that are completely irrelevant for Nb exploration (srtm, slope, Ubendian paragneiss etc).

Phosphate (P)

The BRGM database records 12 occurrences in Tanzania of which the deposit at Minjingu in the East African Rift System is the most promising for direct application.

The data to produce the MPM comprised the BRGM 1:2M scale geological map and structural data of Tanzania, the mineral occurrence database (SIG-Afrique), the UN-CCD 500k SOTER soil map of southern Africa, the SRTM and the slope.

The MPM shows areas with medium to high P-potential mainly in south and east of the Tanzania Craton, which is underlain by the Usangara and East African Belts (Figure 9). However, apatite is genetically rather associated with small Neoproterozoic and Cenozoic

alkaline intrusions that due to their small size often do not appear on the 1:2M geological map or, alternatively Mesozoic to Cenozoic phosphate-bearing sediments that were deposited in the Karoo, Cretaceous and East African rift basins.

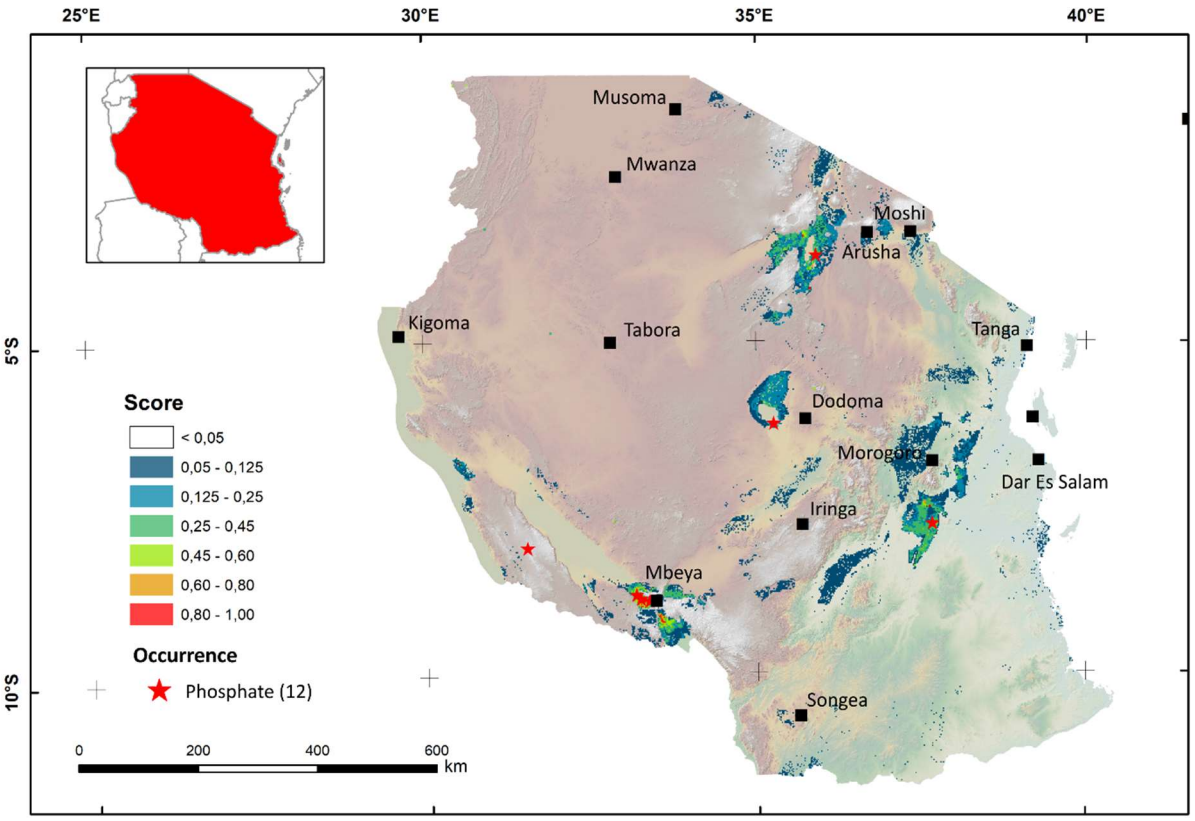

Figure 9: Mineral Potential Map of Tanzania for phosphate (P); known occurrences are shown as red stars.

The DBA-RF model has an accuracy of ~100% (i.e. it is overfitted) and indicates that about 0.1% of Tanzania is prospective for phosphate, applying the optimised threshold of 0.64. The statistically most favourable factors are, in decreasing order, **8** (Neogene alkaline volcanism), **Nb** (niobium), **srtm**, **CMo** (Chromi-Ferralic Cambisols), **slope**, **21** (Ubendian paragneiss), **521** (Mixed gneiss with Archean relics), and **SNg** (Calci-Gleyic Solonetz).

Tin (Sn)

Tin occurrences in Tanzania, are limited to the northeastern extreme of the country underlain by the Kibaran belt. The Kaborishoke Kwerya Tin Mine, located in the Kagera region, has been closed and there are no plans to re-open it. The mine, which specifically targets tin, holds significant geological and historical importance in the area (https://thediggings.com/mines/usgs10183461). The database of BRGM (SIG Afrique) records 14 entries of the commodity.

The data to produce the MPM comprised the BRGM 1:2M scale geological map and structural data of Tanzania, the mineral occurrence database (SIG-Afrique), the UN-CCD 500k SOTER soil map of southern Africa, the SRTM and the slope.

The MPM confirms that the main area with tin potential is in the northwestern corner of Tanzania (Figure 10). A second small field is shown west of Mbeya and probably associated with Neoproterozoic alkaline intrusions that are known across the border from Malawi.

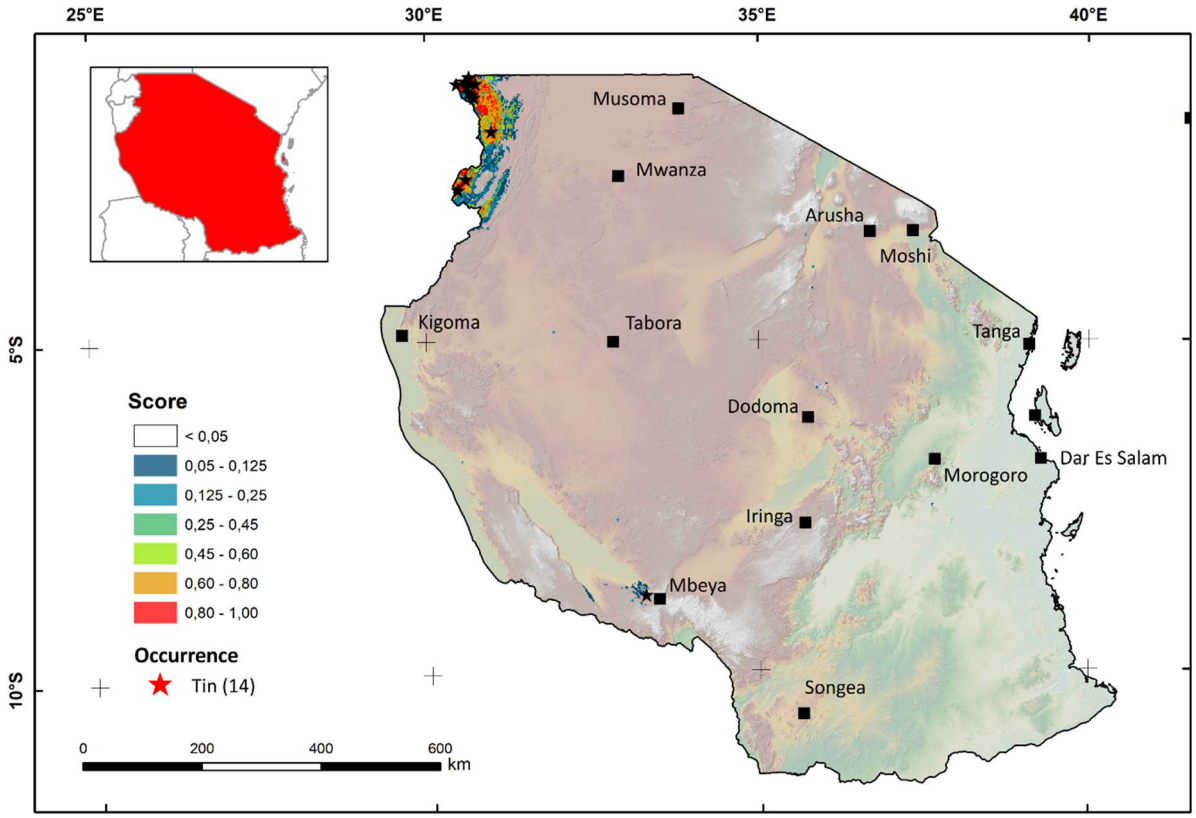

Figure 10: Mineral Potential Map of Tanzania for tin (Sn); known occurrences are shown as red stars.

1.2.3. Mineral high potential areas

This section explores the key considerations and factors that come into play when selecting ECRMs for prospectivity. It involves a multidisciplinary approach that was used to determine areas with the greatest potential for prospectivity. With the analysis completed in the previous chapter, graphite is targeted to have a higher potential than other ECRMs shortlisted for Tanzania. Graphite, due to its significant reserves and the growing demand for this mineral worldwide, has been assessed as follows:

- **Geological Conditions:** Tanzania's geological conditions are conducive to the formation of graphite deposits. This natural advantage makes the exploration and extraction of graphite feasible and cost-effective.
- **Graphite Reserves:** Tanzania is known to have substantial graphite deposits, with large-scale and high-quality graphite resources in various regions of the country. These reserves are attractive for mining companies and investors looking to capitalize on the demand for graphite.

- **Demand for Graphite:** Graphite is a critical component in various industries, including electric vehicles (EVs), energy storage, and the production of lithium-ion batteries where it represents almost 50% of the materials needed by weight. With the global shift towards cleaner and more sustainable technologies, the demand for graphite, particularly in the form of battery-grade graphite, is on the rise. This trend presents significant opportunities for countries with significant graphite resources like Tanzania.

It is important to note that while graphite has high potential in Tanzania, the development of the industry must also consider environmental and social sustainability, as well as responsible mining practices to ensure that the benefits are maximized while minimizing negative impacts. Additionally, market dynamics, technological advancements, and global demand for graphite can influence the overall potential and success of the industry in Tanzania. Figure 4 and 6 show areas where graphite mineralization potential is high.

1.3. Ore processing and refining capacities in Tanzania

Copper concentrate and phosphate are the only ECRMs produced at a large-scale mining level in the country. Copper is mined by Barrick Inc. Gold mines (Bulyanhulu and Buzwagi) and phosphate is mined and processed into fertilizer by the Minjingu Mines and Fertilizer Limited. The rest of the ECRMs are produced by ASM activities spread across the country. Most of the ECRMs are exported in unprocessed raw product to China, India, Europe, Japan, and some in the East African region. The only mine that has the capacity to process ore, is the **Minjingu Phosphate Mine**, which refines (granulation) phosphate to make fertilizer for the Tanzania and East African market (100,000 MT per annum of various types of compounded fertilizer). There are however plans for expansion programmes to reach a market beyond the East African Community (EAC) (MFFL, 2023), with no other smelting or refining capabilities of ECRM in Tanzania.

Mine	Status and Plans
Bulyanhulu Gold Mine	• Cu concentrate (capacity = 20,000tpa) • Copper concentrate is exported to Japan and China for smelting and sold abroad. • Planning for a Ni and Cu smelting facility by 2026; when Kabanga Nickel Project comes on stream (Kabanga Nickel Website; IPPMedia 2023)
Kabanga Nickel Project	• Planning to construct a Ni and Cu smelting facility by 2026 at Kahama, Shinyanga when Nickel mine is commissioned)
Liganga Ti, V mining	• Plans to process V and Ti into concentrates for smelting and refining in the country when mining begins (NDC, 2021)
Nachu Graphite project	• Planned for production of graphite-based technology products like EV batteries in country (Tanzania Invest, 2023c, 2003d).

Mine	Status and Plans
Ngualla REE Project	• Plan for the establishment of the REE multi-commodity refinery for the REE minerals, niobium, phosphate, and fluorspar in Tanzania or at Peak's Teesside site in the UK (LISCORP website, 2022; Ngualla website, 2022)

Table 6: Mine Processing and refining capacities

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2. Assessment of the ECRM value chain

The development of the ECRM value chain in Tanzania is very limited due to the historical preference of exporting raw materials. Very few factories and industries can utilize local ECRMs due to the limited number of mines that produce them, particularly for the local market. ECRM-based manufacturers identified within this section are therefore propelled into importing ECRMs rather than obtaining them from within the country.

Through the **IDRC Canadian funded Agro-Geology Project**; there have been efforts to expand the phosphate sub-sector to the agricultural industry in the late 1980s. The project aimed at the possibility of applying rock phosphates directly to farms (Chesworth et al. 1988). The project was however considered unsuccessful and to date, this value chain remains limited.

Whereas phosphate has a recognizable value chain network, copper (produced by the gold mining company Barrick Inc.), is directly exported as a concentrate to Japan and China. There is also some other production of copper ore, natural graphite, tin ore (cassiterite), lithium, cobalt, tantalum, tungsten, magnesium ore (magnesite), manganese and aluminium ore (bauxite) from ASM activities that are exported to Kenya, Rwanda, India, and China. It is however noted that only copper and phosphate are produced in substantive amounts in Tanzania.

2.1. Characterisation of the value chain for primary and secondary raw materials

Characterizing the value chain for primary and secondary raw materials requires an examination and understanding of the method by which resources are extracted, processed, and utilized. This characterisation assists in identifying key participants, activities, and potential areas for improvement.

To characterize the value chain for primary and secondary raw materials, it is essential to identify key stakeholders, assess environmental and social impact at each stage, and identify opportunities for resource efficiency, sustainable practices, and innovation. It is crucial to consider variables like environmental sustainability, circular economy principles, and social responsibility in the characterisation process.

Although it is urged that African nations like Tanzania step up their efforts to look for ECRMs, the sector is not yet integrated into either local or global value chains (African Development Bank - AfDB, 2021). The early stages of the ECRM sector's development are characterized by little to no local production, recycling, or value addition. Figure 11 shows the standard mineral mining maturity model.

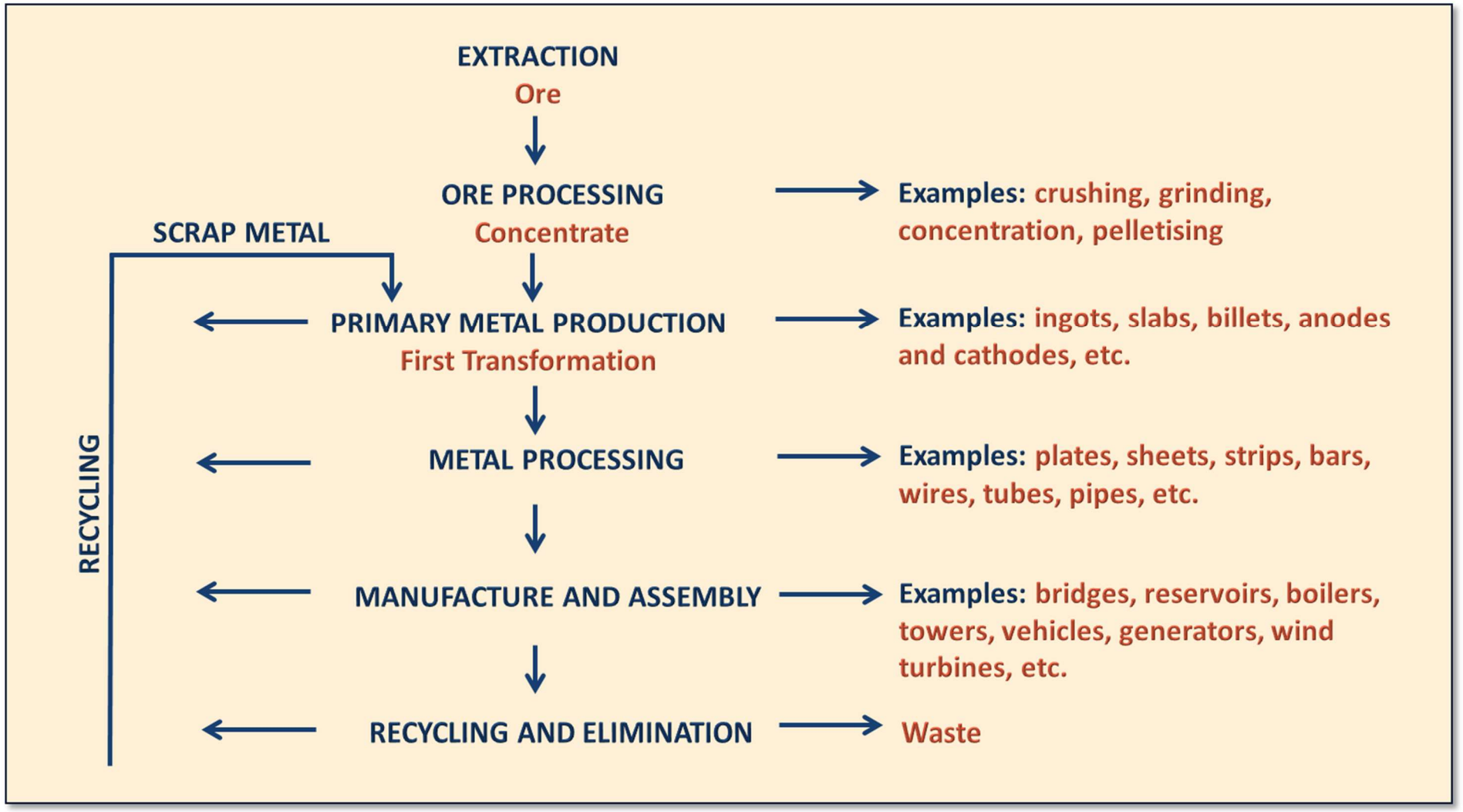

Figure 11: Mining Projects Maturity Model

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2.1.1. List of the mining and recycling projects

The maturity levels of copper and phosphate ECRM projects in Tanzania are presented below.

The **Bulyanhulu Gold Mine** (Cu mining) is mainly focused on operational efficiency and without any link to the local value chain (export the ECRM commodities).

The **Minjingu Phosphate Mine and Fertilizer Company** of which its operations include a mine and processing factory has extended its activities to incorporate partners in the agricultural sector.

Recycling Projects

No ECRM recycling projects have been identified for Tanzania during the period of writing this case study report.

2.1.2. Status of economic links between the formal and informal sectors

Formal Sector: mining operations that are carried out in accordance with the nation's mining laws, rules, and licensing requirements are referred to as formal mining. It covers mining operations that the Tanzanian government has approved and recognized lawfully. The following are some essential aspects of Tanzanian formal mining (ITA, 2022):

- Legal Recognition: Formal mining operations are legally recognized in Tanzania, and miners are in possession of current licences or permits issued by the appropriate government agencies. These licences, which must be applied for formally, outline the terms and conditions under which mining operations may be carried out.
- Compliance with Regulations: All applicable mining laws, regulations, and environmental requirements must be complied with by formal mining activities. To safeguard workers, communities, and the environment; this includes abiding with safety, environmental, and labour rules.
- Payment of Fees and Royalties: Official mining operations must pay the government a variety of fees, royalties, and taxes, which adds to the nation's revenue. Typically, these payments consist of a mix of levies, mining royalties, and license fees.
- Environmental and Social Responsibilities: Formal mining operations are frequently the subject of environmental and social impact studies, and they are required to adopt responsible mining techniques to reduce negative effects on the environment and nearby communities.
- Record Keeping and Reporting: Official mining operations must frequently report to government officials and keep records of their activities. This promotes accountability and openness in the industry.

- Investment and Infrastructure: To ensure effective and secure resource extraction, formal mining operations frequently entail large expenditures in mining infrastructure, machinery, and technology.
- Market Access: Official miners have better access to regional and global markets, enabling them to sell their products at competitive prices and in accordance with trade agreements.

It is important to note the fluidity of the distinction between the formal and the informal mining; for mining activities range from fully formalized to fully informal. Like other countries, Tanzania has been working on formalizing mining by regulating the sector and operating in a transparent, legal, and environmentally responsible manner. However, complicating the process is the presence of ASM activities which are difficult to regulate. The dominance of ASM activities in Tanzania is linked to adverse environmental and social impacts due to the informal and unregulated nature typified by these operations.

Informal Sector: Informal and unregulated mining conducted without the necessary legal authorization is called small-scale mining (ASM) (Mutagwaba et al., 2018). It is characterized by the following features:

- Lack of Legal Authorization: The government often does not formally recognize or authorize informal mining operations. It is possible that miners working in the informal sector do not have the necessary permits, leases, or licences.
- Limited Regulation: Informal miners frequently work without thorough regulatory supervision, resulting in issues with safety, environmental protection, and poor working conditions.
- Small-Scale Operations: Compared to massive, automated mining operations, informal mining activities typically take place on a smaller scale. This covers pursuits like quarrying, mining for gemstones, and artisanal gold panning.
- Low Investment: Informal mining operations frequently have a restricted budget and make use of simple, manual equipment. They have limited access to cutting-edge mining machinery and technology.
- Resource Extraction for Livelihood: Individuals and communities who engage in informal mining frequently rely on it as a source of income and a way of life. They may be able to sustain themselves and their families in this way.
- Environmental and Social Concerns: The informal mining sector is associated with environmental challenges, including land degradation, deforestation, and pollution. Additionally, labour conditions and health and safety standards are often suboptimal.

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- Revenue Leakage: Since illegal mining activities are exempt from formal taxation, royalties, and fees, the government could miss out on potential money from these activities.
- Land Tenure Issues: Disputes over who has the right to mine on a particular tenure of land can arise in regions with informal mining, making land rights and ownership a difficult subject.

The Tanzanian government and various stakeholders have made efforts to legitimize and regulate the informal mining industry. While ensuring that the sector contributes to the nation's development in a responsible and sustainable way, these initiatives seek to improve environmental, social, and economic consequences.

A typical step in the formalization process is to grant artisanal miners permits, train them, and encourage safer and more ecologically friendly mining techniques. While this formalization is still taking place, Tanzania's informal mining industry continues to play a considerable role in the country's mining landscape, particularly in areas with abundant mineral resources.

Tanzania has been attempting to strengthen the economic ties between the formal and artisanal sectors, like many other nations with sizable artisanal and small-scale mining (ASM) industries (Pedersen et al., 2019). This is a complex and developing process with many difficulties and initiatives. The state of Tanzania's economic ties between the formal and artisanal sectors are presented as follows:

- Government Initiatives: To improve the management of mineral resources, the Tanzanian government has been taking initiatives to legitimize and regulate the artisanal mining sector. This involves initiatives to collect revenue from artisanal mining businesses and guarantee adherence to safety and environmental regulations.
- Licensing and Formalization: To formalize artisanal mining activities and make it simpler for miners to operate legally, the government has introduced licensing schemes. The goal of this procedure is to integrate unregulated miners into the formal economy.
- Cooperative Models: To facilitate access to formal markets, some artisanal miners have banded together to form cooperatives for various benefits including access to better technology, training, and credit.
- Supply Chain Integration: Integration of artisanal miners into mineral supply chains has been a focus of efforts. Initiatives to ensure that artisanal miners' minerals can be traceable and certified as "conflict-free" or responsibly sourced, which is crucial for international trade, are included in this.
- Challenges Remain: Despite these efforts, there are still challenges. Informality, a lack of access to financial institutions, poor infrastructure, and little technical capability are

frequently traits of artisanal mining. The regulatory environment can also be complicated, and enforcement practices can differ.

- Land Tenure Issues: Land rights are a significant issue in artisanal mining, as miners may not have secure tenure over the land they work on. Land tenure conflicts can hinder formalization efforts.
- Mineral Trade and Export: Ensuring that minerals from artisanal mining operations meet international standards and regulations for export is an ongoing concern. Compliance with international due diligence requirements is crucial.
- Community Development: Formalization and better economic links between sectors should ideally result in improved community development and reduced social and environmental impacts. However, this aspect often requires focused attention.

Gold and gemstones are the major commodities associated with ASM production in Tanzania. The sector employees between 1 and 1.5 million people based on the most recent estimation and is the second livelihood opportunity in rural areas after agriculture. In terms of ECRMs, some production and exports are registered for commodities like copper, tantalum, tin, and tungsten. However, stakeholders' engagement to date confirms limited availability of information on the profile of the ASM sector for ECRM, and most initiatives continue to focus on gold and gemstones production. Efforts including some promoted by the government, have focused on formalisation of the sector, and supporting access to finance, for example through microfinance services tailored to the ASM sector. A more detailed analysis of the ASM sector role in the production of ECRMs in Tanzania, including major challenges and investment opportunities on production, social, governance and environmental impacts and value chain, will be available as part of deliverable 7.2 of the AfricaMaVal project.

For the period of 2019 to 2022, there has been informal ASM mining of copper ore, natural graphite, bauxite (aluminium), and cassiterite (tin concentrate) and spodumene (lithium ore), ferberite (tungsten concentrate), nickel, cobalt, magnesite (magnesium ore) and manganite (manganese ore). However, the linkage between the formal and informal stakeholders has been limited.

By exception, the phosphate sub-industry is directly linked to informal small-scale farmers as they use fertilizers manufactured by the Minjingu Mines & Fertilizer Limited (MMFL, 2023).

2.2. Identification of the bottlenecks along the value chain

2.2.1. List of the main bottlenecks and the links between them

Despite the recent boom in ECRM commodity demand, Tanzania's mineral value addition remains low, rendering a poor attainment of a substantive value chain state in Tanzania. The mining value chain in Tanzania, like in many other countries, consists of various stages, from exploration and extraction to processing and export. Along this value chain, there are several

bottlenecks and interdependencies that can affect the efficiency and productivity of the mining sector. Table 4 presents the main bottlenecks and links between them.

	Bottleneck	Links
1.	**Exploration and Licensing Bottlenecks:** Lengthy and complex licensing processes.	Delays in acquiring exploration and mining licenses hinder the development of mining projects. Limited ECRM mining projects in the country and many with development plans not linked to local markets.
2.	**Artisanal and Small-Scale Mining (ASM) Issues:** Lack of formalization of the ASM sector.	Informal ASM operations can result in revenue loss and environmental issues.
3.	**Infrastructure Challenges:** Insufficient transportation and energy infrastructure.	Inadequate infrastructure hampers the movement of goods/equipment, raising costs and slowing down operations.
4.	**Environmental and Social Concerns:** Environmental regulations and community relations.	Failure to comply with environmental and social standards can lead to legal and reputational risks.
5.	**Processing and Value Addition:** Limited in-country processing and value addition. No value addition, manufacturing, recycling industries and factories based on ECRMs available in the country.	Exporting raw materials result in lost opportunities for revenue generation and job creation.
6.	**Mineral Trade and Export Issues:** Compliance with international standards and due diligence. FDI is skewed towards exports of ECRM to support a hi-tech industry in developed countries.	Failure to meet international trade requirements can restrict market access and create reputational risks.
7.	**Revenue Collection and Management:** Inadequate revenue collection and management.	Weak revenue collection can result in underfunding for infrastructure and social programs.
8.	**Land Tenure and Conflict:** Land tenure disputes and conflicts.	Land tenure issues can lead to project delays and operational disruptions.

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	Bottleneck	Links
9.	**Regulatory Framework:** Complex and inconsistent regulatory environment.	Regulatory uncertainties can discourage investment and impede operational efficiency.
10.	**Skills and Workforce Development:** Shortage of skilled labour and workforce development.	A lack of skilled personnel can hinder mining operations and safety.
11.	**Technology and Innovation:** Limited access to modern mining technologies and innovation.	Technological constraints can result in lower productivity and efficiency.
12.	**Market Price Volatility:** Fluctuations in global commodity prices.	Price volatility affects the profitability of mining operations and investment decisions.
13.	**Political and Regulatory Stability:** Political and regulatory instability. No enabling policy and legislation to regulate and promote ECRM exploitation and utilization.	A stable political environment is crucial for attracting investment and sustaining mining projects.
According to the UN (2016), the following generic aspects also remain bottlenecks that hinder the establishment of a high-quality value chains in developing countries such as Tanzania		
14.	The lack of capital or poor access to financial resources for investments in exploration, mining, and value addition, therefore leaving an industry heavily dependent on FDI.	
15.	The lack of technology in Tanzania (including inadequate ICT facilities).	
16.	High tax rates (including impute duties and heavy customs procedures) that block smooth inflow of FDI in Tanzania.	
17.	Poor investment climate due to inadequate business governance to attain appropriate labour skills, meeting standards and other regulatory requirements.	

Table 7: Main bottlenecks and the links between them

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World Bank - World Governance Indicators

The WGI provides valuable insights into the quality of governance across various dimensions, including rule of law, government effectiveness, regulatory quality, and control of corruption. These indicators offer a broader context for assessing the socio-political environment in which critical minerals are extracted, processed, and traded. By considering governance factors, analysts can gauge the stability, transparency, and efficiency of regulatory frameworks, minimizing the risks associated with geopolitical instability, corruption, and inadequate legal structures. The scoring goes from -2.5 to 2.5, with -2.5 reflecting a negative governance environment. Overall, Tanzania scores relatively poorly on all metrics, with all the scores in the negative. Table 8 summarizes the 2022 indicators and the potential impacts on the CRM value chain.

Indicator	Score (-2.5 to 2.5)	Impact
Voice and accountability	-0.7	This can affect transparency and lead to poor outcomes due to stakeholders not being able to assert their concerns.
Regulatory quality	-0.6	Poor regulatory quality can result in adverse impacts on the environment and mining communities. It can also result in difficulties obtaining the necessary permitting due to governmental inertia and backlogs of a poorly regulated system.
Rule of law	-0.4	Vulnerabilities introduced by poor rule of law, there is an increased risk of supply chain disruptions
Government effectiveness	-0.4	Weak governance may discourage domestic and foreign investments in mineral exploration and extraction. Investors may be hesitant to commit funds to projects in regions with unreliable regulatory frameworks and poor infrastructure development
Control of corruption	-0.3	High corruption rates can lead to increased harm to communities and the environment. It can also create a hostile operating environment for businesses and other organisations.

Table 8. 2022 WGI indicators and their impacts on the CRM value chain

Tanzania must therefore be assisted to circumvent bottlenecks in the ECRMs value chain and support investment proposals should include:

- Funding exploration companies in undertaking projects of ECRM in Tanzania;
- Funding mining companies to set up smelting and refining facilities within the country;
- Establishment of ECRM based value addition, manufacturing and recycling factories and industries that source primary and secondary raw materials from within the country; and
- Government policy and legislation to regulate and promote ECRM exploitation, value addition and manufacturing.

A consistent supply of raw materials from the developing world is sought after by geopolitics of commodity availability in industrialized countries. For Tanzania's mining sector to grow sustainably, these bottlenecks must be addressed, and the links between the various phases of the mining value chain must be strengthened. Reforming policies, building infrastructure, involving the community, and promoting ethical mining methods, among other things, may be necessary to achieve this. For the benefit of all stakeholders involved, it is crucial for stakeholders, including the government, industry, and local communities, to work together and address these concerns.

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3. Investment/financing prospects for ECRM projects in Tanzania

3.1. Fiscal, legislative, and regulatory context for in-country financings

Fraser Institute's annual survey of mining and exploration companies, in 2022, ranked Tanzania 52nd place out of 62 countries with similar countries such as Botswana, Ghana, and South Africa ranking 10th, 33rd, and 57th respectively. Recognising keen investor interest in Tanzania, especially given the countries rich mineral resource endowments and geological prospectivity, the country is committed to improve the business climate and identified attracting FDI as a key priority.

A total of 47 banks operates in Tanzania and are categorized as commercial banks (34), community banks (4), microfinance banks (4), development banks (2), non-bank financial institutions (1), housing financing companies (1), and mortgage refinancings companies (1). A list of financing institutions in this regard is presented in

Large			
Azania Bank Ltd	Diamond Trust Bank (T) Ltd	National Microfinance Bank (T) Ltd (NMB)	Stanbic Bank (T) Ltd
Citibank (T) Ltd	Exim Bank (T) Ltd	Standard Chartered Bank (T) Ltd	National Bank of Commerce
CRDB Bank Plc			
Medium			
ABSA Bank Tanzania Limited	Bank of Baroba (T) Ltd	First National Bank (T) Ltd	The People's Zanzibar Ltd
Akiba Commercial Bank Limited	Bank of India (T) Ltd	I&M Bank (T) Ltd	United Bank for Africa (Pty) Ltd
Amana Bank Ltd	Dar es Salaam Community Bank	Kenya Commercial Bank (T) Ltd	Canara Bank (T) Ltd
African Banking Corporation (T) Ltd	Ecobank (T) Ltd	Mkombozi Commercial Bank Plc	China Dasheng Bank
Bank of Africa (T) Ltd	Equity Bank Tanzania Ltd	NCBA Bank Tanzania Ltd	Habib African Bank Ltd
Regional and Small			

Guaranty Trust Bank (T) Ltd	Letshego Bank (T) Ltd	Mwalimu Commercial Bank	Tanzania Commercial Bank Ltd
International Commercial Bank (T) Ltd	Maendeleo Bank Plc	Mwanga Hakika Bank	Uchumi Commercial Bank Ltd
NBFI's			
TIB Development Bank Limited	Tanzania Agriculture Development Bank		

Table 9.

- **Stanbic bank** of Tanzania is a member of Tanzania Chamber of Mines and one of its priorities is to contribute to the growth of the mining sector by providing financing and advisory services.
- **Azania bank** in partnership with the State Mining Corporation (Stamico) have agreed to support ASM gain access to credit facilities and financing choices.
- **The National Microfinance Bank (NMB)** is also supporting ASM in the country when it allocated more than 120 billion Tanzanian Shillings (TZS) to provide miners with loans to purchase mining equipment to increase productivity in the mining sector.

Large			
Azania Bank Ltd	Diamond Trust Bank (T) Ltd	National Microfinance Bank (T) Ltd (NMB)	Stanbic Bank (T) Ltd

Citibank (T) Ltd	Exim Bank (T) Ltd	Standard Chartered Bank (T) Ltd	National Bank of Commerce
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Guaranty Trust Bank (T) Ltd	Letshego Bank (T) Ltd	Mwalimu Commercial Bank	Tanzania Commercial Bank Ltd
International Commercial Bank (T) Ltd	Maendeleo Bank Plc	Mwanga Hakika Bank	Uchumi Commercial Bank Ltd
NBFI's			
TIB Development Bank Limited	Tanzania Agriculture Development Bank		

Table 9: Financing institutions in Tanzania

Incentives

The government offers incentives and assistance through the Tanzania Investment Centre and maintains ongoing dialogue with the private sector through the Tanzania National Business Council (TNBC).

Foreign investors generally enjoy treatment like domestic investors, but some limitations persist in certain sectors. There are no geographical restrictions on private establishments with foreign participation, no restrictions on the number of foreign entities operating in any sector, and no specific sectors requiring approval for FDI but not for domestic investment. However, Tanzania discourages foreign investment in some sectors through limitations on foreign equity ownership

and other activities. Although foreign ownership limitations in the mining sector were relaxed in 2020, they were not eliminated.

Strategic projects

The **Tanzania Investment Act No. 10 of 2022** is a criterion for investments to qualify as strategic investments or special strategic investments, through requirements like creating at least 1,000 local jobs, increasing exports by at least 50%, stimulating production, introducing new technologies to Tanzanians, and aligning with socio-economic priorities. The minimum investment capital threshold for Tanzanian and foreign-owned businesses is $50,000 and $500,000 respectively.

The **Finance Act, No. 5 of 2022**, granted the Minister for Finance powers to impose, alter taxes, duties, and fees. It exempted certain income (special strategic investments, gains from the realization or transfer of mineral rights, etc.) from taxation. The Act introduced changes that may deter investors, including the removal of the appeal channel from the TIC to the Minister of Industry and Trade. Provisions related to technology transfer agreements were removed, and the automatic immigration quota for expatriate workers was abolished.

Foreign currency accounts and currency convertibility

Tanzania's Foreign Exchange Regulations (G.N. No. 294 of 2022) allow residents and non-residents to open and maintain foreign currency accounts with Tanzanian banks or financial institutions. These accounts enable the holding, selling, and purchasing of foreign currency, but trading outside the interbank foreign exchange market, especially with foreign banks, is restricted. Tanzania, as an IMF member, is obligated to facilitate currency convertibility for current transactions, and the regulations issued in May 2022 cover foreign currency and gold dealings, current account transactions, and capital and financial account transactions.

The regulations permit various transfers, such as net profits, repayment of foreign loans, royalties, foreign technology fees, and remittances through authorized banks in freely convertible currency. Exporters must receive proceeds from their exports in foreign currency through local banks within 7 days of completing customs procedures, with a maximum payment period of ninety days. Remittances for services provided outside Tanzania are allowed, subject to compliance requirements, simplifying dividend remittances under certain conditions. Foreign investors have the right to repatriate returns from their investments.

However, the government's introduction of Non-Tariff Barriers (NTBs) could create bureaucratic hurdles and delays in transactions, potentially complicating the conversion of local currency into foreign currency. While the regulations themselves do not explicitly prohibit fund transfers abroad, NTBs may result in delays and complications in the process.

Thin Capitalization Rules

Thin capitalization rules are tax regulations that limit the amount of interest expense a company can deduct for tax purposes when the company is heavily financed with debt, especially debt from related parties. These rules are designed to prevent profit shifting and base erosion through excessive interest deductions. In Tanzania, thin capitalization rules were introduced in the Income Tax Act, 2004: Debt-to-Equity Ratio, Related Party Debt, Transfer Pricing Rules and Interest Deductibility.

Foreign/local currency accounts regime in Tanzania

The country has specific regulations and guidelines regarding these accounts, which are aimed at maintaining financial stability, controlling foreign exchange rates, and encouraging economic growth.

Foreign Currency Accounts in Tanzania**:** These accounts can be useful for international trade, investments, and hedging against currency fluctuations. Individuals can open foreign currency accounts for personal use, while businesses can hold such accounts for various purposes, including trade and investments.

It is important to note that the regulations governing foreign currency accounts in Tanzania can be stringent. Rules include restrictions on who can open foreign currency accounts, the permissible sources of foreign currency deposits, and limits on foreign currency transactions. Such regulations are in place to curb capital flight and excessive currency speculation, which could destabilize the national economy.

Local Currency Accounts in Tanzania: These accounts are primarily denominated in Tanzanian Shillings (TZS) and are suitable for everyday transactions, local trade, business operations, and personal savings. Various forms of these accounts, including savings, current, and fixed deposit accounts, are available, and they are overseen by the central bank to ensure compliance with regulatory guidelines.

Tanzanian companies have limited options for holding offshore accounts in foreign jurisdictions, often chosen for favourable tax regulations, privacy, or ease of doing business. While Tanzanian companies can establish offshore entities in these jurisdictions, repatriating offshore funds to Tanzania involves strict controls and reporting requirements, as the country aims to combat tax evasion and ensure tax compliance.

Onshore accounts denominated in hard currency are allowed for Tanzanian companies under certain conditions and regulations. Companies engaged in international trade, receiving foreign currency income, or needing foreign currency for specific transactions can open hard currency accounts but must adhere to guidelines of the Bank of Tanzania.

Arbitration in Tanzania (The Arbitration Act, 2002):

International arbitration in Tanzania is primarily regulated by the Arbitration Act, 2002, which is based on the United Nations Commission on International Trade Law (UNCITRAL) Model Law. This aligns Tanzania's arbitration practices with international standards, making it an appealing option for international parties looking for a fair and efficient dispute resolution process.

Key points regarding international arbitration in Tanzania include:

- Arbitration Agreements: Parties can agree to arbitration in their contracts, specifying the arbitration rules and the seat of arbitration.
- Arbitral Institutions: The most prominent institution for international arbitration in Tanzania is the Dar es Salaam Centre for International Arbitration (DIArb). It provides administrative support and facilities for international arbitrations. DIArb is designed to meet the standards set by international arbitration institutions, promoting transparency and impartiality.
- Confidentiality: International arbitration proceedings in Tanzania offer confidentiality, which is often preferred by parties wishing to protect sensitive business information.

Key aspects of local arbitration in Tanzania include:

- Domestic Arbitration Agreements: Parties in domestic contracts can opt to include arbitration clauses in their agreements, specifying the arbitration rules and appointing authorities.
- Arbitral Institutions: The Institute of Arbitrators Tanzania (IAT) plays a significant role in promoting local arbitration, offering arbitration services and arbitrator training.
- Enforcement of Arbitral Awards: To enforce an award, a party must apply to the Tanzanian High Court, meeting legal requirements for enforcement, which generally respects and enforces arbitral awards.
- Mining Disputes Resolution: The Mining Commission, established under the Mining Act, 2010, resolves disputes related to mining operations and activities. It operates according to the Mining (Disputes Resolution) Rules.
- Commercial Disputes in Mining: Commercial disputes concerning mining activities are typically adjudicated in the Commercial Division of the High Court, with the possibility of appeals to the Court of Appeal of Tanzania.
- Arbitration Act: Tanzania has enacted the Arbitration Act [Cap 15 R.E 2020], replacing the 1931 Arbitration Act. This new act establishes a robust regulatory framework for arbitration, including accreditation of arbitral practitioners and the Tanzania Arbitration Centre (TAC) for domestic and international disputes.

- Accessible Dispute Resolution: The new Arbitration Act enhances investor confidence in dispute resolution and provides an accessible alternative to reduce case backlogs in national courts. It also clarifies the distinction between domestic and international commercial arbitration.

3.2. Macroeconomic context for in-country financings

Tanzania initially underperformed economically after gaining independence, leading to severe economic distress by the 1980s. Subsequent structural adjustments and policy reforms allowed Tanzania to qualify for debt relief under the Heavily Indebted Poor Country (HIPC) Initiative in 2000, establishing macroeconomic stability. This stability created an environment conducive to FDI, leading to sustained high economic growth, often ranking among Africa's fastest-growing economies. Judicious monetary policies stabilized inflation, the TZS value, and foreign reserves. Despite historically high global trade integration, Tanzania has recently experienced a depressed trade-to-GDP ratio and a recurrent negative trade balance. Overall, from a macroeconomic standpoint, Tanzania presents an attractive environment for business.

Gross Domestic Product and annual growth rates

In 2021, Tanzania had a GDP of $64.16 billion (in constant 2015 prices), making it the second-largest economy in East Africa and ranking among the top 10 economies in sub-Saharan Africa (Statista, 2023). The country consistently saw annual GDP growth rates ranging between 4.5% and 7.7% from 2000 to 2021. The COVID-19 pandemic temporarily slowed economic growth, with a 2% rate in 2020, but Tanzania rebounded with a 4.3% growth rate in 2021, slightly above the Sub-Saharan Africa average of 4.2% (World Bank, Tanzania Economic Update 2022). Tanzania's population has grown consistently, reaching over 63.5 million in 2021, with a growth rate of 3% or more over the past decade. High population growth poses challenges, including increasing dependency ratios. Economic mobility remains a challenge, but the country's strong macroeconomic performance is reflected in a per capita GDP of $1,036 in 2021.

Sectoral breakdown of GDP

The sectoral breakdown of GDP in Tanzania has seen limited change in recent years (Figure 12). Agriculture continues to be the dominant sector, especially in rural areas, while manufacturing mainly focuses on processing agricultural products and faces constraints in diversification due to various factors. Industry and construction have slightly increased their share of GDP, driven by growth in mining, quarrying, and construction, particularly from increased public infrastructure investments. The services sector's contribution to GDP has decreased by approximately 4% from 2015, with the sector accounting for around 36.5% of GDP in 2021.

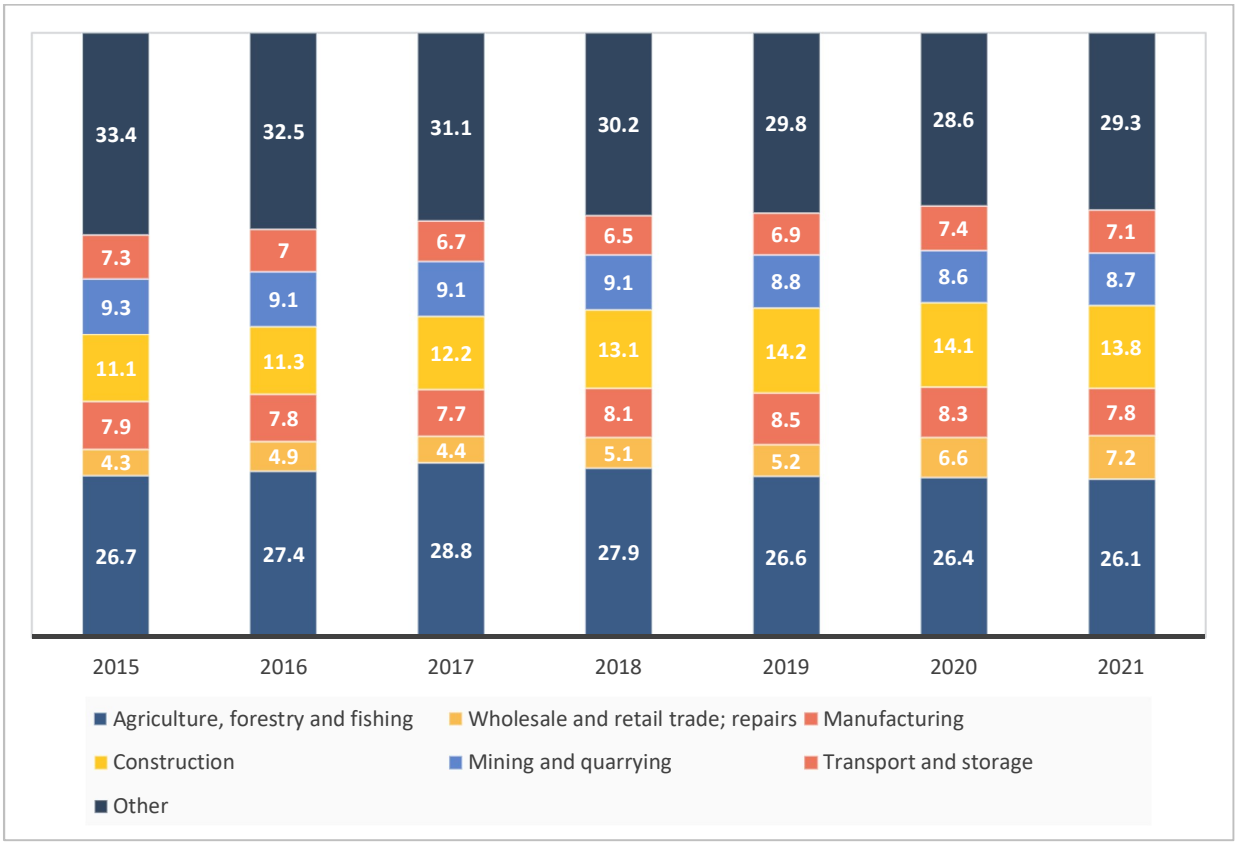

Figure 12: Share of GDP by main economic activity 2015-2021 (at current prices) (Source: Tanzania Bureau of National Statistics)

Foreign Direct Investment (FDI)

Tanzania has become a preferred destination for FDI in Africa due to its sound macroeconomic policies, successful privatization programs, and abundant natural resources. In 2021, FDI inflows amounted to $922 million, higher than the $685 million in 2020 but still below the peak of $2.087 billion in 2013 (Figure 13). Barriers to investment include low levels of industrial development, environmental concerns, lack of transparency, inconsistent application of legislation, inflexible labour laws, limitations on foreign land investment, and sector-specific investment screening requirements. Tanzania's total FDI stock in 2021 was $17.1 billion, equivalent to about 24.4% of GDP, indicating a high level of economic integration into the global economy. The manufacturing, mining, and energy sectors are the primary recipients of FDI (Lloyds Bank, 2023).

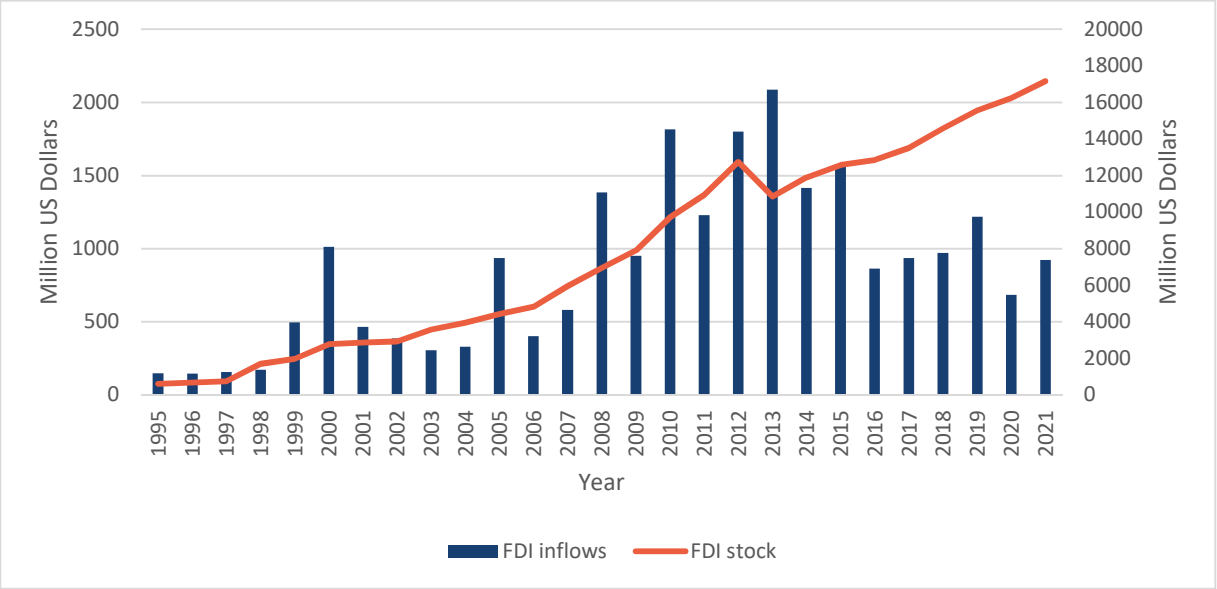

Figure 13: Foreign Direct Investment inflows and stock at current prices (1995-2021), (UNCTAD).

Monetary policy

The Bank of Tanzania, established in 1965, is the country's central bank, operating under the 2006 Bank of Tanzania Act. Its main objective is to maintain domestic price stability to support balanced economic growth, targeting a 5% inflation rate. The bank uses market-based instruments to manage money supply growth, interest rates, and exchange rates. It has transitioned to inflation targeting with interest rates as its operational target, replacing the previous reserve-money targeting approach, reflecting changes in Tanzania's financial markets and economic conditions. This transition aims to enhance transparency, monetary policy effectiveness, and the development of Tanzania's financial sector while maintaining the bank's independence and fiscal discipline.

Inflation

In Tanzania, prior to macro-economic reforms, high double-digit inflation rates were common, peaking at 34% in 1994. Reforms led to single-digit inflation in 1999, and apart from a brief period during the 2008 global financial crisis, inflation has remained in single digits for the past decade. In 2021, CPI inflation was estimated at 3.7%. The African Development Bank projects inflation to rise to 4.4% in 2022 and 3.8% in 2023, mainly due to higher energy prices driven by the Russian invasion of Ukraine. The World Bank anticipates a slightly higher inflation rate of 5.2% in 2022, still within the official target of 5%, and expects moderate price pressures in the medium term. Tanzania's headline inflation rate remains the lowest among East African Community members.

Trade

International trade is crucial for a modern economy, promoting specialization in areas of comparative advantage. Tanzania's trade-to-GDP ratio, the sum of exports and imports of goods and services as a percentage of GDP, has fluctuated over the years. It reached its peak in 2011 at 56% of GDP but declined to 30% in 2020 due to factors like global economic conditions and domestic trade policies. Tanzania's main imports include machinery, transportation equipment, and petroleum products, while exports consist of minerals, agricultural products, and more. China, Germany, India, and others are significant trading partners. Tanzania has consistently run a trade deficit, with the value of imports exceeding exports, driven by factors like increased oil imports for power generation and fluctuations in commodity prices. The impact of this recurring trade deficit on the economy depends on various complex factors.

Foreign Exchange & Reserves

The Bank of Tanzania actively manages foreign exchange reserves to support a market-driven exchange rate and ensure an orderly foreign exchange market. They aim to maintain exchange rate flexibility while having sufficient foreign reserves for balance of payment purposes. The exchange rate remained stable in the first half of 2022/23, trading at an average of TZS 2,318.33 to the US dollar. This stability was attributed to market confidence, low inflation compared to trading partners, and increased transparency in foreign exchange operations. Prudent foreign exchange management has contributed to this stability, helping preserve export competitiveness and keeping inflation and interest rates low. The Bank of Tanzania maintains foreign exchange reserves equivalent to at least four months of imports and international transactions, signalling macroeconomic stability and confidence for investors and creditors.

National Debt

As of the end of 2022, Tanzania's national debt stood at $40.1 billion, with a $1.9 billion increase from the end of June the same year. External debt comprised 72.4% of the total national debt, while public debt (combining external and domestic debt) made up 80.6% of the national debt. Within the public sector, which includes the government and public corporations, external debt represented 73.3%. Multilateral institutions were the largest creditors, accounting for 47% of the debt, followed by commercial creditors at 28.2%, bilateral creditors at 7.7%, and export credit entities at 17.7%.

A Debt Sustainability Analysis (DSA) from late third-quarter 2021 and an IMF update in mid-2022 found that Tanzania's public debt and publicly guaranteed (PPG) debt remained relatively low. The PPG debt was 39.7% of GDP at the end of the 2020/21 financial year, slightly up from 38.0% in the previous year. However, this marked a more than 13% increase over a decade.

The analysis indicated that Tanzania's risk of debt distress had risen to "moderate," mainly due to weakened debt-service capability due to the Covid-19 pandemic's impact on exports. Although the economy was recovering from the pandemic, risks remained tilted to the downside, according to the IMF. However, external debt burden indicators, except for a one-off breach caused by the collapse in tourism receipts during the pandemic, remained below policy-determined thresholds and were expected to remain controlled in the medium term, making default highly unlikely. Nevertheless, the IMF recommended that Tanzania prioritize external financing on concessional terms, when possible, enhance revenue mobilization, improve public investment management, and accelerate the reform agenda outlined in the Five-Year Development Plan to maintain fiscal and debt sustainability.

Risk

In August 2022, the Economist Intelligence Unit (EIU) assessed Tanzania's risk factors. They gave Tanzania a B-rating for political risk, noting positive governability. However, they highlighted risks related to corruption, macro-economic factors, and global economic challenges.

Tanzania received a B-rating for economic structure risk due to its heavy reliance on mineral exports and a significant current account deficit. Both the EIU and the IMF expressed concerns about risks in the banking sector, given its relatively early development stage. The currency risk was rated BB, reflecting monetary stability and a well-managed exchange-rate regime. Tanzania earned a B-rating for sovereign risk, supported by manageable public debt, good access to finance, and a strong commitment to debt repayment, reducing the risk of default. Tanzania's membership in the World Bank's Multilateral Investment Guarantee Agency (MIGA) provides access to political risk insurance and technical assistance to attract FDI.

Regional economic integration

Tanzania is part of two regional economic communities: the East African Community (EAC) and the Southern African Development Community (SADC). In the EAC, member states, aim to deepen economic, social, and political cooperation to achieve balanced growth and development. They have achieved milestones like the Customs Union (2005), Common Market (2010), and the Monetary Union Protocol (2013), which promote free movement of goods, persons, labour, and harmonization of investment incentives.

The SADC also focuses on industrial development and market integration. Various programs like the Regional Indicative Strategic Development Plan (RISDP) 2020-2030, the SADC Industrialisation Strategy and Roadmap 2015-2063, and the SADC Regional Mining Vision (RMV) and Action Plan 2019 aim to boost intra-SADC trade and investment. However, progress toward a common market, customs union, and monetary union in SADC has been slow due to significant

obstacles. These regional affiliations aim to enhance regional economic cooperation and integration.

Imports/Exports and customs clearance

Tanzania is a member of the World Trade Organization (WTO) since 1995 and participates in various regional trade agreements through its membership in EAC and SADC. It also benefits from nonreciprocal unilateral trade preferences like the Everything but Arms (EBA) by the EU, the African Growth and Opportunity Act (AGOA) of the US, and Generalized System of Preferences (GSP) schemes from fifteen countries. These arrangements provide Tanzania with improved market access to various markets. Tanzania signed the Kigali Declaration for the African Continental Free Trade Agreement (AfCFTA) in March 2018.

Non-tariff barriers pose challenges for Tanzanian businesses involved in cross-border trade, affecting their competitiveness. Delays, high fees, procedural obstacles, and the need for permits, licences, and certifications hinder exporters. Regulatory reforms and government initiatives have partially resolved some trade obstacles, but customs and port authorities are the main hindrances for importers. Underdeveloped infrastructure also presents significant challenges, causing unpredictable delays and extra costs for importing goods into the country.

Import procedures are governed by the EAC Customs Management Act, 2004, which mandates the appointment of a licensed clearing and forwarding agent and online documentation submission through the Tanzania Customs Integrated System (TANCIS) at least seven days before goods arrive. Prohibited and restricted imports and exports are outlined in the Second and Third Schedules of the Act, covering items like counterfeit currency, hazardous goods, narcotics, and more. Tanzania has imposed export bans, like on grain in 2017 and mineral ores in 2017, which were lifted in 2020 after negotiations with major producers and resolving tax disputes. Such experiences highlight the impact of regulatory changes and policy uncertainty on investment and economic growth.

3.2.1. Taxation and royalties

Revenue collected by the Government from mining companies through taxes and royalties are categorised as follows:

- Income Tax
- Withholding Tax
- Employment Tax
- Value Added Tax
- Customs Duty
- Excise Duty

Royalties payable by an authorised miner is charged on gross value of the minerals produced. Where an authorised miner sells his production to a licensed dealer, the royalties are paid by the licensed dealer.

A summary of the key provisions on the above taxes and royalties are provided in Table 10.

Relevant Tax	Key Provisions
Income Tax	• Taxes on income include Corporate Income Tax (CIT), Withholding Taxes (WHT), Employment Tax and Rental Taxes • CIT is charged at 30% • Companies newly listed with the Dar es Salaam Stock exchange with at least 30% equity issued to the public are charged 25% for 3 years from date of listing • Gains derived from transfer of mineral rights are taxed once at 30%
Withholding Tax	• Charged on interest, dividend, technical services and management fees • Residents: 5% charged on management or technical and/or professional services • Non-residents: technical service fee with a source in Tanzania is charged at 15% • 15% should be withheld by the employer from non-resident employees and on annual director's fees payable to a non-executive director • For dividends, 5% is charged for companies listed on the DSE or 10% for non-listed • For interest, rent or a commuted pension paid to a resident or interest, or rent paid to a non-resident, WHT of 10% • 15% is charged for all other payments related to interest, natural resource payment, rent or royalty
Employment Tax	• Personal income tax or Pay as You Earn (PAYE) and Skills Development Levy (SDL) • Resident employees PAYE range from zero to 30% depending on employment income • Non-residents are taxed at a flat rate of 15% on employment income • Skills Development Levy is chargeable at 6% of the total wage bill
Value Added Tax (VAT)	• Value Added Tax (VAT) in Tanzania is single rate regime set at 18% • Goods exported within the meaning of the term "export" in the law are zero rated • All minerals exported by mining companies are zero rated for VAT • Import of goods by registered and licensed explorer or prospector for the exclusive use in oil, gas or mineral exploration or prospection activities are exempt from VAT • Mining, oil, and gas companies with binding agreement with government are entitled to VAT relief
Capital Gains Tax	• CGT is at the rate of 30% income tax.

<table>
<tr><th>Relevant Tax</th><th>Key Provisions</th></tr>
<tr><td>Custom Duty</td><td>• Mining operators and their contractors are entitled to payment of duty < 5% on import of listed goods after first anniversary of commencement of production
• Listed goods are imported without payment of custom duty during the first anniversary of commencement of commercial production</td></tr>
<tr><td>Exercise Duty</td><td>• Extractive Industry is exempted from excise duty on imported or domestically off-bond purchased oil for mining/exploration purposes
• Exemption is granted only if fuel is imported by the mining company or their agent
• Companies buying tax paid fuel are refunded for fuel consumed in mining operations</td></tr>
<tr><td>Royalty</td><td>• Royalty payable by an authorized miner is charged on gross value of the minerals produced:
<table>
<tr><th>Type of Mineral</th><th>Royalty</th></tr>
<tr><td>• Uranium</td><td>5%</td></tr>
<tr><td>• Gemstone and diamond</td><td>6%</td></tr>
<tr><td>• Metallic minerals such as copper, gold, silver, and platinum group minerals</td><td>6%</td></tr>
<tr><td>• Gold sold at refinery centres</td><td>4%</td></tr>
<tr><td>• Coal used as industrial raw material</td><td>1%</td></tr>
<tr><td>• Gem (cut and polished or engraved gemstone)</td><td>1%</td></tr>
<tr><td>• Other minerals, including building materials, salt, all minerals within the industrial minerals group</td><td>3%</td></tr>
</table>
• Where an authorized miner sells his production to a licensed dealer or broker, the royalties of such minerals are paid by the licensed dealer or broker</td></tr>
<tr><td>Other Fees</td><td>• Sorting and valuation fee is paid for purposes of sorting and valuation of gemstones
• An inspection fee of 1% of the gross value of minerals is charged to any person in possession of minerals prior to clearance for domestic use or export
• In addition to application fee, an annual charge is payable in respect of every mineral right, dealer’s licence or broker’s licence</td></tr>
</table>

Table 10: Key provisions on taxes and royalties

3.3. Political context for in-country financings

Tanzania is considered a unitary presidential democratic republic where the President is both head of state and head of government. The country is further classified as a hybrid regime according to the Economist Intelligence Unit, implying that it is defined by regular electoral fraud preventing fair and free democracies. Such nations have governments that apply pressure on political opposition, non-independent judiciaries, widespread corruption, harassment, and

pressure on media, anaemic rule of law, and pronounced faults in realms of an underdeveloped political culture, low levels of participation in politics and governance functionality issues. This status has, however, improved over time and Tanzania currently hosts about 20 registered political parties, with the political landscape strongly dominated by the CCM.

Episode of authoritarianism

An episode of authoritarianism after the election of President John Magafuli in 2015 saw Tanzania experience sever critics on political opposition and civil society.

Tanzania's commitment to international treaties

Tanzania is a member of several international organizations, including the United Nations, the Commonwealth, the World Trade Organization, the African Union, the East African Community, and the Southern African Development Community. When sanctions or embargoes are imposed by these organizations, Tanzania enacts implementing legislation to enforce them. African Union, SADC, and EAC regulations have direct legal effect in Tanzania, and penalties under them are determined by the Tanzanian government. UN Resolutions are not directly applicable but are incorporated into Tanzanian legislation through orders and regulations.

Tanzania's Constitution allows the National Assembly to deliberate upon and ratify treaties and agreements that require ratification. While some UN conventions and protocols under the International Convention for Suppression of Financing of Terrorism have not been ratified, Tanzanian laws criminalize terrorism and terrorist financing. Key enactments, such as the Anti-Money Laundering Act of 2006, the Prevention of Terrorism Act of 2002, and the Proceeds of Crime Act 1991, provide the legal framework for addressing money laundering and terrorist financing in Tanzania.

Economic and political outlook

Tanzania has achieved positive economic indicators over the past two decades, such as economic growth, FDI, and stable macroeconomic conditions. However, despite these achievements, it still faces challenges related to poverty reduction. The high population growth rate and structural issues within the country's political and economic system contribute to this challenge.

The economic outlook for Tanzania is generally positive, with the IMF predicting a recovery in real GDP growth. To capitalize on its natural resource wealth for poverty reduction, the country needs consistent and investor-friendly economic policies. These policies should streamline bureaucratic procedures, simplify business regulations, and enhance transparency (ECF, 2023).

Responsible mining investors increasingly consider ESG factors when making investment decisions. The government should promote policy, legislative, and regulatory reforms to create a favourable investment climate and ensure that investments are protected. Tanzania is

committed to the EITI to make the extractive sector more competitive and maximize benefits from mining. Structural reforms are needed to promote natural resource-led industrial development, but they must be accompanied by measures that enhance democratic governance and strengthen state institutions. President Samia Suluhu Hassan is expected to lead these efforts, which include addressing internal party issues, constitutional reform, developing natural gas reserves, ensuring fair elections, and revising laws to attract foreign direct investment, particularly in the mining sector. These actions aim to set Tanzania on a path toward democratic and economic prosperity on the global stage.

Ownership requirements

Ownership requirements for businesses and mining operations in Tanzania are established to promote local participation and ensure that Tanzanian citizens benefit from the mining industry. The Mining Public Offering Regulations mandate that holders of special mining licences must ensure that at least 30 percent of their mining operations' shareholding is locally owned, giving Tanzanian citizens a stake in the industry.

To meet this requirement, special mining licence holders must make a public offer through the Capital Markets Securities Authority, allowing Tanzanian citizens to participate in mining ownership. These requirements apply to mining licences with investments of up to US$100,000,000 or the equivalent in Tanzanian shillings. For investments exceeding this threshold, licence holders must list a specific percentage of their shares on a local stock exchange to facilitate broader local ownership.

As part of the license application process, mining operators must submit a local procurement plan, demonstrating their commitment to sourcing goods and services from local Tanzanian suppliers, further contributing to the local economy and sustainable development.

Primary mining licences are granted exclusively to Tanzanian citizens or companies where all members and directors are Tanzanian citizens, ensuring local control over the primary mining sector. A mining licence may be granted to a non-Tanzanian citizen with the condition that at least 50 percent of the license is held directly by a Tanzanian citizen, balancing foreign investment with local participation.

Special mining licence holders must consult with the Minister of Energy and Minerals and offer shares to the public through a listing on the Dar es Salaam stock exchange, making ownership accessible to Tanzanian citizens. Draft regulations proposed in 2013 emphasize the listing of a minimum of 30 percent of shares by special licence holders on either the Main Investment Market or the Enterprise Growth Market, both designed to promote local ownership and investment.

4. Assessment of environmental, social, and governance challenges

Improving mining practices is a global call for sustainable and responsible extraction with a broader stakeholder focus, accounting for environment, employees, customers, and communities. ESG is a comprehensive framework largely utilised by investors and companies to assess the performance and risk based on a set of standards brought about by authorised agencies. The disclosure of ESG data therefore increases transparency, indirectly reduces risks, and potentially identifies opportunities. ESG reporting standards are set by various boards, namely:

- The International Accounting Standards Board (IASB);
- *Global Sustainability Standards Board (GSSB);*
- Sustainability Accounting Standards Board (SASB); and
- International Sustainability Standards Board (ISSB).

Generally, the Mining Industry in Tanzania uses the **Global Reporting Initiative (GRI)** guidelines as per the GSSB. ESG reporting compliance in Tanzania is still voluntary and mostly implemented by foreign mining companies.

4.1. Country-level assessment and context

4.1.1. Context

The modern mining sector in Tanzania can be categorized as a mature sector as it has been operational for nearly 25 years. Over that period, several legislations regulating the social and environmental matters have been enacted and amended accordingly to meet the local and international changes in the industry. The **first mining policy of 1997** and the **mining legislation in 1998** are credited for the stimulation and attraction of foreign investment in the mining sector. However, as time went by, and more experiences were gained locally; some of the provisions were found not to be beneficial for the development of the country's economy as was envisaged in the policy. Issues around local capacity building to participate effectively and ensure economic gains in communities surrounding the mines, were all not well supported in the earlier legislations. These necessitated the **policy change in 2009** and the **mining act of 2010**. Despite the few gaps that were still an issue, the changes in 2010 saw continued growth of the sector, more involvement of local businesses in the supply of goods and services to the industry and stabilization of corporate social responsibility programmes in surrounding communities.

In **2017**, several legislations aimed at protecting the country's natural resources and employment opportunities for Tanzanian citizens were introduced by parliament. These included the following:

- The Natural Wealth and Resources (Permanent Sovereignty) Act (No. 5), 2017;
- The Natural Wealth and Resources Contracts (Review and Renegotiation of Unconscionable Terms) Act (No. 6), 2017; and
- The Written Laws (Miscellaneous Amendments) Act (No. 7), 2017;

These new Acts introduced new conditions for exploration and mining companies, such as the following, but not limited to (Ngcobo and Magai, 2020):-

- Restrictions on export of raw materials;
- Sourcing of goods and services to give preference to indigenous Tanzanian companies; and
- Incentivising contractors, subcontractors and licences undertaking mining activities that employ and train local citizens.

Following a **change in Government in 2020** and subsequent reviews of the mining regulations, issues which had stagnated growth of the sector were somewhat resolved. This has prompted positive feedback from foreign investors. The National Environment Management Council (NEMC) has also established more regional branches and employed mining experts which have expedited environmental approvals. Land use conflicts between large scale mining companies, artisanal and small-scale mining as well as other land users remain a challenge. The formalisation of ASM has a positive outlook, however, shows slow progression. Despite efforts to monitor and assess ESG aspects of mining activities in Tanzania, in practice, the country's ability to promote ESG reporting and to protect public interest has remained limited.

In general, there has been positive response by foreign investors on the reforms that have been undertaken since 2020. These can be seen through more interest in exploration and the increase in issuance of mining licences and commencement of construction of projects that had stalled. The environmental management regulations have stabilized over time and structures to reduce the bureaucracy and hence the time for approval of EIAs, environmental audits and monitoring have been put in place. The National Environment Management Council (NEMC) has established more regional branches and employed mining experts which has made environmental approvals faster. Land use conflicts between large-scale mining companies, artisanal and small-scale mining (ASM) and other land users remain a challenge. The formalization process of ASM although positive, has been rather slow. In the process the Government is continuing with the construction of demonstration centres aimed at training miners to adopt good mining and processing

practices. Non-mining land use conflicts resulting in surrounding communities entering mine licenced areas are mostly related to lack of land use plans in the villages which results in abandoned demarcations of village boundaries. However, good stakeholders' engagement programmes by mining companies and involvement of community leaders in issues of common interest have been found effective in minimizing these conflicts. Rapid population growth in urban and suburban centres coupled with poor planning of these centres also result in land use conflicts especially for projects located in proximity of these centres.

4.1.2. Mineral and mining policies, industry policies

To achieve the goal of the mining sector integration with other sectors for optimised GDP contribution and poverty alleviation, the Government of Tanzania commits to attracting and enabling the private sector to take the lead in exploration, mining, and mineral beneficiation, as well as marketing. The Mineral Policy, 2009 sets its objectives on aspects such as the following:

- Improving the economic environment to attract and sustain local and international private investment in the mineral sector;
- Promoting economic integration between the mineral sector and other sectors of the economy, to maximize the contribution of the mineral sector to the economy;
- Strengthening the legal and regulatory framework for the mineral sector and enhance the capacity for monitoring and enforcement;
- Strengthening the institutional capacity for effective administration and monitoring of the mineral sector;
- Participating strategically in viable mining projects and establish an enabling environment for Tanzanians to participate in ownership of medium and large scale mines;
- Supporting and promoting development of small-scale mining to increase its contribution to the economy;
- Facilitating, supporting and promoting increased participation of Tanzanians in gemstone mining;
- Establishing transparent and adequate land compensation, relocation and re-settlement schemes in mining operations;
- Strengthening involvement and participation of local communities in mining projects and encouraging mining companies to increase corporate social responsibilities;
- Promoting and developing a marketing system of minerals to ensure that miners get right values of minerals traded in formal markets;

- Promoting and facilitating value addition activities within the country to increase income and employment opportunities;
- Promoting research development and training required in the mineral sector and encourage its utilization;
- Developing a local base for technical capacity;
- Improving communication on the mineral sector to the public through education and provision of accurate and timely information;
- Strengthening the institutional capacity of the Geological Survey of Tanzania (GST) to perform its roles and functions effectively and efficiently;
- Strengthening cooperation with the regional and international bodies to take advantages of facilities, resources and information provided by the organisations;
- Promoting safety and maintaining hygiene conditions and protecting the environment in mining areas; and
- Encouraging and promoting women participation in mining activities and strengthening enforcement of laws and regulations against child labour in mining activities.

In realising its objectives, the policy commits the Government to continue giving priority to the mineral sector in the National Strategy for Growth and Reduction of Poverty (NSGRP) and contribute to the achievement of the National Development Vision 2025.

The policy provides strategies for achieving each of the above objectives. A summary of some of the issues that are addressed as part of the strategies and that are relevant to this project i.e., those that support the development of "*EU-Africa partnership ensuring a responsible sourcing of minerals for the European industry while providing for a sustainable local co-development in the best Environmental, Social and Governance (ESG) conditions and creating a long-term's business environment for European and African companies*" include the following:

Conducive economic environment for private sector investment in the mineral sector

The policy recognizes the need for a sound, transparent, and stable macroeconomic environment for promotion of investment and development of the mineral sector. A macroeconomic environment includes conducive fiscal regime, reliable infrastructure, and reliable financial services. To ensure the objectives are realized, the following strategies are outlined:

- The Government will provide a competitive and predictable fiscal regime for the mineral sector;

- The Government in its own or in collaboration with the private sector will provide reliable infrastructure to service the mining industry where feasible; and
- The Government will encourage and promote establishment of reliable and capable financial institutions.

Promote and develop mineral marketing systems

To facilitate minerals trading, the policy recognises the role of reliable, stable, and efficient marketing system in the promotion of growth of both local and international markets and increases foreign earnings and Government revenue. The strategy for realizing this objective commits the Government to:

- Collaborate with stakeholders to develop local mineral markets;
- Harmonize taxes and tariffs on minerals produced in the country to ensure that they are competitive;
- Source foreign markets for minerals and strive to accrue information relating to mineral markets in general; and
- Collaborate with the private sector to develop and improve training institutions on mineral marketing, mineral grading, and valuation.

Promotion of mineral value addition activities

The policy also recognizes the importance of value addition activities in country as a way of creating employment, improve local skills in mining industry and increase income. The policy also recognizes that this can be achieved if there are necessary technical skills, access to capital and adequate infrastructure and facilities. To achieve this objective, the policy commits the Government to:

- Promote investment in the fabrication and manufacturing sectors to stimulate minerals beneficiation;
- Promote investment in lapidary, stone carving and jewellery making; and
- Collaborate with the private sector, regional and international organisations to strategically invest in smelting and refining industries.

Develop and Sustain Co-operation with Regional and International Organisations

The policy recognizes that cooperation with Regional and International Organisations is important for the development of the mineral sector. Tanzania can realise benefits of being a member of regional and international bodies related to mining industry by fully utilising

opportunities provided by these organisations. To ensure development of sustainable cooperation with regional and international organizations, the policy commits the Government to:

- Collaborate with regional bodies of which Tanzania is a member to harmonize its mineral policy with other mineral policies; and
- Continue to work together with regional and international organisations in research, transfer of technology, training, and exchange of information.

The last two objectives of the mineral policy outlined above deal with cross-cutting issues, specifically on *i) Provision of Environmental Management, Health and Safety Measures*; and *ii) Promoting Women Participation and Prohibiting Child Labour in Mining*. The policy strategies for ensuring there is adequate management of safety, occupational health and environment in mining activities commits the Government to:

- Strengthen the institutional capacity in monitoring and enforcement of laws and regulations on safety and occupational health, environmental protection and management in mining areas;
- Require mining companies to set aside funds for environmental rehabilitation and mine closure obligations;
- Continue to harmonize laws and regulations governing safety, occupational health and environmental issues in the mineral sector;
- Continue to collaborate with stakeholders to ensure that small, medium and large-scale miners preserve the environment;
- Continue to provide education on health and safety; HIV/AIDS and environmental management to small, medium, and large-scale miners and their surrounding communities; and
- Administer and monitor exploration, mining, handling, transportation, storage, usage and export of radioactive minerals, explosives, and toxic materials.

The policy recognizes the need to encourage and promote women participation in mining activities as a way of promoting socio-economic development processes in the country. In addition, the exposure of children to harsh mining conditions, affects their well-being and causes them to miss education opportunities is against the laws of the country. As such, the policy stipulates for strengthening enforcement of laws and regulations against child labour in mining activities. The strategies outlined in the policy commits the Government to:

- Continue to promote participation of women in mining activities;

- Ensure that all programmes related to mining, including education and training opportunities, are based on gender equality and equity; and
- Collaborate with stakeholders to strengthen monitoring and enforcement of laws and regulations on child labour in mining activities.

The policy also outlines the role of the Government as being a regulator; promoter and facilitator; service provider; and an investor. As such, the Government is responsible for formulating policy and minerals law, developing regulations, establishing guidelines, and regulating the mineral sector. It is also responsible for promoting and facilitating private investments and provide essential services needed by the mines. The Government may participate strategically in mining activities such as exploration, mineral exploitation, and value addition to stimulate other sectors of the economy and increase benefits to the nation.

4.1.3. Mining regulations

Since modern mining in Tanzania dates to the late 1990s, its regulation is associated with the Mining Act (No. 5), 1998. Following the development of the sector and hence the need to address issues that emerged over time, the 1998 Act was repealed by the Mining Act (No. 14), 2010. The Mining Act (No. 14), 2010 (as amended from time to time) is the principal legislation for the management of all mining activities in Tanzania. The major amendments of this Act were made in 2017 which put in place major changes through Acts stipulated earlier.

A revision of the Mining Act of 2010 and its amendments was then necessitated by these changes and hence a revised version came in force in 2018, i.e., Mining Act CAP 123, (R.E. 2018). This was followed by the publication of the relevant regulations for the operationalization of the legislation. The 2018 revision of the Act was further revised in 2019 and incorporates the amendments done through:

- The Miscellaneous Amendments (No. 2) Act, 2019; and
- The Miscellaneous Amendments (No. 7) Act, 2019;

As such, the current principal legislation for the governance of the mining sector is the “Mining Act CAP 123, (R.E. 2019) (as amended from time to time). However, in continual improvement of the administration of the sector, amendments to the 2019 revision of the Act have been made in 2021 and 2022 through:

- The Miscellaneous Amendments (No. 4) Act, 2021; and
- The Miscellaneous Amendments (No. 3) Act, 2022;

These amendments are incorporated into this discussion.

The control and ownership of minerals in Tanzania is vested in the President in trust for the people of Tanzania, (section 5(1)). As such, under Section 5A-(1), the President may, after consultation with the relevant local authorities, through the Minister responsible for local government and by Order in the *Gazette;* declare any area of Tanzania which is subject to mining operations to be a controlled area. The order made under this Section prescribes the conditions applicable to the controlled area. This is regularly used to set aside areas for artisanal and small-scale mining in the bid for formalization of the sub-sector.

The Minerals administration under the Mining Act are summarised in Appendix B.

4.1.4. Land-use and mineral rights

All land related matters in Tanzania are regulated through the Land Act, Cap. 113 (R.E 2019) and Village Land Act, Cap. 114 (R.E 2019). Key areas of issues related to land use and mineral rights ownership include, but are not limited to surface and mineral rights, compensation for land and co-existence. The issues related to land use and the mineral rights ownership are summarised in

Issues	Description
Surface & Mineral Rights	• Ownership of land entitles one to the surface rights and not to the subsurface minerals in that land • Ownership of minerals is vested in the President in trust for the People of Tanzania
Compensation for Land	• Minerals exploration and mining in land already occupied can only be carried out after compensation for the loss of land and/or properties • Where mineral rights are issued in protected areas, consent from the responsible authority is required
Co-existence	• Coexistence between mineral right & other land users is supported by law • Mineral rights holders required to exercise their rights reasonably not affect injuriously the interest of the occupier of land • A lawful occupier of land in a mining area requires consent of the registered holder of the mineral rights to erect any structure in that area • Where disturbance of the rights of the lawful occupier of land is caused during mining or exploration, the mineral rights holder is liable to pay a fair compensation • Where an ASM licence was in the area prior to allocation of a large-scale mining licence, coexistence of the two mineral rights is protected by law

Table 11.

Issues	Description
Surface & Mineral Rights	• Ownership of land entitles one to the surface rights and not to the subsurface minerals in that land

	• Ownership of minerals is vested in the President in trust for the People of Tanzania
Compensation for Land	• Minerals exploration and mining in land already occupied can only be carried out after compensation for the loss of land and/or properties • Where mineral rights are issued in protected areas, consent from the responsible authority is required
Co-existence	• Coexistence between mineral right & other land users is supported by law • Mineral rights holders required to exercise their rights reasonably not affect injuriously the interest of the occupier of land • A lawful occupier of land in a mining area requires consent of the registered holder of the mineral rights to erect any structure in that area • Where disturbance of the rights of the lawful occupier of land is caused during mining or exploration, the mineral rights holder is liable to pay a fair compensation • Where an ASM licence was in the area prior to allocation of a large-scale mining licence, coexistence of the two mineral rights is protected by law

Table 11: Issues related to land use and mineral rights ownership

4.1.5. Environment

The Environmental Management Act (EMA) (No.20), 2004 is the principal legislation in Tanzania, providing the legal and institutional framework for sustainable management of the environment. Compliance with the EMA is monitored through NEMC. The mining industry in Tanzania imposes pressing environmental challenges through the extraction of minerals, subsequent processing as well as the disposal of waste generated during these activities. Some of these environmental challenges include, but are not limited to:

- **Water pollution** through improper wastewater management practices;
- **Air pollution** during mineral extraction processes; and
- **Deforestation and soil degradation** through land clearing processes for large scale mineral exploration.

In addition, Tanzania still faces challenges with tracking and reviewing the quality of relations between mining companies and affected communities.

The key provisions of the environmental legislation that are relevant to mining are summarised in Table 12.

Key Areas	Description
Environmental Impact Assessment (EIA)	• All developers of projects specified in the law should undertake, at their own cost, an environmental impact assessment (EIA) • Mining, including quarrying and open-cast extraction are some of the projects to which EIA is mandatory

Procedure for Undertaking EIA & Certification	• Projects must be registered and screened to ascertain the magnitude of the impacts to the environment
	• After screening projects are categorised into:
	  • Category "A" – Projects to which EIA is Mandatory
	  • Category "B1" - Projects regarded as Borderline Projects
	  • Category "B2" - Projects to which EIA is non-Mandatory
	  • "Special Category" Projects or projects where potential risks are uncertain and requires detail specialized study prior to EIA
	  • Mining (Large and Medium scale) and Cement manufacturing are classified as "Category A" Projects
	• Environmental Impact Statement (EIS) should be sent to NEMC for review before being sent to Minister for environment for approval and issue of the EIA Certificate
	• NEMC review includes a site verification visit within sixty days of submission of EIS
	• Any person aggrieved with Minister's decision may appeal through a Tribunal

Experts to carry out EIA	• EIA should be carried out by Experts who are registered with NEMC
EIA & Application for Mining Licence	• Mining act requires applicants for Special Mining Licence & Mining Licence and their renewal to provide an EIA Certificate • Licensing authorities cannot issue a project certificate without proof of EIA Certificate
Transferability	• EIA certificate may be transferred from one holder to another in the event the project changes ownership
Requirement of EIA during Operations	• Substantial changes or modification in operations may require a new EIA • New EIA's may be required if project pauses impacts that were not foreseen in study
Monitoring & Audits	• Monitoring carried out to assess effects to the environmental & non-compliances

Funded by
the European Union

Key Areas	Description
	• Proprietor required to undertake environmental audits and report annually to NEMC
Decommissioning & Closure	• Proponent required to undertake safe decommissioning, site rehabilitation and ecosystem restoration before project closure
Rehabilitation Bond	• Minister for environment to prescribe in Regulations, activities or processes which threaten the environment of which environmental performance bond is required • Minister for mining, in consultation with the Mining Commission to provide for the posting of a rehabilitation bond • NEMC not to discharge an environmental performance bond deposited until safe decommissioning and closure requirements are fulfilled • Currently, all issues pertaining to mine closure are managed through a committee known as "Mine Closure Committee" under Ministry of Mines
Sector Environmental Regulations	• Mining Projects required to comply with environmental regulations of other sectors • Key sector legislations are for water, land, forestry, industrial and consumer chemicals and others
Mining in Protected Areas	• Mining can be carried out in forest reserves with consent of the relevant institutions • Working in game reserve is limited to prospecting and mining of uranium, oil, and gas

Table 12: Key provisions of the environmental legislation that are relevant to mining

4.1.6. Societal and community aspects, cultural heritage

The urban environment is managed by three types of authority, i.e. city, municipal and town councils, whereas the rural areas are managed by 2 levels of authority being district councils with township authorities and the village councils. Mining companies engage with societal and community through:

- **Corporate Social Responsibility Plan (CSR) Programmes** - Mining companies are expected to work closely with local government authorities to ensure a license to operate and engage with communities as part of CSR programmes. Section 105 of the Mining Act requires that every mineral right holder prepares, on an annual basis, a credible CSR plan jointly with the respective local authorities.

- **Local Content Regulations** – Local content plans are one of the requirements for the approval of a Prospecting License, Mining License, Special Mining License and Primary Mining License.

The Cultural Heritage Policy of 2008 provides for the preservations and protection of historic monuments, archaeological, and paleontological objects produced or modified before 1863. The Graves Act (No. 9), 1969 is another legislation that protects the cultural heritage of Tanzania.

4.1.7. Public health and safety

Matters related to public health are regulated through the Public Health Act (No. 1), 2009 and occupational related health and safety are regulated through the Occupational Health and Safety Act (No.5), 2003. In addition, the EMA also addresses aspects of public health.

Other regulatory instruments that deal with public health and safety include the Environmental Management Act (No. 20), 2004 and the sector specific legislations, regulations, and guidelines.

4.2. Mining practices *vs.* Environmental, Social and Governance (ESG) goals

4.2.1. Environmental challenges

The mining industry in Tanzania is facing significant environmental challenges. The issues are largely related to the extraction of minerals and their subsequent processing, as well as the disposal of waste generated by these activities. Tanzania's mining sector's most pressing environmental challenge is **water pollution** caused by improper wastewater management practices that allow contaminants such as heavy metals and other pollutants to enter surface and groundwater sources. A Reuters article by Ng'wanakilala, F. mentions a fine of 5.6 billion Tanzanian shillings (US$2.4 million) imposed on Acacia Mining for alleged pollution highlighting one of the environmental challenges associated with mining in Tanzania. This has a detrimental effect on local ecosystems, leading to decreased biodiversity and loss of habitat for wildlife species that depend on clean water sources for survival.

In addition, **air pollution** from dust particles created during mineral extraction processes can cause respiratory illnesses among nearby communities that rely heavily on natural resources like forests or rivers for sustenance or income generation activities such as fishing or farming.

Furthermore, **soil degradation and deforestation** due to land clearing associated with large-scale mineral exploration projects further exacerbates this problem because it reduces available habitats even more significantly than air pollution alone would do, if left unchecked.

Mining activities such as digging, blasting, and transporting ore can release toxic chemicals into nearby water sources and soil, leading to the contamination that can harm public health and the

environment. Additionally, using heavy machinery and cutting trees for timber and charcoal exacerbate soil erosion and deforestation, leading to biodiversity loss and soil degradation. The government has also initiated plans to address environmental concerns including, introducing more stringent environmental regulations, and encouraging companies to use environmentally friendly technologies.

The mining industry in Tanzania has encountered several environmental impacts' investigations. The results show that mismanaged water pollution results in contamination of water sources that lead to main water sources such as Lake Victoria, an important source of livelihood for most communities, regions and even nationwide. There is a need for greater regulation and enforcement of environmental laws to ensure that mining activities promote sustainable development and do not degrade the natural resources on which communities depend. Some companies publish detailed results of their water quality monitoring programmes, which cover surface water, wastewater, and groundwater in and around the mining concessions. Political leaders have similarly been calling upon public members to work together with their leaders at different levels to develop strategies for saving the ecology and biodiversity and curb deforestation. There are still challenges with tracking and reviewing the quality of mining companies' relationships with affected communities. Companies' reports show limited evidence of systematic action on identifying and addressing how climate change can exacerbate the impacts of its operations on its workforce, affected communities, and the environment.

4.2.2. Socio-economic issues

The mining sector accounts for just 4.5% of total GDP showing a low reliance on minerals, but it is comparatively a high contributor to FDI in the country. However, the mining industry in Tanzania faced several social and economic challenges over the past few years. These issues stem from various factors, including limited access to resources, regulatory and taxation policies in the sector, and environmental concerns related to large and small-scale operations. The lack of access to resources is particularly acute for small-scale miners who often have difficulty obtaining the required capital and technology for production. Other disputes have been on compensation and land rights which has led to a conflict between small scale miners and communities with larger companies operating on their land due to low compensation and disputes over rights and ownership. Whilst the law or publicly documented policy specifies rules for expropriation and compensation to landowners or land users, there are no procedures governing the resettlement of land users when project development interferes with their access to or use of land. However, Section 97 of the Mining Act R.E. 2019 requires a resettlement plan to be developed as per the land laws. The Land Act Cap 113 and the Village Land Act Cap114 on the other hand do not have a requirement for resettlement.

In addition, significant environmental concerns are associated with large-scale operations such as open pit mines. Reports and information from these companies tend to be too technical, leaving some communities near these sites feeling alienated from decision-making processes about how they should be managed. The RMI 2022 report shows that the vast majority of the assessed mine sites cannot demonstrate that they are informing and engaging with host communities and workers on basic risk factors such as environmental impacts, safety issues or grievances. Some 94% of the mine sites score an average of less than 20% on the fifteen basic ESG issues assessed. At the same time, a few mine sites show better practices on some of these issues, proving 'it can be done'.

The Tanzanian government has taken various steps to address these issues. For instance, in recent years, there has been a push for stricter regulations, increased government ownership in mining projects, and efforts to formalize the artisanal mining sector. However, the effectiveness of these measures in mitigating the socio-economic issues associated with mining is an ongoing concern, and achieving a balance between economic development and environmental and social responsibility remains a challenge.

4.2.3. What would be the best practices for responsible mining?

The OECD Guidelines for Multinationals Enterprises and the UN Guiding Principles on Business and Human Rights provide a framework for responsible mineral supply chains that promote respect for human rights (OECD, 2016). In addition, the EITI aims to stimulate demand for responsibly produced minerals. Responsible mineral extraction practices should ideally prioritize protecting human rights, the environment, and the well-being of local communities. This can be done through:

- Addressing sustainability issues through incorporating strong ESG principles in all operations;
- Comprehensive policy reforms, implementation and monitoring;
- Promoting an environment that encourages domestic and foreign investments, while ensuring proper management practices;
- Strengthening disclosure of environmental and social impact assessments and mitigation plans; and
- Amending land legislation to provide for the resettlement of landowners and compensation to land users

5. Business network between the EU and Tanzania

Tanzania is perceived as a gateway to East Africa, hosting the Delegation of the EU (Dar es Salaam), the EAC headquarters (Arusha) and subsequently portraying a secure and stable investment climate.

5.1. Assessment of the upstream and downstream business ecosystem

Tanzania and the EU have a history of collaboration through programs mostly focused on development initiatives such as education, healthcare, and conservation of maritime areas. The business ecosystem in Tanzania and the EU has steadily seen development into agriculture, manufacturing, and the healthcare sectors. During the 2023 Tanzania-EU Business Forum held in Dar es Salaam, 7 trade agreements between the EU and Tanzania focused heavily on the infrastructure and banking sectors (European Commission, 2023a). The landmark agreements provide an indicator of the changing investment and business climate in Tanzania.

5.1.1. Context, formal and informal players

Business networks are the main framework promoting investment from the EU, and involve approaching the European Stakeholders, who work to connect prospective investors with the relevant Tanzanian stakeholders. Key stakeholders in the Tanzanian-EU Business network are provided in

Organization/Entity	Business Mandate
Delegation of the EU to the United Republic of Tanzania and the EAC	• First stop for all European entities interested in investing in Tanzania and the EAC
EU – Tanzania Business Forum	• Specific business forum comprising of EU Member state companies, industry organizations and Tanzanian service providers.
Tanzanian Investment Centre	• Advisory organization that acts as a connective medium between foreign investors and local stakeholders.
Ministry of Industry and Trade	• Provides support in industrial development and trade as well as policy formulation and regulatory compliance for foreign investment in Tanzania.
Ministry of Minerals	• Primary stakeholder regarding mineral extraction, local content, beneficiation, and fabrication of minerals in Tanzania.
State Mining Corporation (STAMICO)	• The state invests alone or participates in mining and processing activities of foreign investors.
Tanzanian Chamber of Mines	• Responsible for private mining companies as an advocacy group regarding policy and overall business climate relating to mining in Tanzania.
Federation of Miners Association of Tanzania (FEMATA)	• Responsible advocacy organization for small scale miners in Tanzania.

Table 13. Table 14 provides a list of institutions in Tanzania within the realm of critical minerals.

Organization/Entity	Business Mandate
Delegation of the EU to the United Republic of Tanzania and the EAC	• First stop for all European entities interested in investing in Tanzania and the EAC
EU – Tanzania Business Forum	• Specific business forum comprising of EU Member state companies, industry organizations and Tanzanian service providers.
Tanzanian Investment Centre	• Advisory organization that acts as a connective medium between foreign investors and local stakeholders.
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Tanzanian Chamber of Mines	• Responsible for private mining companies as an advocacy group regarding policy and overall business climate relating to mining in Tanzania.
Federation of Miners Association of Tanzania (FEMATA)	• Responsible advocacy organization for small scale miners in Tanzania.

Table 13: Key Tanzanian stakeholders in the Tanzanian-EU Business network

Institution	Mandate
Tanzania Chamber of Mines	• Main aim is to represent the interests of the mining industry and its stakeholders.
Mining Commission	• The Tanzania Mining Commission (TMC) was established to oversee and regulate the mining industry in Tanzania
State Mining Corporation	• Oversees and promotes the development of the mining industry in the country
Ministry of Energy and Minerals	• Responsible for facilitating the development of the energy and mineral sectors
Tanzania Environmental Experts Association	• Provides information to its members on issues of environment regulations and compliance.
National Environment Management Council	• It was established is to undertake environmental enforcement, compliance, review and monitor environmental impact statements, research and awareness raising.
African Environmental Information Network	• A multi-stakeholder capacity building process that aims to harness and enhance access to information and knowledge to support the management of Africa's environmental resources as assets for sustainable development.
Africa-EU Partnership	• To promote cooperation and collaboration between African and European countries in the field of energy
Tanzania Investment Centre	• Promotes and facilitates investment in the country.

Table 14: Institutions for the development of an Africa-focused critical minerals network

5.1.2. Relationships at local or regional levels

The EU has been an investor in Tanzania and the East African region for over several decades. It focuses on growing business primarily in agricultural exports to the European Union and imports of goods and services through unilateral trade agreement with individual EAC members. The EU has also heavily invested in healthcare and social welfare programs relating to education, skills training for young women and empowering communities to develop agricultural activities.

The current trade partnership that exists between the EU and Tanzania is a unilateral trade agreement that encompasses all sectors in Tanzania. The agreement termed "*Everything but Arms",* involves exporting of all types of commodities ranging from agriculture to minerals except for arms/weapons. The trade agreement has grown stronger over decades as import and export volumes increased with a trade balance mostly in European favour. The unilateral trade agreement allows for a foundation in which critical minerals can be exported to Europe, however

bringing local content rules into the equation, critical raw materials in unprocessed form make it difficult to export. This provides an opportunity to build on the trade agreement and involves investment in the critical raw materials downstream space.

Like Tanzania, its EAC members also have unilateral trade agreements. For the regional cluster, the EU tabled the Economic Partnership Agreement (EPA) aimed at trading with the East African Community as a block rather than individual countries. The agreement is yet to be ratified and implemented as three member states are deliberating accepting the terms of the new agreement. Although, the EPA has not been ratified, the intent of the agreement indicates.

Investing in Regional Cooperation

The promotion of value addition activities related to ECRMs in Tanzania provides the country a unique opportunity to act as a catalyst for developing and sustaining value chain activities. This can be done by:

- Supporting the direct mining operations and businesses that generally exist only for the life of the mine (LoM), and
- Developing downstream activities – industrial hubs that are currently existent in other countries such as smelting, refining, and manufacturing (battery cells, clean energy infrastructure components such as solar panels and wind turbines).

With this narrative, Tanzania, and other countries in the EAC region and beyond (like Southern African Development Community (SADC) and Common Market for Eastern and Southern Africa (COMESA)) should seek to promote investment innovation to increase growth beyond LoM. This can be done by collaboration and strategizing to share expertise and resources (financial and raw materials) within the region to create value chain activities in which the mine must be integrated to rest of the economic activities in those countries (Figure 14).

A mine must utilize local infrastructure like railway lines, airlines, water, electricity, etc. It must provide an arena for education, and to transfer of technology and innovation to the local expertise and workforce. The mine must also procure goods and services and employ from the local market.

Also, there must be a link between the mine and local factories and industries in the supply of raw materials. Other sectors must feed from the mine through a clear and transparent value chain network (FMF, 2023).

Figure 14: ECRM Value Chain Diagram (FMF, 2023).

Investment and collaboration in regional (EAC, COMESA, SADC, etc.) cross-border value chain activities are necessary to ensure the availability of raw materials as countries complement one another. In this way, ECRM availability will be secured from country to country during the establishment of local industries and factories to increase the local value chain base of these nations. Tanzania and other countries in the EAC region and beyond (like SADC and COMESA) can promote investment innovation through the creation of a conducive environment found on a three-pillar strategy:

Pillar 1 **Political**	To create a single market; political leadership should organize a roundtable dialogue to discuss and initiate the following: Harmonization of legal, fiscal, and institutional policy framework by creating common external tariff, tax convergence, free circulation of goods, capital and persons, and common standards that apply to ECRM and other mineral resources. This will create regional fiscal policies for the ECRM resources sector, that harmonize ECRM resources contracts to facilitate investment in the sector and as well as develop regional dispute resolution mechanisms in the ECRM resources sector.
Pillar 2 **Regional capacity building and implementation**	Initiate and implement a cooperation in capacity building in institutions (universities, technical institutes, research organisations); to share and acquire training capacities increasing required skills at the various levels of specialization. Establishing a set of regional directives, creating technical, economic, and social monitoring unit for the sector, and developing a regional capacity building programme based on networking between national institutions and specialization for some of them to ensure cross-border trade in high-value products. Developing regional networks to monitor the ECRM resources sector by conducting studies to update geological, economic, and technological data on the sector – a regional databank for the mineral resources sector.
Pillar 3 **Regional infrastructure**	To ensure regional functioning infrastructure is developed and used efficiently, share energy infrastructure for industrial sites through regional connections and common hydroelectric plants that feed regional power pools. Create a network of roads, railways, harbours, ports, and telecommunications and ensure it is efficiently shared and the land locked countries use the infrastructure profitably.

5.1.3. Overview of the local or regional clusters

Apart from trade with the EU, Tanzania, which is favourably located in east Africa has several local and regional clusters that play a significant role in the country's economy and development. Key clusters in Tanzania include:

- **Agriculture Cluster**: one of the most prominent clusters, with sub-clusters including coffee, tea, tobacco, cashew nuts, maize, and rice. The Southern Agricultural Growth Corridor of Tanzania (SAGCOT) is a notable initiative to promote agricultural investments in the southern regions of the country.
- **Mining Cluster**: the mining sector is significant, with gold historically being a major focus.
- **Tourism Cluster**: vital to the economy, with renowned attractions like Mount Kilimanjaro, Serengeti National Park, Ngorongoro Conservation Area, and Zanzibar. Arusha, Moshi, and Dar es Salaam are key hubs for tourism and hospitality.
- **Manufacturing Cluster:** Tanzania has been working on developing its manufacturing sector, with industrial zones in Dar es Salaam, Mtwara, and other areas. The textile and garment industry in the Mwanza region is growing, with initiatives like the Special Economic Zones (SEZs) promoting industrial development.
- **Fishing Cluster**: Tanzania has a coastline along the Indian Ocean, and fishing is a significant industry, particularly in areas like Mtwara, Tanga, and Dar es Salaam. The country exports various seafood products to international markets.
- **Information and Communication Technology (ICT) Cluster**: Tanzania is developing its ICT sector, and the city of Dar es Salaam is the main ICT hub. The establishment of tech hubs and incubators is fostering innovation and entrepreneurship in the sector.
- **Zanzibar Spice Cluster**: the semi-autonomous region of Tanzania, is famous for its spice production, including cloves, cinnamon, nutmeg, and black pepper. The spice industry is a crucial part of Zanzibar's economy and cultural identity.
- **Renewable Energy Cluster**: Tanzania is working on expanding its renewable energy sector, with a focus on hydroelectric, solar, and wind energy. The development of the Stiegler's Gorge Hydropower Project and various solar power initiatives are examples of investments in this cluster.
- **Construction and Real Estate Cluster:** a growth sector, driven by infrastructure development projects and urbanization. Major cities like Dar es Salaam are witnessing rapid construction and property development.

These clusters reflect the diversity of economic activities in Tanzania, with opportunities for investment and development. Some of these clusters would share infrastructure developed or enhanced for the requirements of the critical minerals' projects. However, it is essential to note that the economic landscape can change over time due to various factors, including government policies, global market dynamics, and regional development initiatives.

5.2. Building new B2B relations

5.2.1. Promoting local content and enabling mining cluster actors

The local content policy in Tanzania (Ministry of Minerals, 2018) relating to mining is robust and rigid, in its requirements and through its implementation. Miners in Tanzania have the option and are encouraged to beneficiate and undertake fabrication. The local content model is viewed as a mine to market integrated model with the purpose of growing Tanzanian business into downstream activities.

This, however, is also seen as an impediment to investment particularly regarding the shortage of competency and capability from Tanzanian downstream stakeholders. To address this, local companies are encouraged to engage with competent institutions and specialized processors to increase downstream beneficiation and fabrication through partnerships and on-site skills training through the various business forums that currently exist. Similarly, foreign investors particularly are encouraged to utilize the EU-Tanzania business forum, the respective government organizations, and the Tanzanian Investment Centre to find local partners to yield mutually beneficial partnerships through collaboration.

An example of a structured relationship is highlighted in the mining industry where foreign minerals exploration companies conducting mineral exploration in Tanzania employ and train members of the surrounding community or local exploration firms to map out deposits and to apply various sampling techniques during an exploration program. The process of enabling mining clusters in Tanzania from a European perspective must involve local community participation in the projects and partnering with local, low-skilled downstream stakeholders with the intent of enhancing competency through skills transfer programs. By forming strategic partnerships with Tanzanian prospectors and special mining license holders, downstream progression can be unlocked early on.

The model has been tested and proven through the Integrated Mining Technical Training (IMTT) Program where mining companies collaborated with public and private sector companies to build competency and skills in the extractives sector.

Duplicating the IMTT model is critical in enhancing local capacity, however this must not end at technical skills transfer, rather must be extended to R&D involving university collaborations between European technical institutes and Tanzanian universities. Through collaboration on

developing R&D, Tanzanian universities can empower themselves and develop a skills base with high technical capabilities and competency. In the short term, exchange programs for students and academics can achieve the desired outcome for skills transfer and develop the platform for further R&D collaboration. A list of key institutions that can develop research, development and innovation intellectual property are provided in Table 15.

Institution	Focus	Website
University of Dar es Salaam – School of Mines & Geosciences	Providing education and research in the fields of mining, geology, and related sciences	https://www.udsm.ac.tz/web/index.php/schools/somg
University of Dodoma – Department of Geology	Providing education and research in the fields of mining, geology, and related sciences	https://www.udom.ac.tz/programme/view?id=VFhwTlBRPT0=
African Minerals & Geosciences Centre – (Formerly Southern & Eastern African Mineral Centre)	Acting as an independent regional centre of knowledge and information for southern and eastern Africa	https://www.seamic.org/index.php
Sokoine University of Agriculture – Soil & Geological Sciences Department	Providing training to undergraduate and postgraduate students, consultancy services to government departments, farmers, private firms, and NGOs on matters related to soil and geological sciences.	https://www.sua.ac.tz/soil-and-geological-sciences-department
Nelson Mandela African Institution of Science and Technology	Delivering and promote high quality and internationally competitive teaching and learning, research and innovation, and public service in Science, Engineering, Technology, and Innovation (SETI).	https://nm-aist.ac.tz/
Ardhi University	Providing innovative and integrated learning, research and public services that advance sustainable development at national level and beyond.	https://www.aru.ac.tz/
Tumaini University Makumira	Tumaini University Makumira is primarily focused on providing quality education and training in various fields including social sciences and business management	https://makumira.ac.tz/
State University Zanzibar	Offering the demand driven programmes to produce high-quality graduates in the field of Natural and Social Sciences that respond to the needs of modern society	https://www.suza.ac.tz/
Darwin Education Agency Limited	Providing quality education on the mining industry in areas such as: machinery production and design, mine design, mine construction	https://dea.co.tz/

Table 15: Integrated Mining Technical Training (IMTT) Program Education and training programmes

Funded by
the European Union

Organisations across the African continent and in Europe to host interns and apprentices with upstream and downstream players in the extractive industry

Facilitating internships and apprenticeships in the extractive industry is essential for building capacity and fostering responsible practices. There are various organizations across the African continent and in Europe that may be involved in hosting interns and apprentices in the extractive industry (

Table 16).

Organisation	Focus
Organisation	Focus
African Minerals and Geosciences Centre	AMGC provides training and capacity-building programs in the field of geosciences and mining.
African Union Commission	May offer internship and apprenticeship opportunities in various fields, including those related to natural resources and mining.
European Federation of Geologists	EFG or similar geological associations in Europe may facilitate internships for geology and earth sciences students interested in the extractive industry.
United Nations Economic Commission for Africa	UNECA may provide opportunities for interns interested in sustainable development, including extractive industries.
African Development Bank (AfDB)	Offers internships for students in various fields, including those interested in the economics and development aspects of the extractive industry.
European mining companies	Many European mining companies have internship and apprenticeship programs for students interested in gaining hands-on experience in the extractive industry. Examples include BHP, Rio Tinto, and Anglo American.
Universities and research institutions	Universities and research institutions in Africa collaborate with industry partners to offer internship opportunities for students studying mining, geology, and related fields. This can be extended to European partners.
Local and national mining associations	Mining associations in Africa and Europe may have programs to connect students with internship and apprenticeship opportunities in the industry.
Non-Governmental Organizations	Some NGOs focus on responsible mining practices and may offer opportunities for interns interested in the social and environmental aspects of the extractive industry.
Government agencies	Ministries and agencies responsible for mining and natural resources in African and European countries may provide internship opportunities for students interested in policy and regulatory aspects of the industry.

Table 16: Some organisations across the African continent and in Europe that may host interns and apprentices with upstream and downstream players in the extractive industry

5.2.2. Strengthening African Mining Clusters

Incentivizing investment in Tanzania is important to establish entrepreneurial capacity and unlock potential in the mining sector. The positive economic growth numbers alone showcase Tanzania as a premium investment hub (TIC, 2023). Considering the business network that is currently growing, a prospective European investor is assured that business network will receive adequate support in the investment venture.

Local content policy is clear, in that it requires local capacity building as well as local participation in activities across the mining value chain. Thus, bringing in local content regulations highlights that a prospective investor would require additional effort to engage and build a partnership with local stakeholders that may not necessarily have the required competency or capability that the investor is looking for.

The EU and its banks have embarked on financial deals aimed at increasing entrepreneurial endeavours particularly in the mining sector. Interested Tanzanian stakeholders receive increasing access to local funding for mining project development, thus laying a foundation for a prospective European investor to partner with them. From the Tanzanian side, a new Investment Act ratified in late 2022 now provides a shield for investors through security of investment and access to international arbitration which was not present in the old act.

Existing alternative financing models

Existing alternative financing models can help address challenges related to funding, infrastructure development, and environmental sustainability. Some strategies and models that can be used to achieve this goal include, but are not limited to: -

- Public-Private Partnerships (PPPs): Encourage collaboration between the government, private sector, and development partners to finance infrastructure projects, such as roads, railways, and energy supply, that are essential for the mining sector's growth. Establish clear regulations and incentives to attract private sector investment in mining infrastructure.
- Carbon Credits and Environmental Financing: Explore opportunities to earn carbon credits through sustainable mining practices and reforestation efforts. Use the proceeds from carbon credits and environmental financing to support environmental restoration and conservation efforts in mining areas.
- Mining Cluster Development Agencies: Create specialized agencies or organizations responsible for coordinating the development of mining clusters. These agencies can

work with various stakeholders, including the government, mining companies, and local communities, to ensure the holistic development of mining areas.

6. Energy and digital transition: a strategy for the EU and Africa Partnership

Tanzania is one of the four countries poised to benefit from the 111.5 million Euros (approximately 307.9 billion Tanzanian Shillings) in funding provided by the EU (European Commission, 2023b). This funding has been earmarked to target the mining sector, and it is part of the broader OACPS-EU Development Mineral Programme. The initiative seeks to enhance the mining environment and empower small-scale miners, focussing on engaging young people and women in the sector. The program is set to span three years, from 2022 to 2024. The announcement of Tanzania's inclusion in this project was made by the OACPS Secretariat based in Brussels, Belgium. In addition to Tanzania, three other countries from the African, Caribbean, and Pacific Community—Burkina Faso, the DRC, and Suriname—have also been selected to participate in the second phase of this program.

This initiative is pivotal for Tanzania as it aligns with the broader objectives of the AfricaMaVal project initiated by the EU. The Africa-EU Energy Partnership (AEEP) was launched in 2007 as a collaborative effort between African and European Heads of State at the AU-EU Summit in Lisbon, Portugal. The AEEP serves as a central partnership of the Joint Africa-EU Strategy, fostering cooperation in the energy sector. Its overarching goal is to facilitate universal access to affordable, sustainable, and modern energy services in Africa, including in rural areas. This is seen as a prerequisite for achieving inclusive development and generating employment opportunities.

Tanzania, as one of the beneficiaries of EU support, is focusing on several key aspects within the AEEP framework. One vital area of investment is in energy infrastructure, particularly in the enhancement of rural energy access. This includes projects such as mini-hydro installations, biogas digesters, and solar systems. Furthermore, investments are directed toward the development of transmission and distribution infrastructure to enhance the overall energy landscape in Tanzania. These efforts are in alignment with the Tanzania Electricity Supply Industry Reform Strategy and Roadmap. This is particularly salient in the context of CRMs as infrastructure constraints are one of the major challenges for the development of this sector.

Additionally, the EU is actively supporting capacity and skills development in the extractive sector, specifically in the oil and gas industry. It is a major contributor to the Tanzanian Extractive Industry Transparency Initiative (EITI), which aims to promote transparency and good governance in the extractive sector. This is crucial for responsible sourcing of minerals and resources in Tanzania.

A noteworthy feature of EU-funded energy projects in Tanzania is its emphasis on productive energy use for job creation. For instance, projects like small-scale hydropower initiatives in the

Southern Highlands and solar-hybrid mini-grids in Lake Victoria are designed to stimulate economic activities and job creation. Moreover, job creation, particularly among women, is promoted through capacity building and the training of professional Energy Auditors and Energy Management Specialists.

Tanzania's inclusion in the OACPS-EU Development Mineral Programme and its alignment with the broader objectives of the AfricaMaVal project demonstrates the EU's commitment to fostering responsible sourcing and sustainable development in the country. These initiatives not only aim to improve the mining sector but also to enhance the overall energy infrastructure, support job creation, and empower marginalized groups such as young people and women, contributing to Tanzania's long-term socio-economic growth.

Additionally, the EU supports research and innovation initiatives in Tanzania. This includes collaborations in areas such as scientific research, education, and technology transfer. Examples of these initiatives are listed below.

- Horizon 2020: The program is one of the world's largest research and innovation initiatives and includes Tanzania amongst other countries. It provides opportunities for Tanzanian researchers and organizations to participate in collaborative projects with EU counterparts in various research areas.

- EDULINK: The program supports higher education, research, and innovation in African, Caribbean, and Pacific (ACP) countries, including Tanzania. It fosters partnerships between the EU and Tanzanian universities and institutions to enhance research and academic cooperation.

- Digital4Tanzania: The support programme aims to enhance employability and entrepreneurship through digital skills development, foster green jobs creation through SMEs development, support Government systems to deliver effective policy development and implementation, and render the business environment more conducive to private sector growth and increase investment and trade.

- Team Europe launched an initiative to support the government, civil society, and private sector in tackling gender-based violence. Proposals also include a green cities initiative which will aim to create green infrastructure, disaster risk reduction and preparedness, local economic development, improved public service delivery and e-governance potential of the ocean and coastal economy and preserving its biodiversity.

Overall, the relationship between the EU and Tanzania at the local and regional levels is multifaceted, covering a wide range of areas from development cooperation to trade, governance, and environmental issues. This partnership is designed to promote economic and social development in Tanzania and enhance regional integration in East Africa.

Existing enabling platforms and networks in Tanzania

- Tanzania Mineral Dealers Association (TAMIDA): an organization focused on promoting ethical practices and responsible sourcing within the mineral trade in Tanzania.
- Tanzania Mineral Audit Agency (TMAA): plays a crucial role in ensuring transparency and accountability in the mining sector. It audits and monitors mineral production, export, and trading to prevent illegal activities and promote responsible sourcing.
- Tanzania Extractive Industries Transparency Initiative (TEITI): part of the global EITI initiative and works to enhance transparency and accountability in the extractive industries, which includes mining.
- Mining Commission of Tanzania: a government agency that regulates and oversees the mining industry. It can influence responsible sourcing through its regulations and policies.
- Tanzania Mineral Dealers Network (TAMDEN): a network of mineral dealers and stakeholders that may promote responsible practices in the downstream mineral trade.
- Tanzania Chamber of Mines: organization represents mining companies in Tanzania and may have initiatives or guidelines related to responsible sourcing.
- Delve: collaborates with various stakeholders, including government agencies, mining companies, and local communities, to develop and implement strategies that prioritize equitable economic benefits, minimize the environmental impact, and uphold human rights standards. Their efforts not only seek to enhance the profitability of the mining sector but also to ensure it positively contributes to the well-being of Tanzanian society and the preservation of its natural resources.

Summarised are some key aspects of the relationship between the EU and Tanzania at the local or regional levels:

Development Cooperation: The EU is one of Tanzania's major development partners. It provides financial support to the country through various development programs and projects. This cooperation focuses on areas such as poverty reduction, healthcare, education, infrastructure development, and good governance.

Trade Relations: Tanzania, along with other countries in the EAC, benefits from the EU's preferential trade agreements. The EAC and EU have a comprehensive Economic Partnership Agreement (EPA) that facilitates trade, promotes regional integration, and supports economic development in the region.

Regional Integration: The EU supports regional integration efforts in East Africa. The EU provides funding and technical assistance to promote economic integration, infrastructure development, and the free movement of goods and people within the EAC.

Economic and Investment Cooperation: The EU promotes investment and economic cooperation in Tanzania. European companies invest in various sectors in Tanzania, and the EU provides support for improving the business environment and attracting more investment to the country.

Human Rights and Democracy: The EU is engaged in promoting human rights, good governance, and democracy in Tanzania. It supports civil society organizations and initiatives aimed at strengthening democratic institutions and the rule of law.

Climate Change and Environmental Cooperation: Tanzania, like many African nations, is vulnerable to the effects of climate change. The EU supports environmental and climate change mitigation and adaptation programs in the country to address these challenges.

Humanitarian Assistance: The EU provides humanitarian aid to Tanzania in times of crisis, such as natural disasters and refugee crises. This assistance helps address immediate needs for food, shelter, and healthcare.

Migration and Mobility: The EU works with Tanzania and other African nations on issues related to migration and mobility. This includes discussions on legal pathways for migration, addressing irregular migration, and supporting the rights of migrants.

Roadmaps, Strategies and Plans

Tanzania, like many African countries, has set forth various roadmaps, plans, and strategies to guide its development, with a focus on the mining sector, which plays a pivotal role in its economic growth and development (Table 17). To understand how these plans relate to the European Union's (EU) twin transition (which aims to transform the EU economy to a greener and more digital model). and responsible sourcing of critical minerals, we must first examine the general points of each plan and discuss their alignment with these broader goals.

Strategy /Plan	Objective(s)	Alignment with the EU's twin transition:	Opportunities
Five-Year Strategic Plan for Mining Commission (2019/20 – 2023/24):	• These objectives primarily focus on HIV/AIDS reduction, anti-corruption measures, improving the contribution of the mining sector to the national economy, ensuring sustainability, and enhancing the capacity of the Mining Commission.	• HIV/AIDS reduction and improved support services reflect a commitment to social responsibility and sustainability, mirroring the EU's focus on responsible sourcing. • Anti-corruption measures align with the EU's emphasis on ethical and transparent practices. • Enhancing the mining sector's contribution to the national economy complements the EU's goal of economic growth through responsible sourcing. • A focus on sustainability and capacity building is in line with the EU's twin transition objectives.	• Opportunities lie in collaboration within the East African Community (EAC) and the Southern African Development Community (SADC) can enable knowledge and resource sharing, joint investment projects, and harmonization of policies to accelerate industrialization and mineral value addition in the region.
Tanzania Development Vision and Long-Term Perspective Plan (2011/12-2025/26)	• These plans emphasize the strategic importance of the mining sector for economic growth, industrialization, and job creation. They also aim to increase revenue generation, promote value addition, and enhance environmental sustainability and governance.	• The focus on industrialization and job creation aligns with the EU's goal of transitioning to a greener and more digital economy. • The emphasis on value addition and beneficiation resonates with the EU's responsible sourcing approach, promoting in- country processing. • The commitment to environmental sustainability and good governance mirrors	• Opportunities here also lie in collaborating with other EAC member states to develop joint industrial projects and share best practices in sectors such as technology transfer, capacity building, and regional industrial development banks.

Strategy /Plan	Objective(s)	Alignment with the EU's twin transition:	Opportunities
		the EU's efforts to ensure responsible and sustainable mineral sourcing.	
National Five-Year Development Plan (2021/22-2025/26)	• This plan seeks to strengthen the management and control of mining, empower small-scale miners, promote mineral value addition and beneficiation, identify rare minerals, and enhance cooperation in the mining industry.	• Strengthening management and control in mining aligns with responsible sourcing practices. • Empowering small-scale miners is consistent with social responsibility. • Promoting value addition and beneficiation resonates with the EU's approach to responsible mineral sourcing. • Identifying rare minerals reflects a commitment to responsible sourcing and sustainable development.	• Opportunities lie supporting ESG practices • Supporting and participating in downstream activities in CRMs required for the twin transition
East African Community (EAC) Industrial Policy and Strategy (2012 - 2032)	• The EAC policy aims to foster economic growth, job creation, and industrialization in the region, with a focus on key sectors such as agro-food industries, leather, and pharmaceuticals.	• By fostering industrialization, the EAC policy contributes to economic growth and aligns with the EU's transition goals. • Promoting technology transfer and capacity building supports the EU's emphasis on a green and digital transition. • Opportunity: Collaborating with EAC partner states to establish regional financial instruments, intellectual property rights regimes, and technology transfer centres to promote innovation and enhance access to financing for industrial projects	• Supporting regional infrastructure and capabilities in CRMs space

Strategy /Plan	Objective(s)	Alignment with the EU's twin transition:	Opportunities
Southern African Development Community (SADC) and African Union (AU) Agreements	• These agreements, including the SADC Industrial Development Policy Framework, RISDP, SADC Industrialization Strategy and Roadmap, Regional Mining Vision, and the AU's Africa Vision 2063 and AIDA, all have broad objectives to promote industrial development and economic growth in Africa.	• These agreements collectively contribute to regional development and growth, which aligns with the EU's goals of responsible sourcing and a green and digital transition.	• Tanzania can engage with SADC member states to explore synergies in infrastructure development, trade facilitation, and the development of regional industrial value chains, considering that some SADC countries also have significant mining sectors.

Table 17: Tanzania's roadmaps, plans, and strategies

Tanzania's plans and strategies related to the mining sector align well with the EU's twin transition and responsible sourcing of critical minerals. They emphasize economic growth, job creation, sustainability, good governance, and value addition, which are all in line with the EU's broader objectives. These plans demonstrate Tanzania's commitment to responsible mineral sourcing and its contribution to regional economic development. Within the CRM value chain, the focus lies primarily in exploration, extraction, and sustainable mining practices, as these stages have the most significant environmental and social implications. National strategies and roadmaps, along with cooperation between ministries and national agencies, are crucial in ensuring responsible sourcing from the earliest stages. The current policy instruments do not relate directly to digitalisation and green technologies.

EU-Africa partnership risks and opportunities

A European-African partnership in Tanzania holds significant potential for enabling responsible sourcing of critical minerals while fostering sustainable development. Existing EU-African collaborations in the country offer promising models. For instance, the European Union has been actively involved in supporting infrastructure development, such as financing the expansion of key transportation networks and energy infrastructure. These investments not only facilitate the development of critical minerals but also create employment opportunities and improve local living standards. Additionally, collaborative efforts between European and African stakeholders have contributed to policy development aimed at ensuring ethical and transparent mineral extraction practices, thereby mitigating environmental and social risks. This partnership also underscores the importance of environmental custodianship by promoting sustainable mining techniques and environmental safeguards, ultimately enhancing Tanzania's capacity to harness its mineral wealth responsibly and in harmony with its natural surroundings. Together, these initiatives demonstrate the potential for EU-African cooperation to promote responsible sourcing and sustainable mineral development in Tanzania.

Opportunities lie across the mining value chain and include:

- Value Chain Integration: Establishing a partnership that covers the entire value chain, from extraction to processing and manufacturing, can create a more resilient and reliable supply chain. Through collaboration, the EU and Tanzania can diversify the supply chain for CRMs, reducing the vulnerability to supply disruptions. This is crucial for ensuring a stable supply of minerals vital to the European technology and green energy sectors.
- Global Leadership in Responsible Mining: Collaborative efforts can position the EU and Tanzania as global leaders in responsible mining and environmental protection, setting the standard for sustainable resource extraction and encouraging other regions to follow suit.

- Research and Innovation: Joint research initiatives can foster innovation in mineral exploration, processing, and recycling, which can reduce the overall demand for critical minerals and promote a circular economy, aligning with the EU's sustainability goals.

However, there are major challenges that will need to be overcome to foster a successful collaboration. These challenges include:

- Geopolitical Competition: The geopolitical landscape often strains partnerships. Major global powers, such as China and the US, are actively engaged in securing CRMs from African countries, such as Tanzania. This competition can result in conflicting interests and strategies between the EU and Tanzania, leading to challenges in forming a united front to address the CRMs issues. Tanzania may be tempted by offers from other global players, making it difficult for the EU to establish a cohesive partnership.
- Lack of Regulatory Frameworks: The absence of comprehensive and harmonized regulatory frameworks for mining and resource extraction in Tanzania poses a significant challenge. These regulatory gaps contribute to issues such as corruption, environmental degradation, amongst others. The EU seeks sustainable and ethical sourcing of critical minerals, making it crucial to address these regulatory deficiencies.
- Environmental Concerns: Sustainable and ethical sourcing of critical minerals is a priority for the EU, with environmental standards and social responsibilities taking centre stage. Tanzania, while recognizing the importance of these principles, often faces resource development dilemmas, as exploiting mineral resources may be a significant source of revenue. Balancing these concerns with environmental preservation and local communities' rights can strain the EU-Tanzania partnership.
- Infrastructure and Technological Challenges: Tanzania often lacks the necessary infrastructure and technological capabilities for efficient mining and processing of critical minerals. The EU may be willing to invest in infrastructure development but coordinating such efforts can be logistically complex and resource-intensive, posing a challenge to the partnership.
- Socio-Economic Disparities: The distribution of the benefits from mining and resource extraction is often uneven. This issue of socio-economic disparities leads to discomfort among local communities. The planned or future extraction and processing of CRMs therefore present an opportunity to address socio-economic disparities by increasing engagement with local communities and governments.
- Infrastructure and Transport Logistics: Securing and transporting CRMs operations, which are often located in remote and logistically challenging areas, can be a formidable

challenge. Poor infrastructure and transport networks can result in delays, higher costs, and supply chain disruptions, making it harder for the EU to access these minerals reliably.

- Long-Term Investment vs. Short-Term Gains: The EU's focus on sustainable and ethical sourcing of critical minerals may conflict with Tanzania's government desire for quick revenue gains. Balancing long-term investments in responsible mining practices with immediate economic needs can be a significant challenge, potentially straining the partnership.

From the research conducted and as indicated in the previous sections of the report, the EU is already in partnership with the Tanzanian government to help with energy and digital transition. With the EU as a committed partner to Tanzania's sustainable and inclusive economic growth, it has invested in multiple sectors of the Tanzanian economy, including Energy, ICT, Mining, Manufacturing, Banking and Finance, Retail and Trade, Agriculture, etc. Through the EU Global Gateway, the government of Tanzania is being supported to achieve green transition and realise its development imperatives. The EU Gateway is an investment package aimed to support Africa's green and digital revolution.

Tanzania has a basket of different critical minerals which can be exploited and manufactured locally to enhance the government's efforts towards energy and digital transition as well as contribute towards economic and human development. The EU already has a CRM strategy and could assist the government of Tanzania with the development of its strategy as a framework. The process of strategy development and the outcome will help the government realise where there are gaps, and the EU will help close those gaps. For instance, the issue of responsible sourcing requires urgent attention, and it can be addressed through the strategy. Infrastructure development also requires attention, and the strategy would map out plans how to address such a need. As a developing country, Tanzania requires a lot of capacity building which the EU could provide. The country's population is predominantly youth, and they need an assortment of capacity building programmes such as skills development including entrepreneurial skills.

7. Opportunities for responsible investments

Investing in Exploration and Mining

One opportunity is investing in exploration and mining of emerging ECRMs such as phosphate, lithium, graphite, REE, PGM, and base metals (copper and cobalt) Tanzania is still under-explored, and the positive prospectivity outlook presents a very attractive investment opportunity in ECRM exploration and mining in Tanzania (

No	ECRM	Geological Prospectivity
1	Phosphate	Deposits available in carbonatites currently not considered.
2	REE	Lucrative exploration investment opportunity in many carbonatites of Tanzania.
3	Lithium	Deposits can possibly be found in the EARS playa lakes brines as over 90% of lithium mining comes from brines in rift systems.
4	PGM	Multi-element deposits are in Layered Ultramafic Complexes of the Ubendian, Usagaran and Mozambican mobile belts.
5	Base Metals (Ni, Cu, Co)	Multitude of exploration targets are in the Nyanzian Rock System in the Lake Victoria goldfields as well as in in the Ubendian-Usagaran-Mozambican mobile belts.
6	Graphite	Occurs in good quantity and quality in the Usagarana and Mozambican mobile belts.

Table 18).

No	ECRM	Geological Prospectivity
1	Phosphate	Deposits available in carbonatites currently not considered.
2	REE	Lucrative exploration investment opportunity in many carbonatites of Tanzania.
3	Lithium	Deposits can possibly be found in the EARS playa lakes brines as over 90% of lithium mining comes from brines in rift systems.
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6	Graphite	Occurs in good quantity and quality in the Usagarana and Mozambican mobile belts.

Table 18: Investment opportunities in exploration and mining

Investing in Processing and Manufacturing of goods and components

ECRMs are in high demand, particularly driven by the hi-tech cyber world of communication and global energy transition which aims to mitigate climate change by meeting zero emission by 2050. The hi-tech industry and energy transition based on readily available ECRM commodities (cobalt, copper, graphite, nickel, PGM, REE, titanium, vanadium) in the Tanzania offer a huge opportunity for investment in the areas highlighted in

t	ECRM	Value Chain activities
nd	Nickel, copper and cobalt	**ECRM to be refined and smelted from:** • Nickel, copper and cobalt from the Kabanga Nickel Giant project and the Bulyanhulu Gold Mine (Copper Proje • Dutwa, Zanzui, Ntaka, Haneti Exploration projects will add on the Cu, Ni Co feed to the smelter and Refiner pla • Titanium and Vanadium Liganga, Maganaga Matitu and Fungoni Heavy Sand Projects offer a smelting and refi
and uring	Graphite	**Products to be manufactured include:** • Production of graphene sheets for use in hi-tech industries (electronics li-ion batteries, cell phones coatings, s the country or abroad. • Production of powder and accessories for the manufacture electric motor brushes, electrodes, cores of nuclea lubricants for various applications. • Factories to manufacture electric motors, Li-ion batteries, electronic gadgets (TV screens, and cell phones).
and uring	Nickel	**Products to be manufactured include:** • Electric wires in various applications and temperature resistant metal and parts for gas turbines. • Core chambers and components in airplanes and rocket engines. • Production of various alloys for various applications.
and uring	Copper	**Products to be manufactures include:** • Manufacture of electric transmission wires (present East African Cables can use locally produces copper metal • Manufacturing of electric motors solenoid copper windings. • Manufacture of power transformers (TANALEC Transformer Factory in Arusha can use copper metal from the • Production of various metal alloys for various applications.
and uring	REE	To follow (depending on availability)
and uring	PGM	To follow (depending on availability)

Table 19.

No	Investment	ECRM	Value Chain activities
1	Smelting and Refining	Nickel, copper and cobalt	**ECRM to be refined and smelted from:** • Nickel, copper and cobalt from the Kabanga Nickel Giant project and the Bulyanhulu Gold Mine (Copper Project). • Dutwa, Zanzui, Ntaka, Haneti Exploration projects will add on the Cu, Ni Co feed to the smelter and Refiner plants. • Titanium and Vanadium Liganga, Maganaga Matitu and Fungoni Heavy Sand Projects offer a smelting and refining opportunity.
2	Processing and Manufacturing	Graphite	**Products to be manufactured include:** • Production of graphene sheets for use in hi-tech industries (electronics li-ion batteries, cell phones coatings, sensors etc.) within the country or abroad. • Production of powder and accessories for the manufacture electric motor brushes, electrodes, cores of nuclear reactors and lubricants for various applications. • Factories to manufacture electric motors, Li-ion batteries, electronic gadgets (TV screens, and cell phones).
3	Processing and Manufacturing	Nickel	**Products to be manufactured include:** • Electric wires in various applications and temperature resistant metal and parts for gas turbines. • Core chambers and components in airplanes and rocket engines. • Production of various alloys for various applications.
4	Processing and Manufacturing	Copper	**Products to be manufactures include:** • Manufacture of electric transmission wires (present East African Cables can use locally produces copper metal). • Manufacturing of electric motors solenoid copper windings. • Manufacture of power transformers (TANALEC Transformer Factory in Arusha can use copper metal from the local market). • Production of various metal alloys for various applications.
5	Processing and Manufacturing	REE	To follow (depending on availability)
6	Processing and Manufacturing	PGM	To follow (depending on availability)

Table 19: Investment opportunities in processing and manufacturing of goods and components (Priority ECRM readily available in the near future (when graphite, copper, nickel and cobalt mines will come on stream)

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7.1. Proposal of projects

7.1.1. Identification of individual exploration, mining, and refining projects

Eight projects were identified in the Tanzania for consideration. These projects are presented in Table 20, which include the need as identified by the owners. The geographical positions of these projects are demonstrated in Figure 15.

No.	Project Name, Country	Main Commodity and by-products	Project Owner	Project need
1.	Bunyu Project, Tanzania	Natural Flake Graphite, both fine and coarse	Volt Graphite Tanzania, subsidiary of Resources Ltd	Financing for development
2.	Grafica Graphite Project	Main Commodity: Graphite, By-product: Gold	Grafica Resources Limited	Potential JV partner for investment and development
3.	Mahenge Graphite Project	Graphite concentrate	Black Rock Mining Limited	Finance for development
4.	Nachu Graphite Project (NGP)	Graphite	Magnis Energy Technologies	The owner prefers to discuss directly with any interested party
5.	Pula Graphite Partners	Graphite	Pula Graphite Partners Tanzania Limited	Financing and technical support for development
6.	Changube Copper Project	Copper, Gold	State Mining Corporation (STAMICO)	JV partner for early-stage exploration
7.	Bahi (Sedimentary) and Sengeri (Igneous) Phosphate projects	Mineral Phosphate	State Mining Corporation (STAMICO)	JV with technical, financial and skills in phosphate exploration
8.	Kyerwa Tin Project	Tin	State Mining Corporation (STAMICO)	JV partner at early-stage of exploration

Table 20: Shortlisted exploration, mining, and refining projects in Tanzania.

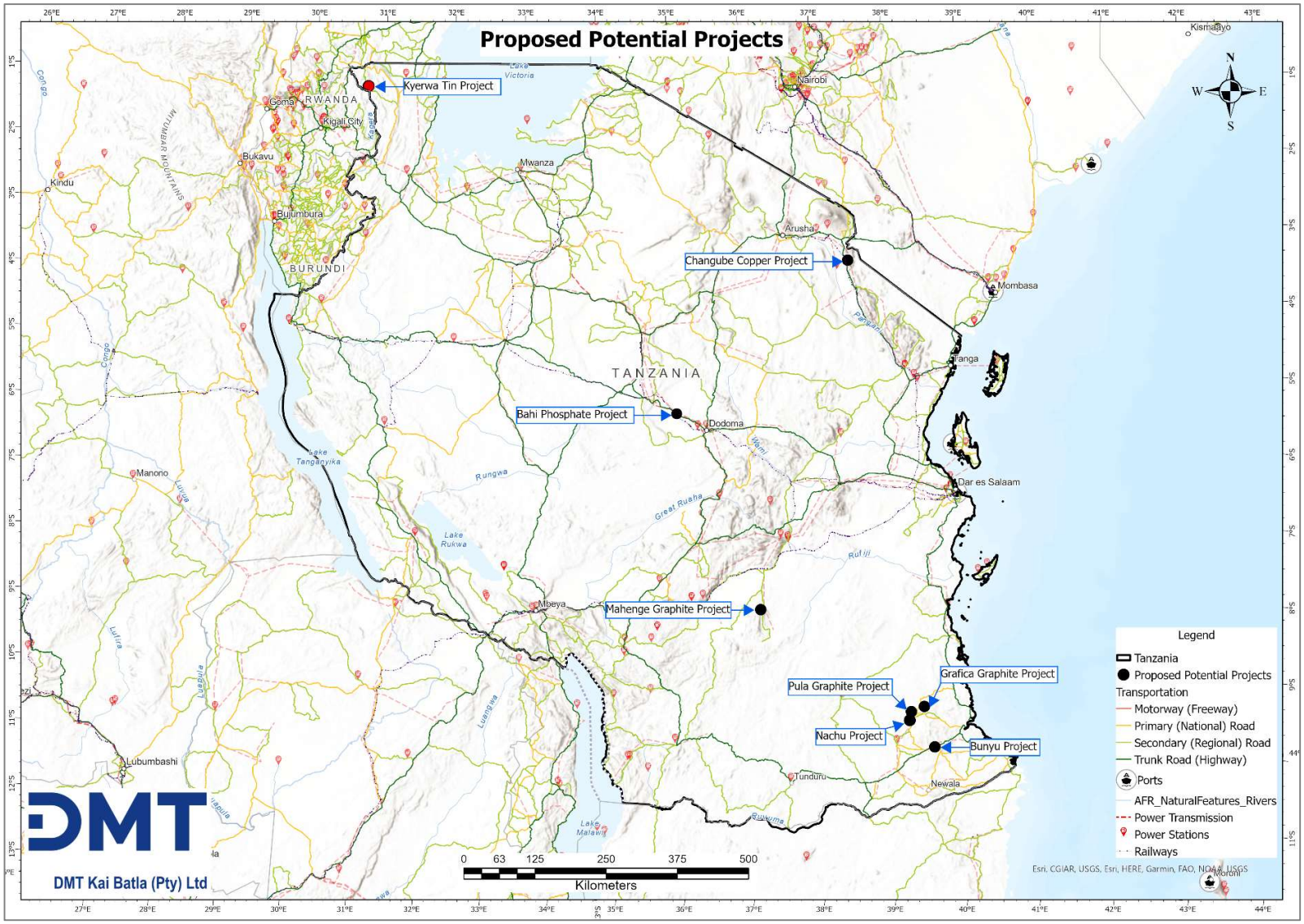

Figure 15: Localities of shortlisted graphite projects in Tanzania.

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7.2. ASM sector country profiles

7.2.1. Country profiles on ASM sector developments and investment

In Tanzania, a large number of small showings of tungsten, tin and copper mineralization is found. Many of which have been mined in the past by small-scale miners going underground or in open pits. In part, these mineral occurrences belong to industrial mining concessions (licence type: mining leases) and the concessions holders buy and resell the production of the artisanal working groups. However, there also exist artisanal mining zones from where the production is directly sold to traders or middlemen. The main obstacles for ASM are the lack of infrastructure, difficult supply to water and the complicated system of commercialization that has multiple stages of governmental involvement.

Because of their structural-tectonic control unknown mineral occurrences for tin and tungsten could be in large anticlines in the roof of granite cupolas. Since Tanzania's known tin and tungsten deposits have proven to be small and low grade there is only a small supply potential for the European market. For the EU, the establishment of business relations to well organized mining companies could provide at best a moderate flow of tin and tungsten concentrates to it.

The development of small graphite and lepidolite mines by ASM that are considered too small for industrial mining could also be an option for EU supply with critical raw materials. The selling of graphite and lithium ore in small lots to Chinese businessperson in Tanzania and East Africa has already proved that there is an economic potential for ASM activities.

The prospectivity of Tanzania for copper mineralization exploitable via ASM is significant and the country already has experience in terms of setting up small-scale copper processing facilities. It would be of interest to evaluate the feasibility of these processing operations in more detail, as a function of formal licensing requirements as well as local supply capacities, logistics and economies of scale.

8. Conclusion

In conclusion, Tanzania presents both opportunities and challenges as a case study for mining investments. On the positive side, the country boasts rich mineral resources, including that of ECRMs, making it an attractive destination for mining investors. The Tanzanian government has taken steps and initiative to create a conducive investment environment, with policies aimed at attracting foreign capital and fostering economic growth.

One of the significant advantages is the abundant natural resources that provide a solid foundation for mining activities. The mining sector has the potential to contribute significantly to Tanzania's economic development, generating revenue, creating jobs, and fostering infrastructure development.

However, alongside these opportunities, there are notable challenges that investors must consider. One of the primary concerns is the regulatory environment, which has experienced changes over the years, creating uncertainties for investors. The government's approach to taxation and regulations can impact the profitability and sustainability of mining projects. Additionally, there have been instances of disputes between the government and mining companies over revenue sharing and other related issues.

Infrastructure limitations, such as inadequate transportation and power supply, pose operational challenges for mining ventures. These constraints can lead to increased costs and delays in project development. Environmental and social issues, including community engagement and responsible mining practices, also require careful consideration when developing ECRMs projects; to ensure sustainable and ethical operations. The Tanzanian government adopts a proactive approach in addressing these challenges and fosters dialogue with stakeholders indicating a willingness to adapt and find mutually beneficial solutions.

In navigating the complexities of investing in Tanzania's mining sector, prospective investors must conduct thorough due diligence, engage in transparent communication with government authorities, and implement robust strategies for environmental and social responsibility. Despite the challenges, the potential rewards of investing in Tanzania's mining sector remain significant, and with careful planning and adherence to best practices, investors can contribute to both the economic development of the country and the sustainable extraction of available ECRMs.

References

African Development Bank, (2021). Rare earth Elements (REE) Value Chain analysis for mineral based Industrialization in Africa. (http://www.indiaenvironmentportal.org.in/files/file/rare%20earth%20elements.pdf)

Bailly, L., Callec, Y., Billay, A., Fullgraf, T., Hyvönen, E., Karinen, T., Konnunaho, J., Thomas, B., Gondwe, F. Mhango, S. and Mtumbuka, H. 2022. Mineral resources of Malawi. GEMMAP Memoir Series. Geological Survey Department, Zomba, Malawi, 357 pp.

Bhadare, S. (2021). Tanzanian nickel deposit project is world's largest (African law business). (https://iclg.com/alb/15624-tanzanian-nickel-deposit-project-is-world-s-largest)

Boniface, N., (2017) Crystal chemistry of pyrochlore from the Mesozoic Panda Hill carbonatite deposit, western Tanzania. Journal of African Earth Sciences, 126 33-44. DOI: https://doi.org/10.1016/j.jafrearsci.2016.11.026

Britannica, (2023b): Rare Earth elements; Website: (https://www.britannica.com/science/rare-earth-element/Minerals-and-ores)

Chesworth, W., Semoka, J.M., Van Straaten, P., Mnkeni, P.N.S, Kamasho, J.A.M., and Mchihiyo, E.P. (1988). Tanzania-Canada Agro-geology Project. Report On Completion of the First Phase No. ARCH IV50650. Ministry of Minerals Dodoma; 98p. (Available at: https://idl-bnc-idrc.dspacedirect.org/bitstream/handle/10625/4859/IDL-4859.pdf?sequence=1)

Champion, D. 2019. Australian Resource Reviews: Tantalum. Geoscience Australia, Canberra. http://dx.doi.org/10.11636/9781925848298

Economic Stability, The United Republic of Tanzania, 2023. Tanzania Investment Centre, https://www.tic.go.tz/reasons/economic-stability

EU, 2023. Tanzania-EU Business Forum: Team Europe raises 1 billion EUR investment in Tanzania. https://www.eeas.europa.eu/delegations/tanzania/tanzania-eu-business-forum-team-europe-raises-1-billion-eur-investment-tanzania_en?s=124

Geological survey of Tanzania, 2015

Government of Quebec, Ministry of Energy and Resources. Natural resources, 'Guide to writing an economic opportunity study and market for processing in Quebec', The Ministry of Energy and Natural Resources of the Government of Quebec, October 2015, p. 1.

Hatibu A. A., Shitindi, M. J. and Marwa E. M. M. (2021). Assessment of Phosphorous Release from Bat Guano with Respect to their use as Organic Fertilizers in Crop Production.

International Journal of Advances in Scientific Research and Engineering, 7(8) 99p. DOI:10.31695/IJASRE.2021.

https://www.eeas.europa.eu/sites/default/files/press_release_got_eu_sign_six_financing_agreements.pdf

https://www.futuremineralsforum.com/

IPPMedia (2023). Nickel smelter to employ 3,000 people from Ngara an Kahama. (Available at: https://www.ippmedia.com/en/news/nickel-smelter-employ-3000-ngara-and-kahama-districts)

International Tungsten Industry Association. 2005. Tungsten Uses http://www.itia.info. Default.asp?page=25

IT (2022). Tanzania - Country Commercial Guide: Mining. https://www.trade.gov/country-commercial-guides/tanzania-mining

Kabanga Nickel Website (2022). Creating Tanzania's mining and benediction champion (Available at: https://tembonickel.com/about)

LISTCORP website, (2022). Completion of Ngualla Project BFS Update. (Available at: https://www.listcorp.com/asx/pek/peak-rare-earths-limited/news/completion-of-ngualla-project-bfs-update-2784791.html)

Lloyds Bank, 2023. Foreign direct investment (FDI) in Tanzania. https://www.lloydsbanktrade.com/en/market-potential/tanzania/investment

Markwitz, V., Maier, W., Gonzalez-Alvarez, I., McCuaig, T.C., Porwal, A. 2000. Magmatic nickel sulfide mineralization in Tanzania: Review of deposits and development of exploration criteria for prospectivity analysis. Ore Geology Reviews Volume 38, Issue 3, November 2010, Pages 139-155

MC (Mining Commission) (2023) Tanzania mining Cadastre Portal. https://portal.madini.go.tz/map/

MC Data (Mining Commission) (2022). Mineral Search results from the Mining Commission. MC, Dadoma

Ministry of Minerals, 2018. Mining (Local Content), GN. No. 3 (cont'd), 75, GOVERNMENT NOTICE NO. 3 published on 10/01/2018. THE MINING ACT, (CAP. 123). https://www.madini.go.tz/media/MINING-LOCAL-CONTENT-REGULATIONS-2018.pdf

MMa (Ministry of Minerals), (2021). Minerals available in Tanzania. https://www.tumemadini.go.tz/uploads/files/Minerals%20Available%20in%20Tanzania.pdf

MMFL (Minjingu Miners and Fertilizer Ltd.) (2023). (Available at: https://minjingumines.com/)

Moye, C.D. and Msabi M.M. (2021). Mineralogical and Geochemical Characteristics of Graphite-BearingRocks at Chenjere Area, South-Eastern Tanzania: Implications for the Nature and Quality of Graphite Mineralization. Tanzania Journal of Science. Tanzania Journal of Science 47(2): 535-551. DOI: https://dx.doi.org/10.4314/tjs.v47i2.11. (Available at: file:///C:/Users/Magdaena/Downloads/207036-Article%20Text-515486-2-10-20210608.pdf)

Mutagwaba, W, Bosco Tindyebwa, J, Makanta, V, Kaballega, D and Maeda, G (2018) Artisanal and small-scale mining in Tanzania – Evidence to inform an 'action dialogue'. Research report, IIED, London. http://pubs.iied.org/16641IIED, ISBN: 978-1-78431-594-8

Mutakyahwa, M.K., Ikingura, J.R. and Mruma A.H, (2003) Geology and geochemistry of bauxite deposits in Lushoto District, Usambara Mountains, Tanzania, Journal of African Earth Sciences, 36, 357-369. DOI:10.1016/S0899-5362(03)00042-3)

NDC (National Development Corporation), (2003). Profile of the Liganga, Vanadium, Titanium, Iron Ore and related minerals Project. NDC, 12p.

Ngcobo, B. and S. Magai, (2020). "Mining in Tanzania: Effects of the mining legal framework overhaul", IMMA Advocates, Dar es Salaam, Tanzania

Ngualla Rare Earths Project, Tanzania. https://www.nsenergybusiness.com/projects/ngualla-rare-earths-project/

Ng'wanakilala, F., 2019. Finance: Tanzania fines Acacia Mining $2.4 mln over alleged pollution. https://www.reuters.com/article/us-tanzania-acaciaidUSKCN1SQ0RA/#:~:text=DAR%20ES%20SALAAM%20(Reuters)%20%2D,running%20tax%20dispute%20with%20Tanzania

OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas (https://www.oecd.org/corporate/mne/mining.htm)

Rasmus Hundsbæk Pedersen, Willison Mutagwaba, Jesper Bosse Jønsson, George Schoneveld, Thabit Jacob, Maisory Chacha, Xiaoxue Weng, Maria G. Njau. Mining-sector dynamics in an era of resurgent resource nationalism: Changing relations between large-scale mining and artisanal and small-scale mining in Tanzania, Resources Policy, Volume 62, 2019, Pages 339-346, ISSN 0301-4207. https://doi.org/10.1016/j.resourpol.2019.04.009.

Saltworks Consultants Pty Ltd (2017). Lithium in Saline Geo-systems: Lake Brines and Clays. Consultancy Report: (www.saltworkconsultants.com). Available at: https://www.saltworkconsultants.com/downloads/29.%20Lithium_saline.pdf)

Semkiwaa, P., Kalkreuth W., Utting, J., Mayagilo, F., Mpanju, F. and Hagemann H. (1998). The geology, petrology, palynology and geochemistry of Permian coal basins in Tanzania. 1. Namwele-Mkomolo, Muze and Galula coalfields. International Journal of Coal Geology, 36(1-2), 63-110. DOI: 10.1016/S0166-5162(97)00020-7

Statement made at the Extended Credit Facility (ECF) 2023 Article IV Consultation with Tanzania, April 2023

Statista (2020). World Graphite Reserves by Country 2020. Statista website (Available at: https://wwww.statista.com/statistics/267367/reserves-of-graphitr-by-country/)

Statista. 2023. African countries with the highest GDP 2021. Available at: https://www.statista.com/

statistics/1120999/gdp-of-african-countries-by-country/ (Accessed April 2023)

Szilas, C., Bender K. C., Msolla, M.M. and Borggaard, O.K. (2008). The reactivity of Tanzanian Minjingu phosphate rock can be assessed from the chemical and mineralogical composition. Geoderma 147 (2008) 172–177. (Available at: https://www.academia.edu/14023893/The_reactivity_of_Tanzanian_Minjingu_phosphate_rock_can_be_assessed_from_the_chemical_and_mineralogical_composition)

Tanzania Bureau of National Statistics. 2021. National Account of Tanzania 2021: Shares of GDP at current prices. Available at: https://www.nbs.go.tz/index.php/en/gross-domestic-product-gdp (Accessed April 2023)

TanzaInvest website (2023d). Nachu Graphite Project Will Supply Anode Active Materials to Tesla. (Available at: https://www.tanzaniainvest.com/mining/magnis-nachu-graphite-will-supply-aam-to-tesla and follow twitter on www.twitter.com/tanzaniainvest)

TanzaniaInvest Website, (2023c) Tanzania Lincense Fungoni Mineral Sands Project (Available at: https://www.tanzaniainvest.com/mining/fungoni-mineral-sands-project-license and follow on twitter: www.twitter.com/tanzaniainvest)

UN (United Nations). 2016. Regional Value Chains in the Mineral Resources Sector: Strengthening Development Linkages from the Mineral Resource Sector Opportunities & Challenges. United Nations Conference on Trade and Development: In ECCAS Countries. Regional Workshop, Brazzaville, Republic of The Congo; 28 - 30 September 2016.

(https://unctad.org/system/files/non-official-document/Congo_28092016_R1_Babafemi_Oyewole_En.pdf)

United Nations Conference on Trade and Development. 2022. World Investment Report 2022: International tax reforms and sustainable investment. New York and Geneva: United Nations

URT (United Republic of Tanzania), (2008b). Industrial Minerals of Tanzania: An Investor's Guide. Ministry of Energy and Minerals, Dar es Salaam. 202p.

URT (United Republic of Tanzania) (2005). Tanzania: Opportunities for Mineral Resources Development. URT, 130p.

Vella, A. 2023. Highlighting mineralized geological environments through a new Data-driven predictive mapping approach. PhD thesis University Orléans, France

World Bank. 2022. Tanzania Economic Update: Clean Water, Bright Future: The Transformative Impact of Investing in WASH – Issue 18. Washington, DC: World Bank

APPENDICES

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Appendix

A. Mining operations, ore deposits and occurrences of ECRMs in Tanzania

Main Commodity	Operation / Exploration / Occurrences	Name & Locality	Element and ore minerals	Geology	Reserves (R) & projected annual production (AP)	Ownership	Licensing	Reference
Bauxite	Occurrence	Magamba (Lushoto District)	Aluminium - Al Gibbsite – Al (OH)3)	Bauxite a weathering product of metamorphic rocks	Reserves: (37Mt @ 66.9% Al2O3 EST. Production 0.12 Mt/annum (est.)	Owned by Lindian Resources of Australia and Operated by Exploration venture 100% owned East African Bauxite Limited	PL 11176/2018, PL 11177/2018, PL 11178/2018	Source: (Mutakyahwa, et. al., 2003; URT 2005, 2008b; GST 2015; MC 2022, 2023; Lindian Renounces Ltd., 2021).
Bauxite	Occurrence	Amani Bauxite (Muheza District, Tanga Region)	Aluminium - Al Gibbsite - Al(OH)3)	Bauxite a weathering product of metamorphic rocks	No reserve estimate; grade: Al2O3 – (40 - 69wt %);	Exploration venture 100% owned East African Bauxite Limited	PL 11262/2019	
Cobalt	Occurrence	Kabanga Nickel (Ngara District)	Linnaeite (Co,Ni)2(Co, Ni, Fe, Cu)S4	Mesopalaeozoic Kibaran Belt associated with mafic/ultramafic intrusions	Co will be a byproduct in a Ni Measured reserves: 13.5Mt @ 2.48% Ni; 0.34% Cu; 0.21% Co. Production/annum (est)	Operated by Tembo Nickel Corporation Company Limited an owned by Kabanga Nickel UK (84%) and URT (16%)	SML 641/2021	Source: (URT, 2005, 2008b; GST 2015; Kabanga Nickel Website, 2022).
Cobalt	Occurrence	Haneti (Kondoa District)***	Cobalt (Co) Associated with Chrysoprase erosion	Ni bearing weathering products of ultramafic rocks to form Co-rich LATERITES	Occurrence of Co in soil anomalous zone of up to 1.08 % Ni and 0.31 % Co	ASM mine chrysoprase for gem purposes	nd	
Copper	Occurrence (Gold Mines (producing copper concentrates))	Bulyanhulu Gold Mine (Kahama District)*	Copper-Cu Chalcopyrite (Fe,Cu)S2 (ore)	Shear hosted Au quartz-vein deposit Greenstone belt) composed of mafic volcanic flows, pyroclastic and ash flows. Argillite are present between the mafic and felsic rocks.	>28.1 Mt @ 11.3g/t Au; 9.38g/t Ag; 0.669% Cu Production: 25,000tpa	Operated by Twiga Minerals Corporation owned by Barrick Inc. of Canada (84%) and URT (16%).	SML 44/99	
Copper	Occurrence (Gold Mines (producing copper concentrates)	Buzwagi Gold Mine (Kahama District)*	Copper –Cu Chalcopyrite (Fe,Cu)S2 (ore)	A fleece hosted quartz vein deposit in a porphyritic granite host rock.	>61.4Mt @ 1.47g/t AU; 0.114% Cu Production: 10,000tpa	Operated by Twiga Minerals Corporation owned by Barrick Inc. of Canada (84%) and URT (16%).	SML 274/2007	Source: (Barrick website 2023a; URT, 2005, 2008b; GST 2015; MC, 2022, 2023; Chamberlain, 2003). Nd =no data.
Copper	Occurrence	Tambi Copper (Mpwapwa District, Dodoma Region)0	Copper –Cu Chalcopyrite FeCuS2	Copper-bearing ferruginous shales and fine sandstones	Reserve unknown Grades 10.25%Cu	Occurrence with ASM mining activities	Several Primary Mining Licenses for ASM	

Main Commodity	Operation / Exploration / Occurrences	Name & Locality	Element and ore minerals	Geology	Reserves (R) & projected annual production (AP)	Ownership	Licensing	Reference
			Bornite				mining activities.	
			2Cu2S·CuS·FeS					
Copper	Occurrence	Lufusi Copper (Mpwapwa District, Dodoma Region)0	Chalcopyrite FeCuS2	Cu sulphides hydrothermal intrusion in metamorphic rocks of the Usagaran syatem	nd	Occurrence with ASM mining activities	Several Primary Mining Licenses for ASM mining activities.	
Copper	Occurrences	Mkwamba old Mine. (Mpanda District); Katavi Region***	Chalcopyrite FeCuS2	Ultramafic massive Ni-Cu sulphide intrusive in high grade metamorphic rocks of the Ubendian mobile belt	Reserves: 1.95Mt @ 0.6%Cu	ASM gold and copper mining activities	Several Primary Mining Licenses for ASM gold mining	
			Gold (Au)					
Copper	Occurrences	Ntaka hill (Nachingweya District)	Chalcopyrite FeCuS2	Ultramafic massive Ni-Cu sulphide intrusive in high grade metamorphic rocks of the Mozambican mobile belt	20.3Mt@0.58%Ni and 16.79% Ni; 2.99% Cu	ASM mining activities in the past now it is a Nickel project	nd	
Copper	Occurrences	Makongolosi Copper (Chunya district, Mbeya Region)0	Chalcopyrite FeCuS2	Proterozoic gneisses and with some mafic intrusive making up the Lupa goldfields mineralization	No reserves known	Gold mining with no Copper mining	nd	
					Grade 0.9% Cu			
Copper	Occurrences	Chimala [Kigugwe] Copper (Mbarari District, Mbeya Region)	Chalcopyrite FeCuS2	Mata –sediments of Buanji gGroupconsists of conglomerates, shales and occasional sandstone	nd	nd	nd	
Copper	Occurrences	North Pare Mountains Copper (Mwanga District, Kilimanjaro Region)0	Chalcopyrite FeCuS2	Chalcopyrite mineral in Meta-sediments Metamorphic rocks of the Usagaran	Grade 13.95% Cu	Evaluated by Eliton Group now inactive with ASM Cu Mining Activity	nd	
REE	Resource	Ngualla REE Project (Mbeya)**	Bastnäsite - Nd(CO3)F	A REE rich weathered Sovite carbonatite rich in bastnasite mineral	21.3 million tonnes (Mt) @4.75% REO, 480 Mt @0.33% Nb2O3	PR NG Minerals, 87.5% ownership by Peak Resources of Australia	SML601/2021	Source: (URT 2005, 2008b; Peak Resources, 2013, 2021; GST 2015; Boniface 2017; Montero Mining & Exploration, 2011; Witt, et. al. 2019; MC 2022, 2023).
			Fluorite - CaF2					
			Flourspar (F)					
			Phosphate (P)					
REE	Resource / Occurrence	Sengeri Carbonatite REE (Mbozi District Mbeya region)	Bastnäsite - Nd(CO3)F	Mg- carbonatite dykes and breccias carbonatites	nd	nd	nd	
			Phosphate (P)					
			REE					
			Flourspar (F)					
REE	Resource / Occurrence	Nakonde Carbonatite REE (Mbeya Rural District)	Bastnäsite - Nd(CO3)F	nd	Mg- carbonatite contains 1500 ppm La+ Ce+ Nd	nd	nd	
REE	Resource	Wigu Hill Carbonatite (Morogoro Region)***	Bastnaesite,	Weathered dolomitic carbonatite (rauhaugite), hydrothermal solutions rich in RARE, Sr, F, Ba and silica.	3.3Mt @2.%REO	Montero Mining and exploration (Canada)	nd	
			Monazite,					
			Ce-Goyazite					
			Fluorite - CaF2					

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Main Commodity	Operation / Exploration / Occurrences	Name & Locality	Element and ore minerals	Geology	Reserves (R) & projected annual production (AP)	Ownership	Licensing	Reference
REE	Resource	Lihogosa Swamp (Njombe District)	Phosphate (P2O5)	Lateralized Apatite-Epidote granite	6-10 times enrichments in the bauxite laterite deposit	nd	nd	
			REEs					
Lithium	Occurrence	Hombolo Li Project (Chamwino District, Dodoma Region)***	Lithium – Li (element)	Li minerals are found in pegmatite of Dodoman Craton granites	No Reserves established	Auroch Resources (Australia)	nd	Source: (URT 2005, 2008b; GST 2015).
			Lepidolite (K(Li,Al)3(Al,Si,Rb)4O10(F,OH)2)		Grade grade of 1.34 % Li20			
			Rubelite (Na(Al,Li)3Al6(BO3)3Si6O12)					
Lithium	Occurrence	Mohanga Li Project (Chamwino District, Dodoma Region)***	Spodumene (LiAl(SiO3)2)	Li minerals are found in pegmatite of Dodoman Craton granites	No Reserves established	Liontown Resources (Australia)	nd	
					Grade 3.3% Li2O			
Lithium	Occurrence	Karagwe Li Occurrence (Karagwe District, Kagera Region)0	Casitterite mineral associated with lithium (li), tungsten (W) and Ttantlum (Ta).	Pegmatites in granites in the karagwe Ankoleana riock system associated with Sn, W and Ta.	nd	nd	nd	
Magnesium	Occurrence	Chambogo	Magnesium – Mg	Magnesite in hydrothermal veins in high grade metamorphic rocks of the Usagara rocks.	Historical production in the late 1980s was approx. 25,000 tons/annum	individual licenses of Christina G Kessy	PL 11473/2020	Source: (URT 2005, 2008b; GST 2015; MC 2022, 2023).
		Same District)	Magnesite (MgCO3)					
Manganese	Occurrence	Manyoro – Katabi region	Finely banded and folded metamorphic manganese-quartz metamorphic rock of the Phanerozoic Ubedian system,	No reserve estimates.	nd	nd		Sources {GST, 2015 & URT, 2005)
				Grades 7% – 20 % MnO				
Manganese	Occurrence	Matamba - Njombe region	Strongly weathered metamorphic-manganese rich rocks grading into lateritic gossan alterations.	No reserve estimates.	nd	nd	Matamba - Njombe region	
				Grades 7% – 13.3% MnO			98°44’48”S : 33°55’12” E	
Manganese	Occurrence	Kibakwe and Bunduku areas in Dodoma	In Usagaran amphibolite hornblende rich metamorohic rocks	nd	nd	nd	Kibakwe and Bunduku areas in Dodoma	
							60° 43’00” S	
							36° 22’00”	
Natural Graphite	Resource (JORC Certified)	Nachu - Ruangwa District, Lindi**	Graphite	-	174 Mt @ 1.4% graphite	100% owned and operated by URANEX Tanzania Limited (Subsidiary of Magnis Resources of Australia)	SML 550/2015	Source: (TanzaniaInvest Website 2020; URT 2005, 2008; GST 2015; MC 2014, MC 2022, 2023;
					AP: 240,000tpa		JORC compliant	
Natural Graphite	Resource (JORC Certified)	Chilalo – Nachingwea, Lindi**	Graphite	-	20 Mt@ 9.9% graphite	100% owned and operated by Ngwena Tanzania Limited)	ML569/2017	
					AP:50,000 tpa		JORC compliant	

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Main Commodity	Operation / Exploration / Occurrences	Name & Locality	Element and ore minerals	Geology	Reserves (R) & projected annual production (AP)	Ownership	Licensing	Reference
						(subsidiary of Graphex Resources Limited of Australia)		Magnis Website 2016; Park and Dodd, 1994)
Natural Graphite	Resource (JORC Certified)	Bunyu -Masasi, Lindi**	Graphite	-	AP:170,000 tpa	100% owned by Volt Graphite Tanzania Limited (subsidiary of Volt Resources of Australia)	ML00648/2018 ML649/2018 PL10718/2015 JORC Compliant	
Natural Graphite	Resource (JORC Certified)	Epanko – Morogoro. Ulanga District, Morogoro region**	Graphite	-	AP:60,000 tpa	100% owned and operated by Tanzgraphite (TZ) Limited (subsidiary of Kibaran Resources Limited of Australia)	ML 548/2015 JORC Compliant	
Natural Graphite	Resource (JORC Certified)	Mahenge – Morogoro**	Graphite	-	(JORC Coded): 88.1 Mt	Company Name (Operator): Faru Graphite Corporation	ML611/2019 ML612/2019	
					Grades: 7.9% Graphite	Partnership (JV): Blackrock Mining Limited (Australia) (84% shares) and the United Republic of Tanzania (16% shares)	JORC Compliant	
					250,000 to 340,000 tpa			
Natural Graphite	Resource (JORC Certified)	Ruangwa – Lindi**	Graphite	-	AP:40,000 tpa	100% owned and operated by Lindi Jumbo Limited (70%) (aa subsidiary of Walkabout Resources Ltd of Australia) and Aly Mbaraka Mohamed (30%)	ML579/2018 JORC Compliant	
Natural Graphite	Resource	Nazareth Ruangwa Project (Ruangwa District - Lindi Region)***	Graphite		AP:40,000 tpa	100% owned and operated by Nazareth Mining Investment Limited of tanzania	ML586/2018 ML587/2018 Avanced Exloration	
Natural Graphite	Resource	PACCO Ruangwa Project (Ruangwa District, Lindi region)***	Graphite		AP:50,000 tpa	100% owned by Pacco Gems Limited of Tanzania;	ML498/2013 ML 499/2013 Advanced Exploration	
Natural Graphite	Resource	Pula Graphite Project (Ruangwa District, Lindi region)***	Graphite		50,000 tpa	100% owned by Pula Graphite Partners Limited of USA;	PL 10332/2014 Advanced Exploration	
Natural Graphite	Resource	Advancement Mahenge Project (Ulanga, Mahenge District)***	Graphite		AP:40,000 tpa	100% owned and operated by Graphite Advancements (Tanzania) Limited (subsidiary of 11Armadale Capital PLC of Au12stralia)	PL10840/2 PL 10846/2016 Advanced exploration	
	Resource		Graphite		AP:50,000 tpa		ML 613/2019	

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Main Commodity	Operation / Exploration / Occurrences	Name & Locality	Element and ore minerals	Geology	Reserves (R) & projected annual production (AP)	Ownership	Licensing	Reference
Natural Graphite		Tanzos Lindi Project (Ruangwa District, Lindi Region)***				100% owned and operated by Tanzoz Ltd of Tanzania	Advanced Exploration	
Natural Graphite	Resource	Dayou Tanga Project (Handeni District)***	Graphite		nd	Dayou Graphite Mining Company Limited (100%)	ML 622/2019 Advanced Exploration	
Natural Graphite	Resource	United Graphite Tanga Project (Handeni District)***	Graphite		nd	United Graphite Mining Company Limited (100%)	ML 625/2019 Advanced Exploration	
Natural Graphite	Resource	East Africa Harmony Tanga Project (Handeni District)***	Graphite		nd	East Africa Harmony Mining Co. Limited (100%)	ML 615/2019 Advanced Exploration	
Natural Graphite	Resource	Tanzgraphite Ulanga Project (Morogoro Ulanga District)***	Graphite		nd	Tanzgraphite (TZ) Limited (100%)	ML 613/2019 Advanced Exploration	
Natural Graphite	Resource	Kilimanjaro Simanjaro Project (Manyara, Simanjiro District)***	Graphite		nd	Kilimanjaro Outdoor Safaris Limited (100%)	PML0007MYR and PML0008MYR ASM Mining activities	
Natural Graphite	Resource	Grafica Ruangwa Project (Lindi Ruangwa District)***	Graphite		nd	Grafica Resources Limited (100%)	ML 498/2013 Advanced Exploration	
Natural Graphite	Resource	Gemini Ruangwa Project (Lindi Ruangwa District)***	Graphite		nd	Gemini Exploration & Mining Services Limited (100%)	ML 524/2014 Advanced Exploration	
Natural Graphite	Resource	Mererani (old mine) (Simanjiro District)***	Graphite		8.8 Mt @ 8.3 wt% (C)	Owned and operated by the Mining Commission as a Tanzanite mine and graphite as a by-product (currently no production of graphite)	ML 490/2013 Advanced Exploration	
Natural Graphite	Resource	Mererani Graphite Exploration Project (Manyara region)***	Graphite		17.7Mt @ 6.5% (C) for 1.15Mt of graphite.	Owned by Ecograph - former Kibaran Resources Ltd. (Australia). Operated by: Tanzgraphite (TZ) Limited (subsidiary of Kibaran)	Pl11082/2017	
Natural Graphite	Resource	Henan Morogoro Project (Morogoro Rural District)***	Graphite		Nd	Henan Yukuan International Mining nvestiment (T) Co. Ltd	ML 644/2021 Advanced Exploration	
Natural Graphite	Resource	Ulanga District			nd	Graphite Advancements (Tanzania) Limited (100%)	ML 648/2021	

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Main Commodity	Operation / Exploration / Occurrences	Name & Locality	Element and ore minerals	Geology	Reserves (R) & projected annual production (AP)	Ownership	Licensing	Reference
							Advanced Exploration	
Nickel	Occurrence	Kabanga nickel (Ngara)**	Nickel (Ni) in Pentlandite (Ni,Fe)9S8	The Kabanga nickel Occurence occurs in mafic/ultramafic intrusions in a meta-sedimentary complex of the Mesopalaeozoic Kibaran Belt	58 Mt @ 2.62%Ni	Tembo Nickel Corporation a 84%:16% JV between Government of Tanzania and Kabanga Nickel of UK	SML 651/2021 JORC Compliant	(URT 2005, 2008; USGS 2006; Goldstream Mining NL, 2002 & 2007; GST 2015; Wilhelmij and Cabri 2016; MC 2022, 2023; Kabanga Nickel website, 2022)
Nickel	Occurrence	Dutwa Occurences (Simiyu)***	Ni, Co	Massive sulfide mafic/ultramafic intrusions in a meta-sedimentary complex of the Nyanzian system	106Mt @0.91%Ni	Evaluated by African Eagle of Australia now put on sale	Inactive advanced exploration	
Nickel	Occurrence	Ntaka Occurence***	Ni	Ultramafic massive sulphide intrusive in high grade metamorphic rocks of the Mozambican mobile belt	20.3Mt@0.58%Ni and 16.79% Ni; 2.99% Cu	Evaluated by Ntaka Nickel Holdings of Australia	Inactive advanced exploration	
Nickel	Occurrence	Haneti Occurence (Kondoa District)***	Ni, Co, Cu	Ni Laterites derived from ultramafic rocks		Operated by Power Metal Resources (Tanzania) and owned by Katoro Gold LC (UK)	exploration	
Nickel	Occurrence	Kapalagulu (Kasulu District)***	Ni, Co, Cu PGM (Pt & Pd)	A sheared serpentinised Ultramfic intrusive composed of norite, dunite, harzburgite, and gabbro rocks.	20 Mt 0.7 % Ni and 0.4 % Cu and 0.3 % Ni and 0.1 % Cu in the base rock.	Massive Nickel Tanzania Limited (100%)	PL 11724/2021 Exploration	
Nickel	Occurrence	Zanzui Bariadi District)***	Ni, Co	Ultramafic intrusions in the Nyanzian metamorphic metasediments	27.1Mt resource at 0.81% Ni and 0.06% Co	Owner: Archer Exploration Corp (Canada)	Advanced exploration	
Nickel	Occurrence	Luwumbu (Makete District)***	PGE in massive sulphide intrusions Gold (Au)	Ultraamfic layered Intrusives of the Ubendian system. PGE occur in Massive sulphides	No reserve estimates Grade 1.49g/t Pt; 3.85g/t Pd PGE+Au5.1g/t	Massive Nickel Tanzania Limited Evaluated by Goldstream NL and Lonmin in the 2000.s and then it became inactive	Exploration	
Niobium	Occurrence	Panda-Hill deposit (Songwe)**	Niobium - Nb	Carbonatite intrusion in fenitised Proterozoic gneiss and granulite rocks	Nb reserve, P resource (480 Mt@0.33Nb2O5 wt.-%P2O5)	Panda Hill Tanzania Limited (PHT), which is a 50:50 JV between Cradle Resources, and Tremont Investments (Tremont)	ML 237/2006	(URT, 2005, 2008; Boniface 2017; GST 20015; Cradle Website, 2015a&b; MC 2022, 2023)
			Pyrochlore (Nb2P2O5)		And		ML 238/2006	
			Flourspar (F)		178Mt @ 0.5% Nb2O5.		ML 239/2006	
			Phosphate (P)				JORC Compliant	
Niobium	Occurrence	Gallapo Carbonatite (Mbulu District, Arusha Region)	Niobium - Nb Pyrochlore (Nb2P2O5)	Braciated carbonatite and soviet surrounded by fenite tuff and conglomerate	40Mt @0.12% Nb2O5 40Mt @8% P2O5	nd	Nd occurrence	

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Main Commodity	Operation / Exploration / Occurrences	Name & Locality	Element and ore minerals	Geology	Reserves (R) & projected annual production (AP)	Ownership	Licensing	Reference
			Phosphate (P)					
Niobium	Occurrence	Nachendezwaya (Nbeya Rural District)	Niobium - Nb Pyrochlore (Nb2P2O5)	Alkaline complex with soviet core associated with apatite	43,484t @0.03% Nb2O5 51Mt @8% P2O5	nd	Nd Eploration	
PGM	Reserves	Kapalagulu (Uvinza Districts)	PGE in massive sulphides (petlandite, chalcopyrie and cubanite)	The Kapalagulu Intrusion is composed of ultramafic, igneous rock. The rock contains olivine minerals massive Sulfide Succession.	No reserve estimates Grade 1.75g/t Pt.; 3.25g/t Pd PGE+Au5.1g/t	Massive Nickel Tanzania Limited	PL 11724/2021 Exploration	(Goldstream, 2003&2007; URT 2005, 2008; GST 2015; MC 2022, 2023; Wilhelmij and Cabri 2016).
PGM	Reserves	Luwumbu Makete District)***	PGE in massive sulphide intrusions	Ultraamfic layered Intrusives of the Ubendian system. PGE occur in Massive sulphides	No reserve estimates Grade 1.49g/t Pt; 3.85g/t Pd PGE+Au5.1g/t	Massive Nickel Tanzania Limited	Exploration	
PGM	Reserves	Mibangu PGM Project*** (Kasulu District, Kigoma Region)	Ni, PGM, Co, Cu, Au	Ultramafic layered Intrusives of the Ubendian system. PGE occur in Massive sulphides	No Reserve estimates Grade: 0.57m @ 7.1%Ni, 7.4g/t Pt+Pd+Au, 1.1%Cu and 0.25%Co.	Evaluated by Goldstream NL and Lonmin in the 2000.s and then it became inactive	Exploration	
Phosphate Rock	Mine	Minjingu Phosphate Mine*	Phosphate Rock (P2O5)	Bird uano deposit of accumulated excrement and remains of birds. Composition is Phosphorous Pentoxite (P2O5) – Rock Phosphate.	Phosphate Grade 28% , P2O5 and CaO 36% Production per year: 100,000 MT	Minjingu Mines & Fertiliser Limited (MMFL)	ML 129/2002 Mine	GST, 2015, URT, 2005 & Szilas, et al. 2008, Chesworth, et al. 1988; Boniface, 2017; Hatibu et al. 2021.
Phosphate Rock	Occurrence	Sukumawera Phosphate (Mbozi District, Songwe Region)0		Bat guano accumulation in limestone (travertine) caves at Sukaumawe caves	Unknown reserves with a 26% - 38% P2O5 grade	nd	Nd Occurrence	
Phosphate Rock	Occurrence	Zizi Carbonatite Phosphate (Zizi, Morogoro)	Phosphate (P) REE	Phosphate is found as Fluorapatite Ca5 (PO4)3F in within breccia of a CARBONATITE intrusion.	57mt @7.38 P2O5 no estimate of production rate	nd	Nd Occurrence	
Phosphate Rock	Occurrence	Mbalizi Carbonatite Phosphate (Mbalizi, Mbeya Urban)0	Phosphate (P) Niobium (Nb)	A sorvite rich CABONATITE associated with Apatite - Ca5[PO4]3(OH,F,Cl) (Phosphate, Nb)	nd	nd	Nd occurrence	
Tin	Occurrence	Kyerwa, Kagera region	Tin - Sn Cassiteritte (SnO2) Tung stein -Wofromite (WO4)	Pegmatite, pneu-matolytic formations in granites and hydrothermal Karagwe-Ankolean ti Occurences associated with tungsten (W) and lithium (Li) metals	No reserve estimates Grade: 0.2%-0.3% Sn	Kyerwa Tin Company Limited (a subsidiary of STAMICO) in Collaboration with Artisanal and small-scale miners)	A number of Primary Mining Licences (PMLs)	(URT 2005, 2008; GST 2015; MC 2022, 2023; Pirjano, 19926; Prasad, 2006; Guilbert, and Park, 2007).
Tin	Occurrence	Muleba and Kyetwa Districts	Tin - Sn Cassiterite (SnO2) Tung stein -Wofromite (WO4)	Pegmatite, pneu-matolytic formations in granites and hydrothermal Karagwe-Ankolean ti Occurences	No reserve estimates. Grade: 0.2%-0.3% Sn	Upsilon Tanzania Limited (100%)	PL 11672/2021 PL 11673/2021	

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Main Commodity	Operation / Exploration / Occurrences	Name & Locality	Element and ore minerals	Geology	Reserves (R) & projected annual production (AP)	Ownership	Licensing	Reference
				associated with tungsten (W) and lithium (Li) metals				
Titanium	Occurrence	Ludewa (Associated with the Liganga iron Ore resource)**	Iron ore Fe - Titanium – Ti	Titano-Magnetite: Magnetite Fe2O3 (with up to 6 % Ilmenite TIO2) formed in a titan- ferrous meta-anorthosite intrusion of the Ubendian system.	1.2 billion tons @ 13%TiO2, 0.4%V2O5; 50% Fe2O3.	Tanzania China International Minerals Resources Limited (TCIMRL) Company Limited a JV company URT (20%) and Sichuan Hongda Company of China (80%)	SML 533/2014	(NDC 2003, 2021; URT 2005, 2008a&b; GST 2015; MC 2022, 2023); (Pirjano, 19926; Prasad, 2006; Guilbert, and Park, 2007).
		Titanium - Ti	Vanadium – V		Planned production capacity 1-2 Mt/annum of Fe steel; 175,400 t/annum Ti concentrates and 5,000 t/annum V concentrates		SML 534/2014 JORC Compliant	
Titanium	Occurrence	Ludewa (Associated with the Maganga Matitu iron Ore resource)***	Titanium – Ti		nd	Government property under NDC (being tendered)	Nd	
			Vanadium - V				Advanced Exploration	
Titanium	Occurrence	Fungoni (Dar es salaam)**	Titanium - Ti in form of Rutile minerals (TiO2) and Ilmenite minerals (FeTiO3)	in Total Heavy Minerals (THM) along the Indian Coastline	12.3Mt @3.9% THM; 22Mt @ 2.8% THM	Operator a JV company:	Nd	
		The Tanzania Indian Ocean coastline				Nyati Minerals Limited (Tanzania)	JORC Compliant	
		(Tanga Coastline region				Owners: Strandline Resources Ltd. (Australia) (84%), URT (16%)		
		Bagamoyo Coastline region						
		Dar es Salaam coastline						
		Mtwara Coastline region)						

B. Minerals Administration under the Mining Act

	Prospecting Licence (PL)	Gemstone Prospecting Licence (GPL)	Special Mining Licence (SML)	Mining Licence (ML)	Primary Mining Licence (PML	Primary Processing Licence (PPL)	Processing Licence	Smelting Licence; Refining Licence	Dealers Licence; Brokers Licence	Lapidary Licence
State Agency	State Mining Corporation (STAMICO), a wholly owned Government enterprise under the Ministry of Minerals established by the Public Corporation Act CAP 257 through State Mining Corporation Establishment Order No. 163 of 1972 as amended in 2014.									
Description	prospecting licence for metallic minerals, energy minerals, gemstone excluding kimberlitic diamond, kimberlitic diamond, industrial minerals or building materials	For Large scale mining with capital investment not less than US$100M		For medium scale mining with capital investment between US$100,000 & US$ 100M	SSM with minimal machinery/technology with capital investment less than US$ 5M	Issued conduction of ball mill or sluicing operations in SSM	For persons not entitled to process minerals in any area within or outside a mineral right area	Issued to any person who wishes to smelt or refine minerals	For dealing in Gold, metallic minerals, coloured gemstones, diamond, coal, industrial minerals & building materials.	Issued in two categories: large lapidary licence and small lapidary licence issued for gemstones only
Special considerations	PML for gemstones may be granted in an area subject to PL for minerals other than gemstones	Issued upon approval by the Cabinet		ML or PML for building materials granted in area for other minerals;						

	Prospecting Licence (PL)	Gemstone Prospecting Licence (GPL)	Special Mining Licence (SML)	Mining Licence (ML)	Primary Mining Licence (PML	Primary Processing Licence (PPL)	Processing Licence	Smelting Licence; Refining Licence	Dealers Licence; Brokers Licence	Lapidary Licence
				ML for Gemstones & PML granted only to Tanzanians Where special skills are required a non-citizen with <50% share may be allocated Gemstone ML						
		Govt shall have 16% free carried interest & may acquire up to 50%								
Size of area	300 km^2	5 km^2 (gemstones & building materials)	70 km^2 for superficial deposits, 35 km2 for non-superficial	10 km^2 or 1 km2 for building materials & gemstones	10 Ha or 5 Ha for gemstones	N/A	N/A	N/A	N/A	N/A
Fees Payable	Fees and rent payable for all licences are attached as Appendix 1									
Period	4 years – Initial	Life of ore body – as indicated in feasibility study report		10 years – Max;	7 Years – Max;	1 Year	10 years – Max;	25 years – Max;	12 months; Expires on 30th June of each year	5 Years for Large Lapidary; 12 months for small Lapidary
Renewal & Transferability	3 years – 1st Renewal; 2 years – 2nd Renewal; Not renewable after 2nd period of renewal; Renewal within one year before the expiry date;	Renewable; Renewal application 1-year before expiry date; Renewal period not exceeding life of remaining orebody.		Renewable Renewal application in six months before the expiry date; Renewal period not exceeding 10 years;	Renewable Renewal within three months before the expiry date.	Renewable	Renewable	Renewable	Renewable Renewal within one month before expiry date	Renewable
		Mineral rights may be transferred; Holder may apply for area enlargement								
Rights & Obligations	Report on discovery; Adhere to program & expenditure; Prepare & implement Local Content Plan	Employ & train locals; Prepare & update closure plan; Implement RAP; May amend mining & training programs;		Protect environment; Implement RAP; Employ & train locals; Implement local procurement plan;	Prospect & mine in the area; Sell mineral to broker or dealer; Prepare & implement Local Content Plan		Terms and conditions prescribed in licence.		Buy or acquire minerals from the Mineral & Gem Houses; Sell or dispose of minerals as specified in the licence; export minerals specified in the licence	Buy minerals specified in Licence; Undertake value addition; Operate 10 – 30 machines; Transfer skills to locals;

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	Prospecting Licence (PL)	Gemstone Prospecting Licence (GPL)	Special Mining Licence (SML)	Mining Licence (ML)	Primary Mining Licence (PML	Primary Processing Licence (PPL)	Processing Licence	Smelting Licence; Refining Licence	Dealers Licence; Brokers Licence	Lapidary Licence
		Prepare & implement Local Content Plan		Prepare & implement Local Content Plan						Keep & maintain accurate records.
		Keep records required under the law at registered official address in Tanzania; Submit operations information quarterly; File annual returns on efforts to enhance performance of the Tanzanian economy								
Restrictions	Cannot remove any mineral from the area without consent;	**<u>For an Individual:</u>** Must be over 18 years Must be citizen of Tanzania or has been ordinarily resident for a period of four years; Not un-discharged or declared bankrupt; Not convicted of dishonesty in the last 10 years. **<u>For a Company:</u>** Has established physical & postal address in the Country; Is incorporated in country or operates Mining Licence; Not in liquidation unless liquidation is for amalgamation; No director who is disqualified under the Mining Law. **<u>General:</u>** Apply for certificate to surrender land; Apply for certificate to abandon land; Won minerals stored on site < 5 days before moving to Government Mineral Warehouse under Govt supervision; All won raw minerals to be mined, sorted, and valued in presence of Mines Resident Officer, an Officer of Tanzania Revenue Authority & relevant state organs. Government have lien in all mineral concentrates; To give procurement preference to goods produced in Tanzania; To prepare a goods & services procurement plan for 5 years;					Set aside certain amount of minerals to process in country;		Issued only to person qualified for issue of PML; No criminal offence relating to buying and selling or possession of mineral or minerals; Brokers can buy or acquire gold or gemstones in designated buying station; Brokers not authorized to export any mineral or minerals.	Applies to Gemstones only; Large Lapidary Licence issued only to person qualified for issue of PML or has >25% shares in Company; Renewal

	Prospecting Licence (PL)	Gemstone Prospecting Licence (GPL)	Special Mining Licence (SML)	Mining Licence (ML)	Primary Mining Licence (PML	Primary Processing Licence (PPL)	Processing Licence	Smelting Licence; Refining Licence	Dealers Licence; Brokers Licence	Lapidary Licence
		prepare a credible corporate social responsibility plan annually; to comply with the integrity pledge.								
	Cumulative licence area < 2000km^2;		Issued if not in default of the PL obligations;		Application to include a local content plan;				No person is eligible for grant of a licence as a broker or dealer in uranium minerals	
Work Commitments	Commence operations within three months; Adhere to prospecting programme appended to prospecting licence; Expend on prospecting the amount prescribed; Submit prospecting records quarterly;	Start mining in 18 months Demarcate & keep area demarcated; Submit annual financial report;		Start mining in 18 months Demarcate & keep area demarcated;						

Special rules for SSM	May convert Primary Mining Licence or licences to a mining licence; Primary Mining Licence allocation in designated areas are allocated according to provisions provided in the Regulations; Application for licence should contain environmental investigations and social study and an environmental protection plan; Primary Mining Licence for sand and other fast depleting building materials shall be valid for a period of one year and may be renewed; When PML is converted to ML the remaining period on PML is not considered.
Gender Issues	A Training & Employment programme that considers gender, equity, persons with disabilities, host communities and succession plan should be prepared by mineral rights holder.
Skills Development Issues	Prepare a detailed programme for recruitment and training of Tanzanians with 12 months of grant of licence; Programme to show commitment to reserve adequate practical training opportunities to students from local training institutions; Submit report on the execution of the recruitment & training programme annually;
Research and Development Issues	One of the functions of the Mining Commission is to promote and conduct research and development in the mineral sector that will lead to increased Government revenue; Among the functions of Tanzania Geological Survey is to collect, arrange and maintain geo-scientific books, records, publications, rock or mineral or fossil or core samples for research, learning and future reference.
Environmental Principles and Liabilities	All licence holders to comply with environmental principles and safeguards prescribed in the Environmental Management Act and other relevant laws; Licence holders are liable for pollution damage without regard to fault; Licence holders and contractors may not claim compensation for damage caused by pollution against a person exempted from liability, except where such person acted willfully or negligently.

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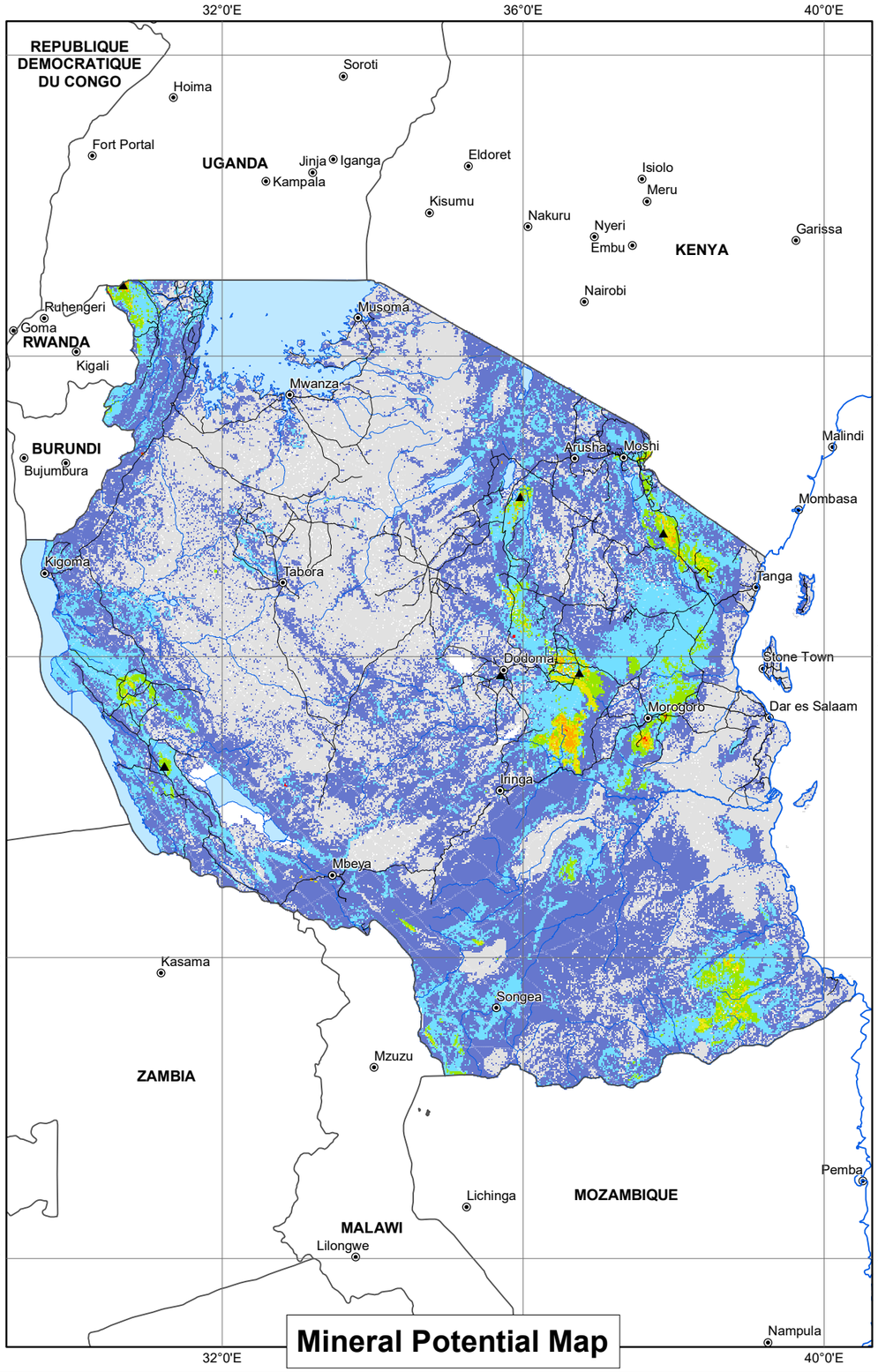
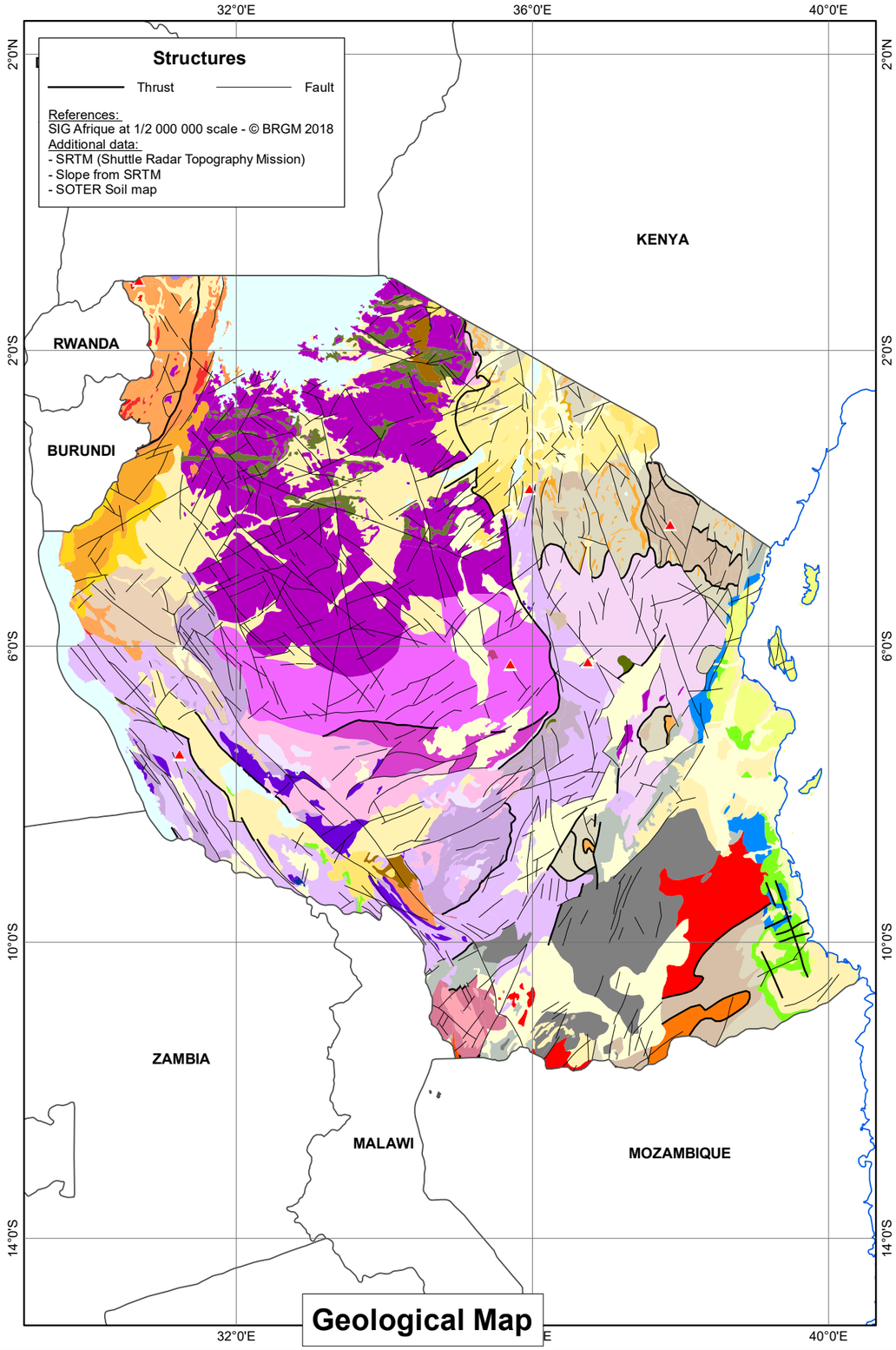
Country: TANZANIA

MINERAL POTENTIAL MAP - *BERYLLIUM (Be)*

Africa MaVal



Mineral Potential Map



Geological Map

Structures

Thrust — Fault

References:
SIG Afrique at 1/2 000 000 scale - © BRGM 2018
Additional data:
- SRTM (Shuttle Radar Topography Mission)
- Slope from SRTM
- SOTER Soil map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

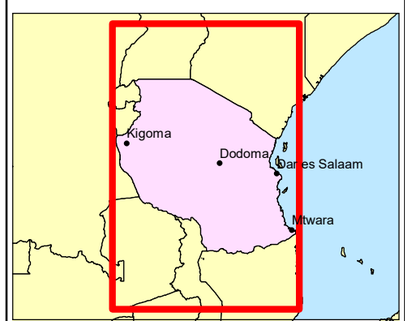
Known occurrences

Beryllium (Be)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 219950 99.54% Non-occurrence in database Non-occurrence predicted	False positive Cells: 956 0.43% Non-occurrence in database Occurrence predicted
False negative Cells: 1 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 63 0.03% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.54
Cell size: 2000 m



N 0 100 200 400 Km

Datum : WGS84 (World Geodetic System 1984)

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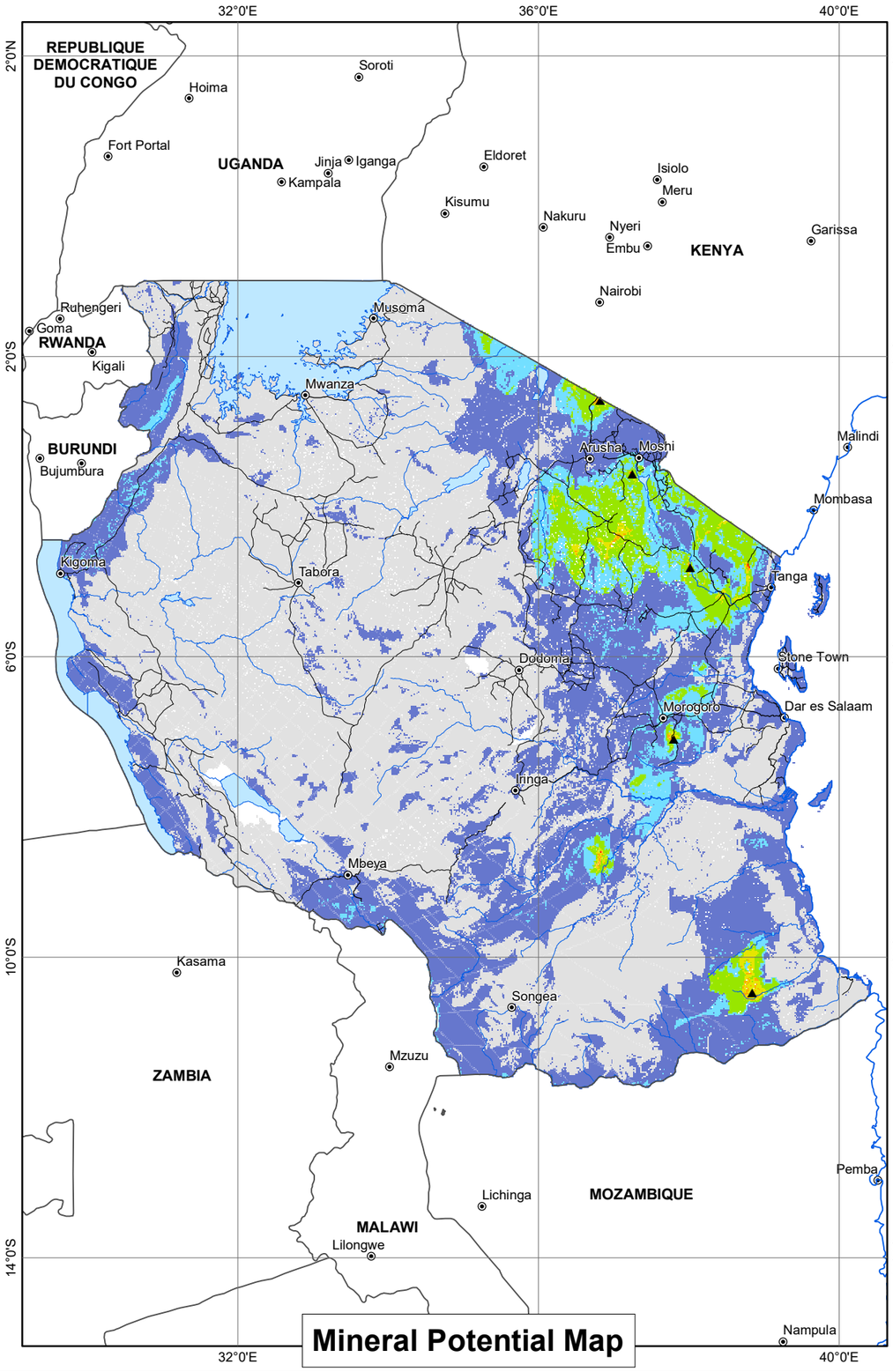
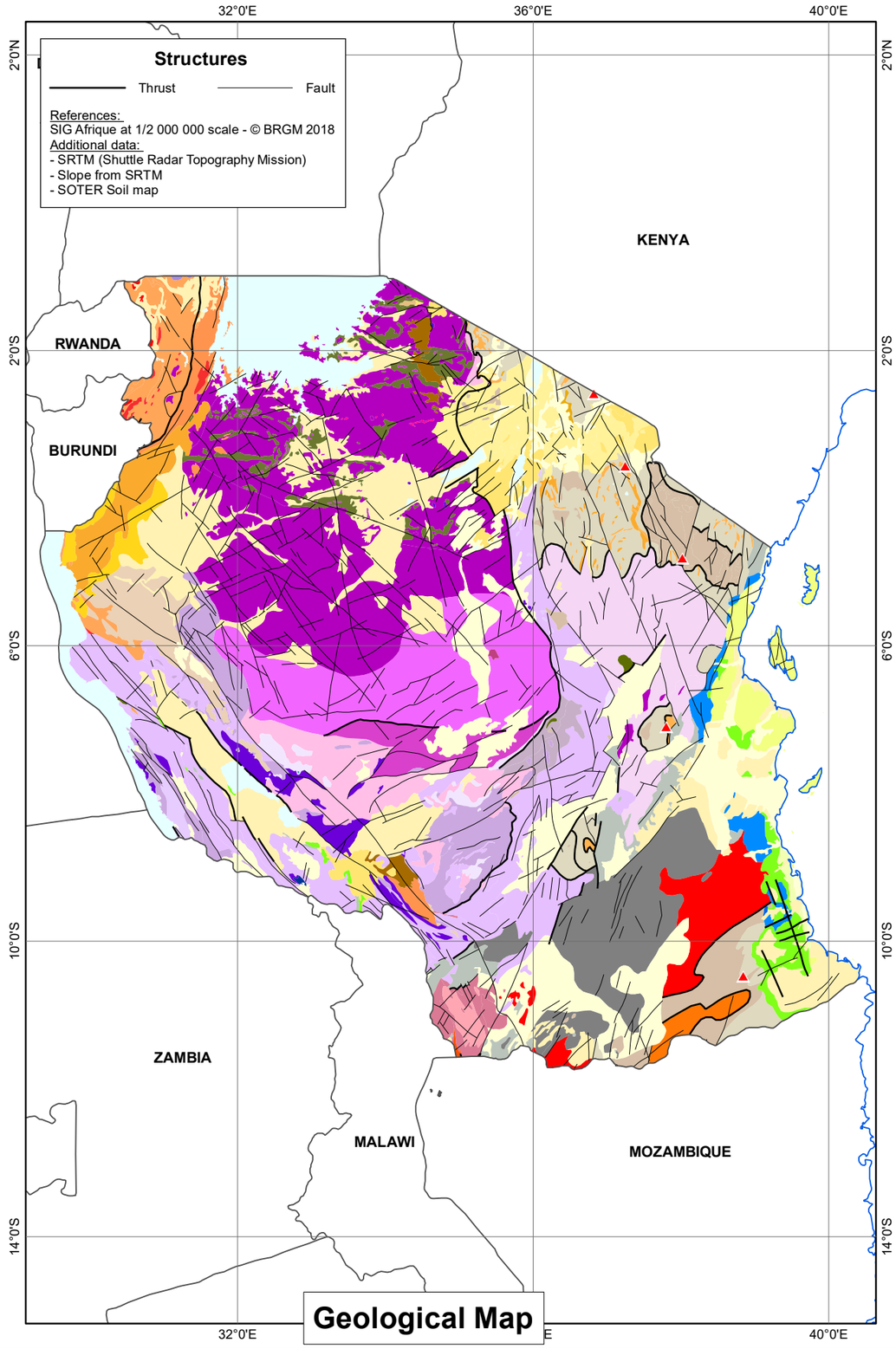
Country: TANZANIA

MINERAL POTENTIAL MAP - *GRAPHITE (Gr)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

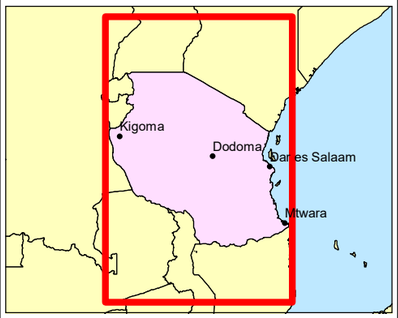
Known occurrences

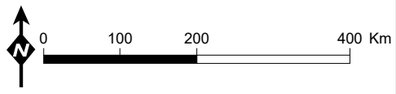
▲ ▲ Graphite (Gr)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 220877 99.96% Non-occurrence in database Non-occurrence predicted	False positive Cells: 68 0.03% Non-occurrence in database Occurrence predicted
False negative Cells: 0 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 25 0.01% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.65
Cell size: 2000 m





Datum : WGS84 (World Geodetic System 1984)

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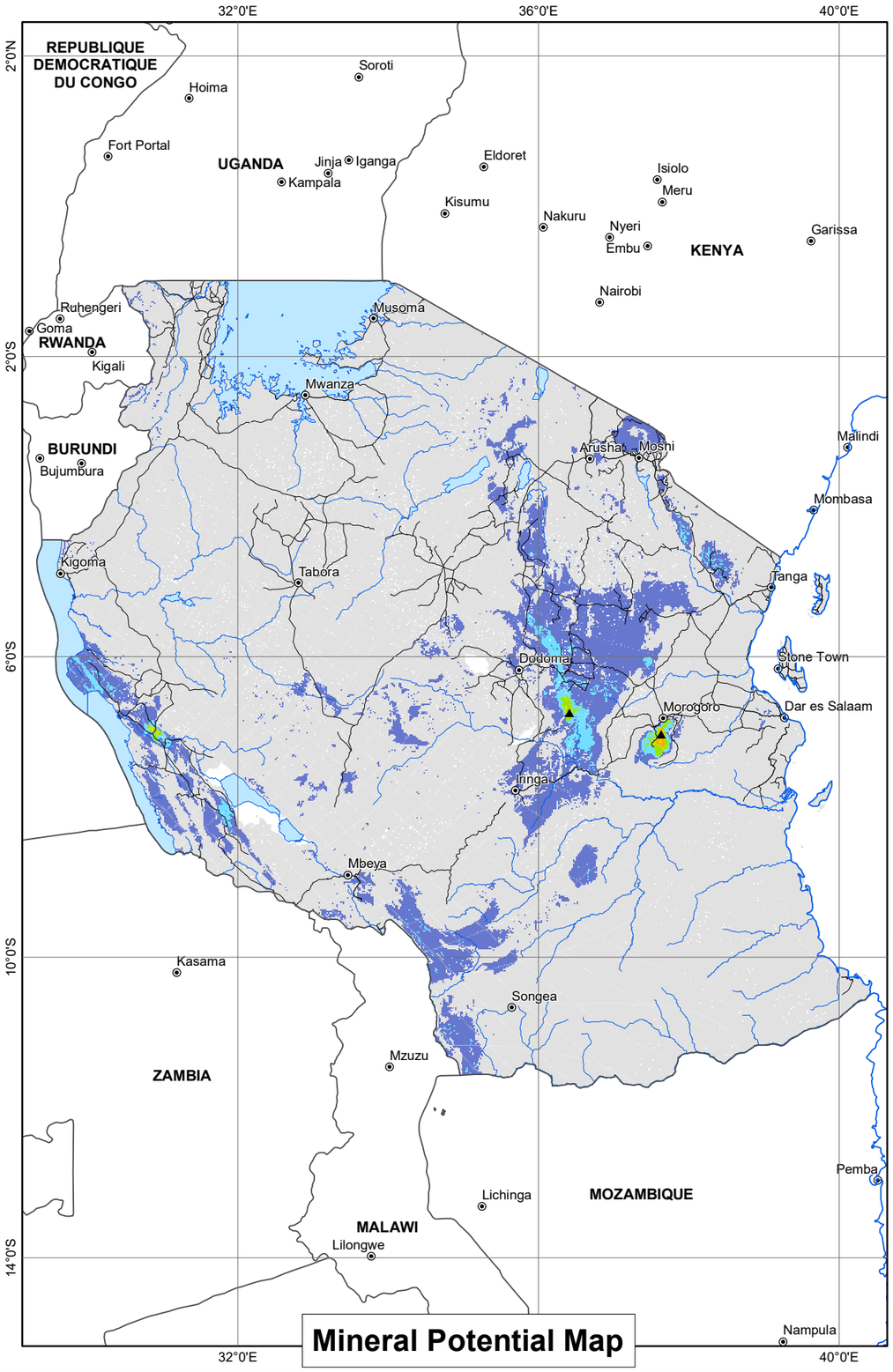
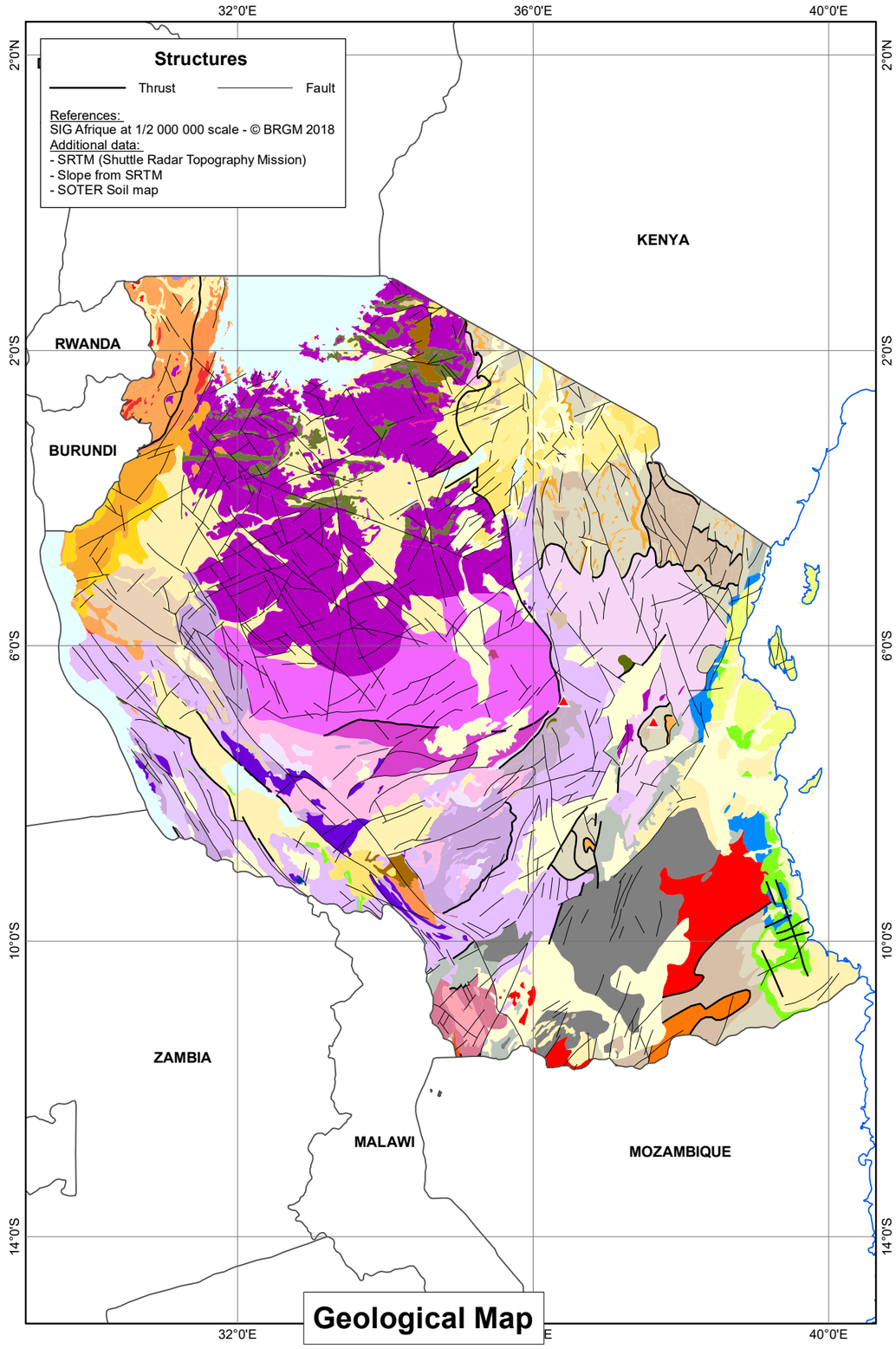
Country: TANZANIA

MINERAL POTENTIAL MAP - *MANGANESE (Mn)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

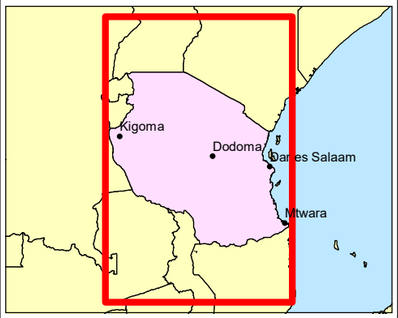
Known occurrences

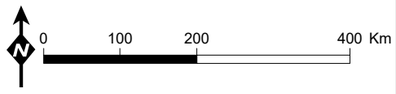
▲ ▲ Manganese (Mn)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 220960 100.00% Non-occurrence in database Non-occurrence predicted	False positive Cells: 1 0.00% Non-occurrence in database Occurrence predicted
False negative Cells: 1 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 8 0.00% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.71
Cell size: 2000 m





Datum : WGS84 (World Geodetic System 1984)

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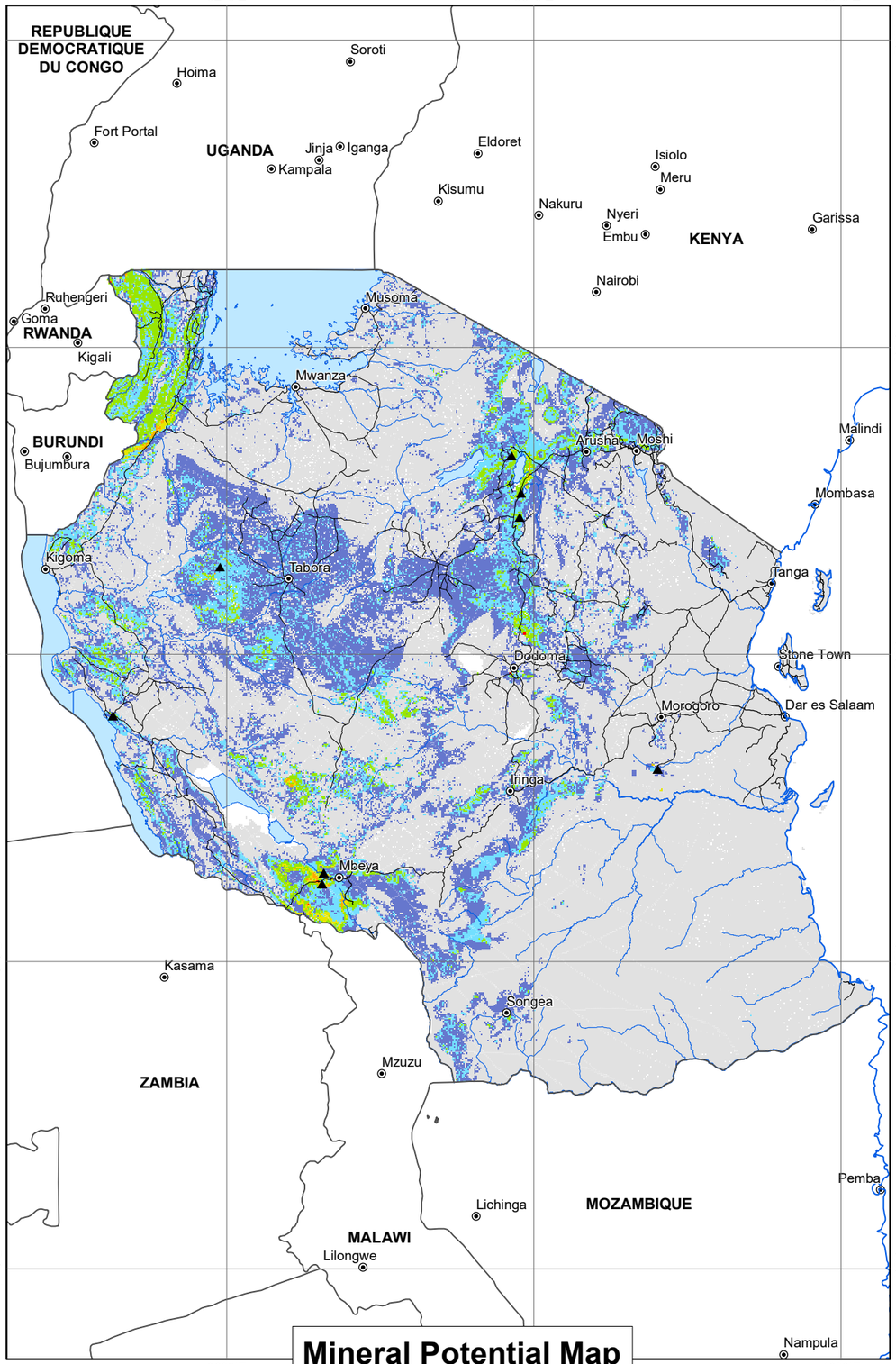
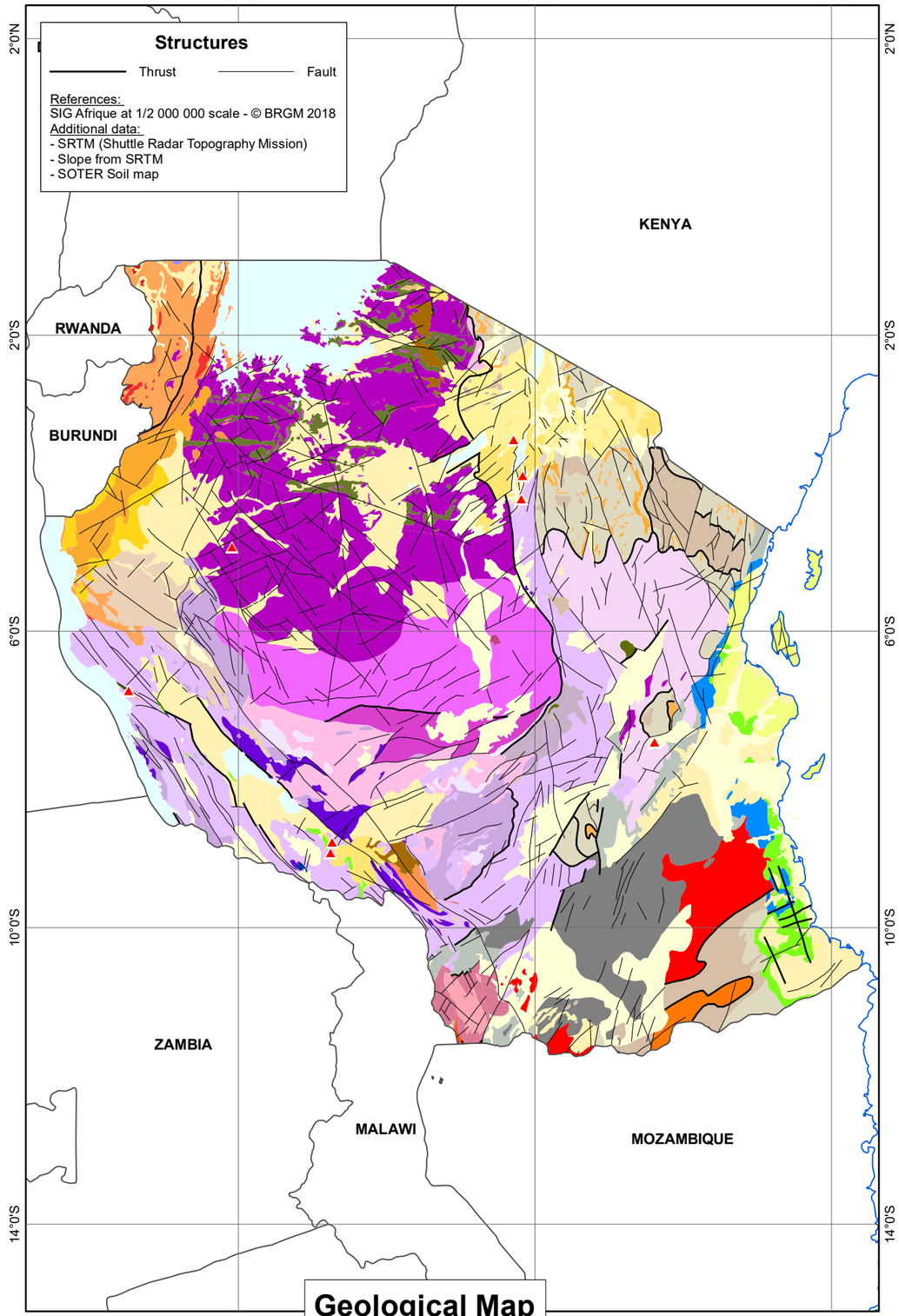
Country: TANZANIA

MINERAL POTENTIAL MAP - *NIOBIUM (Nb)*

Africa MaVal



Mineral Potential Map



Geological Map

Structures

Thrust — Fault

References:
SIG Afrique at 1/2 000 000 scale - © BRGM 2018
Additional data:
- SRTM (Shuttle Radar Topography Mission)
- Slope from SRTM
- SOTER Soil map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

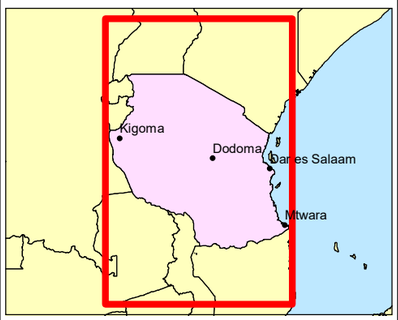
Known occurrences

▲ ▲ Niobium (Nb)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 220157 99.63% Non-occurrence in database Non-occurrence predicted	False positive Cells: 763 0.35% Non-occurrence in database Occurrence predicted
False negative Cells: 0 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 50 0.02% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.43
Cell size: 2000 m



N 0 100 200 400 Km

Datum : WGS84 (World Geodetic System 1984)

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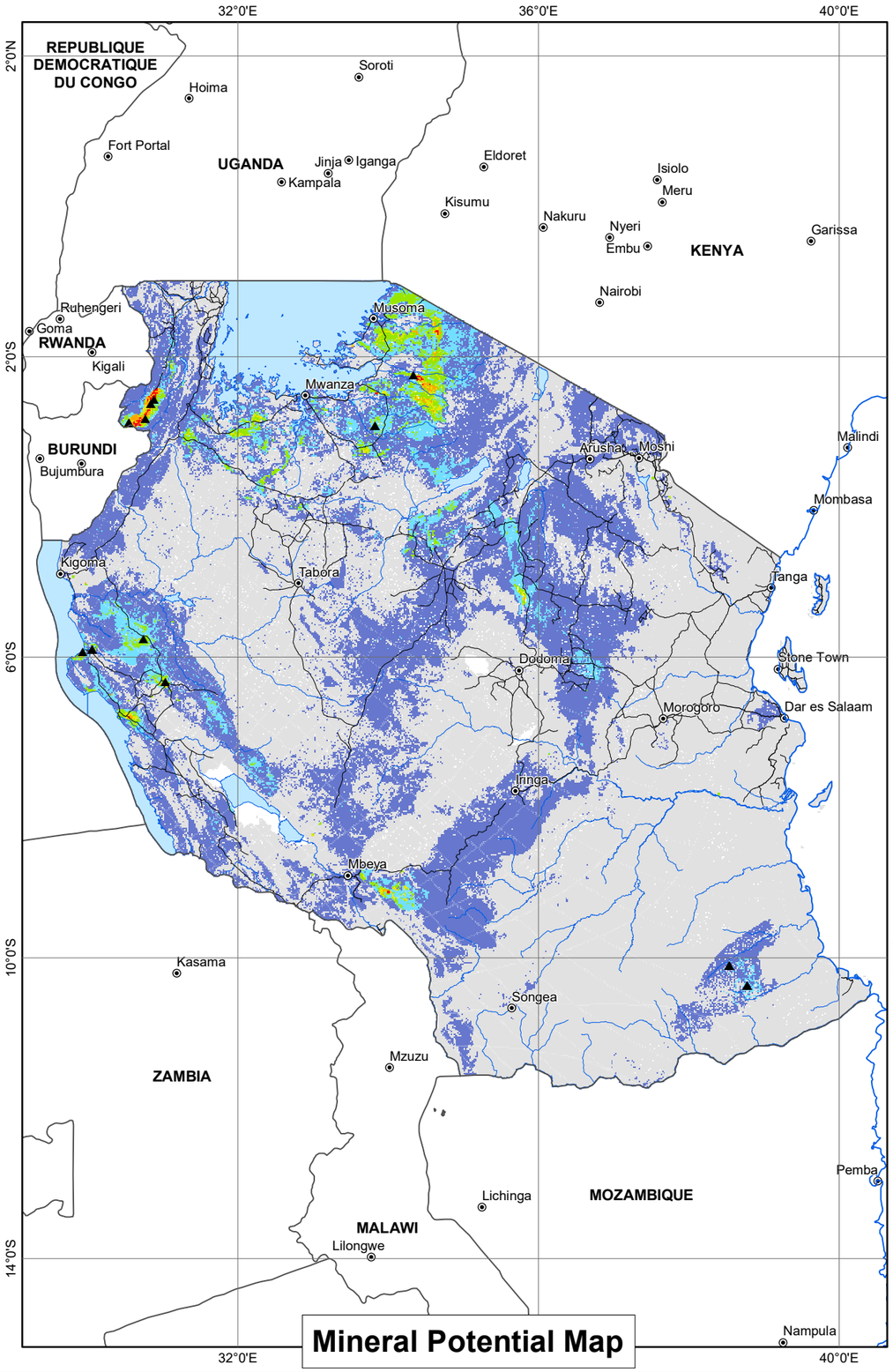
brgm

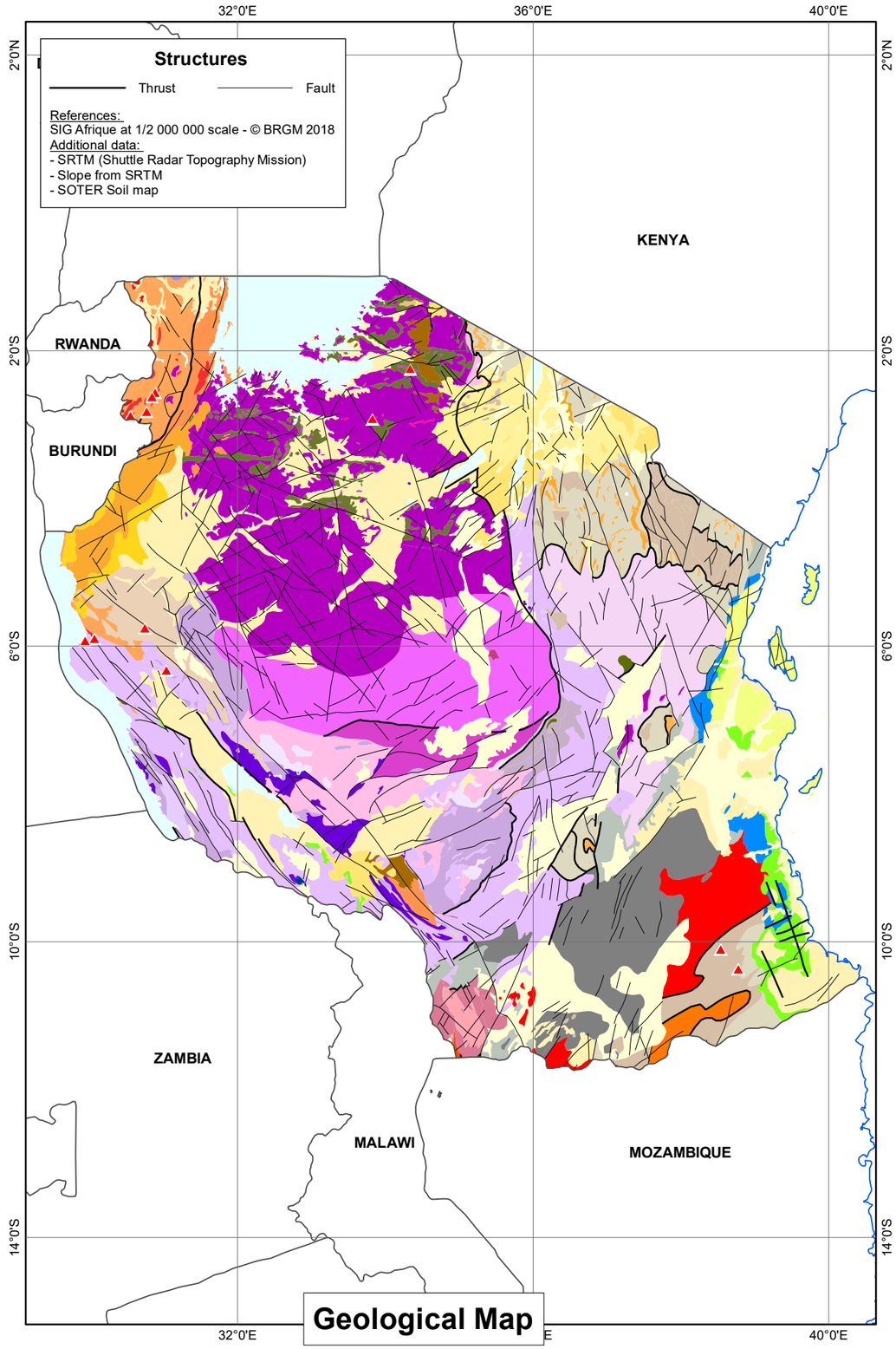
Country: TANZANIA

MINERAL POTENTIAL MAP - *NICKEL (Ni)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

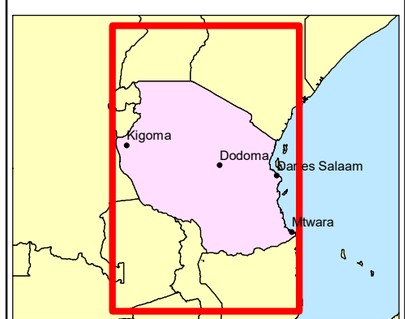
Known occurrences

▲ ▲ Nickel (Ni)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 220333 99.71% Non-occurrence in database Non-occurrence predicted	False positive Cells: 573 0.26% Non-occurrence in database Occurrence predicted
False negative Cells: 0 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 64 0.03% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.50
Cell size: 2000 m



N 0 100 200 400 Km

Datum : WGS84 (World Geodetic System 1984)

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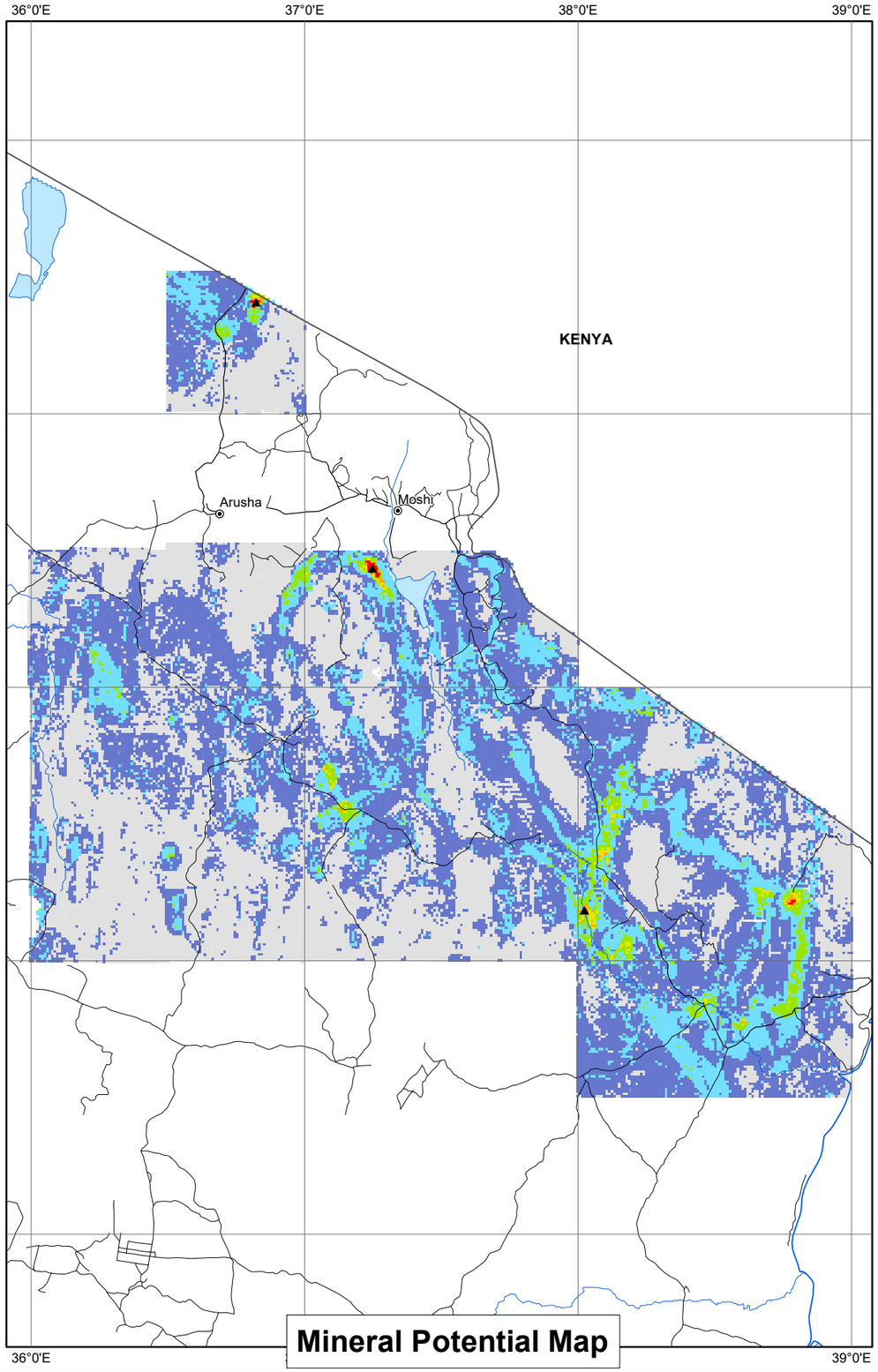
brgm Géosciences pour une Terre durable

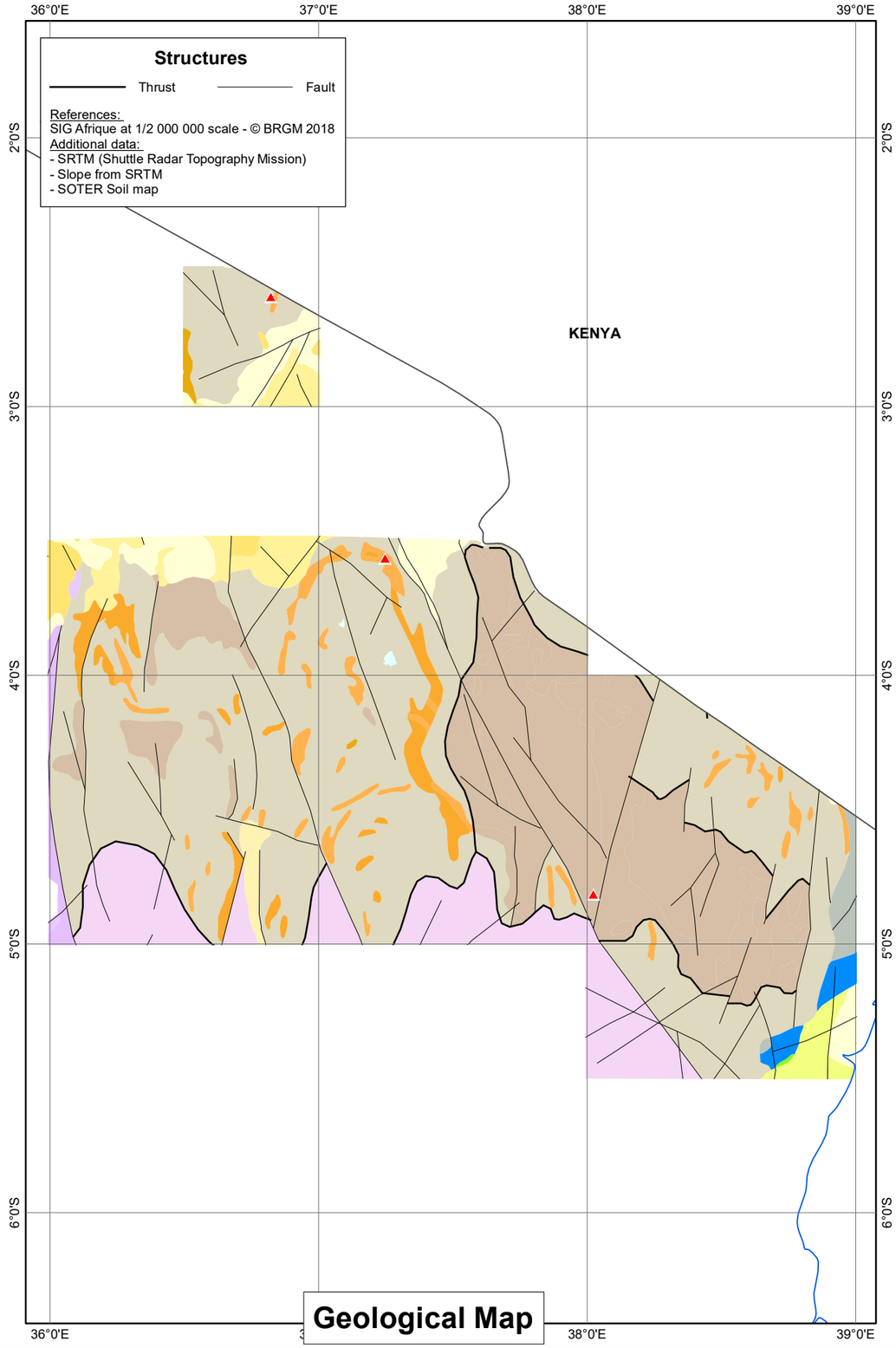
Country: TANZANIA (North East)

MINERAL POTENTIAL MAP - *GRAPHITE (Gr)*

Africa MaVal



Mineral Potential Map



Geological Map

Structures

Thrust — Fault

References:
SIG Afrique at 1/2 000 000 scale - © BRGM 2018
Additional data:
- SRTM (Shuttle Radar Topography Mission)
- Slope from SRTM
- SOTER Soil map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

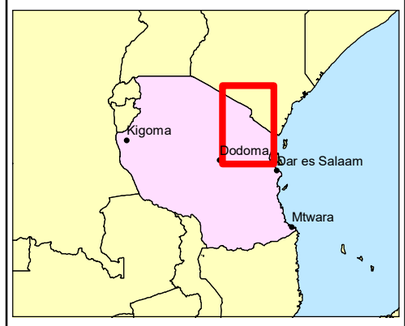
Known occurrences

Graphite (Gr)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 55398 99.84% Non-occurrence in database Non-occurrence predicted	False positive Cells: 39 0.07% Non-occurrence in database Occurrence predicted
False negative Cells: 0 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 48 0.09% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.60
Cell size: 1000 m



N

0 25 50 100 Km

Datum : WGS84 (World Geodetic System 1984)

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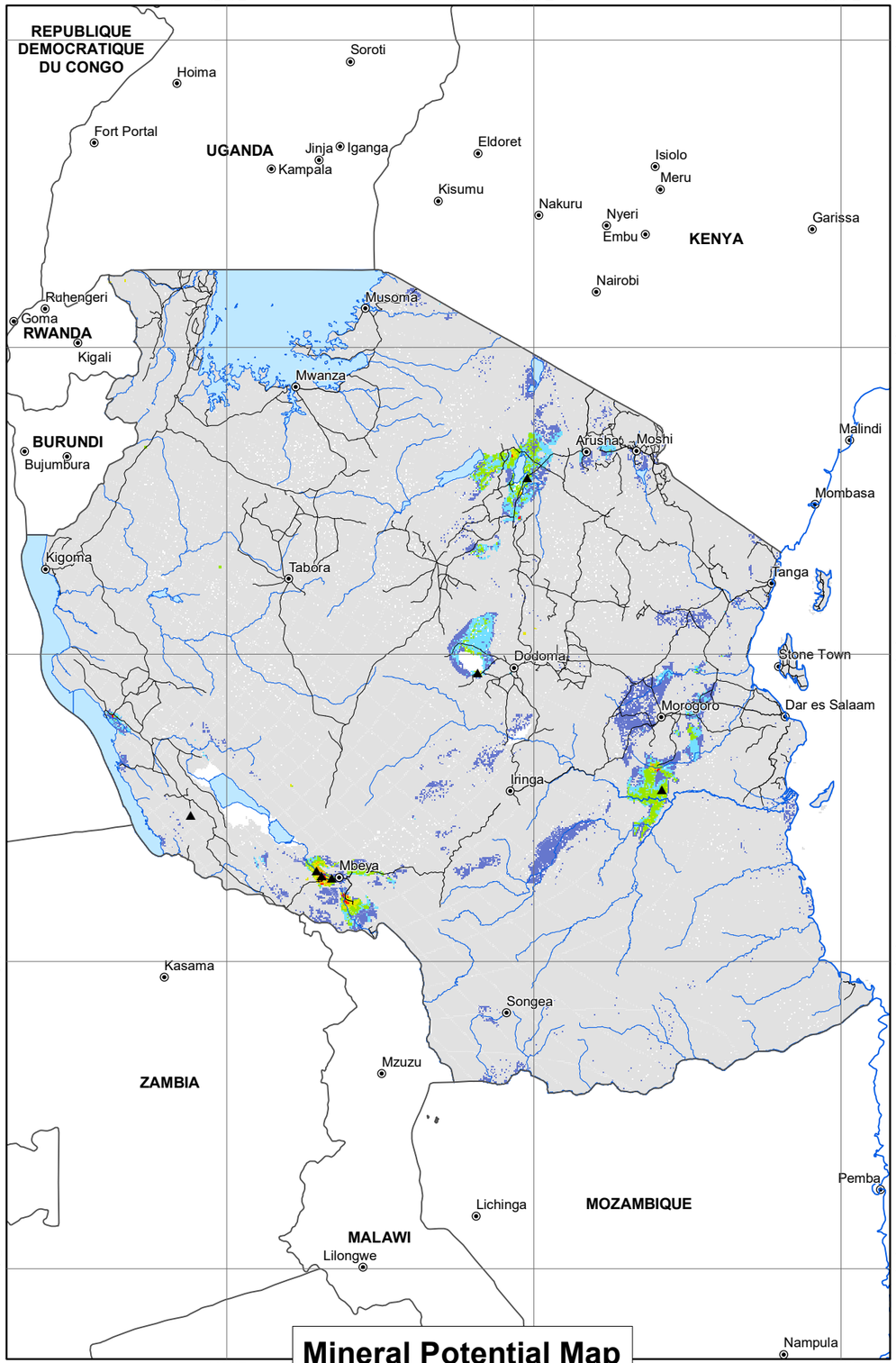
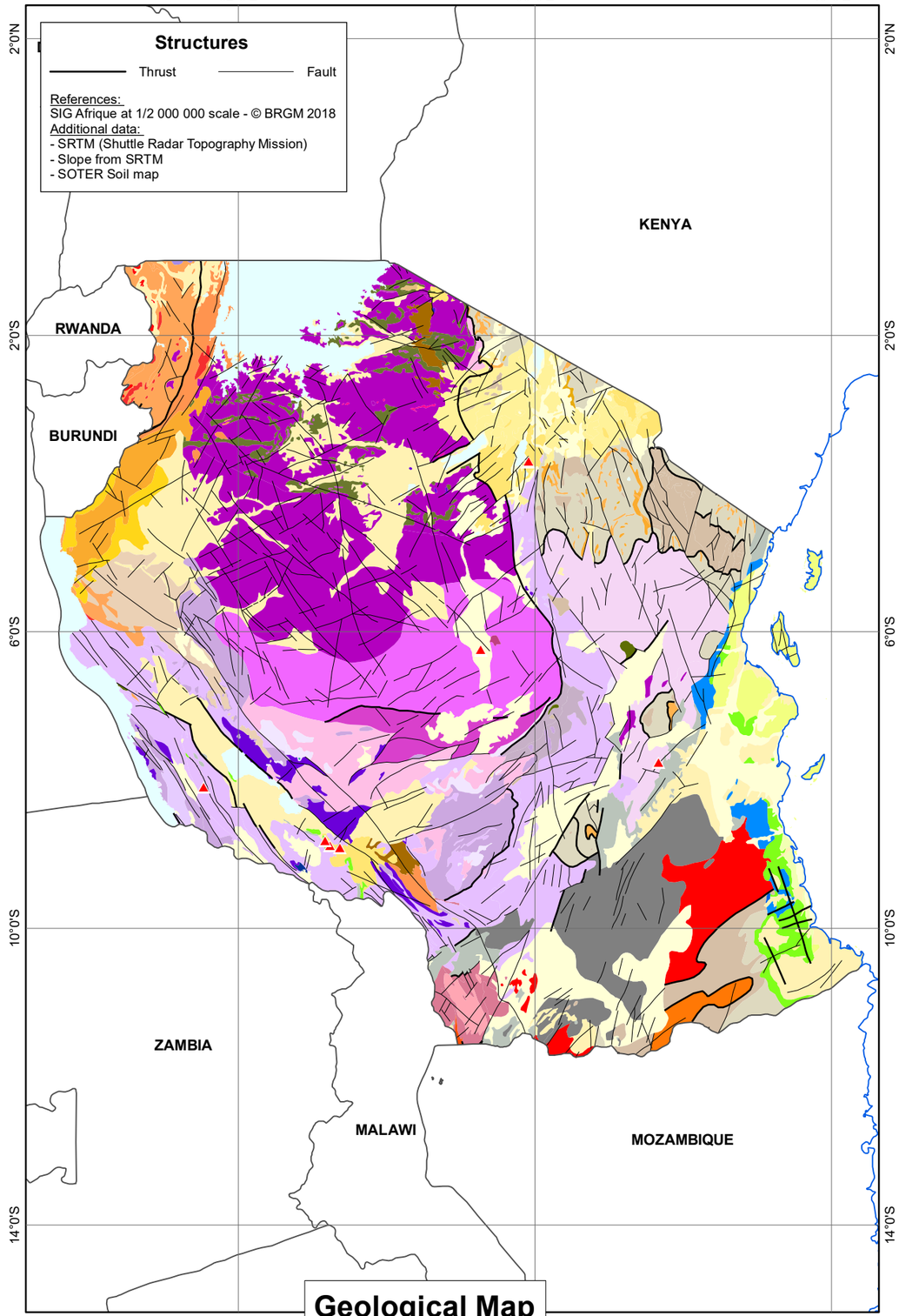
Country: TANZANIA

MINERAL POTENTIAL MAP - *PHOSPHATE (P)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

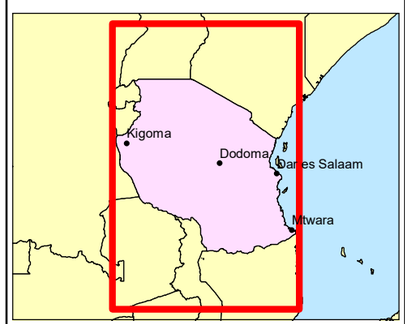
Known occurrences

▲ ▲ Phosphate (P)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 220846 99.95% Non-occurrence in database Non-occurrence predicted	False positive Cells: 92 0.04% Non-occurrence in database Occurrence predicted
False negative Cells: 1 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 31 0.01% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.64
Cell size: 2000 m



N 0 100 200 400 Km

Datum : WGS84 (World Geodetic System 1984)

January 2024

brgm Géosciences pour une Terre durable

Horizon Europe Framework Programme (HORIZON)

D9.3 – Zimbabwe Case study

WP9 - Task 9.4

Date [06/12/2023]

M. Meck[1] G. Jemwa[2] G Chigumira [3] T. Fullgraf[4] F. Mugyenyi[5]

[1]*University of Zimbabwe*

[2]*Native Geosciences Consultancy Services,*

[3] *Zimbabwe Economic Policy Analysis and Research Unit*

[4]*BRGM*

[5]*MADI*

Disclaimer

The content of this deliverable reflects only the author's view. The European Commission is not responsible for any use that may be made of the information it contains.

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Project Title	EU-**Africa** Partnership on Raw **Ma**terial **Val**ue chains
Project Acronym	AfricaMaVal
Project Coordinator	Guillaneau Jean-Claude (jc.guillaneau@brgm.fr) - BRGM
Project starting date (duration)	1st June 2022 (42 months)
Related Work Package	WP9
Related Task(s)	Task 9.4
Lead Organisation	BRGM
Contributing Partner(s)	LNEG
Due Date	January 2024
Submission Date	January 2024
Dissemination level	

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08/12/2023	V1	MADI – M. L. Meck	BRGM – C. Zammit	structure & content to review + WP5-6-7 to add
29/01/2024	V2	MADI – M. L. Meck	BRGM – C. Zammit	WP5-to add + table processing units + structure & content
31/01/2024	V3	MADI – M. L. Meck	BRGM – C. Zammit	Insertion of missing information
31/01/2024	FINAL	BRGM – C. Zammit	BRGM. L. Bailly	

Funded by
the European Union

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- The Consultancy team comprising of Mr. Gilbert Jemwa, Dr Chigumira and Thomas Fullgraf for implementing the project.

The team leader (Dr Maideyi Meck) bears full responsibility for all the errors and omissions.

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Table of Contents

1. Extended Critical Raw Materials (ECRM) supply potential of Zimbabwe 12

1.1. Inventory of the ECRM 12

1.1.1 Geological setting 12

1.1.2 Known Ore deposits and occurrences 13

1.2. Prospectivity and mineral high potential mapping 15

1.2.1 Selection of the ECRM for mineral prospectivity 17

1.2.2 Mineral high potential areas 18

1.3. Ore processing and refining capacities 26

2. Assessment of the ECRM value chain 30

2.1. Characterisation of the value chain for primary and secondary raw materials ... 30

2.1.1 List of the mining and recycling projects (sorted by degree of maturity) 31

2.1.2 Existing ESG indicators 57

2.1.3 Status of economic links between the formal and informal sectors 58

2.2. Identification of the bottlenecks along the value chain 58

2.2.1 List of the main bottlenecks and the links between them 61

3.1. Fiscal, legislative and regulatory context for in-country financings 63

3.2. Macroeconomic context for in-country financings 68

3.3. Political context for in-country financings 76

4.1 Country-level assessment and context 78

4.1.1. Context 78

4.1.2. Mineral/mining policies, industry policies 81

4.1.3. Mining regulations 81

4.1.4. Taxation and royalties 82

4.1.4. Land-use and mineral rights 83

4.1.5. Environment 84

4.1.6. Societal and community aspects, cultural heritage 85

4.1.7. Public health and safety 86

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4.2 Mining practices *vs.* Environmental, Social and Governance (ESG) goals 86
4.2.1 Environmental challenges 87
4.2.2 Socio-economic issues 87
4.2.3 What would be the best practices for a responsible mining? 87
5 Business network between the European Union and Zimbabwe 89
5.1 Assessment of the upstream and downstream business ecosystem 89
5.1.1 Context, formal and informal players 89
5.1.2 Relationships at local or regional levels 95
5.1.3 Overview of the local or regional clusters 95
5.2 Building new B2B relations 96
7.1 Identification of individual exploration, mining and refining projects 103
7.2 ASM sector country profiles 104

List of Figures

Figure 1 Simplified Geological map of Zimbabwe 13
Figure 2 ECRM occurrences recorded in the SIG-Afrique of BRGM 17
Figure 3 Mineral Potential Map of Zimbabwe for beryllium (Be). Known occurrences are indicated as black dots. 20
Figure 4 Mineral Potential Map of Zimbabwe for lithium (Li). Known occurrences are indicated as black dots 21
Figure 5 Mineral Potential Map of Zimbabwe for nickel sulfides (Ni); known occurrences are shown as black dots 22
Figure 6 Mineral Potential Map of northeastern Zimbabwe for lateritic nickel; known occurrences are shown as black dots 23
Figure 7 Mineral Potential Map of Zimbabwe for Tantalum (Ta); known occurrences are shown as black dots 24
Figure 8 Mineral Potential Map of Zimbabwe for tungsten (W); known occurrences are shown as black dots 26
Figure 9 Schematic diagram of the general mineral value chain and the various linkages at each stage. Modified after Jourdan (2016 31
Figure 10 Zimbabwe Exclusive Prospecting Orders, Special Grants and Reservations map 33
Figure 11 Map of the Lithium exploration and mining projects in Zimbabwe 40
Figure 12 Policy perception index by Fraser institute showing the Zimbabwean position (2022) 59

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Figure 13 Foreign Direct Investment inflows (US$M) 74

List of Tables

Table 1 Overview of known mineral occurrences in Zimbabwe and their geological environment 16
Table 2 The applied parameters for the MPM's of Zimbabwe 18
Table 3 Results of data driven mineral potential mapping in Zimbabwe applying the FAMME algorithm 19
Table 4 Favourable factors (in decreasing importance) for the exploration of the selected ECRM's 19
Table 5 List of the main refining / processing units 29
Table 6 Estimated endowment of the Top 7 minerals in Zimbabwe 32
Table 7 PGMs mine production data from major operating mines 34
Table 8 ECRM Export volumes from 2018-2022 35
Table 9 Zimbabwe lithium deposits with their levels of maturity 36
Table 10 Zimbabwe PGMs projects with their level of maturity 40
Table 11 Zimbabwe's nickel projects and their level of maturity 45
Table 12 Zimbabwe's tantalium projects and their level of maturity 50
Table 13 Zimbabwe Magnesite Projects with level of maturity 52
Table 14 List of Tungsten Project and their level of Maturity 53
Table 15 Antimony project and level of maturity 54
Table 16 Main sectoral GDP Growth Rate (%) Source: MOFED, ZIMSTAT, RBZ 70
Table 17 Merchandise Exports (US$M) Source: MoFEDIP, 2023 70
Table 18 Main Sectoral Contribution to GDP (%) Source: MoFEDIP (2023) 71
Table 19 Mining Sector Output (thousand tonnes) Source: MoFEDIP, ZIMSTAT 71
Table 20 Royalty rates as applicable from the 1st of January 2022 82
Table 21 Rare mineral value chains targeted by Zimbabwe government 101
Table 22 Info on projects to be presented as opportunities for investments in Zimbabwe 104

Abbreviations and Acronyms

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Acronym	Description
AMV	African Mining Vision
AMREC	African Mineral and Energy Resources Classification and Management System
AOI	areas of interest
APP	Approved Processing Plant
APT	Additional Profits Tax
ASM	Artisanal and Small-Scale Mining
BRGM	Bureau de Recherches Géologiques et Minières
CRMs	Critical Raw Materials
COM	Chamber of mines of Zimbabwe (COMZ)
DBA	disc-based association
DMS	dense media separation
ECRMs	Extended Critical Raw Materials
EMA	Environmental Management Agency
EPA	Economic Partnership Agreement
EPO	Exclusive Prospecting Orders
ESG	Environmental, Social and Governance
EU	European Union
EV	Electric vehicles
FRP	Fidelity Refiners and Printers
GDP	Gross Domestic Product

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GeoSurv	Government Geological Survey
GoZ	Government of Zimbabwe
IEA	International Energy Agency
IFS	International Financial Institutions
IMR	Institute of Mining Research
IISD	International Institute for Sustainable Development
LCT	Lithium-cesium-tantalum
LME	London Metals Exchange
LSZ	Lower Sulphide Zone
MAA	Minerals Audit Agency
MADI	Minerals Africa Development institutions
MMCZ	Minerals Marketing Corporation of Zimbabwe
MMMD	Ministry of mines and Mining Development
MPM	Mineral Potential Mapping
MSZ	Main Sulphide Zone
NDS	National Development Strategy
PGMs	Platinum Group Elements
PAMUST	Pan African Minerals University of Science and Technology
PMD	Provincial Mining Director
RBZ	Reserve Bank of Zimbabwe
RDCs	Rural District Councils
RF	Random Forest
ROM	Run of Mine

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SDGs	Sustainable Development Goals
SI	Statutory Instrument
SML	Special Mining Lease
SOTER	Soil and Terrain (soil map)
SRTM	Shuttle Radar Topography Mission
TSP	Transitional Stabilization Programme
UNCCD	United Nations Convention to Combat Desertification
US	United States of America
USGS	United States Geological Survey
UZ	University of Zimbabwe
WP	Work package
WPIC	World Platinum Investment Council
ZEPARU	Zimbabwe Economic Policy and Research Unit
ZEU	Zimbabwe Economic Update
ZIDA	Zimbabwe Investment Development Agency
ZIMRA	Zimbabwe Revenue Authority
ZMDC	Zimbabwe Mining Development Corporation
ZSE	Zimbabwe Stock Exchange

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Executive Summary

Critical minerals are essential for the development of various industries, such as renewable energy, electronics, defense, and health. Zimbabwe has a rich endowment of critical minerals that includes lithium, platinum, cobalt, and rare earth elements, but faces challenges in developing its full potential. The value chain of critical minerals in Zimbabwe consists of upstream activities in the form of exploration, mining, and beneficiation; and downstream activities in the form of processing, manufacturing, and recycling.

The objective of this work was to describe the state of play of critical minerals value chain in Zimbabwe as well as provide an overview of the mineral potential of the country, investment financing prospects and fiscal regulation, environmental and social framework for the whole value chain, and to assess how the AfricaMaval project could potentially improve these issues. The study used literature review, data collection, gap analysis, risk assessment and field visits to address these objectives. Zimbabwe is a significant producer and exporter of critical minerals such as lithium, nickel and manganese, which are essential for the global transition to low-carbon energy.

Using Mineral potential mapping (a technique that uses geospatial data and models to identify and rank areas that have a high potential to host mineral deposits), five critical minerals (Be, Li, Ni, Ta, and W)'s geological settings, occurrences, and favourable factors are described in this report.

Though small scale and medium scale mining is observed throughout the country, the upstream sector is dominated by large-scale mining companies, while the downstream sector is largely underdeveloped and dependent on imports. Zimbabwe's minerals ore processing and refining capacities is still low but there is potential for growth. However, the country faces several challenges and opportunities in developing its critical minerals value chain. The work identified the main bottlenecks and challenges that hinder the development of the value chain, as infrastructure, skills, finance, governance, and environmental and social issues.

This report provides an overview of the investment financing prospects and fiscal regulation of the mining sector in Zimbabwe, as well as the policy and legal framework that governs the sector. The report also discusses the opportunities and incentives for investors, as well as the risks and uncertainties that affect the sector's performance. Sustainability and governance issues of the Zimbabwean critical minerals is assessed in this report. Opportunities for the mining sector in Zimbabwe are evaluated.

Keywords

ECRM, Mineral potential, Ore processing, Refining capacities, Recycling units, Value chain, Primary raw material, Secondary raw material, Bottlenecks, Finance, Investment, Sustainability, ESG, Land-use, Taxation, Mining regulation, Mining policies, Child labour, Responsible extraction, Zimbabwe, Beryllium, Fluorspar , Lithium, Magnesium, Manganese, Niobium, PGMs, Antimony Tantalum, Tungsten

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Wording

Mineral prospectivity: “Mineral potential mapping is concerned with quantifying and mapping the likelihood that mineral deposits are present in a study area. It is synonymous to mineral prospectivity mapping, which is concerned with quantifying and mapping the likelihood that mineral deposits may be found by exploration in a study area.”

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1. Extended Critical Raw Materials (ECRM) supply potential of Zimbabwe

AfricaMaVal is focusing on the minerals and metals present in the fourth list of CRMs for the EU as well as on Copper (Cu), Nickel (Ni), Tin (Sn) and Manganese (Mn) that are particularly pertinent considering Africa's geological potential and their critical status in the digital and energy twin transitions. Zimbabwe is host to most of the ECRM.

1.1. Inventory of the ECRM

At the time of this report the inventory of documented ECRMs in Zimbabwe as of December 2023 is as follows: lithium (37), graphite (9), antimony (28), barite (8), beryllium (76), bismuth (5), cobalt (5), coking coal (24), fluorspar (9), PGE (11), phosphate rock (3) , silicon metal (13), tantalum (37), tungsten (6), vanadium (3), bauxite (4), copper (70), nickel (14), manganese (8).

1.1.1 Geological setting

The geology of Zimbabwe is mainly characterized by the Zimbabwe Craton, a core of Archean basement composed of granitoids, schist and gneisses, which is surrounded by Proterozoic and Phanerozoic sedimentary basins and mobile belts. The craton also incorporates greenstone belts comprising mafic, ultramafic and felsic volcanics, which are associated with epiclastic sediments and iron formations. These greenstone belts host most of the country's mineral resources, including gold, platinum group elements, nickel, copper, iron ore and coal. The most prominent geological feature of Zimbabwe is the Great Dyke, an elongate ultramafic/mafic igneous complex that runs for more than 500 km along a SSW/NNE oriented graben. The Great Dyke consists of peridotites, pyroxenites, norites and bands of chromitite, and contains the main sulfide zone, the principal platinum group element-bearing horizon in the country. The geology of Zimbabwe reflects a long and complex history of tectonic, magmatic, metamorphic and sedimentary processes that span from the Archean to the present day. Figure 1 shows the geological map of Zimbabwe

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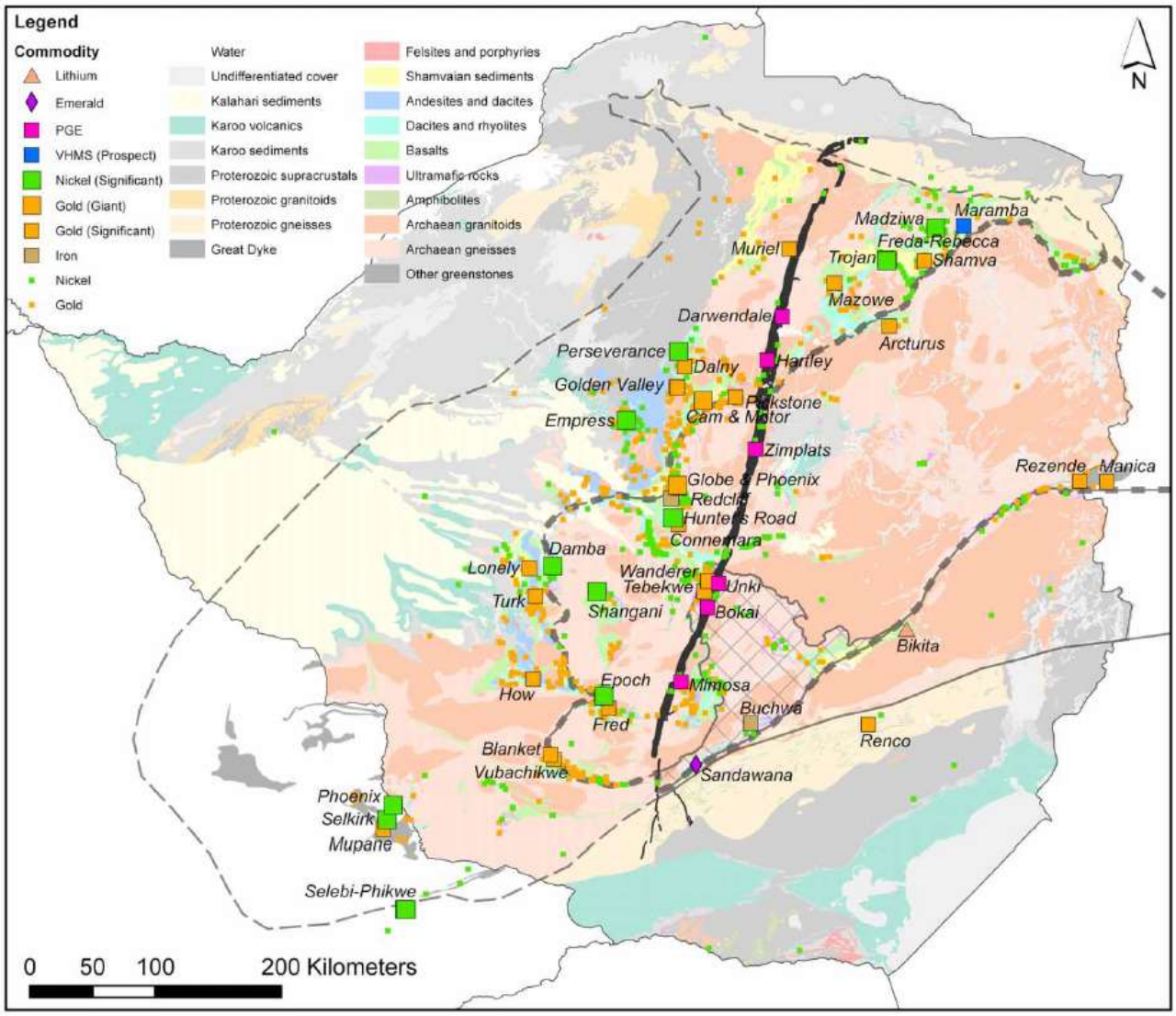

Figure 1 Simplified Geological map of Zimbabwe[1]

1.1.2 Known Ore deposits and occurrences

Among the mineral resources of Zimbabwe are critical raw materials (CRMs), which are essential for the development of high-tech industries and green technologies. CRMs include rare earth elements (REEs), platinum group elements (PGEs), lithium, cobalt, tantalum, niobium, and graphite. Zimbabwe has significant potential for the production of these CRMs, as they are associated with different geological settings and mineralization styles.

The main geological domains that host CRMs in Zimbabwe are the Archean Zimbabwe Craton, the Proterozoic Magondi Belt, the Karoo Basin, and the Limpopo Belt. The craton also hosts several REE

[1] Exploring our current understanding of the geological evolution and mineral endowment of the Zimbabwe Craton. 2021

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deposits in carbonatites and pegmatites, as well as graphite deposits in metamorphic rocks. The Magondi Belt hosts lithium deposits in pegmatites and spodumene-bearing granites, as well as tantalum and niobium deposits in rare-metal granites and pegmatites. The Karoo hosts coal deposits that are potential sources of coal-bed methane and coal-to-liquids. The basin also hosts lithium deposits in lacustrine sediments and claystones. The Limpopo hosts PGEs and chromite deposits in layered mafic intrusions, as well as REEs in carbonatites.

Zimbabwe hosts, after South Africa, the second largest known platinum world reserves, in the Main Sulphide Zone on the Great Dyke. The Great Dyke consists of four ultramafic/mafic complexes, with from north to south, Musengezi, Hartley, Selukwe and Wedza. The Hartley Complex is the largest and contains about 80 % of Zimbabwe's total PGM resources. With at least 20 % of mineral exports revenue, platinum is among the country's largest foreign currency earners.

Zimbabwe hosts the largest coal reserves in the Lower Karoo rocks of the mid-Zambezi Basin and the Save-Limpopo basin. Most of the country's coal deposits are located in the north-western parts of the country in Matabeleland North where all the mines are concentrated. Coal is also a source and reservoir for methane gaz occurrence. It mainly occurs in the Middle Zambezi Basin (e.g. Lupine tenement) and in the Save Limpopo Basin (e.g. Save Runde district).

Nickel is produced at several mines located on the greenstone belt and more than 30 deposits were identified. Nickel sulphides are hosted by a variety of komatiite and mafic rocks. BNC (Bindura Nickel Corporation Ltd is the largest nickel producer with the main operation being at Trojan Mine in Bindura (Mashonaland Central Province). BNC also owns the Shangani deposit in the central part of Zimbabwe. Other nickel deposits are hosted by the Great Dyke where companies such as Zimplats is involved in nickel mining at Bimha Mine.

Graphite occurrences are mainly located in mid-Precambrian, early Proterozoic sedimentary formations within the Hurungwe and Makonde districts, and to Precambrian rocks in the Hwange district. The Lynx graphite mine was the only operating mine in the country. It is located near Karoi, in the Hurungwe district. Several other deposits of the same district have produced small amounts of graphite (Graphite King mine, Juma, Silaka, Kaswaya and Zororo claims).

Eleven occurrences of alkaline rocks associated or not with carbonatites have been identified in Zimbabwe. Several of these occurrences were investigated for their phosphate potential but their REE potential remains unknown. Several exploration projects were conducted on these rocks, the results of which remain unknown.

Pegmatites in Zimbabwe have been noted to be enriched in elements such as Li, Cs, Ta, Sn, and Rb. The Zimbabwean pegmatites are mainly hosted in metamorphosed supracrustal rocks of the Archaean Zimbabwe Craton where they are believed to have formed during the Meso- to Neoarchean period. The pegmatites can be divided into two groups: an early pegmatite suite that is genetically related to the granitoids and a late pegmatite suite that is almost 1000 million years younger and formed by partial melting of metasediments during the assembly of Rodinia. The late pegmatites include the Bikita

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pegmatite, which is one of the largest and the only exploited lithium deposits in Africa, and the Kamativi pegmatite, which was previously mined for tin and is now being investigated for lithium.

The main types of Zimbabwean pegmatites are:

- Lithium-cesium-tantalum (LCT) pegmatites, which contain spodumene, lepidolite, pollucite and tantalite as the main ore minerals. These pegmatites are the most economically important, as they account for most of the lithium production in Zimbabwe. Examples of LCT pegmatites include the Bikita pegmatite and the Kamativi pegmatite.
- Petalite pegmatites, which contain petalite as the main lithium-bearing mineral. These pegmatites are less common and less explored than LCT pegmatites, but they may have significant lithium resources. Examples of petalite pegmatites include the Zulu pegmatite and the Sandawana pegmatite, which also contains emerald and beryl.
- Beryl-columbite-phosphate (BCP) pegmatites, which contain beryl, columbite and phosphate minerals as the main ore minerals. These pegmatites are not very important for lithium production, but they may have potential for tantalum, niobium and beryllium extraction. Examples of BCP pegmatites include the Mwami pegmatite and the Mutoko pegmatite.

The spatial and temporal relationships of Zimbabwean pegmatites are not well understood, but they are generally related to regional tectonic events and magmatic processes that affected the Zimbabwe Craton during the Archean. The economic potential of Zimbabwean pegmatites depends on several factors, such as their size, grade, mineralogy, accessibility and market demand.

1.2. Prospectivity and mineral high potential mapping

Zimbabwe's main commodities are gold, nickel, iron ore, lithium, tantalite, tin, wolframite, precious stones, diamonds, platinum group metals, chromium, coal and uranium. The distribution of these raw materials is linked to specific geological features, especially the greenstone belts found in the Zimbabwe craton (Au, Ni), the Great Dyke (Cr, PGM), pegmatite swarms (lithium, tantalite, tin), and the Karoo basins (coal). In addition, the BRGM database indicates the country's potential for manganese, copper, antimony, bauxite and al-silicates, amongst other ECRM’s as well as a wealth of industrial minerals and ornamental stones. Zimbabwe currently has operational mines for lithium (4), nickel (3), PGM (10) and wolframite (1).

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Zimbabwe (1268 occ.)			Archean	Paleoproterozoic			Neoproterozoic	Paleozoic-Mesozoic	Cenozoic	
Subst. AfricaMaVal	Element	No occ	Zimbabwe Craton (754)	Great Dyke (62)	Limpopo Belt (3)	Magondi Belt (312)	Zambezi Belt (13)	Karoo Basin (59)		Sum
Bauxite	Al	4	*					*		0
Beryllium	Be	237	1			2	*			3
Bismuth	Bi	7	0.5							0.5
Borate	B									0
Baryte	Ba	10	*							0
Cobalt	Co	11	1	*						1
Coal	C	37						2		2
Copper	Cu	117	1	1	*	1		0.5		3.5
Fluorine	F	10				0.5		*		0.5
Gallium	Ga (Al, Zn)									0
Germanium	Ge (Zn)									0
Graphite	C	9				1				1
Hafnium	Hf (Zr, HM)									0
HM	Heavy Minerals	47							2	2
Indium	In (Zn)									0
Lithium	Li	43	1			1				2
Magnesium	Mg	10	1		*			*		1
Manganese	Mn	12	1					1		2
Niobium	Nb	8	*			*				0
Nickel	Ni	30	1	2						3
Phosphorus	P	4	*							0
Platinum Group Metals	Pt, Pd, Rd	50	2	2						4
REE non-diff	REE									0
HREE	HREE									0
LREE	LREE									0
Antimony	Sb	35	1							1
Scandium	Sc									0
Siliciumoxide	SiO2									0
Tin	Sn	76	1			1				2
Strontium	Sr									0
Tantalum	Ta	142	2			1	*			3
Titanium	Ti									0
Vanadium	V	3								0
Tungsten	W	355	2	*	0.5	1	*	0.5		4
Zinc	Zn	11	0.5			2				2.5
		Sum	16	5	0.5	10.5	0	4	2	

0.5	Minor presence
1	Presence
2	Major presence
*	Potential

Table 1 Overview of known mineral occurrences in Zimbabwe and their geological environment[2]

[2] Based on SIG-Afrique of BRGM

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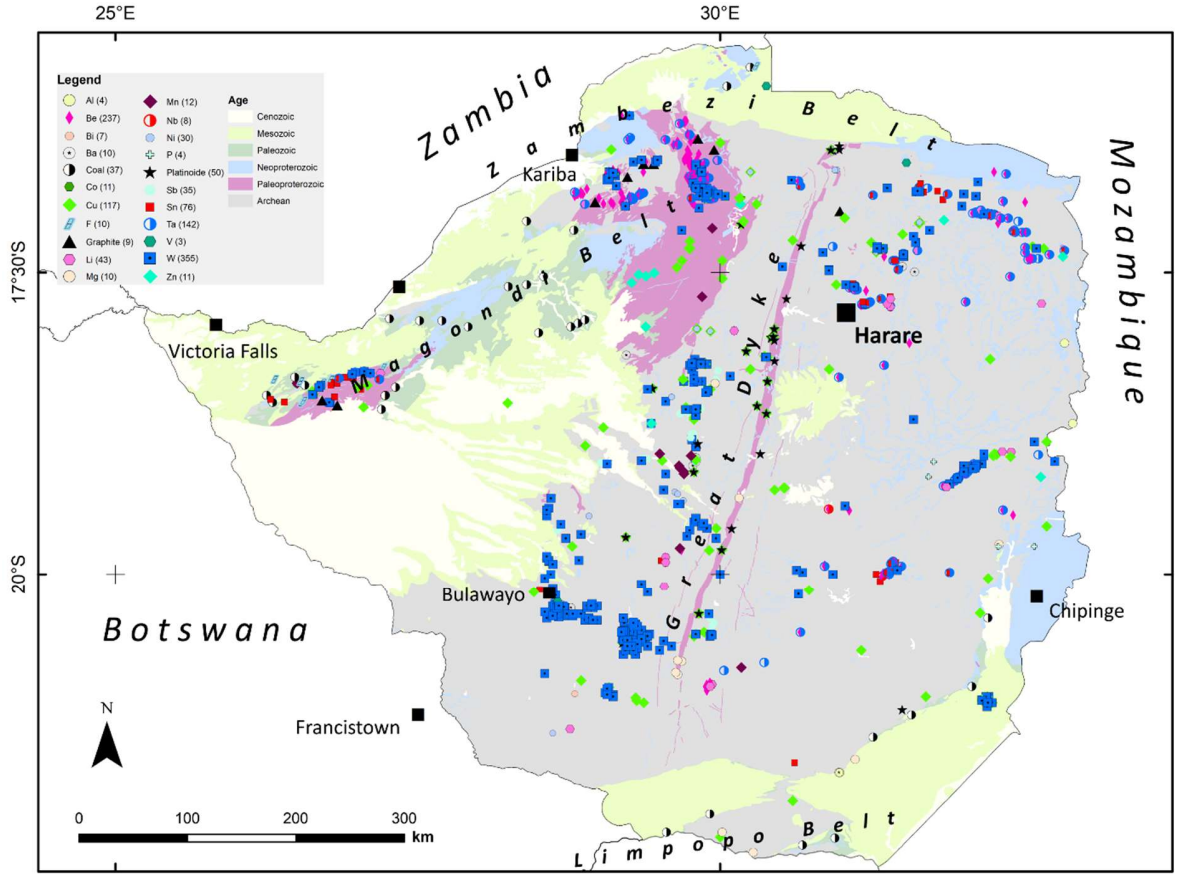

Figure 2 ECRM occurrences recorded in the SIG-Afrique of BRGM

1.2.1 Selection of the ECRM for mineral prospectivity

Among the 35 ECRMs present in Zimbabwe, five were selected for the Mineral Potential Mapping task (MPM) in order to demonstrate the principle of the method: **Be, Li**, **Ni**, **Ta** and **W**. A special study was done on lateritic nickel deposits, which have been identified in northern Zimbabwe. The lack of geoscientific data (e.g. aerial and ground geophysics, satellite data, and soil / stream geochemistry) and the relatively low resolution of the geological map used for this study (1:2M) implies only limited interest of the weakly constrained mineral potential maps for exploration. There was no use to illustrate this for the whole range of ECRM's.

The MPM was performed using the disc-based association (DBA) grid method coupled with Random Forest (RF) method (*Vella, 2022*); the algorithm applying these principles has been labelled "FAMME" by the author. The method is based on the analysis of the local spatial associations of geological variables and features of various natures to describe the relationships between the predictors and the mineralization. This allows the identification of geological environments in the study area around each node of the DBA grid, and the integration of both quantitative and non-quantitative spatial data, such as geophysical anomaly maps and location of geological map units, respectively. In a second step, RF classification is used to perform a generalization of complex geological environments and features and evaluate their likelihood to host potential mineralization occurrences by giving a score between 0 (low potential) and 1 (high potential).

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The data for the MPM of Zimbabwe comprised the following:

- SIG-Afrique mineral resources database – BRGM
- Lateritic Nickel occurrences presented by Prendergast (2016)
- SIG-Afrique 1:2,000,000 geology - BRGM
- SIG-Afrique 1:2,000,000 structural data (faults, thrusts) – BRGM
- UNCCD 1:500k Soil and Terrain (SOTER) – soil map of southern Africa
- SRTM (Shuttle Radar Topography Mission)
- Slope

The DBA grid for predictive modelling is mainly defined by **five parameters**:

- Size of cell – d;
- Buffer for lithologies – R;
- Buffer for mineral occurrences – R1. It can be null (= false), in this case the search radius will be restricted to the cell size (d)
- Buffer for faults – R2. It can be null (= false), in this case the search radius will be restricted to the cell size; it can also take into account the distance of the cell to the neighbouring faults (distance)
- Buffer for soils – R3. It can be null (= false), in this case the search radius will be restricted to the cell size

In order to maximize the grid resolution while minimizing overlaps and cells with only one lithology, the parameters of DBA grid for the four selected commodities in individual areas of interest (AOI) used in this study are as indicated in Table 2.

Parameter/ECRM	Be	Li	Ni_all	Ni_lat.	Ta	W
d [m]	2250	2250	2250	1000	2250	2250
R [m]	9000	9000	9000	5000	9000	9000
R/d	4	4	4	5	4	4
Total cells	123590	123590	123590	88166	123590	123590
R_1 [m]	2000	2000	2000	1000	2000	2000
R_2 [m]	1000	1000	1000	no	1000	750
R_3 [m]	no	no	no	false	no	no
srtm	no	no	no	yes	no	no
slope	no	no	no	yes	no	no
merged ultramafic rocks (UB)	no	no	false	false	no	no

Table 2 The applied parameters for the MPM's of Zimbabwe[3]

1.2.2 Mineral high potential areas

Predictive mapping of critical raw materials in Zimbabwe can help to improve the exploration efficiency, reduce the environmental footprint, and enhance the social acceptance of mining activities. Predictive mapping is a technique that uses geospatial data and models to identify and rank areas that have a high potential to host mineral deposits. The ECRMs in Zimbabwe have different geological settings and require different exploration methods and models. The PGMs are associated with layered mafic intrusions, lithium is found in pegmatites, cobalt is linked to copper deposits, tantalum occurs in carbonatites, and REEs are hosted by alkaline rocks. Predictive mapping of these materials can use various types of data, such as geological maps, geochemical surveys, geophysical surveys, remote sensing images, and mineral occurrence databases. By applying spatial analysis techniques, such as weights of evidence, fuzzy logic, or

[3] "yes/nota" = data used/not used for the analysis

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machine learning, these data can be integrated and processed to produce prospectivity maps that show the spatial distribution of mineral potential. These maps can then be used to guide further exploration activities and inform decision making on resource management and policy.

The data for the production of the MPM comprised the 1:2M scale geological map and structural data of Zimbabwe, the UN-CCD 500k SOTER soil map of southern Africa, the SRTM and the slope.

Areas of high mineral potential for the ECRM's Be, Li, Ni, Ta and W

Six mineral potential maps were produced for the five selected ECRM's (**Be**, **Li**, **Ni**, **Ta**, and **W)**. The results of the DBA-RF (TN, FN, FP, TP = confusion matrix) together with the critical parameter for the assessment of the model are shown in Table 3.

	TN	FN	FP	TP	TPR	FPR	PPA [%]	Prec. [%]	Acc. [%]	J-score	Thresh.
Beryllium	72099	18	5735	374	0.95	0.07	7.8	6.12	92.6	0.88	0.50
Lithium	74000	2	4139	89	0.98	0.05	5.4	2.11	94.7	0.93	0.52
Nickel_all	74763	5	3384	74	0.94	0.04	4.4	2.14	95.7	0.89	0.51
Nickel_lat.	62471	0	113	28	1.00	0.00	0.2	19.86	99.8	1.00	0.63
Tantalum	70780	16	7171	259	0.94	0.09	9.5	3.49	90.8	0.85	0.52
Tungsten	69479	14	8187	546	0.98	0.11	11.2	6.25	89.5	0.87	0.50

Table 3 Results of data driven mineral potential mapping in Zimbabwe applying the FAMME algorithm

Note: *True Positive (TP) and True Negative (TN) correspond to the number of grid cells, which are correctly predicted by the RF model (i.e. mineralized and non-mineralized cells, respectively). Inversely, False Positive (FP) and False Negative (FN) correspond to the number of grid cells, which are incorrectly predicted by the RF model (i.e. mineralized instead of non-mineralized cells and non-mineralized instead of mineralized cells, respectively).* ***FP indicate cells with high mineral potential****, which so far are not indicated in the mineral occurrence data base. From these data the following useful parameters are calculated: True positive rate (TPR, also "recall") = TP/ (TP+FN), False positive rate (FPR) = FP/ (FP+TN), Percentage of prospective area (PPA) = (TP+FP)/All, Precision = TP/ (TP+FP), Accuracy = (TP+TN)/All and J-score = TPR – FPR.*

The statistically most favourable factors (in decreasing importance) for exploration of each commodity are shown in Table 4.

	F1	F2	F3	F4	F5	F6
Beryllium	27	34	36	16	175	17
Lithium	34	41	38	27	19	40
Nickel_all	100	28	29	35	36	38
Nickel_lat.	slope	LP	100	srtm	40	41
Tantalum	27	36	34	16	38	35
Tungsten	34	36	27	16	6	38

6	Granite and syenite, Late Jurassic
16	Granite, Paléoprotérozoïque
17	Neoarchaean gneiss and charnockites (~2630 Ma)
19	Paragneiss, other metasediments and amphibolite
27	Phyllite and minor quartzite (Piriwiri; 2100-2000 Ma)
28	Great Dyke: Norite and gabbro (2461 Ma)
29	Great Dyke: Serpentinite and pyroxenite (2461 Ma)
34	Metasediment, felsic metavolcanic (Bulawayan; 2839-2631 Ma)
35	Andesitic and dacitic metavolcanic (Bulawayan; 2839-2631 Ma)
36	Basaltic metavolcanic with intercalated metasediment (Bulawayan; 2839-2631 Ma)
38	Komatiites and UM-M intrusions (Bulawayan; 2839-2631 Ma)
40	Older Gneiss Complex (Mesoarchaean)
41	Dolerite and gabbro intrusive (Umkondo, 1105 Ma)
100	Merged ultramafic and mafic rocks
175	Gneiss and charnockites (Palaeoproterozoic with Archaean relics)
LP	Leptosols

Table 4 Favourable factors (in decreasing importance) for the exploration of the selected ECRM's

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Beryllium - Be

Beryllium is found in over 100 minerals but most are uncommon to rare. The more common beryllium containing minerals include: bertrandite, beryl, chrysoberyl and phenakite all of which are hosted by pegmatites, forming mostly small bodies less than one km length that are commonly shown on high-resolution geological maps (<1:25,000 scale) only. In country-scale studies, it is therefore impossible to indicate these rocks as important factor for the exploration of beryllium since they do not appear on the maps. The geographical emplacement of pegmatites appears often random but is commonly associated with the late stage of granite crystallization or within a late or anorogenic context. The *SIG-Afrique* database of BRGM indicates 237 beryl occurrences in Zimbabwe, which are widely distributed over areas with basement exposure. Major pegmatite fields are located in the Piriwiri Group of NW Zimbabwe and a smaller one east of Harare, whereas curvilinear belts with numerous occurrences are indicated in the northeast in the Zimbabwe Craton close to the boundary with the Zambezi Belt and in the southern part close to the contact with the Limpopo Belt.

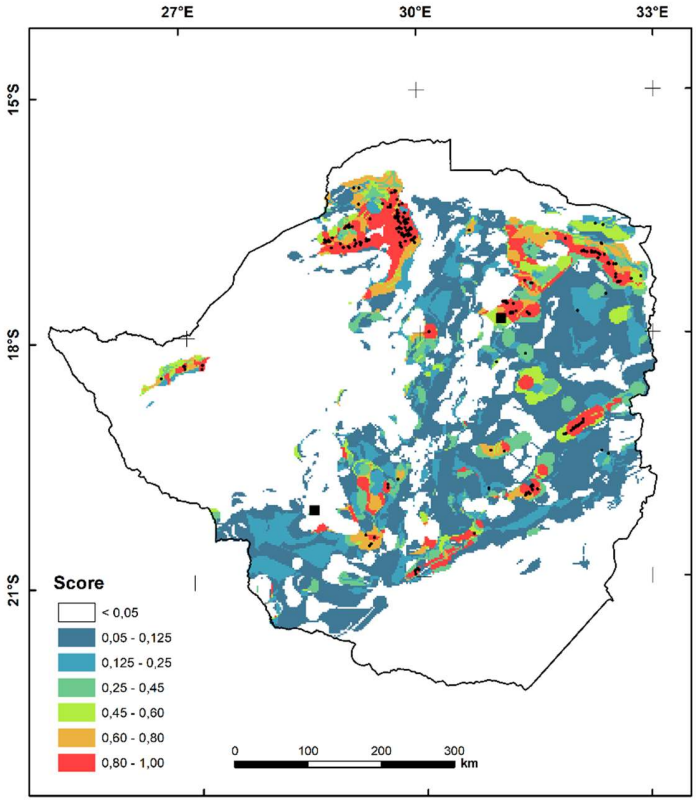

Figure 3 Mineral Potential Map of Zimbabwe for beryllium (Be). Known occurrences are indicated as black dots.

The DBA-RF model has an accuracy of ~93 % and indicates that about 6 % of Zimbabwe has potential for beryllium. The statistically most favourable factors are, in decreasing order, **27** (Phyllite and minor quartzite (Piriwiri; 2100-2000 Ma), **34** (Metasediment, felsic metavolcanic (Bulawayan; 2839-2631 Ma)), **36** (Basaltic metavolcanic with intercalated metasediment (Bulawayan; 2839-2631 Ma)**, 16**

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(Palaeoproterozoic granite), **175** (Gneiss and charnockites (Palaeoproterozoic with Archaean relics) and **17** (Neoarchaean gneiss and charnockites (~2630 Ma).

Lithium - Li

Lithium forms several magmatic minerals in lithium pegmatites, the most important of which are amblygonite, lepidolite, petalite and spodumene. In secondary deposits lithium salts, especially lithium chloride, are also commonly found in brines and salt lakes. In Zimbabwe, 43 occurrences are recorded that are either associated with pegmatite or of unknown status. Secondary deposits were so far not identified. As the beryllium, the occurrences are located mainly within the central Zimbabwe Craton, with an additional small group in the western Magondi Belt. The same problems of statistical treatment and mineral predictivity apply as for other pegmatite hosted elements.

The data for the production of the MPM comprised the 1:2M scale geological map and structural data of Zimbabwe, the UN-CCD 500k SOTER soil map of southern Africa, the SRTM and the slope. The DBA-RF model has an accuracy of ~95 % and indicates that about 5.4 % of Zimbabwe is prospective for lithium deposits. The statistically most favourable factors are, in decreasing order, **34** (Metasediment, felsic metavolcanic (Bulawayan; 2839-2631 Ma)), **41** (Dolerite and gabbro intrusive (Umkondo, 1105 Ma)), **38** (Komatiites and UM-M intrusions (Bulawayan; 2839-2631 Ma)), **27** (Phyllite and minor quartzite (Piriwiri; 2100-2000 Ma)), **19** (Paragneiss, other metasediments and amphibolite), and **40** (Older Gneiss Complex (Mesoarchaean).

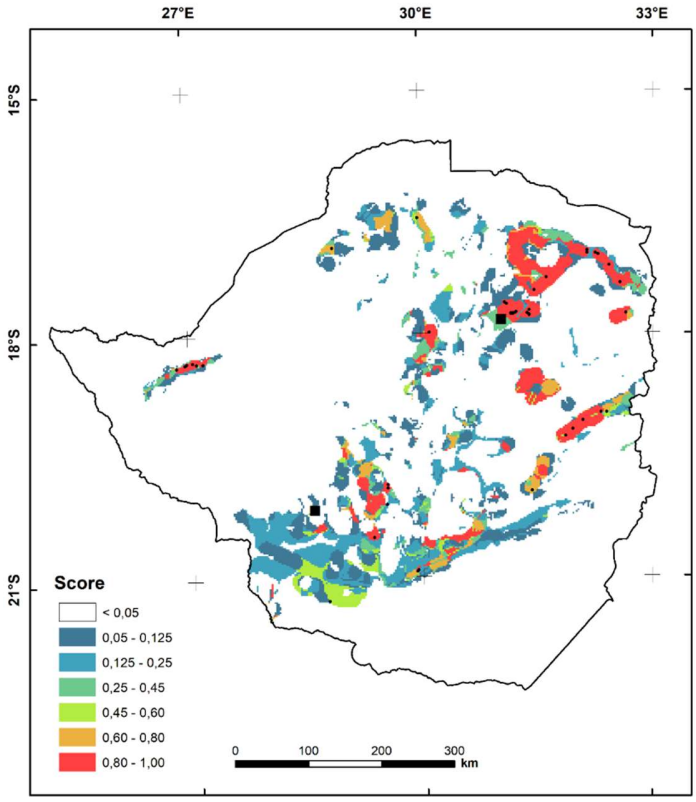

Figure 4 Mineral Potential Map of Zimbabwe for lithium (Li). Known occurrences are indicated as black dots

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Nickel sulfides - Ni

Most nickel sulphide deposits of Zimbabwe are spatially and genetically related to mafic/ultramafic rocks within Archaean greenstone sequences and the Great Dyke. Their review shows that structural control, regional stratigraphy, and age are the best targeting criteria. These criteria were used to perform a country-scale prospectivity analysis for nickel sulphide deposits (Markwitz et al., 2000). The sulphur-rich deep marine facies of the Manjeri Formation are generally more prospective for disseminated nickel in the north and west of the craton. Nickel mineralisation occurs also often adjacent to felsic and intermediate pyroclastic rocks within major structural zones. Economic significant nickel sulphide deposits, such as Empress, Selukwe, and Shangani, are within large intrusive sills. 30 occurrences are recorded in the mineral occurrence database of BRGM (SIG Afrique).

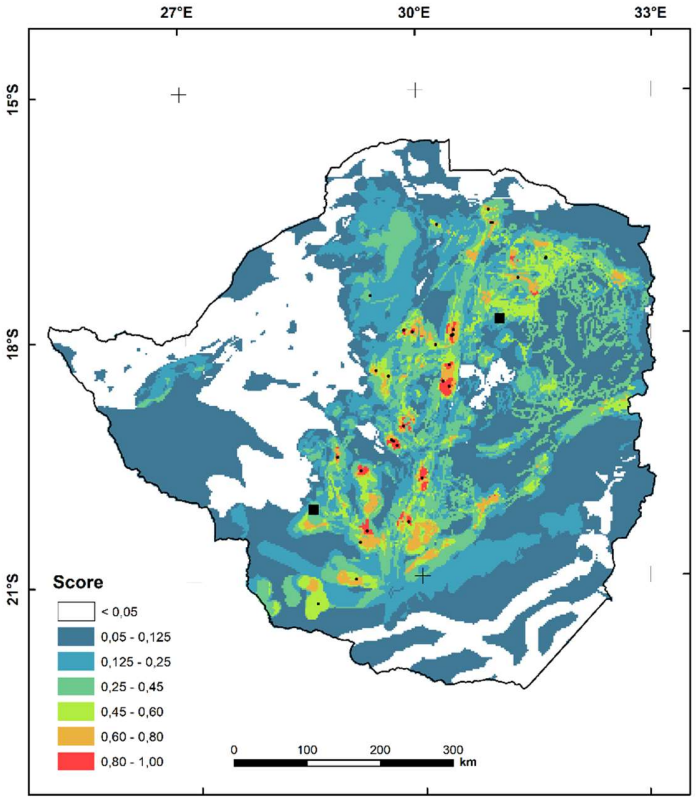

Figure 5 Mineral Potential Map of Zimbabwe for nickel sulfides (Ni); known occurrences are shown as black dots

The data for the calculation of the MPM comprised the 2M geological map and structural data (SIG Afrique, BRGM), as well as a merged layer of all mafic to ultramafic rocks (code: 100). The MPM shows high potential around most of the known occurrences within the Zimbabwe Craton and few others locations, which are considered as interesting targets for mineral exploration. Low to medium potential is shown in a wide network across the Zimbabwe Craton, mimicking roughly the greenstones. A small curvilinear belt is located in the west within the Magondi belt. The DBA-RF model has an accuracy of ~96 % and indicates that about 2.1% of Zimbabwe is prospective for nickel. The statistically most favourable factors are, in decreasing order, **100** (merged mafic and ultramafic rocks), **28** (Great Dyke: Norite and gabbro (2461 Ma)), **29** (Great Dyke: Serpentinite and pyroxenite (2461 Ma)), **35** (Andesitic and dacitic

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metavolcanic (Bulawayan; 2839-2631 Ma)), **36** (Basaltic metavolcanic with intercalated metasediment (Bulawayan; 2839-2631 Ma)), and **38** (Komatiites and UM-M intrusions (Bulawayan; 2839-2631 Ma)). This is in agreement with the findings by Markwitz et al. (2010).

Lateritic Nickel – Ni-lat

A special study has been carried out on request for lateritic nickel, which has been reported in northern Zimbabwe. Several of these deposits overlie the ultramafic rocks at northern tip of the Great Dyke. Prendergast (2016) credited Cotterill with identifying the ultramafic rocks at the northern tip of the Great Dyke in 1970. The database for the calculation of the MPM included ten georeferenced occurrences described by Prendergast (2016), the 1:2M geological map and the SRTM and slope. SOTER Soil data were not taken into account because of their low resolution, where these soils do not occur. Only the northeastern part of Zimbabwe was analysed for this deposit style. The resulting MPM shows high potential for lateritic nickel only along the great dyke (Fig 6). Low potential is shown in few localities in the eastern part of the AOI.

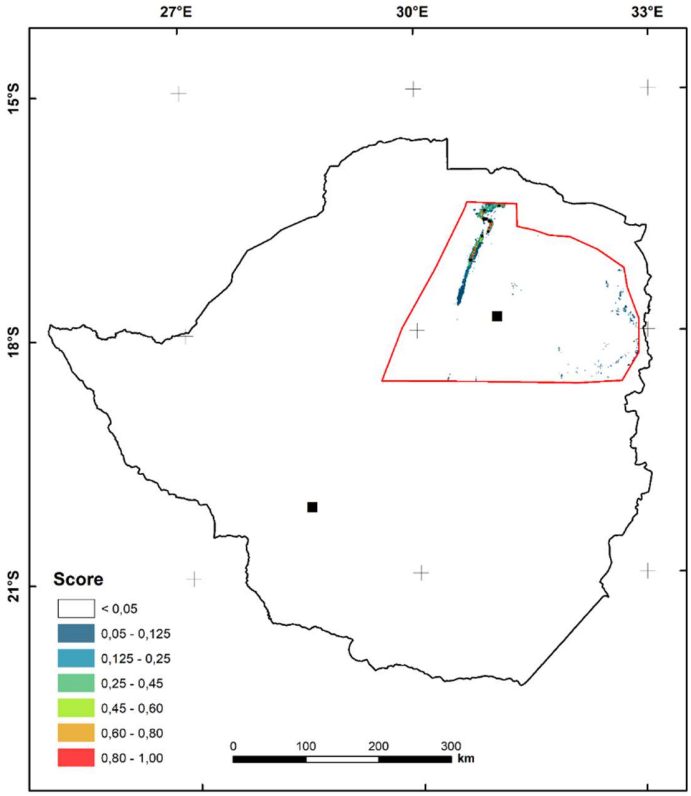

Figure 6 Mineral Potential Map of northeastern Zimbabwe for lateritic nickel; known occurrences are shown as black dots

Tantalum – Ta

Tantalum shares many of its properties with niobium (Nb), with which it is commonly found. This close association has led to use of the 'coltan' terminology, short for columbite-tantalites, reflecting the niobium-dominant (columbite) and tantalum-dominant (tantalite) end-members of this oxide mineral series. Tantalite is a dominant ore mineral of tantalum and is most commonly found within rare-metal

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granites and pegmatites, which are suggested to account for more than three-quarters of current tantalum production (Champion, 2019). In Zimbabwe, 142 occurrences are recorded in the BRGM database (SIG Afrique), which similar to Li and Be are located principally in the central Zimbabwe Craton. The same problems of statistical treatment and mineral predictivity apply as for other pegmatite hosted commodities.

The data for the calculation of the MPM comprised the 2M geological map and structural data (SIG-Afrique, BRGM). The MPM shows areas with medium to high Ta-potential are located mainly around the known occurrences outlining two fields in the northern part of the Zimbabwe Craton (Fig 7). A third NE-SW curvilinear belt is located in the SE part of the craton, parallel to the boundary with the Limpopo Belt. Two areas of high Ta-potential but without any know occurrences are indicated west of Bulawayo and east of Harare and may represent interesting exploration targets for this commodity. The occurrences in the Magondi Belt in western Zimbabwe outline another area with medium to high Ta potential.

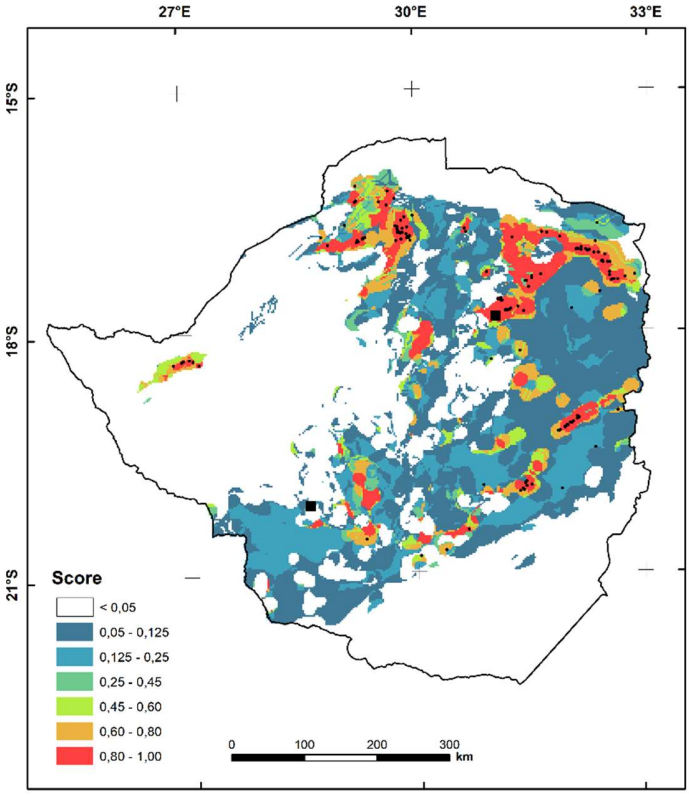

Figure 7 Mineral Potential Map of Zimbabwe for Tantalum (Ta); known occurrences are shown as black dots

The DBA-RF model has an accuracy of ~91 % and indicates that about 9.5% of the AOI is prospective for tantalum. The statistically most favourable factors are, in decreasing order, 27 (Phyllite and minor quartzite (Piriwiri Group; 2100-2000 Ma)), 36 (Basaltic metavolcanic with intercalated metasediment (Bulawayan; 2839-2631 Ma)), 34 (Metasediment, felsic metavolcanic (Bulawayan; 2839-2631 Ma)), 16 (Palaeoproterozoic Granite, e), 38 (Komatiites and UM-M intrusions (Bulawayan; 2839-2631 Ma)), and 35

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(Andesitic and dacitic metavolcanic (Bulawayan; 2839-2631 Ma)). Structures have no influence which is probably due to poor data.

Tungsten – W

Tungsten mineralization is typically derived from granitic plutons found in a variety of tectonic environments including continental collision zones, continental rifts, and volcanic arcs along continental margins. Generally, these granites are emplaced at moderate to high crustal levels in an environment that permits brittle fracturing and migration of metal-bearing fluids into surrounding country rocks (Kirkham and Sinclair 1996). The geology and mineralogy of tungsten ore deposits can vary depending on the type of deposit, which can be classified into three main types: skarn, vein/stockwork, and porphyry. Tungsten ore is typically found in association with other minerals. Tungsten is typically found in tungstate minerals that contain varying proportions of tungsten, iron, manganese, and calcium combined with oxygen; the most common ones are wolframite ($(Fe,Mn)WO_4$) and scheelite ($CaWO_4$)[4].The BRGM database records 355 occurrences in Zimbabwe, which makes it the most frequent commodity in the country (Table 1).

The data for the calculation of the MPM comprised the 2M geological map and structural data (SIG-Afrique, BRGM). The MPM shows areas with medium to high W-potential are located mainly around the known occurrences. Major Fields are indicated southeast of Bulawayo, north, west and southwest of Harare, in the Magondi Belt and in the SE of the Zimbabwe Craton, parallel to the boundary with the Limpopo Belt. The map bears great resemblance with the tantalum and beryllium MPM's and the three commodities share four favourable factors for exploration (16, 27, 34, 36).

The DBA-RF model has an accuracy of ~90 % and indicates that about 11% of the AOI is prospective for tungsten. The statistically most favourable factors are, in decreasing order, 34 (Metasediment, felsic metavolcanic (Bulawayan; 2839-2631 Ma)), 36 (Basaltic metavolcanic with intercalated metasediment (Bulawayan; 2839-2631 Ma)), 27(Phyllite and minor quartzite (Piriwiri; 2100-2000 Ma)), 16 (Palaeoproterozoic Granite), 6 (Granite and syenite, Late Jurassic), and 38 (Komatiites and UM-M intrusions (Bulawayan; 2839-2631 Ma)). The Greta dyke shows weak but consistent W-potential along the structure.

[4] International Tungsten Industry Association, 2005

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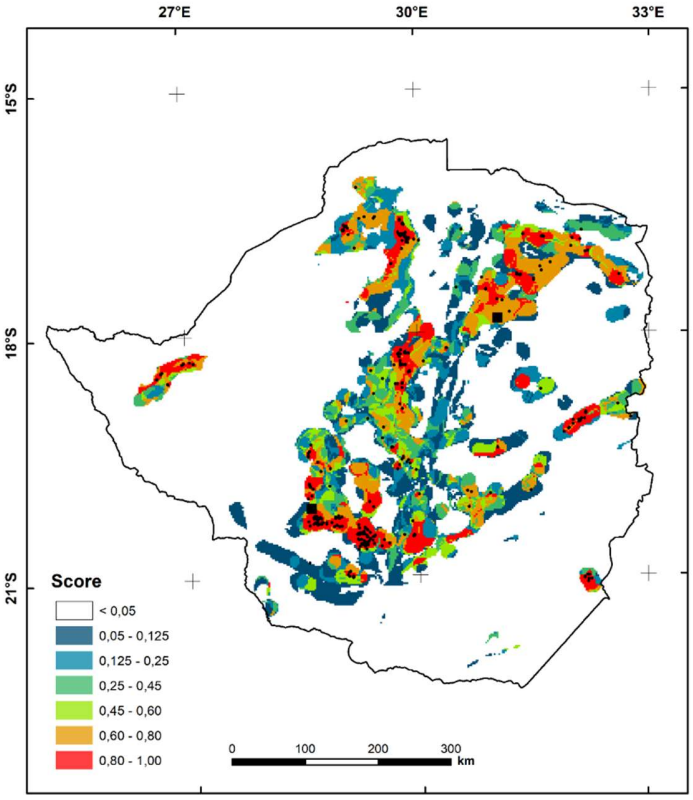

Figure 8 Mineral Potential Map of Zimbabwe for tungsten (W); known occurrences are shown as black dots

The resulting MPM shows, besides locations with known beryl occurrences, high potential in several other places. However, due to the inadequate data, this result is purely statistical and probably lacks any reality.

1.3. Ore processing and refining capacities

The majority of Zimbabwe's minerals are sold on the international markets in raw ore and mineral concentrate forms. There is an estimated 100 mineral processing facilities distributed throughout in Zimbabwe, most of which are gold or base metals processing plants. Major mining operations have their own onsite concentration, processing facilities while some small-scale artisanal miners process their ore at customer milling plants. The Zimbabwean government ban on raw lithium ore on December 21, 2022 through Statutory Instrument (SI) 213 of 2022 later replaced by the Base Minerals Export Control (unbeneficiated Base Mineral Ores) Order, 2023, on 6 January 2023 Statutory Instrument 5/2023, has seen processing CRM plants in particular lithium processing plants being put in place. At the moment, lithium processing and refining in Zimbabwe is a growing industry that has attracted significant investment mostly from Chinese mining companies. Zhejiang Huayou Cobalt's lithium processing plant at its Arcadia mine in currently has the capacity to process around 450,000 metric tons of lithium concentrate

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annually5. Under Zimbabwean law, refined lithium can then be exported for further processing into battery-grade lithium outside Zimbabwe.

Most PGMs are sent to refineries in South Africa as flotation concentrate (Mimosa and some of Zimplats), Smelter concentrate (Unki), and Converter concentrate from (Zimplats' Selous Metallurgical Complex). The recoverable PGMs and the by-products are declared in Zimbabwe. Monthly average refined metals are 9213.6kg platinum, 7349.3kg palladium, 816.79kg rhodium, 378.4 kg iridium, and 784.26kg ruthenium. There is no osmium declared from the Zimbabwean mines. It is most likely not recovered because of its poisonous nature. The monthly average by-product production from all three operations is 1551.5kg of silver, and 18783kg of cobalt. Average copper, nickel, and gold figures were obtained but the metals are produced from three operations.

Fabrication

There is no fabrication happening in Zimbabwe. However, it is possible that some fabrication of steel products will happen after the mega Dinson Steel Manhidze Plant is completed.

[5] https://foreignpolicy.com/2023/08/16/zimbabwe-china-lithium-exports-green-technology-africa/#:~:text=The%20plant%20currently%20has%20the,battery%2Dgrade%20lithium%20outside%20Zimbabwe.

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Name of processing entity	Processing Facility	Status	ECRM processed	Owner	Operator	Products	Processing capacity (t / day /week / month)	Production statistic (latest available data)	Other comments (Capacity expansion, etc.)
Mhangura Refinery	Refinery	Active	Copper (Cu)	Mhangura Copper Mines Ltd. [100%]					
Processing Facility - Refinery	Refinery	Closed	Copper (Cu)	Mhangura Copper Mines Ltd. [100%]				S&P Capital IQ Pro DB 2023	4.0 Very High - No Change
Empress Nickel Refinery	Refinery	Under care and maintenance	Copper (Cu)	RioZim Ltd. [100%]	RioZim Ltd.	Refined	6000 mt/y	S&P Capital IQ Pro DB 2023. USGS 2018 Minerals Yearbook, Vol. III, Zimbabwe Country Chapter, Table 2; various other USGS, industry, geologic research, and company reports; various mining databases	As of July 2022, the capacity at the Empress refinery remained at 17400 mt/y Ni. (INSG July 11, 2022). In 2022, The Refinery operated under care and maintenance throughout the period. 210 tons of matte, 78 tons of PGMs and 21 tons of copper were produced. (RiozZim 12/21 AR Mar 31, 2022). As of January 2022, RioZim Ltd planned expansion project to increase the refinery capacity from 17400 mt/yr to 45000 mt/yr. (INSG Jan 18, 2022)
Bindura Refinery and Smelter	Plant	Under care and maintenance	Cobalt (Co)	Bindura Nickel Corp. Ltd. [100%]	Bindura Nickel Corp. Ltd.	Hydroxide	700 mt/y	S&P Capital IQ Pro DB 2023. USGS 2018 Minerals Yearbook, Vol. III, Zimbabwe Country Chapter, Table 2; various other USGS, industry, geologic research, and company reports; various mining databases	Operations suspended. Capacity is a combination of Bindura Smelter and Bindura Refinery.
Empress Nickel Refinery	Refinery	Under care and maintenance	Cobalt (Co)	RioZim Ltd. [100%]	RioZim Ltd.	Hydroxide		S&P Capital IQ Pro DB 2023. USGS 2018 Minerals Yearbook, Vol. III, Zimbabwe Country Chapter, Table 2; various other USGS, industry, geologic research, and company reports; various mining databases	As of July 2022, the capacity at the Empress refinery remained at 17400 mt/y Ni. (INSG July 11, 2022). In 2022, The Refinery operated under care and maintenance throughout the period. 210 tons of matte, 78 tons of PGMs and 21 tons of copper were produced. (RiozZim 12/21 AR Mar 31, 2022). As of January 2022, RioZim Ltd planned expansion project to increase the refinery capacity from 17400 mt/yr to 45000 mt/yr. (INSG Jan 18, 2022)
Empress Nickel Refinery. Eiffel Flats, ENR	Refinery	Under care and maintenance	Nickel (Ni)	RioZim Ltd. [100%]	RioZim Ltd.	Cathodes	17400 mt/y Ni and 7000 mt/yr Cu	S&P Capital IQ Pro DB 2023. USGS 2018 Minerals Yearbook, Vol. III, Zimbabwe Country Chapter, Table 2; various other USGS, industry, geologic research, and company reports; various mining databases	As of July 2022, the capacity at the Empress refinery remained at 17400 mt/y Ni. (INSG July 11, 2022). In 2022, The Refinery operated under care and maintenance throughout the period. 210 tons of matte, 78 tons of PGMs and 21 tons of copper were produced. (RiozZim 12/21 AR Mar 31, 2022). As of January 2022, RioZim Ltd planned expansion project to increase the refinery capacity from 17400 mt/yr to 45000 mt/yr. (INSG Jan 18, 2022)
Bindura Refinery and Smelter	Plant	Under care and maintenance	Nickel (Ni)	Bindura Nickel Corp. Ltd. [100%]	Bindura Nickel Corp. Ltd.	Refined metal	15600 mt/y	S&P Capital IQ Pro DB 2023. USGS 2018 Minerals Yearbook, Vol. III, Zimbabwe Country Chapter, Table 2; various other USGS, industry, geologic research, and company reports; various mining databases.	As of July 2022, Bindura's production capacity remained to be at 14500 mt/y Ni. (INSG July 11, 2022). During the fiscal year 2015, Bindura Nickel raised a $20 million bond, of which $16.4 million was received before March year-end with an ending balance of $3.6 million. In July 2015, $1.5 million was banked and the $2.1 million balance was expected to be received by September 2015. A portion of the proceeds would be used to fund the re-opening of the Bindura nickel smelter.
Selous Plant	Plant	Active	Nickel (Ni)	Zimplats Holdings Ltd. [100%]	Zimplats Holdings Ltd.	Concentrate, Matte		S&P Capital IQ Pro DB 2023	The Selous metallurgical complex was producing matte and concentrate. (INSG Sept 28, 2020)

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Empress Nickel Refinery	Refinery	Under care and maintenance	PGM-Platinum Group Metals	RioZim Ltd. [100%]	RioZim Ltd.			S&P Capital IQ Pro DB 2023	In 2022, The Refinery operated under care and maintenance throughout the period. 210 tons of matte, 78tons of PGMs and 21 tons of copper were produced. (RiozZim 12/21 AR Mar 31, 2022). As of January 2022, RioZim Ltd planned expansion project to increase the refinery capacity from 17400 mt/yr to 45000 mt/yr. (INSG Jan 18, 2022)
Selous Smelter	Smelter	Assumed Active	PGM-Platinum Group Metals	Zimplats Holdings Ltd. [100%]	Zimbabwe Platinum Mines (Private) Ltd.	Smelter matte, platinum group metals	72 mt/y	USGS 2018 Minerals Yearbook, Vol. III, Zimbabwe Country Chapter, Table 2; various other USGS, industry, geologic research, and company reports; various mining databases	Capacity is a combination of Selous Smelter and Metallurgical Complex.
Mimosa Concentrator	Concentrator	Assumed Active	PGM-Platinum Group Metals	Impala Platinum Holdings Ltd. [50%]	Mimosa Holdings (Private) Ltd.	Concentrate	1900 mt/y	USGS 2018 Minerals Yearbook, Vol. III, Zimbabwe Country Chapter, Table 2; various other USGS, industry, geologic research, and company reports; various mining databases	Capacity is in gross weight of ore and concentrate.
Selous Metallurgical Complex	Plant	Assumed Active	PGM-Platinum Group Metals	Zimplats Holdings Ltd. [100%]	Zimbabwe Platinum Mines (Private) Ltd.	Concentrate, platinum group metals	2180 mt/y	USGS 2018 Minerals Yearbook, Vol. III, Zimbabwe Country Chapter, Table 2; various other USGS, industry, geologic research, and company reports; various mining databases	Capacity is in gross weight of concentrate and is a combination of Selous Concentrator and Selous Metallurgical Complex.
Ngezi Metallurgical Complex	Plant	Active	PGM-Platinum Group Metals	Zimplats Holdings Ltd. [100%]	Zimbabwe Platinum Mines (Private) Ltd.	Concentrate, platinum group metals	3400 mt/y	USGS 2018 Minerals Yearbook, Vol. III, Zimbabwe Country Chapter, Table 2; various other USGS, industry, geologic research, and company reports; various mining databases	Capacity is in gross weight of concentrate and is a combination of Ngezi Concentrator and Ngezi Mine.
Msasa Plant	Plant	Assumed Active	Phosphate rock	Chemplex Corporation Ltd. [100%]	Zimbabwe Phosphate Industries Ltd.	Fertilizer	45000 mt/y	USGS 2018 Minerals Yearbook, Vol. III, Zimbabwe Country Chapter, Table 2; various other USGS, industry, geologic research, and company reports; various mining databases	
Arcadia Lithium	Plant	active	Lithium (Li)	Zhejiang Huayou	Arcadia	spodumene	4.5 million tonnes	Not available	
Bikita Minerals	Plant	Active	Lithium (Li)	Sinomine Resources group	Bikita Minerals	petalite	Petalite Plant: 480, 000 tonnes per year throughput. Spodumene Plant: 300,000 tonnes of chemical grade spodumene concentrate per year.	Not available	
Sabi star	Plant	Active	Lithium (Li)	51% by Chengxin Lithium Group and 49% by MaxMind	Sabi Star	spodumene	1million tonnes per annum	Not available	
Zulu Lithium	Plant	Active	Lithium (Li)	Premier African Minerals	Zulu mine	Spodumene	50,000 tonnes annually.	Not available	

Table 5 List of the main refining / processing units

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2. Assessment of the ECRM value chain

2.1. Characterisation of the value chain for primary and secondary raw materials

The minerals industry value chain is a serie of industrial processing steps that adds value, both in terms of economy and usability from the discovery of valuable minerals to delivery to market as final products. These steps include mineral exploration, first-stage mineral processing, advanced stage mineral processing, product manufacturing, product marketing, and product end-of-life recycling. Each stage represents a value-add on the previous and there are opportunities to invest at each of the major stages. The mineral industry value chain is dynamic and shifts according to commodity market, which is influenced by supply and demand, price fluctuations, changing market structures, jurisdiction, and environmental concerns. An understanding of the mineral industry value chain is important for the effective management and optimization of each stage of the value chain ensuring the smooth flow of materials, maximizing resource utilization, and meeting market demand efficiently.

The stages are segmented into upstream segment, which comprise exploration, mining and first-stage processing. Activities involved in these stages include locating, extracting, and early concentration of minerals to produce first mineral concentrates, which can marketed. The downstream segment, which comprise advanced stage processing, product manufacturing, and marketing stages include refining, manufacturing of products, their marketing and utilization in various applications. The pursuit of a circular economy has spurred the advancement of recycling practices within the mineral industry. Recycling plays a dual role in this context. Firstly, products that have reached the end of their useful lives can be recycled to reintroduce minerals back into the value chain. Secondly, minerals can be recycled from mine tailings, serving the purpose of recovering critical metals or finding alternative uses such as in construction.

Throughout the different segments of the mineral value chain, some connections and linkages allow local entities and individuals to provide goods and services to the mineral sector. This creates opportunities for businesses and individuals to contribute to and benefit from the mineral industry by supplying necessary resources, equipment, expertise, and support services. Figure 9 presents the numerous opportunities along the mineral value chain.

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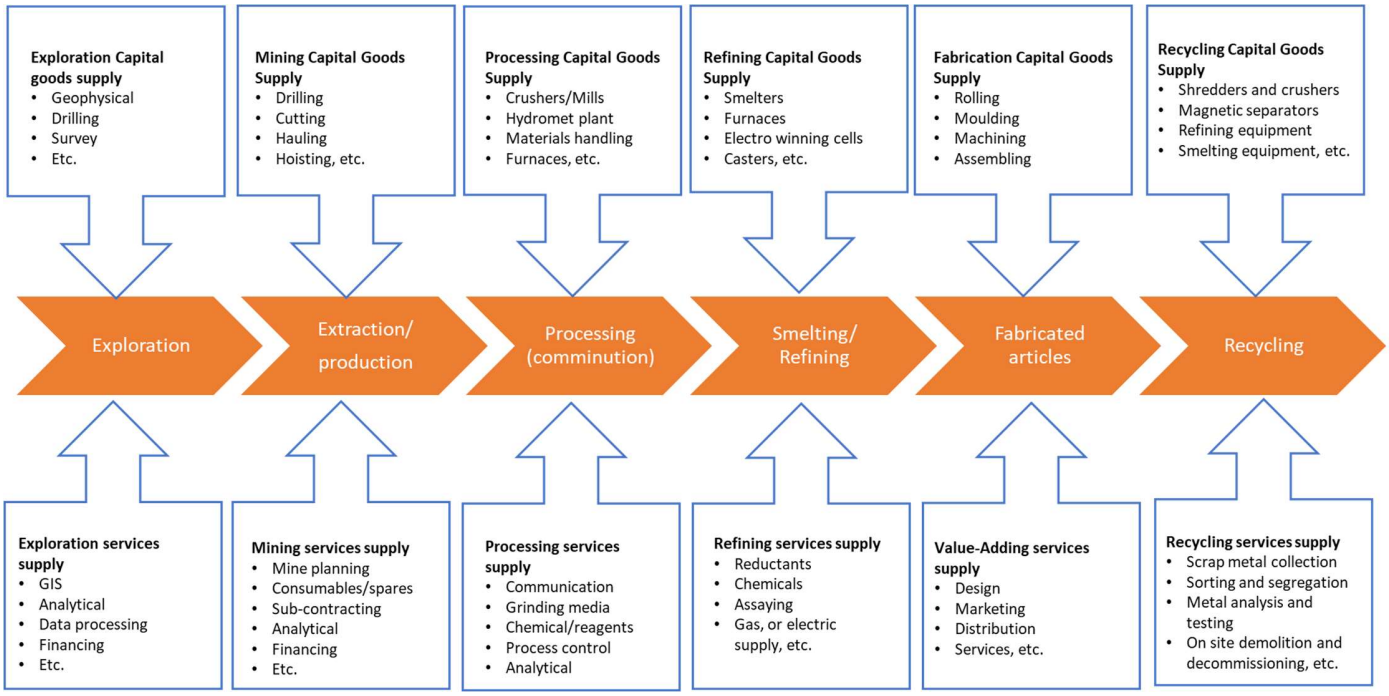

Figure 9 Schematic diagram of the general mineral value chain and the various linkages at each stage. Modified after Jourdan (2016

2.1.1 List of the mining and recycling projects (sorted by degree of maturity)

Mining is a crucial part of Zimbabwe's economy, making up over 60% of annual foreign currency receipts and 13% of the gross domestic product (GDP). The mining sector's performance reached US$5.2 billion in 2022, from US$2.9 billion in 2017 (deVere Zimbabwe, 2022). The minister of mines claims the sector has the potential to generate US$ 12 billion annually by 2023, if the government addresses challenges such as persistent power shortages, foreign currency shortages, and policy uncertainties. Legal exports of gold, Zimbabwe's top mineral export, increased from US$ 1.2 billion in 2020 to US$ 1.7 billion in 202, a 42% increase, attributed to improved output and firm prices (RBZ, 2022).

Exploration

Zimbabwe is underexplored. Modern exploration techniques such as GIS, spectral remote sensing, and high-resolution geophysics used successfully in other jurisdictions with similar geology such as Australia and Canada have not been applied in Zimbabwe. Since the mid-1990s, the Government has not been approving exclusive prospecting orders (EPO) despite mineral exploration being vital for mineral resource quantification. The country has thus lagged behind in terms of new discoveries and large-scale investments.

Zimbabwe is currently operationalizing its automated Mining Cadastre Information Management System to increase efficiency and transparency in mining title management. As a result, it was difficult to establish how many mining claims have been staked and granted throughout the country. However, based on the EPO and special grants (SG) map (Fig. 3. 2) obtained from the Ministry of Mines and Mining Development,

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the country has 251 EPOs comprising 41 granted and 210 pending applications, and 90 SGs comprising 42 granted and 48 pending applications.

	Mineral	Estimated Resource
1	Gold	13 million tonnes
2	Platinum	2.8 billion tonnes
3	Chromite	930 million tonnes
4	Nickel	4.5 million tonnes
5	Diamonds	16.6 million tonnes
6	Iron Ore	30 billion tonnes
8	Copper	5.2 millions
7	Lithium	Has largest Africa's lithium reserve.

Table 6 Estimated endowment of the Top 7 minerals in Zimbabwe[6]

Zimbabwe's Great Dyke, a linear early Proterozoic layered mafic-ultramafic intrusion trending over 550km at a maximum width of about 11 km, has the second largest platinum reserves in the world after the Bushveld Complex in South Africa. An estimated 2.8 billion tonnes of PGMs ore at 4g/t is estimated to lounge on the Dyke. The Dyke has two PGM-bearing horizons, the Main Sulphide Zone (MSZ) and the Lower Sulphide Zone (LSZ). Major platinum mines in development in Zimbabwe include Darwendale Project Open Pit Construction, owned by Vi Holding Group; Landela Mining Venture; Fossil Contracting, Todal Bokai Platinum Mine, Matabeleland North, To be confirmed, Feasibility, Eurasian Resources Group; TransMineral, Mupani Mine, Mashonaland West, To be confirmed, Construction, Impala Platinum; Undisclosed, and Karo Platinum Project, Midlands, Open Pit, Construction owned by Tharisa and Leto Settlement Trust.

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[6] Source: Government of Zimbabwe (2018). Investment Guideline and Opportunities in Zimbabwe

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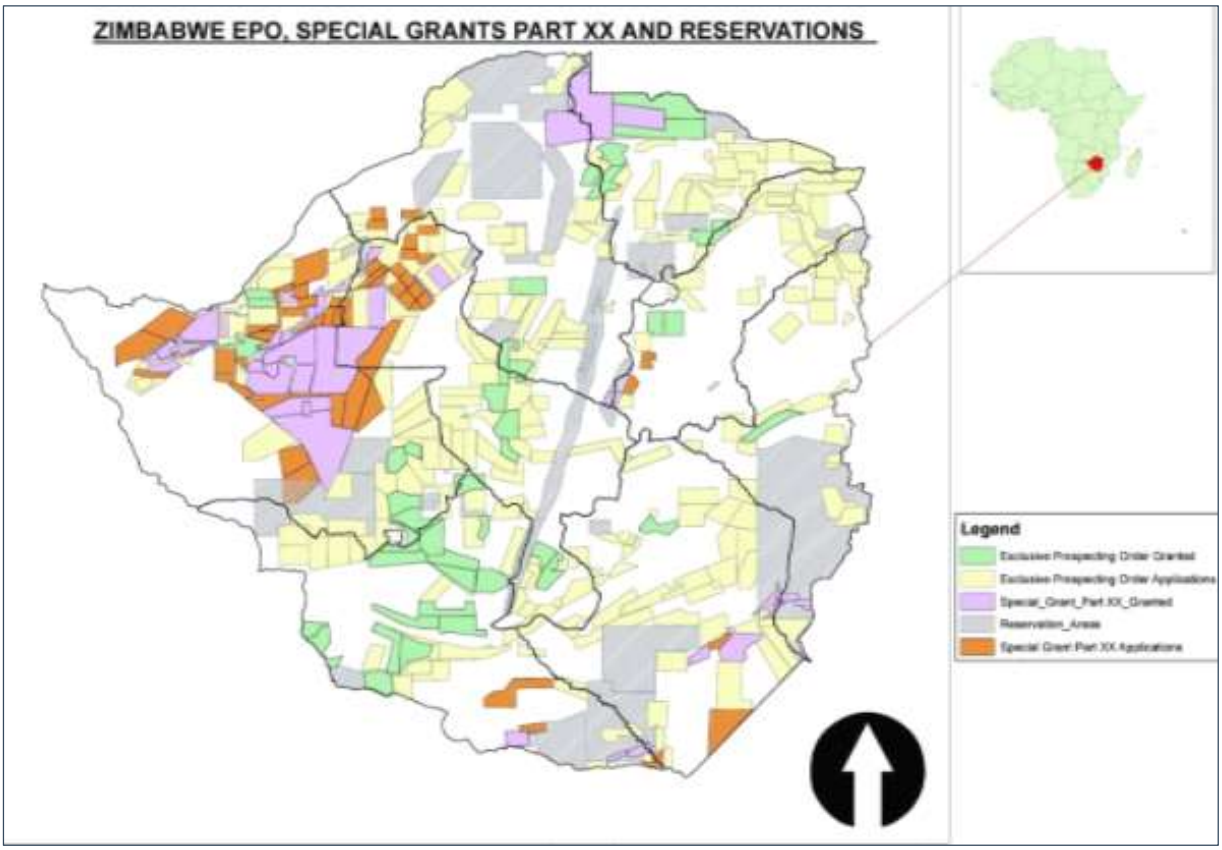

Figure 10 Zimbabwe Exclusive Prospecting Orders, Special Grants and Reservations map[7]

Mining and production

Based on data obtained from the Ministry of Mines and Mining Development, Zimbabwe has 390 operating mines (from which 3 PGMs, 1 primary nickel, 13 chromite, 4 lithium1 magnesite 1 tantalite) as of 3 October 2023, The gold mines comprise mines that are producing 0.001kg to those producing over 200kg per month.

The ECRM being mined in Zimbabwe include PGMs, lithium, tantalite, and magnesite. Antimony is produced as a by-product of gold mining, while tantalite (which contains niobium) is mainly produced as a by-product of lithium mining. Records obtained from the Mineral Marketing Corporation of Zimbabwe (MMCZ) show that there were deliveries of tungsten and manganese in 2022, the sources of these minerals are not given in the data obtained from the Ministry of Mines and Mining Development. Table 7 shows PGM mine production data from major operating mines.

[7] Source: Ministry of Mines and Mining Development (2023)

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Name of Mine	Production (mmtpa[8]) Run of Mine
Zimplats Mine	7.21
Mimosa	2.53
3 Main Mine	2.41
Unki Mine	2.18
Mupfuti Mine	2.12

Table 7 PGMs mine production data from major operating mines[9]

Leading producers of platinum in Zimbabwe are Impala Platinum and Anglo American. During 2020-2021, Impala Platinum's output was up by 12%, Anglo American's output increased by 14%. In the context of platinum mining along the Great Dyke in Zimbabwe, the terms Main Sulphide Zone (MSZ) and Lower Sulphide Zone (LSZ) refer to specific zones within the layered intrusion. The MSZ is the most prominent layer within the Great Dyke layered that carries economic platinum-group element (PGE) mineralization. The LSZ is another layer within the Great Dyke, situated stratigraphically below the MSZ and has lower PGE grades. Current mining is focused on the MSZ while the LSZ could be a potential source of pristine PGMs sulphide ore in the future. Major operating mines in Zimbabwe are the Zimplats group of mines, Mimosa, and Unki Mines. Bindura Trojan Mine is the only operating primary nickel sulphide ore deposit. The deposit is hosted in komatiites and pyrrhotite is the main nickel sulphide mineral. Nickel, copper, and cobalt are also produced as by-products of PGMs mining at Zimplats, Unki, and Mimosa operations. There are three dormant primary nickel sulphide mines including the mothballed Shangani mine.

Table 8 shows the selected ECRMs exported in tonnes between 2018 and 2022. This was an increase of around 7.14 percent compared to the previous year.

Group	2018	2019	2020	2021	2022
PGM concentrate	130,819.00	155,940.00	98,649.48	103,064.11	112,805.93
PGM catte	15,121.00	29,903.00	34,927.80	29,503.39	37,578.57
Nickel	57,560.00	55,102.11	41,614.00	43,235.63	26,796.00
Lithium	77,244.00	60,784.00	13,068.80	26,172.18	86,871.65
Tantalite	110.65	37.61	14.95	7.30	6.45
Magnesite	5,320.00	1,000.00	2,093.00	6,078.00	5,678.87
Antimony	1,139.94	648.93	770.68	888.43	513.86
Manganese	537.00	1,000.00	2,093.00	6,078.00	5,678.87
Tungsten	62.45	37.61	58.52	17.13	38.28
Beryl	-	25.00	10.00	-	-

[8] Million Metric Tonnes per Annum
[9] Source: Global Data 2021

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Table 8 ECRM Export volumes from 2018-2022

Zimbabwe Lithium Value Chain

Zimbabwe has 37 known lithium deposits of significant economic importance. These deposits are hosted in pegmatites. The pegmatite deposits in Zimbabwe have been classified into two major types: those occurring closely associated with Archaean greenstone belts; and those occurring within the Zambezi Metamorphic Belt (Mupaya, 2021). Greenstone belt-type pegmatites are marginal to greenstone belts and usually occur where younger granitoids intrude the greenstone belts. Pegmatites of this group are important for beryllium, tantalite-columbite, microlite, lithium, tin, and sometimes cesium. Table 9 shows the deposits and their level of maturity.

Project	Level of Maturity
Bikita Minerals	In commercial production since 1950s. Bikita has reserves of 10.8-11 million tonnes of lithium ore grading 1.4% (equivalent to about 150,000 tons of pure lithium reserves), representing 65% of Zimbabwe's total lithium reserves in 2019. BM has been mining and marketing over 60,000 tons of lithium and caesium ore per year for the past 60 years.
Arcadia Lithium	Advanced Development Project transitioning to commercial production. The project has 42.3 Mt at 1.19% Li2O (504,000t contained lithium) Code Compliant Ore Reserves in the Measured, Indicated and Inferred category and a Mineral Resource estimate of 72.7Mt at 1.11% Li2O (770,000t contained lithium) published in an ASX release dated 25 October 2017.
Sabi Star Lithium	Development project transitioning to commercial production. It has a declared mineral resource of 7Mt at 1.5% Li2O and ore reserve of 5.5Mt at 2% Li2O. Trial production commenced in August 2023.
Zulu Lithium	Development project transitioning to commercial production. It has a SMAREC Code compliant Mineral Resource of Mineral Resource Estimate of 20.1Mt at 1.06 % Li2O and 51 ppm Ta2O5 using a cut-off grade of 0.5% Li2O. Trial production commenced in April 2023.
Kamativi Mine Project	Re-evaluation underway. The project had 106,741t of spodumene ($LiAlS2O6$) when operations were suspended in 1995. Lithium was co-produced with tin, beryl, and tantalum. Galileo Resources, BC Ventures, and Cordoba Investments Limited are developing the project. In 2018, Chimata Gold Corp (Zimbabwe Lithium Company) announced a JORC (2012) compliant Indicated Mineral Resource of 26Mt at 0.58% Li2O within the Kamativi mine tailings.
Kamativi Lithium Project	Early-stage exploration project whose prospectivity is centered on its proximity to the Kamativi Mine. Galileo Resources is developing the project.
MIRRORPLEX Lithium Project	Early-stage exploration project reportedly with huge potential. So far, 240 rock chip samples have been collected from the Bonnyvale and Loch Ness Pegmatites returning up to 3.13% Li2O, and 4.82% Li2O respectively. The project is speculated to be sitting on 6Mt of lithium (Mining Zimbabwe, September 30, 2022).
Step-Aside Lithium Project	Early stage exploration Project. Prospectivity is based on mineralized LCT pegmatites.
Mistress Lithium	Project under care & maintenance. Mupaya (2021), using a geological factor method (pegmatite parameters), estimated an inferred global resource of 39, 195 000t of

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	spodumene, 29,475,000t of lepidolite, 3,888,00t of muscovite-lepidolite, 98,615,500t of feldspar, 53,559,500t of silica, and 45,000t of beryl.
Benson Lithium	26t of lithium concentrate was co-produced with tantalum in 1954, and 1955. The project is under re-evaluation.
Good Days Lithium	A resource of 30Mt Spodumene and lepidolite historically co-produced with beryl. Project under re-evaluation
Sandawana	Exploration project. Confirmed lepidolite and spodumene mineralization.
Bepe	Exploration project:45t of lithium was co-produced with tantalum in 1967
Blarney	Exploration project: 28t of lithium concentrate was co-produced with beryl in 1956
Bobby	Exploration project: 36t of lithium concentrate was co-produced with beryl in 1963
Bomb	Exploration project: 91t of lithium concentrate was co-produced with beryl in1957,and 1981
Casa Ventura	Exploration project: 606t lithium concentrate was produced in 1957, and 1981
Embizemi	Exploration project: 50t of lithium concentrate was produced in 1967
Pfungwe Gem	Exploration project: 601t of lithium concentrate was co-produced with beryl in 1969. Currently under exploration license.
Good Days	Exploration project: Spodumene, lepidolite with beryl 1970-72
Grand Duke	Exploration project: 103t of lithium concentrate was produced from 1927-70
Green Mamba	Exploration project: 54.4t lithium concentrate was co-produced with beryl in 1962
Guardian	Exploration project: Exploration project: 82t of lithium concentrate was co-produced with tantalum in 1968 and 1969
Gwaai	Exploration project: 74t of lithium concentrate was co-produced with tantalum and tin in 1953,and 1954
Kalinda	Exploration project: 23t of lithium concentrate was co-produced with tin in 1938
Kapata	Exploration project: 4t of lithium concentrate was co-produced with tin in 1954
Lutope	Exploration project: 238t of lithium concentrate was co-produced with tin in 1953,and 19 54
Matake	Exploration project: 130t with beryl 1982, 83
Mauve	Exploration project: 4922t of lithium concentrate was co-produced with tantalum in between 1952-1958
Mbeta	Exploration project: 496t of lithium concentrate was co-produced with tantalum between 1954 and 1960.
Mops	Exploration project: 36t of lithium concentrate was co-produced with beryl in1955
Patronage	Exploration Project: Spodumene, lepidolite, cassiterite, microlite, tantalite, and beryl. 72.6t spodumene, 1531t petalite+ lepidolite, and 227t eucryptite. 1967-68
Porte	Exploration project: 1044t of lithium concentrate was co-produced with tantalum between 1969-1970
Tagara	Exploration project: 3t of lithium concentrate was co-produced with talc in 1975
Vee Cee	Exploration project: 254t of lithium concentrate was co-produced with tin in 1969 and 1970
Vulcan	Exploration project: 36t of lithium concentrate was produced in 1957
Winston	Exploration project: 1122t of lithium concentrate was produced between 1953 and 1967

Table 9 Zimbabwe lithium deposits with their levels of maturity

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Bikita mine

The Bikita mine, which has recently been bought by China Sinomine Resource Group, is located in south-East Zimbabwe. The mine has been periodically mined since tin was discovered in 1910, lithium mining (petalite) commenced in the 1940s. The graded petalite concentrate product produced on-site was sold to the United States of America mainly for glass and ceramics (Goodenough et al., 2021). Tantalite has historically been co-produced with lithium at the mine. The mine historically employed both open pit and underground mining methods to extract lithium ore that undergoes comminution on an onsite concentration plant. In January 2022, the new owners, Sinomine Resources Group commissioned a new processing plant with a capacity to produce 300,000 metric tonnes of spodumene concentrate and 480,000 metric tonnes of petalite per year. The processing facility comprises a Gravity Separation Plant and a Flotation Plant (Bikita Minerals, 2022). The Gravity Separation Plant produces the petalite concentrate and has capacity to process 2 million tonnes of ore per year, while spodumene concentrate is produced in the flotation plant. The lithium spodumene oxide is shipped to China for production of lithium hydroxide and lithium carbonate for manufacture of cathodes and electrolytes for rechargeable batteries.

Arcadia lithium project

The Arcadia lithium project is located 38 km east of the capital city Harare. The property was, acquired from Prospect Resources by Zhejiang Huayou of China for $422 million in December 2021. Arcadia lithium project is an advanced development project transitioning to commercial production. It has a 42.3 Mt at 1.19% Li_2O (504,000t contained lithium) Code Compliant Ore Reserves in the Measured, Indicated, and Inferred category and a Mineral Resource estimate of 72.7Mt at 1.11% Li_2O (770,000t contained lithium) published in an ASX release dated 25 October 2017. Zhejiang Huayou Cobalt commissioned the plant in April 2023, and announced the export of 30,000 metric tonnes after the plant went into trial production.

The Arcadia lithium deposit is hosted within a series of 14 stacked, subparallel petalite-spodumene-bearing pegmatites, intruding the Harare Greenstone Belt (HGB). Drilling results identified pegmatites with an average thickness of 15m and extending up to 3.5km along the strike. Most of the economic lithium mineralization found at Arcadia comprises petalite and spodumene. The crystallization of petalite is expected to have occurred prior or co-genetically with primary spodumene. Secondary mineralization is thought to have occurred through the conversion of petalite and spodumene to spodumene, quartz intergrowth, and eucryptite.

The Arcadia Mine is a conventional truck-and-shovel open pit mining method operation. The ore is extracted by drilling and blasting of the ore rock. A contractor carries out the mining, loading, hauling and dumping of the ore and waste. The run of mine with a head grade of 1.19%Li2O is undergoes crushing followed by high pressure grinding rolling to achieve a 5mm crush size required to achieve optimal liberation of petalite for primary recovery by dense media separation technique. The run of mine (ROM) with a head grade of 1.19%Li_2O undergoes crushing and screening followed by high-pressure grinding rolling (HPGR) to achieve a 5mm crush size required to sufficiently liberate petalite for recovery by dense media separation (DMS) technique to produce a 4% (82%) petalite concentrate product of which 80% is 1.7mm, with less than 0.05% Fe_2O_3 technical grade petalite concentrate, and 20% 1.7mm to +0.6 mm

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chemical grade petalite concentrate product. The post-gravity recovery reports to the flotation circuit where spodumene is effectively recovered at a grind size P100 of 0.212mm (P80 0.150mm). Fatty acid flotation is used to recover a spodumene concentrate of 6% Li_20; i.e. 75% spodumene. Spodumene concentrate will be cleaned, and upgraded, by employing mica flotation at low pH followed by WHIMS to reduce iron contamination. The mica concentrate will be set aside pending the potential identification of a potential commercial opportunity to realize value from this product.

Tantalite is recovered in a dedicated spiral circuit placed in the flotation tailings stream. The rough tantalite is upgraded to a saleable product containing approximately 25% Ta_2O_5 by the use of conventional gravity concentration methods and magnetic separation. The Arcadia plant is planned for a total annual production of 450,000 metric tonnes of lithium concentrates comprised of 147,000 metric tonnes per year of spodumene, 94,000 metric tonnes per year of technical grade petalite, and 24,000 tonnes per year of chemical grade petalite concentrates.

Sabi Star lithium project

Sabi Star Mine is owned 51% by Chengxin Lithium Group and 49% by MaxMind, all Chinese companies is an advanced development project transitioning into commercial production. Trial production commenced in August 2023. The project has a declared mineral resource of 7Mt at 1.5% Li_2O, and 200-ppm Ta_2O_5, and ore reserve of 5.5Mt at 2% Li_2O and 200ppm $_{Ta2O5}$. The operation is expected to produce 1Mtpa Run of Mine (ROM) to be processed via gravity and flotation concentration methods to recover spodumene concentrate. At full operational capacity, the 1Mtpa ore will translate to 300,000t lithium concentrate, and 300t of tantalum-niobium concentrate per year.

Lithium-bearing mineral (spodumene) is recovered from the mining of pegmatite deposits by open-pit method. The ROM ore is transported to the plant on site where it undergoes primary and secondary crushing, screening before it is fed to the ball mill for grinding to produce a slurry. Dense media separation technique is used to separate tantalite from the spodumene concentrate. The spodumene concentrate undergoes flotation to remove the gangue material. The remaining fine tantalum is removed by magnetic separation to produce fine tantalum and 4.5% minimum Li20 spodumene concentrate. The spodumene concentrate is dried via filter pressing. The concentrate still has a 9% moisture content, is bagged and sent to China for further processing to produce battery-grade lithium hydroxide and lithium carbonate.

Zulu lithium project

Located near the village of Fort Rixon, 100km southeast of Zimbabwe's second city of Bulawayo in Matebeleland South Province, the Zulu Lithium project is owned by Zulu Lithium (Pty) Limited, a subsidiary of Premier African Minerals of United Kingdom (UK). Zulu lithium project is a massive, surface outcropping, steeply dipping, pegmatite hosted lithium deposit. The orebody thickness ranges between 5m to 30m. The deposit is amenable to open-pit mining. The property has reported a maiden SAMREC code-compliant inferred mineral resource estimate of 20.1Mt at 1.06% Li_2O and 51 ppm Ta_2O_5 using a cut-off grade of 0.5% Li_2O.

The Zulu lithium project commenced trial production in April 2023. Lithium-bearing minerals, spodumene, and petalite are co-produced with tantalite from mining of pegmatite deposits through open-pit method

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(Premier African Minerals, 2017). Ore excavation is by standard drill, blast, truck and shovel methods. The run-of-mine ore undergoes comminution that includes three stages of crushing; jaw crushing, secondary crushing, and tertiary cone crushing followed by separation by screening method to produce the -0.5mm +0.5mm fraction, and -0.5mm fraction products. The -0.5mm +0.5mm fraction screen product undergoes a two-stage cyclone-based dense media separation, initially to separate the heavier spodumene from lighter petalite and micas, and the second-stage separates petalite from the micas to produce spodumene and petalite concentrates.

The DMS spodumene is milled and further concentrated by flotation method to produce a 6.24% Li_2O spodumene. The spodumene concentrated is thickened, filtered and bagged prior to shipping to market. The DMS petalite concentrate product is milled and subjected to high-intensity magnetic separation to remove most of the iron and manganese before further concentration by flotation method to produce a 3.9% Li_2O spodumene concentrate. The petalite concentrate is filtered and bagged before shipping to market (Bara, 2017).

Lithium value chain summary

Lithium production in Zimbabwe is restricted to the upstream phase of the value chain. The production involves exploration and extraction of lithium ore minerals (spodumene and petalite) from pegmatite deposits and beneficiation of the ore to produce a lithium oxide mineral concentrate sold to overseas markets for further processing. Currently, extraction and processing of lithium ore is carried out at Bikita Minerals, Arcadia, Sabi Star, and Zulu operations.

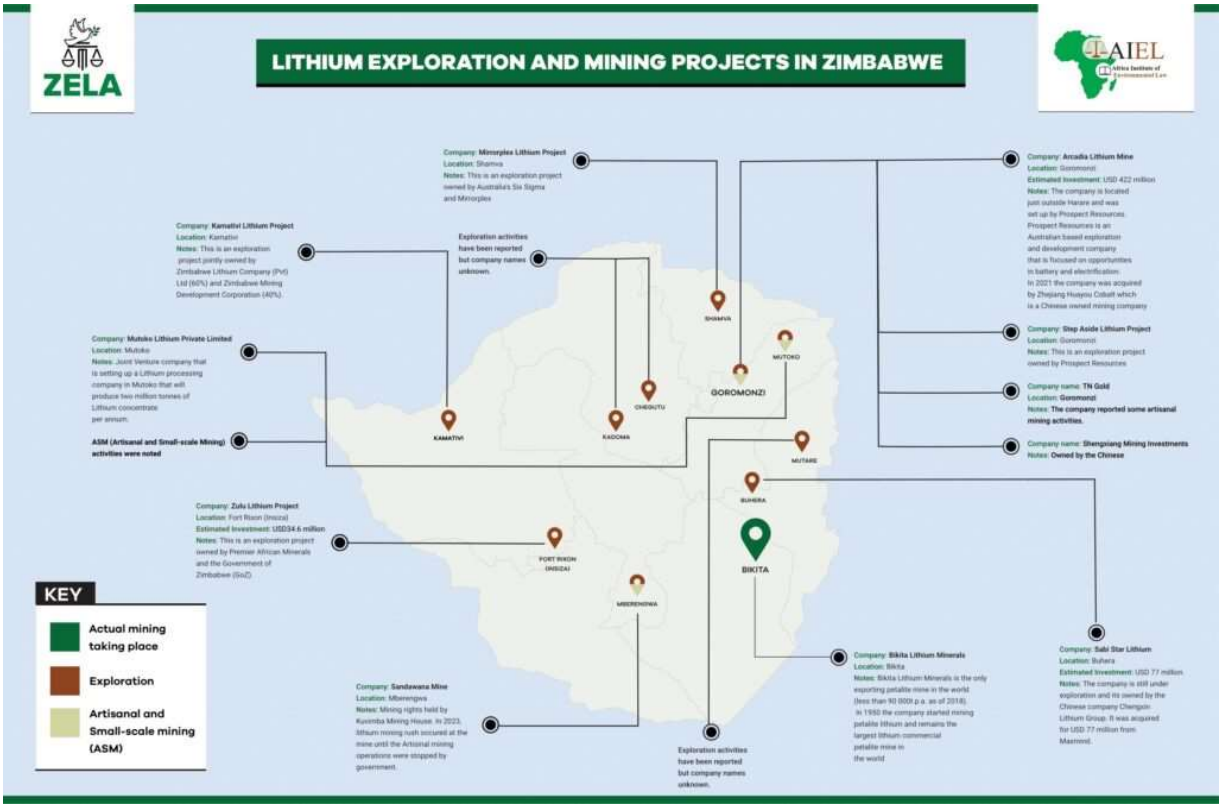

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Figure 11 Map of the Lithium exploration and mining projects in Zimbabwe

Zimbabwe PGM value chain

Three operations, Zimplats, Unki, and Mimosa, in commercial production, dominate Zimbabwe's PGMs value chains. Kadoma Platinum (Karo Resources) and Darwendale Platinum Project (Great Dyke Investments) and Todal Bokai Lithium (CAMEC-ZMDC) projects are advanced exploration stage projects with declared code-compliant mineral reserves and resources. Table 10 shows Zimbabwe's PGMs projects of significant economic importance with their levels of maturity.

Project	Level of maturity
Zimplats	In commercial production. Operates five mines with combined ore production of 7.1Mtpa, Two concentrators with combined capacity of 4.4Mtpa. Exported 623,000 ounces of 6E in matte/concentrate in 2022. (Zimplats, 2022).
Unki	In commercial production: Production is from two decline shafts feeding an onsite plant with a production capacity of 210ktpm.
Mimosa	In commercial production: The ore is processed in the on-site concentrator at a rate of 227,000t per month. The project has a steady-state platinum production capacity of 115,000oz a year. The mine produced 25,000oz of concentrate at a grade of 3.85g/t platinum.
Mimosa North Hill Project	It is an advanced exploration project with a full feasibility study. North Hill is being considered as a life extension for Mimosa due to mining depletion risks at the South Hill from 2029 onwards. It is estimated that the current South Hill Mineral Reserves will sustain the operations until 2034. It targets an area with 6.65Moz 4E Mineral Resources, and will extend the LoM at current rates (+230kOz per year) to ~2044 (+ 8 years). Surface exploration drilling is being carried out in Mtshingwe and Wedza West sections to convert Indicated to Measured Mineral Resources and eventually to prove Mineral Reserves.
Kadoma (Karo Resources)	Advanced exploration project with a code-compliant resource. Open pit. SAMREC code (2016) compliant resource of 109.58Mt at 2.04G/t 5PGE +AU, 0.10% Cu, 0.125% Ni, 0.005%Co. as at September 2022. Karo Resources (2022).
Darwendale (Great Dyke Investments)	Advanced exploration project with a code-compliant resource of 181.3Mt at 1.60g/t Pt and 2.93g/t of 4E containing 17.1 million ounces (Moz) of PGMs and gold in the measured and indicated categories.
Todal Bokai Project	Todal Mining Ltd is a 60/40 joint venture between CAMEC subsidiary Lefever Finance Limited and the state-owned Zimbabwe Mining Development Corporation (ZMDC). 135 million tonnes at 3.5 g/t inferred. Bokai's Phase 1 annual output was expected to reach 180,000 ounces of PGM.

Table 10 Zimbabwe PGMs projects with their level of maturity

PGMs in Zimbabwe are recovered from pristine sulphide ore mined from the Main Sulphide Zone (MSZ) in different sub chambers of the Great Dyke. The Great Dyke is a 550km NE-SW trending, 4km to 11 km wide, 2.5Ga layered magmatic ultramafic intrusion that cuts across the Zimbabwe craton. The intrusion is

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made up of two main chambers, the northern and southern chambers (Chaumba, 2017). The northern chamber has been further subdivided into Hartley, Sebakwe, and Musengezi sub chambers while the southern chamber has been divided into the Selukwe and Wedza sub chambers. The Darwendale and Sebakwe sub chambers are by far the largest and economically most significant. Together, they contain approximately 80% of the Great Dyke's total PGM resources (Gunn & Brenham, 2009; Wilson & Prendergast, 2001).

The MSZ is a 2-8m; locally up to 20m thick zone hosted within a pyroxenite located 10 to 50m below the mafic and ultramafic contact. PGMs occur in pyrrhotite, pentlandite, and chalcopyrite. Palladium and ruthenium are preferentially hosted in pentlandite, while platinum occurs as discrete PGM grains in essentially bismuthotellurides, sulphides and arsenides. The PGMs of MSZ are characteristically fine-grained (<5µm to 250µm) within sulphides (Johan et al., 1989).

The MSZ is characterized by zones of distinctive fine structures caused by successive vertical distribution of palladium, platinum and base metal sulphides. Palladium and ruthenium are preferentially hosted in pentlandite, while platinum is dominantly occurs mainly in the form of discrete PGM grains, mainly bismuthotellurides, sulphides, and arsenides. Gold, silver, asbestos, chromium, nickel, copper, and cobalt also occur in the Great Dyke. Nickel, copper, and sometimes cobalt, are produced as by-products of PGM mining while gold is produced as part of a family. Chromites are found at the bases of cyclic units in the lower ultramafic part of the intrusion. The chromites carry sub economic PGM contents (Oberthür et al, 2002).

Zimplats PGM operations

At Zimplats operations, PGMs are recovered from pristine sulphide minerals mined by mechanized, bord, and pillar underground mining method from five different mines (Ngwarati, Rukodzi, Mupfuti, Bimha, and Mupani) with a combined run-of-mine tonnage of 7.1Mtpa feeding two concentrators (Ngezi 1 and Ngezi 2) with a combined capacity of 4.4Mtpa (Zimplats, 2022). The ROM undergoes a process of crushing, milling and flotation and filtration concentration at each of the two concentrators to produce a filtered flotation concentrate product which is sent to the company's Selous Metallurgical Complex for treatment through a smelter and convertor concentrator to produce a converter matte which is sent to Impala Refining Plant in South Africa for refining and marketing (Mabiza 2006; Zimplats 2022).

The Run-of-mine ore is ground in a Fuller Traylor SAG mill before flash flotation to recover a coarse, high-grade primary concentrate, ahead of regrinding, and rougher and scavenger flotation.

Concentrates produced by flotation are smelted, and then converted to give a final low-iron matte, containing 44% nickel, 33% copper, 21% sulphur and 1,500g/t precious metals, that is sold to Impala Refining Services for subsequent precious-metals recovery (Mining Technology, 2021). Zimplats uses a Larox PF 25/32 filter press with a production of 10.2 tonnes dry solids equivalent per hour at 15% moisture to produce a 45mm thick concentrate cake. A Drytech flash dryer with a throughput of 10,600 tonnes per month dry weigh is used to evaporate water from the filter cake to produce a dried concentrate cake with a moisture content averaging 0.2% to 0.3%. The dried cake product is smelted in a modified Elkem-Hatch Furnace to produce nickel sulphides, copper sulphides, iron sulphides, and minor levels of cobalt together

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with the PGMs and other precious matte (smelter matte). Two Peirce-Smith converters with 22 tuyeres are utilized to produce converter matte of 0.6% Fe from the smelter furnace matte containing 42% Fe and 31% Sulphur. The converter is sent to Impala Refining Plant in South Africa, for PGM and base metal refining and marketing (Mabhiza, 2006). Zimplats has set aside US$ 200million to build a PGM and base metal refinery locally. There are 10 metals produced by Zimplats, namely: platinum, palladium, rhodium, ruthenium, iridium, silver, gold, nickel, copper, and cobalt.

Unki mine

At Unki mine, PGMs are extracted from pristine sulphide minerals mined from the MSZ of the Selukwe Sub chamber of the Great Dyke using a fully mechanized bord and pillar underground mining method. The mining cycle involves the use of Fletcher D914L 1.5m bolts fixed at 1.5m x 1.5m grid for roof support followed by the use of XRF (X-ray fluorescence), visual inspection, and chemical analysis to identify the reef. A Sandvik Axera DD210L 3m hole length with a diameter of 45mm is used for drilling production holes, followed by charging and blasting. At Unki, re-entry for safe making, cleaning and lashing is done 2 hours after blasting. A Gutehoffnungshütte Aktienverein (GHH) Sandvik LH208 is used to transport ore to the grizzly where the ore undergoes sizing ahead of hoisting to the plant on surface by conveyor belts.

Unki mine ore concentration process involve further on surface ore size reduction by crushing and milling in primary autogenous mill at a top size of 300mm of ROM with a head grade of approximately 3.50g/t 4E to produce a 40-45% passing 75µm feed to primary flotation. In the primary flotation, sulphides are removed in the froth using collectors, depressants, and purging and passed on to a cleaner flotation cells to produce a final flotation with the aid of additional depressants. Secondary flotation recovers the further liberated sulphides in a secondary rougher flotation tank. The two concentrates constitute the final concentrate product with a grade of approximately 100g/t 4E. The concentrates are two-stage thickened before final filtration in a Larox PF933 press filter to produce a concentrate cake of 16% moisture. This concentrate cake is the feed to the smelter. Unki smelter treats 62ktpa concentrates from the Unki concentrator. The smelter uses a three-electrode 8.5MW electric arc furnace to melt fluxed concentrates into smelter matte with a grade of 248g/t PGM, and slag. The matte is manually broken and then crushed in a three stage crushing plant to produce a -4mm matte of 248g/t content, which is shipped to Angloplats refinery in South Africa for conversion, refining and marketing. There are 9 metals produced by Unki, namely: platinum, palladium, gold rhodium, iridium, ruthenium, nickel, copper, and cobalt (Musa, 2023).

Mimosa mine

Having commenced operations in 1926, Mimosa mine is the oldest PGM mine in Zimbabwe. The mine is situated in the Wedza sub chamber of the Great Dyke of Zimbabwe. PGMs are recovered from pristine sulphide mineralization of the MSZ mined by fully mechanized bord-and-pillar underground mining method from four erosional isolated and fault-bound blocks, namely North Hill orebody, South Hill Orebody, Mtshingwe Fault Block orebody, and Far South Hill orebody. Each of these blocks is host to a pyroxenite layer known as P1 pyroxenite layer, which is overlain by a layer of gabbro. The PGMs-bearing MSZ is located in the P1 pyroxenite some 10m below the ultramafic/mafic contact. The MSZ is a continuous layer, 2m to 6m thick, and forms an elongated basin in the Wedza sub chamber. The zone

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strikes in a north-north easterly trend and dips at 14°C on the margins flattening towards the axis of the basin. The MSZ at Mimosa has a well-defined grade profile where peak base metal and PGM values are offset vertically, with palladium dominant towards the base, platinum in the centre and nickel towards the top. At Mimosa, the MSZ is visually identified using pyroxene and sulphide mineralization followed by confirmatory channel sampling and underground XRF (X-ray fluorescence) channel definition.

PGM extraction starts underground with drilling, charging and blasting of sulphide ore. The daily production routine involve support drilling to make working stations safe for men and equipment, face preparation, face drilling, charging and blasting, and lashing of the ore. Ore is transported to underground bunkers by conveyor belts, and then to surface stockpile. At the processing plant, the run-of-mine ore (ROM) undergoes primary, secondary and tertiary crushing, and wet milling to produce a pulp in the on-site concentrator at a rate of 227,000t per month. The pulp is fed into flotation tank cells and reagents are added to change the chemistry of the pulp. Tailings are de-watered and pumped to tailing storage facility. The recovered concentrate is thickened and filtered to produce a concentrate product with a grade of 3.85g/t platinum. The product is transported by road to Impala Platinum facilities in Rustenberg, South Africa, for smelting, converting, and refining ahead of marketing. Mimosa has a steady-state platinum production capacity of 115,000 Oz a year (Mimosa, 2023). There are 6 metals produced by Mimosa, namely: platinum, palladium, rhodium, gold, iridium, and ruthenium (Mimosa, 2023).

PGM value chain summary

The level of Zimbabwe PGM value chain development is operation based. The value chain has developed to the refining stage at the Zimplats operations. However, because of a lack of capacity, a big portion of the PGM concentrate produced at the two concentrators (Ngezi 1 and Ngezi 2) is shipped to South Africa, for smelting, converting, refining, and marketing. Unki mine value chain has developed to the smelting stage. The smelter matte concentrate is sent to South Africa for conversion, refining and marketing. There are no plans to install further downstream processing facilities as the current scale of production will not justify such installation. However, it is possible that Unki could utilize facilities at Zimplats on a toll arrangement. Value chains at Mimosa Mine are the least developed of the three mines in commercial production. Mimosa's value chain is restricted to the concentration stage of upstream segment where a thickened an filtered flotation concentrate product is sent to South Africa for smelting, conversion and PGM and base metal refining before marketing. PGM recycling is also going on in Zimbabwe.

Zimbabwe has more than sufficient resource base to justify the development of the entire PGM value chain locally.

Nickel value chain

Zimbabwe nickel value chains

Four companies that are producing nickel at four different operations (Bindura Nickel Corporation, Zimplats, Unki, and Mimosa) dominate Zimbabwe nickel value chain. Kuvimba Mining House is producing nickel at Trojan Nickel operation through its subsidiary Bindura Nickel Corporation, Ngezi Platinum, Mimosa, and Unki are producing nickel as a by-product of PGMs mining at Ngezi Platinum mine, Unki Platinum mine, and Mimosa Platinum mine respectively. Kuvimba Mining House also owns a number of

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nickel projects some of which are previously producing mines under care and maintenance or are exploration projects at various stages of exploration. Zimbabwe has 37 recorded nickel deposits seven of which are associated with PGMs. Table 11 shows Zimbabwe nickel projects of significant economic potential with their levels of maturity.

Nickel Project	Level of Maturity
Trojan Nickel Mine	Producing mine with resource including measured, indicated and inferred resource of 8.59Mt at 1.00% Ni as at 32 March 2021.
Trojan Hill	Resources declared
Kingstone Hill	Resources declared
Mimosa PGM	Producing mine with a declared resource of 129Mt at 0.14%, Ni produced as a by-product of PGMs mining.
Unki PGM	Producing mine with a declared resource of 226Mt at 0.22%, Ni produced as a by-product of PGMs mining.
Zimplats PGM	Producing mine with a declared resource of 2,060Mt at 0.12%, Ni produced as a by-product of PGMs mining.
Kadoma PGM	Advanced exploration project with Nickel resources associated with PGMs.
Empress	Old Dump highly important. Drilling of plus 10,000m on extension of the old mine-results good. Past production of 18Mt at 0.7%Ni mined by Rio Tinto.
Perseverance	Past producing with 0.83t at 1.01%, Ni mined.
Madziwa	Past producing mine with disseminated and massive sulphides, especially in meta-pyroxenite (Bartholomew, 1990); mineralization confined to two distinct ore bodies: Amm's and Sulphide Hill. Nickeliferous ore bodies formed along fractures in Archaean granitic terrane by digesting granitic xenoliths (Chimimba, 1986).
Shangani	Under care and maintenance operation with measured, indicated and inferred resource of 12.03Mt at 0.56% Ni as at 31 March 2021.
Epoch	Past producing mine with structurally controlled nickel mineralization in a well foliated serpentine-talc-magnesite schist (Bartholomew, 1990; Prendergast, 2003).
Hunters Road	Advanced exploration stage project with measured, indicated and inferred resources of 36.4 Mt at 0.55%Ni as at 31 March 2021.
Darwendale Project	Advanced exploration project with Nickel resources associated with PGMs.
Bend	Early stage exploration project. Nickel mineralization occurs at the base of a thick upper komatiitic flow. Deposit lies well above the Manjeri unit (e.g., Prendergast, 2003).
Elmo	Early stage exploration project with mineralization in a serpentinized zone at the contact of gabbro with pyroxenite in a mafic-ultramafic complex intruding granites and metasediments (Bartholomew, 1990
Damba-Silwane	Discovery stage exploration project. Fault controlled Nickel sulphide mineralization occurs in a 7 km komatiitic succession overlain by tholeiitic lavas (Bartholomew, 1990); 5 ore bodies in peridotite on Sebakwian/Bulawayan contact (Wilson, 1979) and each of them are interpreted to be associated with a discrete lava channel complex (Prendergast, 2003). Fault-controlled nickel sulphide mineralization and low-grade metamorphism (Killik, 1986).

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Hills Prospect	Discovery project with Resource of 10MT at 0.4% TNi or 3MT at 0.6% TNi, Significant potential in Laterites-Potential for : 2.23Mt at 0.86%TNi
Lower Gweru	
Matopos Dam	Early stage exploration project historically evaluated by geochemical survey and drilling -information not found. Falcon Bridge did some work on it. However, no Information was obtained.
Noel	Early stage exploration project
Warwick	Early stage exploration project with nickel mineralization in serpentinized dunite body regarded as subvolcanic sill emplaced along the contact between dacitic lavas and tuffs and overlying komatiitic lavas (Bartholomew, 1990)
Zinca	Past producing mine where nickel was produced as a by-product of PGM mining.
Mistake	Discovery stage exploration project with a declared resource of 1.56Mt grade-0.50% TNi over 250m strike 70m depth. (Bishi and Chikutiro, 2022).
Broomrigg	Discovery stage exploration project with a declared resource of 500,000 mt oxide ore at 0.56% TNi. Bishi and Chikutiro (2022).
Nickel Hill	Discovery stage exploration project with a declared resource of 10Mt at 0.4% TNi or 3Mt at 0.6% TNi, Significant potential in Laterites-Potential for: 2.23Mt at 0.86%TNi. Bishi and Chikutiro (2022).
Woodridge & Erina	Discovery stage project with a Resource of 1.56Mt grading at 0.5% TNi declared. Bishi and Chikutiro (2022).
Knocknara – Inyeze	Early stage exploration project with significant Ni in soil anomaly.
Imbeza Nickel Project	Early stage exploration project.
Sword and Ingwenya	Early stage exploration project with limited soil geochemical survey and grab sampling indicating Nickel bearing sulphides
Wedza	Early stage exploration project investigated by two core holes drilled to 100m depth testing the trench anomaly showed high nickel values.
Mphoengs Nickel Prospect	Early stage exploration project. No information obtained.
Nanji and Tynan	Early stage exploration project considered to have similar geology to Trojan mine. Explored by Anglo American Cooperation, Blanket JICA and Mine. Nickel value of 0.4% in cores drilled up to 300m.
Bubi Gabbro	Early stage exploration project.

Table 11 Zimbabwe's nickel projects and their level of maturity

In Zimbabwe, nickel is currently mined from primary nickel sulphide deposits hosted in komatiites, and as a by-product of PGMs, mining from MSZ hosted in mafic and ultramafic rocks of the Great Dyke intrusion (Markwitz et al., 2010; Prendergast, 2003). Zimbabwe's komatiite-hosted primary nickel mineralization occurs at or near the base of lava flow units, especially in lava channels and sills. The main nickel sulphide minerals in these deposits are pyrrhotite, millerite, and pentlandite, with minor chalcopyrite. They have nickel to copper ratios of 12:1 to 20:1, such as at Shangani and Trojan deposits respectively (Markwitz et al., 2010). The deposits are found in both intrusive and extrusive environments. Deposits in intrusive environments are generally low-grade disseminated Ni-Cu sulphides in dykes, or sill like intrusions

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(Prendergast, 2003). Deposits in extrusive environments have well-developed spinifex textures and flow breccias, they are low grade (0.4 to 0.6%), high tonnage massive sulphide mineralization, such as Hunters Road (31, 820t) and Shangani (243,230t) cumulative production (Markwitz et al., 2010). Komatiites hosted deposits extruded onto sedimentary environment are low grade, around 1%Ni with low tonnages.

Nickel sulphide deposits associated with the Great Dyke are mined predominantly for PGMs and are characterized by nickel grades of 0.24% and below and low tonnages ranging from 24.8 to 191.4 t cumulative nickel (Markwitz et al., 2010). Wilson and Tredoux (1990) gave an average Cu/Ni ratio of 8:1.

Zimbabwe has a number of low-grade high tonnage nickel sulphide deposits. These include Madziwa, a massive nickel sulphide deposit with an average nickel grade of 0.6% and Ni/Cu ratio from 5:1 to 3:1; Empress with Ni grades up to 0.4% and Ni/Cu ratios of 2:3, Shangani, Epoch, and Zinca currently out of production. The stalled reopening of these mines has been attributed to the prevailing Zimbabwe economic crisis (Markwitz et al., 2010). Trojan Mine, the only producing primary nickel sulphide deposit in the country, occurs within a pile of lensoidal bodies of serpentinised lavas. Cherts, banded iron formations (BIFs), graphitic shales, and felsic volcanics separate the serpentinite bodies from each other. Komatiitic and tholeiitic basalts form the footwall and hanging wall of the nickel bearing serpentinites. Nickel sulphide mineralization is found in two orebodies, the Main Orebody, and the Hanging Wall Orebody. The main ore body is massive locally also referred to as the footwall orebody. The Main Orebody is the largest and averages 250m long and 30m wide. There are other smaller ore bodies, such as the Trojan Hill, Cardiff East, and Cardiff Far East.

Three types of sulphide mineralization are found at Trojan Mine, namely: massive ore, near massive ore, and disseminated ore. The main sulphide minerals include pyrrhotite, pentlandite, and chalcopyrite, with pyrrhotite being the most abundant. Minor amount of millerite and pyrite are also present. The massive and near massive ores are situated towards the base of the lava units and are overlain by the disseminated ore (SRK Consulting, 2007). Zimbabwe nickel laterite deposits are located in the northern part of the great dyke. According to Mamina (2019), these deposits are yet to be quantified and commercially exploited. However, Dr. Martin Prendergast is reported to have delineated a resource of 20Mt at 1.5%Ni on the Horseshoe section of the Great Dyke between 2009 and 2010. As cited in Mamina (2019), information extracted from Prendergast's 2013 presentation, the Mvurwi laterite deposits have grades above 1% Ni in the sampled pits and fall into the low-grade class 0.6$ to 1.2% Ni on international markets. Information obtained from interviews during this study, the Mvurwi laterite deposits are reportedly being mined by a Chinese group.

Since nickel production from PGM dominant deposits has been dealt with under the PGM value chain, this section will focus on value chains of primary nickel sulphide value chains only. Bindura Nickel's Trojan mine is the only mine producing nickel from this deposit type in Zimbabwe now.

Trojan mine

At Trojan Mine, cathode nickel is recovered from pristine sulphide minerals selectively mined from the massive sulphide, near massive and disseminated sulphide orebodies by sublevel caving underground mining method. The orebodies are accessed from drives installed in the footwall on levels developed from

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sub-level vertical shaft system. The blasted ore is hoisted to 7L, transported to the main shaft by locomotives, and hoisted to surface. The Trojan Mine shaft systems have an ore hoisting capacity of 130ktpm. Stopping operation is trackless using long-hole drill rigs and LHDs for all cleaning.

The ROM with a head grade of …is received into a 2.5kt live capacity silo ahead of primary jaw crushing, secondary and tertiary cone crushing to approximately 80% passing 12mm size. The crushed ore is delivered and milled in three primary ball mills and the combined discharge is pumped to two classifying cyclones. The cyclone underflow is returned to two of the primary ball mills operating in closed circuit. The cyclone overflow is dewatered and fed to the primary flotation plant. The Trojan Mine Concentrator incorporates two stages of flotation each comprising roughing and scavenging in low volume conventional cells with concentrate cleaning and re-cleaning in low volume conventional cells. In primary flotation, coarsely liberated and faster floating minerals are recovered at relatively coarse grind of 50% passing 75µm. Primary flotation tails are reground to approximately 65% passing 75µm ahead of secondary flotation, where finer and slower floating minerals are recovered to produce a flotation concentrate product with Ni grade of 9%Ni.

The flotation concentrate product thickened and filtered before transportation by road to the company owned Bindura Smelter and Refining (BSR) plant. At BSR, the moist flotation concentrate product received from TMC and third party tolling customers are blended and dried before being charged into the 15MW electric furnace for smelting to produce a smelter furnace product with a high sulphur and iron content. Furnace slag is tapped, granulated and removed to dumps. Furnace matte is periodically tapped into ladles for molten transfer to Pierce-Smith converters. Converter slag is recycled to the smelting furnace to produce a low sulphur converter matte, which is granulated ahead of transport to the refinery. Copper sulphide is recycled from the Refinery to the Smelter as required to ensure the required Ni/Cu ratio in leach alloy matte (SRK Consulting, 2007).

At the refinery, Bindura Nickel Corporation (BNC) converter matte is blended with third-party matte ahead of closed circuit ball milling. The ground leach alloy matte is leached at 80°C in acidic sulphate solution in a two-stage counter current atmospheric leach circuit comprising cementation and copper leach. This is followed by a third stage non-oxidizing pressure leach at approximately 140°C and 400kPa. Copper precipitates as copper sulphide under the pressure leach operating conditions and is recovered as a cake after filtration of the autoclave discharge. A separate autoclave operating under oxidizing conditions is used to remove iron and arsenic as an iron arsenate precipitate. This is drummed and disposed of in a secure bunker.

Impure nickel solution in the cementation thickener overflow contains cobalt in solution, which is precipitated with the addition of caustic soda and recovered as a cobalt hydroxide filter cake. Nickel catholyte after cobalt precipitation reports to the Nickel tank house where nickel is recovered by electro winning. The London Metal Exchange (LME) quality nickel cathodes are washed and cut into squares per customer requirement before being drummed and containerized for dispatch. BSR has a Smelter capacity of 160ktpa concentrate producing 22ktpa converter matte. The refinery capacity is 14,500tNi per year.

RioZim's Empress Nickel Refinery is currently under care and maintenance due to shortage of concentrate.

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Zimbabwe nickel value chain summary

Zimbabwe nickel value chain is fully developed, with most segments of the value chain, exploration, extraction, concentration, smelting, converting, refining and production of nickel cathodes infrastructure available in the country. RioZim's Empress Nickel Refinery is currently under care and maintenance due to shortage of concentrate.

Tantalum value chain

Zimbabwe tantalum value chain

Tantalum in Zimbabwe is hosted in pegmatites found in three principal geographical areas namely: (i) northern Zimbabwe west of the Great Dyke, (ii) northeast Zimbabwe and Harare area, east of the Great Dyke, and (iii) the rest of the country. The majority of the tantalum produced in the country was from slags from the Kamativi mine. Tantalite-columbite production has also been recorded from a number of deposits including concentrates from a number other pegmatites and derived eluvial deposits (Bartholomew, 1990).

Tantalum production in Zimbabwe backdates to the 1930s. The country has 120 known tantalum deposits that have historically produced and 300 known occurrences (Bartholomew, 1990: Mlambo, 2011). Of the many tantalum-bearing minerals known, only microlite and tantalite-columbite are mined on a significant scale. The majority of the tantalum produced in the country was from slags from the Kamativi mine. Production of tantalite-columbite has been record from other pegmatites including concentrates from eluvial deposits formed from these pegmatites. Tantalite is produced from pegmatites together with other minerals such as beryl, tin, and lithium (Bartholomew, 1990). Table 12 shows Zimbabwe tantalum projects of significant economic potential with their levels of maturity.

PROJECT	LEVEL OF MATURITY	PROJECT	LEVEL OF MATURITY
AIRD/LUCKY DIP	Produced 1.05t 1975-84	**M AND D/ HILDA**	Produced 0.63t 1961-80
APEX	Produced 0.66t 1956-67	**MAUVE**	Produced 22.77t 1956-63
BERTAN	Produced 0.31t 1964	**MAYDAY**	Produced 0.14t 1954-61
BLUESTONE	Produced 0.68t 1981-82	**MAZOE VALLEY**	Produced 0.30t 1954-61
BREAM	Produced 0.86t 1980-81	**MISTRESS**	Produced 30.95t 1956-84
BUFROI	Produced 0.49t 1954-80	**MKANGA**	Produced 6.92t 1962-81
BURGESS	Produced 0.50t 1960-63	**MONDORO**	Produced 0.53t 1961-62
CARDEN	Produced 0.40t 1980-81	**NAMIKAZE**	Produced 0.63t 1967
CASE	Produced 0.47t 1978	**NEW DOLLAR**	Produced 0.05t 1970
CHIMBUMA	Produced 0.70t 1978	**PATRONAGE**	Produced 6.63t 1948-80
CHITANGA	Produced 0.65t 1969-70	**POPE**	Produced 0.45t 1979
DANNY BOY	Produced 0.18t 1961	**QUEEN'S GIFT**	Produced 3.27t 1966-68
FLORI'S LUCK		**RABBIT WARREN**	Produced 1.26t 1963-76
JACK'S LUCK	Produced 0.52t 1980-82	**SOWA**	Produced 0.01t 1981
JEREJOGA	Produced 1.43tt 1961-67	**SUSAMOYA**	Produced 0.75t 1957-64

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JOKI	Produced 0.66t 1980-81	**SUTSKWE**	Produced 2.75t 1957-81
KAREN	Produced 0.40t 1968-69	**THORNEY**	Produced 1.22t 1962-63
KON	Produced 0.84t 1961-78	**TREB**	Produced 0.86t 1960-83
KONDO	Produced 3.78t 1958-81	**TYNAN**	Produced 0.62t 1967-82
KRAMAC	Produced 0.18t 1955	**VEE CEE**	Produced 0.22t 1969-70
LUCKY DIP	Produced 1.09t 1975-80	**VERDALE**	Produced 1.25t 1968-73
MA'S LUCK	Produced 0.08t 1968-80	**WANROO**	Produced 5.13t 1959-62
MAWALA	Produced 1.21t 1977-81	**WELCOME**	Produced 0.85t 1967-68
MTIRIKATI	Produced 0.16t 1959	**ALPHA**	Produced 0.52t 1954-75
NYANGOMA	Produced 0.09t 1971-81	**BEBE/STAR**	Produced 1.16t 1955-69
PHILLIP	Produced 1.10t 1961-81	**BEPE**	Produced 26.55t 1955-69
PICARDE	Produced 0.48t 1958-73	**BIKITA**	Produced 156.77t 1931-59
RITA	Produced 0.36t 1954-82	**CORUNDUM**	Produced 4.54t 1954-66
RUTANSA	Produced 0.21t 1968	**DELHI**	Produced 3.23t 1947-67
SARA	Produced 0.11t 1973	**DIRK**	Produced 0.36t 1967-82
STAR TURN	Produced 3.31t 1957-78	**EBONITE**	Produced 11.35t 1926-55
TERESA	Produced 1980	**GOD VALLEY**	Produced 0.86t 1964-68
THE MINISTER/ O'BET	Produced 2.17tt 1971-82	**GWAAI**	Produced 34.57t 1954-81
WAJETSI	Produced 0.43t 1980-81	**KALINDA**	Produced 0.02t 1967
WEZUA LILLINGTON	Produced 0.15t 1954-80	**KAMATIU**	Produced 559.08t 1959-84
WEZUVA JMP	Produced 2.82t 1979-83	**KAPATA**	Produced 3.88t 1953-77
BENSON	Produced 167.03t 1954-83	**LAST CHANCE**	Produced 1.37t 1952-52
BERTELITE	Produced 0.33t 1961-84	**LITTLE EDWARD**	Produced 0.99t 1959-67
BERYL ROSE	Produced 26.76t 1961-84	**LUCKY**	Produced 0.58t 1953
BESTER'S LUCK	Produced 0.09t 1970	**LUTOPE**	Produced 7.81t 1954-79
BIRTHDAY GIFTBOMB	Produced 6.68t 1957-80	**MONDEOR**	Produced 1.28t 1961
BRIDGE/ FLORIDE	Produced 0.16t 1966	**MWERIHARI**	Produced 1.45t 1960-68
BUSH RIDGE	Produced 8.76t 1962-81	**NEL'S LUCK**	Produced 7.76t 1962-69
CHRISSIE	Produced 0.10t 1967-82	**NOMIT WEST**	Produced 0.34t 1955
CONSOLATION	Produced 0.23t 1961-62	**PEPE**	Produced 0.25t 1967
DEVIL	Produced 0.15t 1960-61	**PORTREE**	Produced 21.37t 1956-81
DIZZY	Produced 0.35t 1954-61	**PYTHON EGGS**	Produced 3.37t 1954-57
EAGLE	Produced 4.71t 1967-69	**RUB**	Produced 0.22t 1961-68
FRESH START	Produced 0.09t 1955	**SABI STAR**	Produced 0.64t 1962-68
GOD'S GIFT	Produced 2.99t 1960-84	**SERIMA**	Produced 0.69t 1955-57
GOOD DAYS	Produced 2.14t 1956-71	**SMOKY**	Produced 9.12t 1965-81
GUARDIAN	Produced 0.31t 1968-69	**SPECIAL GRANT 208/223**	Produced 0.50t 1960-63

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GUINEY BONE	Produced 0.03t 1960	**SPECIAL GRANT 212**	Produced 0.53t 1961
HOTSPUR	Produced 0.83t 1955-68	**SPECIAL GRANT 213**	Produced 0.36t 1961-70
JOKING	Produced 5.40t 1962-63	**SPECIAL GRANT 317/349**	Produced 0.62t 1966-68
JORDY WITT	Produced 0.25t 1957-69	**SYDKOM**	Produced 0.14t 1967
LOCHNESS	Produced 1.78t 1962-67	**WAGON WHEEL**	Produced 1.27t 1967-68
MABELLE	Produced 5.24t 1968-82	**WOLF**	Produced 8.15 1961-68

Table 12 Zimbabwe's tantalium projects and their level of maturity

In Zimbabwe, tantalum is recovered in the form of tantalite, tantalite-columbite from pegmatites mainly mined by open pit mining methods. Tantalite is produced mainly as a by-product of lithium mining. Concentration process multi-stage crushing of the ROM ahead of milling. At Sabi Star mine, dense media separation technique is used to separate tantalite from the spodumene concentrate. At Arcadia, tantalite is recovered in a dedicated spiral circuit placed in the flotation tailings stream. The rough tantalite is upgraded to a saleable product containing approximately 25% Ta2O5 by the use of conventional gravity concentration methods and magnetic separation.

Zimbabwe tantalum value chain summary

Zimbabwe's tantalum value chain is restricted to the upstream segment of the value chain. Exploration, extraction, and concentration stages of the value chain are developed. Tantalum is sold as Ta205 concentrate.

Niobium value chain

Zimbabwe niobium value chain

In Zimbabwe, niobium is found with tantalum in three principal minerals: columbite-tantalite (Coltan), microlite, and simpsonite in pegmatites. Columbite (Nb) and tantalite (Ta) are end members of isomorphous solid solution series. If the mineral is Fe-rich, it is referred to as ferrotantalite and manganotantalite, if manganese is more than iron in the solid solution. In the columbite-tantalite, the mineral is called tantalite if tantalum (Ta_2O_5) content is greater than 86% and columbite if niobium (Nb_2O_5) is greater than 78%.

Mineralized pegmatites include Bepe Hills, Bikita, Harare-Shamva, and Makati-Makaha pegmatites, emplaced into Archaean Shield (+2.65 Ga), and Palaeoproterozoic (2.0-1.8 Ga), these include the Kamativi and Miami Pegmatites emplaced in Palaeoproterozoic terrain (Barber, 20216). The Kamativi Pegmatite Field pegmatites are predominantly emplaced in Palaeoproterozoic age garnetiferous mica schists during late phase Kibaran Orogeny. The pegmatites are not truly zoned but display three distinct mineralogical phases: potash feldspar, albite-rich, and muscovite-quartz phases. The pegmatites have been divided into four groups: cassiterite bearing, tourmaline mineralized, non-mineralized tourmaline bearing, and quartz pegmatites. Cassiterite-bearing pegmatites predominate (Barber, 2016).The Miami Pegmatite Field is predominantly emplaced in garnetiferous mica schists and metapelitic gneisses of the Magondi Mobile Belt. The pegmatites have been divided into three groups: the uneconomic and barren, economic mica-bearing and economic beryl-bearing pegmatites. In addition to beryl, the economic beryl-bearing

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pegmatites have also been exploited for niobium-rich coltan, small quantities of amblygonite, cassiterite, and magnetite. The Bepe Hills Pegmatite Field situated approximately 70km west southwest of Mutare, contains numerous, commonly tabular, irregular shaped pegmatites emplaced in Archaean aged strata Mutare Greenstone Belt. These pegmatites have been exploited for beryl, cassiterite, coltan, microlite, and lithium minerals.

The Bikita Pegmatite field pegmatites are characterized by zoning and are emplaced sub-parallel to the Masvingo Greenstone Belt. A paper by Masimirembwa and Harawa (2019) states that "Dasent (1981) divided the pegmatites into soda-rich (Na-K) and potash-rich (K-Na). The pegmatites are mined for lithium and beryl minerals, with cassiterite, coltan, and microlite recovered by-products. The Harare-Shamva Pegmatite Field pegmatites are late-Archaean age emplaced in meta-basaltic, gabbroic and gneissic rocks close to the Chinamora and Murehwa Batholiths. A number of mines, albeit small, have produced microlite. The Makati-Makaha Pegmatite Field pegmatites are emplaced in the Makati-Makaha Greenstone Belt.

Niobium-containing minerals columbite-tantalite, microlite, and simpsonite are recovered as by-products of mainly lithium mined by open pit mining method. The ROM undergoes a series of crushing, milling, and flotation to produce a tantalite concentrate containing undeclared amounts of niobium that is shipped to market.

Zimbabwe niobium value chain summary

The niobium value chain in Zimbabwe is poorly developed. Niobium is produced in the form of tantalite concentrate and its value is obscured. This is despite the fact that most lithium mining companies declare the mineral in their mineral reserve and resources.

Magnesium value chain

Zimbabwe magnesium value chain

Magnesium in Zimbabwe is found in magnesite. The country has 11 known magnesite deposits. Table 13 is a list of the magnesite deposits and their level of maturity. The Kadoma Magnesite mine on Farm Barton in Kadoma District, Mashonaland West Province, is the largest and only producing mine in the country. The deposit is hosted in volcano-sedimentary rocks and lavas and is thought to have formed from magnesium alteration of dolomite. Several other deposits are also known including Mat Mine, Calc Deposit and Bukwa Magnesite (Bartholomew, 1990). There is no production of magnesium metal in Zimbabwe. Magnesite is processed to produce a variety of products specific to customer requirements. The value chain consists of exploration, mining, separation, and calcining.

PROJECT	LEVEL OF MATURITY
Barton Farm Mine (Kadoma Magnesite Mine)	Producing mine with an annual capacity of (868024t was produced between 1932-84)
Bukwa Magnesite mine	
CALC	Historical operation. Produced 13739t between 1968-70)

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Freedom	Historical project that produced 351t in 1943
Gwati (Chishanya Phosphate)	Historical project that produced 205t between 1981-82
Krantz	Historical project that produced 98t between 1949-61
Mat	No production prospect
Mwele	273t 1943-62
Pande	Historical project that produced 836308t from 1964-84
PYE	No production prospect
Wojele	Historical project that produced 186t between 1940-47

Table 13 Zimbabwe Magnesite Projects with level of maturity

Magnesite is extracted by underground mining method. The ROM is loaded into coco pans and is hoisted to surface, and trammed to the on-site crusher, where it is crushed to produce fine raw magnesite ore product ahead of thermal separation in the kiln. The fine raw magnesite ore is sent into a kiln for calcination at a temperature of 700-800°C for 1 hour to produce a brittle, porous, and low compressive strength. Gangue minerals such as talc and dolomite are hardened, ahead of selective crushing and screening to separate the magnesium oxide powder from the gangue-containing mineral particles and produce a caustic magnesia final product sold to local farmers for animal feed, lime for agricultural, chemical industries, construction, chewing gum, and other manufacturing uses.

Zimbabwe magnesium value chain summary

The magnesium value chain in Zimbabwe is not fully developed. The magnesite ore is processed to produce caustic magnesia used in different industries.

Tungsten value chain

Zimbabwe tungsten value chain

Zimbabwe has a total of 355 known tungsten deposits and occurrences. Tungsten mineralization occurs in three different geological settings namely, Archaean greenstone belts, Proterozoic Zambezi Metamorphic Belt, and those associated with late Karoo granitic activity. The majority of tungsten production in the country has come from greenstone belts where scheelite is produced as a by-product of gold mining. In the Zambezi Metamorphic Belt, tungsten has been mined from two sectors where it is found in wolframite-bearing quartz veins. Production Nearly all the production in western Hwange sector has come from the R.H.A mine. In the Hwange sector to the east mineralization is concentrated in the Honey Wolframite Belt east of the Karoi and also occurs in higher grade Piriwiri gneisses south-east of Kariba (Bartholomew, 1990). The latest mineralization is found in veins associated with a late Karoo granophyre intrusion in the southeast of the country where veins contain both scheelite and wolframite, as well as abundant sulphide minerals. Table 12 is a list of some of the projects and their level of maturity.

Local tungsten production is in the form of mineral concentrates grading a minimum of 65% tungstic oxide (Bartholomew, 1990). RHA Tungsten mine is the only primary tungsten deposit producing in the country. Tungsten is produced as a by-product of mining of other minerals at Turk, Muriel, Dollar Tantalite and Dorowa mines. Tungsten processing flowsheets from these operations are not available. Zimbabwe

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tungsten processing in this report is based on the RHA Tungsten Mine value chain. The primary tungsten mineral of economic interest is wolframite ((Fe, Mn) WO4).

Name Project	Level of Maturity
RHA Tungsten Mine	Commercial production was planned to start in 2022. The project has a code-compliant resource of 22.14 million tonnes at 2.45kg per tonne in both the underground and open pit operations. The processing plant has a capacity of 40,000tpm (Premier Africa Mineral, 2016).
Dorowa Mine	Producing mine. Scheelite is produced as a by-product of phosphate rock mining.
Turk Mine	In commercial production: Wolframite is produced as a by-product of gold mining.
Muriel Mine	In commercial production: Wolframite is produced as a by-product of gold mining.
Sandawana Mine	Emeralds co-produced with tantalite: Tungsten, beryl, mica, and gold are known to exist.
Dollar Tantalite Mine	Tungsten is co-produced with tantalite.

Table 14 List of Tungsten Project and their level of Maturity

Zimbabwe tungsten is recovered from scheelite and wolframite minerals mined by both open pit and underground mining methods. Drilling and blasting are employed to extract the ore rock. The run of mine ore with a head grade of 3.6% WO_3 (Tungsten oxide), is crushed and jigged to produce a coarse concentrate assaying about 62.7% WO_3. The 62.7% WO_3 is further ground ahead of spiral concentration to produce a concentrate product with a grade of 65.7% WO_3.

Zimbabwe tungsten value chain summary

Tungsten value chains in Zimbabwe are restricted to the upstream segment of the value chain comprising exploration, mining, and concentration. Tungsten extraction and purification (refining) stages are not happening in Zimbabwe. Tungsten extraction involves the roasting and chemical treatment of the 65% WO3 concentrate product to remove sulphides and arsenides to produce a higher value intermediate compound, ammonium paratungstate (APT) product. Tungsten refining involves the chemical treatment of the APT product to produce tungsten to produce most pure tungsten crystals called ATP, which is further treated to produce different tungsten powders.

Beryllium value chain

Zimbabwe Beryllium value chain

Beryllium value chain comprise exploration, mining, separation, smelting, solvent extraction, refining, and product manufacture. These activities are not happening in the country at the moment.

Antimony value chain

Zimbabwe Antimony value chain

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Antimony deposits in Zimbabwe are hydrothermal-type deposits hosted in quartz-carbonate veins in greenstone belts. The Midlands Greenstone Belt, one of the largest gold districts in Zimbabwe and, on a world scale, represents a major province of vein and shear-zone-hosted gold and gold-antimony mineralization. In the Kwekwe district alone, a total of 188Mt of gold and 4,500t of stibnite concentrate has been produced from 137 mines (Bartholomew, 1990: Du Toit, 1998). The Kwekwe district comprises the central part of the Archaean Midlands greenstone belt, which hosts massive antimony mineralization. Stibnite-gold mineralization is a late stage hydrothermal event. Mineralization occurs in the form of polymetallic veins and alteration zones, with massive stibnite mineralization and high gold occurring within brittle deformed veins, and dyke like the one reefs associated with native gold, sphalerite, and pyrite. Hydrothermal alteration includes sericitisation, carbonatisation, and propylitisation (Buchholz et al., 2007). Table 15 shows Antimony projects and level of maturity.

Project	Level of Maturity
Jojo Mine	Producing Gold and Antimony Resource of 487,442t at 6.06g/t Au, and 6% Sb. Owned by a Chinese group that acquired the property from Homestake Mining Company. Mining underground and stockpiling Au/Sb ore while building Carbon In Pulp (CIP) (2000tpd), and Flotation Plant (500tpd) on site
Monte Christo Mine	Producing Gold and Antimony Resource of 754,903t at 3.7g/t Au, and 4.5%Sb. Mining and stockpiling.
Anzac Mine	Producing Gold and Antimony Resource 450,000t at 7g/t Au, and 8%Sb. Underground mining and processing for gold and antimony flotation and roasting methods.
Munyati Antimony Mine	Producing and Feeding the ore to the Sebakwe Flotation Plant.
Dalling Mine	Operational: Underground gold 2.6g/t and 12% Sb. Processing ore at Ivanhoe Milling Centre doing about 4t of concentrate per day (100tpm concentrate). Leaching gold and stockpiling Sb concentrates.
Bell Riverlea	Producing but no data provided. Mining gold and antimony.
Newtron King Mine	Producing

Table 15 Antimony project and level of maturity

Antimony in Zimbabwe is recovered from stibnite mined by underground mining methods from quartz carbonate hydrothermal deposits in greenstone belts. The ore is hoisted to surface and trammed to plant for processing. The majority of the antimony is at the moment stockpiled while the beneficiation facilities are being put in place. The ROM is crushed before being fed into leaching pads to remove the gold. The remaining antimony concentrate is stockpiled.

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Zimbabwe antimony value chain summary

Only the exploration and mining stages of the upstream segment of the antimony value chain are fully developed in Zimbabwe.

Manganese value chain

Zimbabwe manganese value chain

Manganese deposits in Zimbabwe are small, scattered, and not sufficient to meet demand. Manganese has also been produced as a byproduct of iron ore mining (Bartholomew, 1990). According to the Minerals Marketing Corporation of Zimbabwe, Randstad Mining, is the only company exporting manganese ore in the country. The manganese is mined in the Dotito–Rushinga-Nyamapanda area. However, from telephonic interviews carried with some operators on the ground, Randstad Mining is buying manganese ore from a number of artisanal miners working different claims. Manganese deposits in Dotito-Rushinga-Nyamapanda area are stratabound and stratiform hosted in high-grade metamorphic rocks of the Rushinga Group. Historical grab samples have returned impressive grades of up to 53% Mn (Metals of Africa, 2012).

Manganese is ore recovered by on surface excavation of the orebody using hired machinery and times by hand. Ore concentration is achieved through visual separation of ore and waste rock before the manganese ore is sold to customers on site.

Manganese value chain summary

Zimbabwe manganese value chain is poorly developed. In the upstream segment, it is difficult find projects in exploration stage, while there is extraction, albeit, at artisanal level, it is difficult pinpoint the real project sponsors.

Recycling in Zimbabwe

Recycling in Zimbabwe is dominated by the production of steel products from scrap metals. Naisonale Investments, which employs about 150 workers, recycles scrap to supply steel products such as beams to the domestic construction sector. At peak output, the company produces 30 to 40 tonnes of steel per day. Steel is considered by the government to be a critical industry, so companies such as Naisonale have been exempted from the planned power outages, which have crippled other industries in the country.

The scrap includes parts from haulage trucks and railways, such as tracks and train components collected from various centres throughout the country. A tonne of scrap metal sells for US$150, but dealers can get up to US$300 depending on the day's market price.

The ECRMs recovered from various end-of-life components include platinum, palladium recovered together with gold, and silver from electronic waste and catalytic converters by Eco-Tech Recycling. The company also recycles copper, aluminum, and steel from various scrap materials. Zim Battery Recycling recycles lead-acid batteries and recovers lead, sulphuric acid, and plastic. The company also produces new batteries from recycled materials. Green Energy Solutions recycles lithium-ion batteries and recovers

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lithium, cobalt, nickel, and manganese. It also produces new batteries and solar panels from recycled materials. ZimRecycle recovers lithium, cobalt, nickel, and manganese from used batteries and converts them into high-quality products for the battery industry. The company also provides collection and transportation services for battery waste across the country. E-Waste Zimbabwe recycles electronic waste, such as computers, phones, TVs, and printers, and extracts valuable metals, such as gold, silver, copper, and palladium. E-Waste Zimbabwe also offers data destruction and refurbishment services for electronic devices. CatCo, recycles catalytic converters from vehicles and recovers platinum group metals such as platinum, and rhodium. CatCo also sells new and used catalytic converters and provides testing and certification for vehicle emissions. Mine Rec, specializes recycling mining waste, such as tailings and slag, and recovers rare earth elements such as neodymium, dysprosium, and terbium. Mine Rec also provides environmental remediation services.

Lithium Recycling in Zimbabwe

Green Energy Solutions and ZimRecycle are involved in the recycling of lithium in Zimbabwe. Green Energy Solutions recycles lithium-ion batteries and recovers lithium, cobalt, nickel, and manganese. It also produces new batteries and solar panels from recycled materials. ZimRecycle recovers lithium, cobalt, nickel, and manganese from used batteries and converts them into high-quality products for the battery industry. ZIMRecycle also provides collection and transportation services for battery waste throughout the country.

PGM recycling in Zimbabwe

Three companies are involved in PGMs recycling in Zimbabwe. Eco-Tech recovers precious metals, such as gold, silver, platinum, and palladium, from electronic waste and catalytic converters. It also recycles copper, aluminum, and steel from various scrap materials. E-Waste, recycles electronic waste, such as computers, phones, TVs, and printers, and extracts valuable metals, such as gold, silver, copper, and palladium. E-Waste Zimbabwe also offers data destruction and refurbishment services for electronic devices. CatCo recycles catalytic converters from vehicles and recovers PGMs, such as platinum, palladium, and rhodium. CatCo also sells new and used catalytic converters and provides testing and certification services for vehicle emissions. Production statistics of these operations have not yet been established.

Nickel Recycling in Zimbabwe

Green Energy Solutions recycles lithium-ion batteries and recovers lithium, cobalt, nickel, and manganese. It also produces new batteries and solar panels from recycled materials. ZimRecycle recovers lithium, cobalt, nickel, and manganese from used batteries and converts them into high-quality products for the battery industry. ZimRecycle also provides collection and transportation services for battery waste across the country.

Tantalum Recycling in Zimbabwe

Tantalum can be recovered from waste of electrical and electronic equipment. Currently, there is no known company recycling tantalum in Zimbabwe.

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Niobium Recycling in Zimbabwe

There is currently no known niobium recycling in Zimbabwe.

Magnesium recycling in Zimbabwe

Considered the most eco-friendly and sustainable metal, magnesium can be fully recycled, and it dissolves naturally, leaving no trace. Magnesium and its alloys can be fully recycled back into products retaining the same chemical, physical, and mechanical attributes as primary metal. Magnesium recycling is energy efficient, it uses only 5% of the energy required to produce primary magnesium alloys. There is no magnesium recycling in Zimbabwe at present.

Tungsten Recycling in Zimbabwe

Currently, there is no known company recovering tungsten from either tungsten metal scrap or recycling of tungsten tailings. Enhanced gravity separation, wet high-intensity magnetic separation, and flotation have been reported to be successful in reprocessing tungsten tailings. Bioleaching can assist with removing some toxic elements. Tungsten metal scrap is at present the only secondary source for tungsten.

Antimony Recycling

The main end-of-life recycling option for antimony is from spent lead-acid batteries, where antimony is directly recovered as a lead-antimony alloy. Zim battery recycling recycles lead-acid batteries and recovers lead, sulphuric acid, and plastic. It also produces new batteries from recycled materials.

Manganese recycling in Zimbabwe

Manganese is recycled primarily within the scrap of iron and steel, with a minor portion also being recycled within aluminum used in beverage cans, and used car batteries. Manganese recycling is therefore accounted for in iron and steel recycling. In Zimbabwe, Eco-Tech Recycling recovers manganese from steel. ZimRecycle recovers manganese, together with lithium, cobalt, and nickel from used batteries and converts them into high-quality products for the battery industry. ZimRecycle also provides collection and transportation services for battery waste across the country.

2.1.2 Existing ESG indicators

Existing key ESG indicators that can be used to evaluate the performance of CRM mining in Zimbabwe are:

Environmental impact: Mining companies are expected to comply with environmental regulations and standards, and implement best practices for environmental management and restoration.

- **Social responsibility contribution** to the social well-being of its stakeholders, such as employees, local communities, customers and suppliers is paramount in Zimbabwe. Companies working in Zimbabwe are required by law to respect human rights, labor rights, health and safety standards as well as cultural diversity. Mining companies already working in Zimbabwe have demonstrated social responsibility and engaged in dialogue and consultation with its stakeholders. The platinum

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mining companies have supported social development initiatives such as education, health care and infrastructure.

- **Governance and ethics**: The Zimbabwean government places emphasis on mining companies' governance structure, policies and practices. The mining company should have a clear vision, mission and values, and adhere to ethical principles such as honesty, integrity and accountability.
- **Economic performance**: Besides paying taxes, royalties and fees to the government, the Zimbabwean government NDS1 strategy aims to accelerate beneficiation and value addition and move away from exports of raw and semi-processed minerals and thereby mining company are expected to invest in innovation, technology and skills development, and create employment opportunities for local people.
- **CRM stewardship:** Mining companies working in Zimbabwe are expected to manage their CRM resources efficiently and responsibly. CRM are essential for many high-tech applications such as renewable energy, electric vehicles and digital devices. The mining company should ensure that its CRM extraction, processing and supply chain are secure, reliable and sustainable. The mining company should also promote the circular economy of CRM by reducing waste, increasing recycling and reusing materials.

2.1.3 Status of economic links between the formal and informal sectors

Economic linkages between formal and informal sectors are already established with tribute mining being noticeable in the mining sector. Opportunities for informal businesses and individuals to contribute to and benefit from the mineral industry by supplying necessary resources, equipment, expertise, and support services exists in the Zimbabwean minerals industry. Figure 9 presents the numerous opportunities along the mineral value chain in Zimbabwe that can be used for linkages. Throughout the different segments of the mineral value chain, some connections and linkages already exist where informal entities and individuals provide goods and services to the formal mineral sector. The formal sectors also provides equipment and work spaces to the informal sector. However linkages with other actors in the other industries such as banks, brokers, transporters, health service providers and regulators can still be improved. NDS1 which aims to accelerate beneficiation and value addition and move away from exports of raw and semi-processed minerals is expected to strengthen linkages along the mineral value chain as well as between informal and formal sector.

2.2. Identification of the bottlenecks along the value chain

To identify the bottlenecks of the critical raw materials value chain in Zimbabwe, this case study summarized the Fraser Institute 2022 survey, the World Bank Logistics Performance Index (LPI) the World Bank Worldwide Governance Indicators (WGI) and ZEPARU reports (ZEPARU 2020).

According to the 2022 Fraser Institute studies, considering both mineral and policy factors, Zimbabwe was one of the least attractive jurisdictions in the world for mining investment. The institute's annual survey of mining companies assesses how mineral endowments and public policy factors such as taxation and regulatory uncertainty affect exploration investment. The survey also includes an analysis of permit times for mining exploration, which is another potential bottleneck for mining projects. The 2022 survey results

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are based on the responses of 290 individuals from 84 jurisdictions around the world. According to this report some of the policy factors that discourage mining investment in Zimbabwe are corruption, political instability, legal system, infrastructure, and labor regulations.

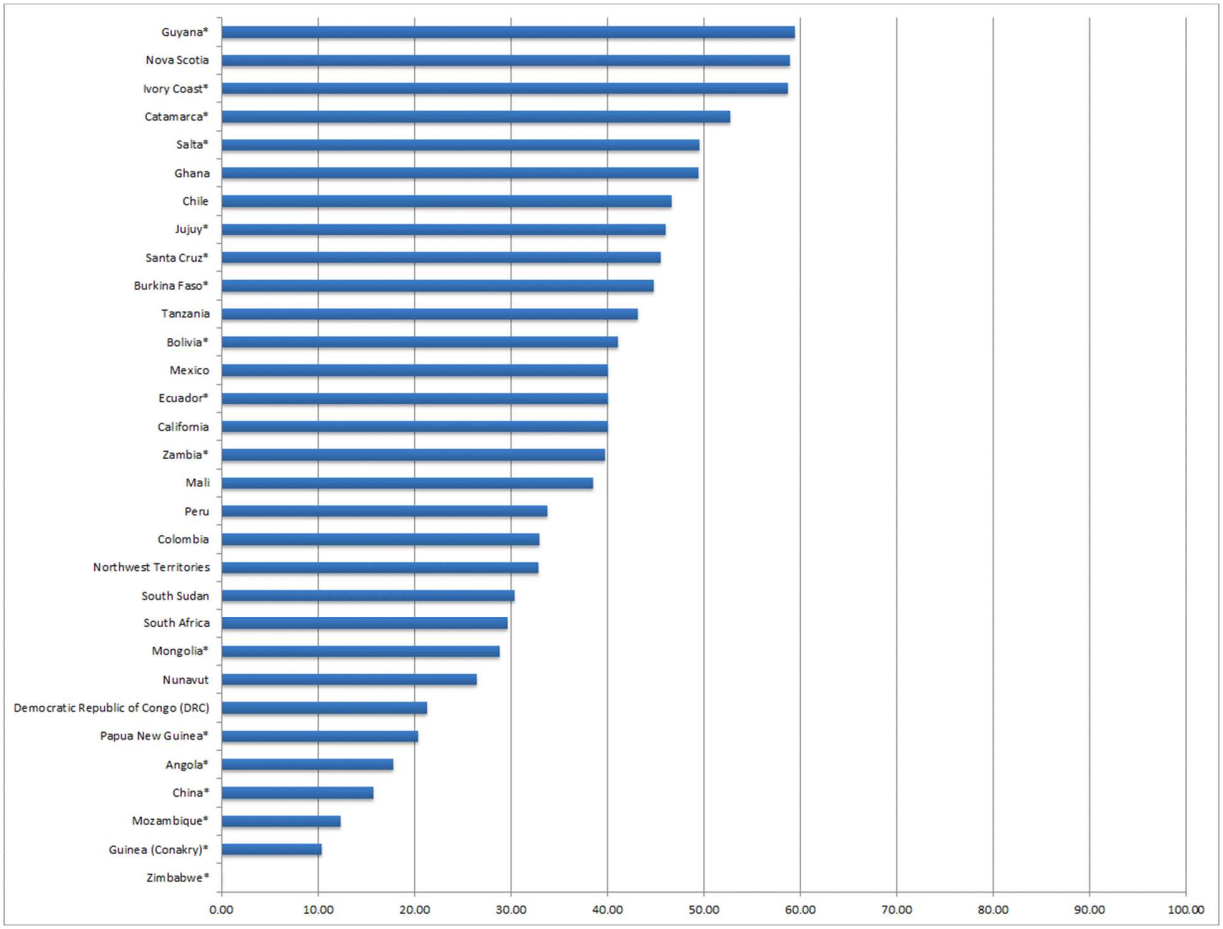

Figure 12 Policy perception index by Fraser institute showing the Zimbabwean position (2022) [10]

The Logistics Performance Index (LPI) is a tool created by the World Bank to measure the efficiency and quality of trade logistics and transport-related infrastructure in different countries. The LPI 2023 covers 139 countries and uses six indicators: customs, infrastructure, international shipments, logistics competence, tracking and tracing, and timeliness. The LPI 2023 report, ranks Zimbabwe 97th out of 139 countries, with an overall score of 2.5 out of 5. Zimbabwe performs best on the timeliness indicator (ranked 87th with a score of 2.8) and worst on the logistics competence indicator (ranked 119th with a score of 2.3). Zimbabwe's LPI score has improved slightly from 2.4 in 2018, but still lags behind the average of Sub-Saharan Africa (2.6) and lower middle income countries (2.7). The report suggests that Zimbabwe needs to address the challenges and opportunities it faces in its trade logistics performance, such as

[10] Accessed at annual-survey-of-mining-companies-2022-figures-and-tables.xlsx (live.com)

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improving its infrastructure, facilitating trade procedures, enhancing its logistics services, and ensuring supply chain security and resilience.

According to the Worldwide Governance Indicators (WGI) by the World Bank, Zimbabwe ranks below the average of sub-Saharan Africa and the world in all these dimensions. The WGI are based on data from various sources, such as surveys, think tanks, NGOs, international organizations, and private sector firms. The WGI show that Zimbabwe has experienced a decline in governance quality since 1996, with some slight improvements in recent years. The WGI suggest that improving governance is crucial for achieving better development outcomes and attracting investment.

A summary of the bottlenecks according to WGI for Zimbabwe is:

- Voice and Accountability: This dimension measures the extent to which citizens can participate in selecting their government, as well as the freedom of expression, association, and media. Zimbabwe scored -1.23 in 2020, ranking at the 14th percentile among all countries. This indicates a low level of voice and accountability in Zimbabwe, which may undermine the legitimacy and responsiveness of the government.
- Political Stability and Absence of Violence: This dimension measures the likelihood of political instability and violence, such as terrorism, civil war, coups, or riots. Zimbabwe scored -1.64 in 2020, ranking at the 7th percentile among all countries. This indicates a high risk of political instability and violence in Zimbabwe, which may disrupt social order and economic activity.
- Government Effectiveness: This dimension measures the quality of public services, the capacity of civil servants, the independence of public institutions from political pressures, and the credibility of policy commitments. Zimbabwe scored -1.32 in 2020, ranking at the 9th percentile among all countries. This indicates a low level of government effectiveness in Zimbabwe, which may affect the delivery and quality of public goods and services.
- Regulatory Quality: This dimension measures the ability of the government to formulate and implement sound policies and regulations that promote private sector development. Zimbabwe scored -1.38 in 2020, ranking at the 8th percentile among all countries. This indicates a low level of regulatory quality in Zimbabwe, which may hinder the growth and competitiveness of the private sector.
- Rule of Law: This dimension measures the extent to which agents have confidence in and abide by the rules of society, such as property rights, contract enforcement, police, courts, and crime. Zimbabwe scored -1.51 in 2020, ranking at the 6th percentile among all countries. This indicates a low level of rule of law in Zimbabwe, which may erode trust and security among citizens and businesses.
- Control of Corruption: This dimension measures the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as the capture of the state by elites or interest groups. Zimbabwe scored -1.36 in 2020, ranking at the 8th percentile among all countries. This indicates a high level of corruption in Zimbabwe, which may reduce efficiency and equity in resource allocation and undermine public integrity.

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According to Zimbabwe Economic Policy and Research Unit (ZEPARU), Companies and authorities in Zimbabwe suffer from inadequate infrastructure, low revenue collection, weak governance and regulatory frameworks, and limited capacity to manage and maintain services. These bottlenecks affect the provision of water, sanitation, waste management, roads, and other public goods that are essential for growth and sustainability. The report recommends strengthening the legal and institutional framework for local authorities, enhancing their financial management and accountability, improving their infrastructure planning and maintenance, and promoting citizen participation and feedback. There are several bottlenecks that hinder the optimal utilization and value addition of CRM resources in Zimbabwe according to the above reports.

2.2.1 List of the main bottlenecks and the links between them

- Lack of adequate infrastructure and logistics: The mining sector in Zimbabwe faces challenges such as poor road and rail networks, unreliable power supply, limited water availability and high transportation costs. These factors increase the operational costs and reduce the competitiveness of the sector. Moreover, they limit the access to domestic and international markets, as well as to downstream industries that can process and transform the raw materials into higher-value products.
- Lack of investment and financing: The mining sector in Zimbabwe suffers from a lack of investment and financing, both from domestic and foreign sources. This is due to several reasons, such as political instability, policy uncertainty, corruption, sanctions, currency volatility and high inflation. These factors create a risky and unfavorable business environment that discourages investors and financiers from supporting the sector. As a result, the sector lacks the capital and technology needed to explore, extract, process and upgrade the raw materials.
- Lack of human capital and skills: The mining sector in Zimbabwe faces a shortage of qualified and skilled personnel, both at the technical and managerial levels. This is mainly due to brain drain, poor working conditions and low wages. These factors affect the productivity and efficiency of the sector, as well as its ability to innovate and adopt best practices. Moreover, they limit the capacity of the sector to comply with environmental and social standards, as well as to engage with local communities and stakeholders.
- Lack of governance and regulation: The mining sector in Zimbabwe operates under a weak and fragmented governance and regulatory framework. This is due to several reasons, such as lack of coordination among different ministries and agencies, lack of transparency and accountability, lack of enforcement and compliance mechanisms, lack of stakeholder participation and consultation, lack of data and information systems. These factors affect the quality and sustainability of the sector, as well as its contribution to the national development goals. Moreover, they expose the sector to risks such as illegal mining, smuggling, conflict, human rights violations and environmental degradation.
- High costs of production and low competitiveness, due to factors such as outdated technology, low productivity, high taxes and tariffs, and exchange rate volatility.

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- Weak linkages and integration among different actors in the value chain, such as miners, processors, manufacturers and exporters.
- Low levels of value addition and beneficiation, which result in exporting raw materials at low prices and importing finished products at high costs.
- Environmental and social challenges, such as land degradation, pollution, deforestation, human rights violations, and conflicts over natural resources.

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3. Investment/financing prospects for ECRM projects in the Zimbabwe

3.1. Fiscal, legislative and regulatory context for in-country financings

Revenue collection and allocation

Government's concern over the years has been that revenue collection from the mining sector is sub-optimal, compromised by loopholes in income tax framework; lack of full disclosure on mining data that undermines revenue forecasting and illicit financial flows characterized by transfer pricing and trade miss-invoicing. In response to these concerns Government has been reviewing the mining fiscal regime particularly license fees and royalties through the several Budget Statements and Finance Acts a view to enhance the balance between revenue generation and attraction of investment into the mining sector. The reviews have also focused on mining eliminating duplication in the collection of levies to improve efficiency in revenue collection, addressing transfer pricing and thin capitalization where high-geared mining companies enjoy tax relief on interest charges.

The outdated 1961 Mines and Minerals Act [Chapter 21:05] which is now being amended is still the main law that governs the exploitation of mineral resources in Zimbabwe. Section 244 (1) states that "...the miner of a registered mining location shall pay royalty on all minerals or mineral-bearing products…" Section 245 further states that the rate of royalty payable in terms of section 244 shall be fixed by the House of Assembly in the Schedule to Chapter VII of the Finance Act [Chapter 23:04].

This New Mines and Minerals Bill seeks to replace the Mines and Minerals Act [Chapter 21:05] to achieve the following main objects:

- To change the composition of the Mining Affairs Board and to clarify and extend its function;
- To formalize the switch in title from "mining commissioner" to "Provincial Mining Director" (PMD): this is the official primarily responsible for administering the Mines and Minerals Act at the local level;
- To establish the Mining Cadastre Register and Registry, and to reduce the classes of Mining Titles to three only; consistently with the introduction of the Mining Cadastre Register, which will ensure uniformity and simplicity of mining titles, the pegging of secondary reefs and the holding of extra-lateral rights are abolished;
- To regulate the activities of prospectors more closely, and to confine their activities to specific areas defined by grids;
- To remove the distinction between precious metal and base metal claims, and to abolish the extra-lateral rights which holders of precious metal claims enjoy at present;
- To provide for mining title to be granted in the form of a mining lease, where the title extends over four or more contiguous blocks;

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- To require holders of mining rights to work their claims rather than allowing them to preserve their title by paying annual fees;
- To require miners to participate in funds and to make other provision to meet the cost of restoring the environment when their mining operations come to an end;
- To convert certain special grants into mining leases;
- To remove much of the excessive particularity from the Act (for example, the detailed provisions setting out the way in which claims must be pegged) and leaving such matters to be prescribed in regulations;
- To make provision for the indigenization and localization of the mining industry at the primary level of mining;
- The introduction of the concept of the concept of "strategic minerals" to which special conditions by mutual agreement between the Minister and the State will attach;
- Generally, to make the procedures under the Act more transparent and to allow aggrieved persons a right of appeal to the Administrative Court against decisions which affect their rights.

The amendment of the Mines and Minerals Act is expected to provide clarity and certainty of the rules governing investment in the Mining sector. Furthermore, the fiscal framework that governs the mining sector is provided for in the Income Tax Act [Cap. 23:06]. Income Tax in Zimbabwe is source based and the rates of tax and deductions are fixed through by the Finance Act [23:04], which is generally revised on annual basis. The general corporate income tax rate across all sectors is 24%.

Government uses the tax system to achieve two competing objectives of generating revenue from taxing the mining enterprises and using tax expenditures tax expenditures (which are benefits granted to specific sectors, activities, or groups of taxpayers through preferential tax treatment, including exemptions, deductions, credits, deferrals, and reduced tax rates) to incentivize investment in the mining sector. Mining sector incentives outlined in the Income Tax Acts and updated various Finance Acts as shown in table 15 include the following:

Allowable deductions/expenditure (all capital expenditure) on exploration, development and operations incurred wholly and exclusively for any mining operations is allowed in full against taxable income. Expenditure incurred during a year of assessment on surveys, boreholes, trenches, pits and other prospecting and exploratory works undertaken for the purpose of acquiring rights to mine minerals in Zimbabwe or incurred on a mining location in Zimbabwe, together with any other expenditure that is incidental thereto, may be allowed in full, unless the taxpayer elects to carry the expenditure forward and be allowed against income from mining operations in subsequent years.

Assessed Losses / Indefinite Carry-over of losses: There is no restriction on carryover of tax losses. Thus, loses can be carried forward for an indefinite period.

Taxable Income of a Holder of Special Mining Lease- in the case of a holder of a Special Mining Lease (SML), corporate income is taxed at a special rate of 15%.

However, holders of a SML are liable to Additional Profits Tax (APT). APT is payable upon attaining a formula-based level of profitability as provided in the Income Tax Act [Cap. 23:06].

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Section 36 (1) provides exemption wholly or partly from any tax charged under section twenty-six, thirty, thirty-one or thirty-two to holders of special mining leases if it is deemed to be in the interests to Zimbabwe[11]. These tax categories include non-resident shareholder tax; tax on fees, remittances, and royalties respectively.

Tax Incentive	Législative Provision
Exemption from Corporate Income Tax for the first 5 years of operation. Thereafter, a corporate tax rate of 15% applies.	Section 3(b) of Finance Act No. 2, of 2017
Special Initial allowance on capital equipment to be allowed at the rate of 50% of cost from year one and 25% in the subsequent two years.	Section 3 of Finance Act No. 2, of 2017
Specialised expatriate staff will be taxed at a flat rate of 15%.	Section 3(a) of Finance Act No. 2, of 2017
Exemption from Non-residents tax on Fees on services that are not locally available	Section 17 of Finance Act No. 2, of 2017
Exemption from Non-residents tax on Royalties	Section 18 of Finance Act No. 2, of 2017
Exemption from Non-residents tax on Dividends	Section 15 of Finance Act No. 2, of 2017;
Exemption from Residents tax on Dividends	Section 16 of Finance Act No. 2, of 2017
Duty free importation of Capital equipment for Special Economic Zones	Statutory Instrument 59 of 2017
Duty free importation of raw materials and intermediate products imported for use by companies set up in the Special Economic Zones	Statutory Instrument 59 of 2017

Table 14 Tax Incentives and Legislative Provisions

The multiple tax rebates, concessions and exemptions provided for in the Income Tax Act also result in foregone revenue by the State. In the 2022 National Budget Statement the government pronounced its intention to evaluate the impact of tax expenditures on socio-economic outcomes. A study evaluating tax expenditures commissioned by the Government of Zimbabwe is currently underway. Financial engineering by mining companies which enables them technically to continue declaring losses has also been noted as a threat undermining revenue collection from the mining sector. In this regard the provision of indefinite carry over of losses provided for in the mining sector incentives framework has been abused and not achieved the intended policy objective.

Key Institutions Involved in the Collection and Management of Mining Revenue

Zimbabwe Revenue Authority (ZIMRA) is the key institution mandated to collect government revenue through the different tax heads (i.e., corporate income tax, pay as you earn, custom duties and levies). There are also multiple fees and license fees that constitute revenue from the mining sector which are collected by institutions like the Environmental Management Agency (EMA); Ministry of Mines and Mining

[11] source (zimlii.org)

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Development and Rural District Councils (RDCs). The following Government Ministries, Departments and Agencies play a key role in regulating and collecting revenue from the mining sector:

1. Ministry of Mines and Mining Development: the parent ministry of the mining sector. Its responsibilities include regulating the sector, administering the mining laws, reviewing mining license applications, and issuing respectively. This is mainly done through the Mining Affairs Board.
2. Ministry of Finance and Economic Development: responsible for leading and guiding the formulation of the mining fiscal regime and managing all mining revenue deposited in the Consolidated Revenue Fund.
3. The Zimbabwe Revenue Authority (ZIMRA: responsible for administering and enforcing all taxes applicable to the mining sector. It also advises the Government on mining fiscal and economic matters such as mining revenue forecasting.
4. Minerals Marketing Corporation of Zimbabwe (MMCZ): responsible for marketing and selling all minerals produced in Zimbabwe, except for gold and silver. Thus, it is required by ZIMRA to deduct royalties on precious stones, precious metals (other than gold), base metals, industrial metals, coal bed, methane, and coal at source. Royalties are charged based on the face value of the invoice and should be remitted to ZIMRA on or before the 10th day of the following month in which such deductions are made.
5. Reserve Bank of Zimbabwe: the Bank or its subsidiaries such as Fidelity Printers and Refiners Pvt. Ltd are also required by ZIMRA to deduct royalties on gold at source.
6. Chamber of Mines: required by ZIMRA to deduct royalties on gold at source and remit to ZIMRA on or before the 10th day of the following month in which such deductions are made.

Zimbabwe does not have institutions that are available in other mining jurisdictions to monitor the contribution of the players in the mining sector to government revenue. For example, Zimbabwe does not have fully fledged Minerals Audit Agency (MAA) responsible for auditing the quality and quantity of minerals produced and exported by miners. This limited capacity to physically audit mineral production and exports implies that revenue accruing to government from mining activities could be understated. Government approved a country wide Mining Audit to be conducted for two months May to June 2023[12]. The objective of the initiative was to ensure that all mining operations are conducted in accordance with the country's laws. The audit team comprised of multiple government Ministries, Department and Agencies[13].

Furthermore, Zimbabwe's legal provisions governing mining information disclosure is scattered in various pieces of legislations. Disclosure stipulated in the mines and minerals Act for example largely relates to

[12] 10th Post-Cabinet Press Briefing.pdf (veritaszim.net) - see section 5.1.

[13] Ministries of Mines and Mining Development, Lands, Agriculture, Fisheries, Water and Rural Development, Local Government and Public Works, Energy and Power Development and Environment, Climate Change, Tourism and Hospitality Industry; Department of Immigration and Labour; Zimbabwe Revenue Authority; Environmental Management Agency and Zimbabwe Republic Police.

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the commercial interest of the companies and tends to be blind on policies and performance relating to business ethics, the environment and, where material to the company, social issues, competitiveness of the mining sector, human rights, and other public policy commitments in line with international best practiced. More so, there are no legal provisions for performance monitoring of mining contracts in line with section 315 of the national constitution. The current transfer pricing regulations do not provide sufficient guidance on reporting procedures for taxpayers engaged in transactions with related parties. This tends to erode the revenue base and promotes profit shifting arrangements arising from business transactions between related parties. Further, there are no clear punitive measures to deter corruption tendencies.

There is further lack of enforcement of the current legal statutes related to mining activities or disclosure of information listed companies disclose by way of financial reporting and disclosure differs with where the companies are registered. Mining companies in Zimbabwe are mandated to disclose information under the statutory provisions that also tie non mining companies like the Company Act, the Zimbabwe Stock Exchange Act and the income Tax Act except for the Mines and Minerals Act. This is unlike jurisdictions which have adopted specific legal framework on mining information disclosure. Mining companies with operations in Zimbabwe but are directly or indirectly listed on foreign bourses are governed by more transparent and strict mining codes and statutory requirements in the jurisdiction in which they are registered. Mining and mineral revenue information is fragmented and this to some extent explains why there has been debate, mistrust and confusion among stakeholders.

The government discloses mining information to some extent but does not go beyond the statutory requirements. Information provided by the government agencies is often highly aggregated, inaccessible, and untimely produced contrary to statutory requirements and often does not meet the needs of the users. There is to some extent non coordination on information sharing amongst government departments/ institutions relevant for disclosure of mining information are not well coordinated, rather they work in silos. They further face institutional, human resources regulatory capacity challenges to ensure effective implementation of the disclosure framework in its current state.

Some of these challenges include inadequate skills to synthesize mining and appropriately package mining information; lack capacity to enforce compliance or compel mining companies to disclose information on mining activities; lack of adequate skills to conduct mining audit; limited knowledge of the geology and mineralization of the country; lack of specialized metallurgical laboratories to verify and conduct specialized assaying process; inadequate weigh bridges.

Zimbabwe's disclosure framework requires strengthening through legal reforms that promote performance monitoring of mining contracts; sufficient guidance on reporting procedures for taxpayers engaged in transactions with related parties; clearly lay down punitive measures to deter corruption tendencies and increased value chain actor coordination. Human capacity building is imperative across the mining value chain in order to enhance information disclosure. Government needs ongoing skills strengthening and development in ongoing auditing, monitoring, regulating and improving resource exploitation regimes, contract negotiation, and compliance enforcement. There in need for improvement in data collection and reporting along the mining value chain. This data has to be more disaggregated and

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further improvements in quality and content are much sought. There is need for increased coordination and proactive sharing of information by government entities; private and public companies; civil society and mining communities.

3.2. Macroeconomic context for in-country financings

According to the fourth World Bank Zimbabwe Economic Update (ZEU) the country's economic growth is projected to slow to 3.5 percent in 2024, a decrease from 4.5 percent in 2023, as agricultural output is expected to suffer from depressed global growth and the predicted erratic and below-average rainfall caused by the El Niño weather pattern. The report also notes that Zimbabwe's economy has seen a strong rebound since the COVID-19 pandemic, making it one of the fastest-growing economies in the Southern African Development Community (2021, 2022, and, so far, in 2023). In previous years, Zimbabwe faced increased global turmoil, while expansionary monetary policy has put initial pressure on inflation and the exchange rate. Yet, since June 2023, the Government proactively tightened monetary policy to bring down inflation and the parallel market premium. It also extended the use of US dollars as legal tender until 2030, further reducing policy uncertainty. Thus according ZEU report while Zimbabwe's economic outlook appears moderate, it reflects continued global headwinds, structural bottlenecks, weather-related shocks, and price and exchange rate volatility. Prolonged global turmoil could result in a slowdown in global output, reduced trade and investment, increased volatility in commodity prices, and supply disruptions. Moreover, fiscal pressures may result in an expansionary economic policy. This could increase economic volatility, impacting private sector activity and growth.

In 2018 Zimbabwe adopted a National Vision to achieve an empowered and prosperous upper middle-income society by 2030. Vision 2030 charts a new transformative and inclusive development agenda, which is expected to deliver broad based transformation, new wealth creation and expanding horizons of economic opportunities for all Zimbabweans. The achievement of Vision 2030 is envisaged to be anchored on the implementation of the following strategic programmes, supported by appropriate annual National Budgets:

- The Transitional Stabilization Programme (TSP). October 2018 to December 2020.
- Two Five-Year National Development Strategies, with the first one running from 2021-2025, and the second covering 2026-2030.

The TSP focused on fiscal consolidation, economic stabilization, and stimulation of growth and employment creation. Adoption and implementation of prudent fiscal and complementary monetary policies anchored investor confidence and stabilized the macroeconomic environment. TSP policies, strategies, and projects guided Zimbabwe's social and economic development interventions up to December 2020 and laid a base for economic growth for the period 2021-2030. Government's intention was to provide a supportive macro-economic and ease of doing business environment to stimulate financing of private sector investments especially in the mining sector that is attracting investor interests. During the TSP period the US$12 billion Mining Industry roadmap was launched; US$4.2 billion Great Dyke

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Investments Platinum and US$4 billion Karo Resources Mhondoro-Ngezi platinum; Arcadia lithium mine commenced; coal production increased as new coal mines opened and preparatory work for on US$ 25 million Invictus Energy Oil and Gas Project in Muzarabani started. In this regard a key success of TSP is the operationalization of Zimbabwe Investment Development Agency (ZIDA)[14] as a one stop investment shop responsible for investment promotion.

Macroeconomic stability is seen as a critical ingredient and important precondition for mobilising investment finance that lubricates economic transformation and diversification. Historically the country's macroeconomic performance has been characterised by cycles of booms and slumps since 1980, reflecting both the impact of exogenous shocks such as droughts and floods; shortage of foreign currency; low investor confidence; volatility of international commodity prices; financial/economic crisis; pandemics (i.e. COVID 19); internal productivity challenges and policy/regulatory/legislative distortions. An analysis of the evolution of key macroeconomic indicators since 1980, shows a discernible pattern where the economy enjoyed greater success in three decades 1980-1990, 1991-2000 and 2010-2018. The average growth rates for the three decades were 4.3%, 0.7% and 7.44%, respectively. The economy experienced a major economic crisis from 2001 to 2007, losing close to half of its Gross Domestic Product (GDP) and undermined by hyperinflation. The economy had a strong rebound of GDP growth during the period 2010 to 2018 following the stabilisation effects of the multi-currency system (dollarisation) adopted in 2009. The growth was largely driven by commodity price booms and by good mining sector performance including the discovery and mining of alluvial diamonds in the Marange Diamond fields.

Real GDP growth rate increased from 4.7% (2017) to 5.5% (2018) in response to the TSP policy measures. The economy contracted by -6% and -4.1% respectively in 2019 and 2020. The contraction was induced by several factors including COVID-19 pandemic; devastating impacts of climatic shocks associated with drought and Cyclone Idai, which all had profound impact on the country's health system, livelihoods, and the economy at large. Economic growth recovered to 8.4% and 6.5% in 2021 and 2022 driven by strong recovery in agriculture, mining, electricity, construction, transport, and communication as well as finance and insurance. The economy is estimated to grow by 5.5% in 2023. Table 16 depicts the main sectoral contributions to GDP which were dominated by wholesale and retail trade, mining, agriculture, and manufacturing for the period 2022 to 2023. The mining sector which has the second largest weighing in the economic growth is projected to grow by 7.6% in 2024.

	Weight	2022	2023	2024	2025	2026
Agriculture, Hunting and Fishing and forestry	12.0	6.2	11.1	-4.9	10.1	5.2
Mining and quarrying	**13.2**	**10.5**	**4.8**	**7.6**	**4.9**	**4.8**
Manufacturing	11.2	1.6	2.2	1.6	2.7	2.5
Wholesale and retail trade; repair of motor vehicles	18.7	4.6	5.5	4.2	4.4	7.4
Information and communication	6.2	14.1	9.4	4.8	6.4	5.4

[14] ZIDA which repealed the Zimbabwe Investment Authority Act, the Special Economic Zones Act and the Joint Ventures Act, all which were dealing with investors separately was launched on 17 December 2020. ZIDA is now effective a one stop Investment Service Center for Investors.

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Financial and insurance activities	8.2	15.6	6.1	4.5	3.9	4.4
Overall Growth Rate		**6.5**	**5.5**	**3.5**	**5.0**	**5.0**

Table 16 Main sectoral GDP Growth Rate (%) Source: MOFED, ZIMSTAT, RBZ

In terms of the composition of GDP in 2024, agriculture, mining and manufacturing contribute 11.6%, 13.7% and 10.6%, respectively. The manufacturing, mining, wholesale, and retail sectors accounted for 7.8%, 7.6% and 17.6% of employment in 2019[15]. The country's exports are also dominated by primary exports led by Gold and Platinum Group of Minerals (PGMs) and Lithium in mining sector as shown in table 17.

	2023		2024	*22/23 Change (%)*	*23/24 Change (%)*
Agricultural Exports	**1,240.1**		**1,316.3**	***16.2***	***6.1***
Mineral Exports	**5,628.8**		**5,891.5**	***1.0***	***4.7***
Gold	1,871.1		1,818.8	*-6.3*	*-2.8*
PGMs	1,403.6		1,328.4	*-36.8*	*-5.4*
Chrome & HCF	455.8		480.1	*3.1*	*5.3*
Diamonds	476.8		290.4	*222.5*	*-39.1*
Coke	185.7		209.6	*28.2*	*12.9*
Lithium	717.9		1,216.2	*917.0*	*69.4*
Nickel	58.6		61.3	*-8.2*	*4.6*

Table 17 Merchandise Exports (US$M) Source: MoFEDIP, 2023

Gross Domestic Product (GDP) analysis

According to the World Bank, Zimbabwe's GDP was worth 20.68 billion US dollars in 2022. Zimbabwe's GDP has fluctuated over the years, reflecting the political and economic challenges faced by the country. Zimbabwe's GDP growth rate in 2022 was 3.4 percent, which is higher than the previous year's rate of -7.82 percent. However, Zimbabwe's GDP per capita, which measures the average income of its population, was only 1,267 US dollars in 2022, which is one of the lowest in the world. Table 17 shows projected sectorial contribution to 2024 with agriculture, mining and manufacturing contributing 11.6%, 13.7% and 10.6%, respectively. The contribution of the mining sector is expected to be consistent over the period 2022 to 2024.

	2021	2022	2023	2024
Agriculture, Hunting and Fishing and forestry	12.0	12.0	12.6	11.6
Mining and quarrying	12.8	13.2	13.2	13.7
Manufacturing	11.7	11.2	10.8	10.6
Wholesale and retail trade;	19.1	18.7	18.8	18.9

[15] *ZIMSTAT, 2019a and Government of Zimbabwe, 2020b*

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Table 18 Main Sectoral Contribution to GDP (%) Source: MoFEDIP (2023)

The contribution of different minerals to the mining sector output are shown in table 18 with gold playing a dominant role. Critical minerals such as lithium, copper, nickel, and platinum group of minerals (PGMs) will have a significant contribution to the mining sector output over the period 2022 to 2024. Thus, the performance of the mining sector in general and critical minerals in particular have immerse potential to drive economic

growth assuming stability in international prices.	Weights	2022	2023 Initial	2023 Rev	2024 Proj
Overall Growth		**12.4**	**9.1**	**4.8**	**7.6**
Cobalt \t	*0.2*	211.2	387.0	350	580
Copper \t	*1.4*	10,168.1	9,684.0	10,473	10,200
Lithium \t	*0.3*	102,420	881,709	881,709	Historically1,1 13,965
Iridium \t	*0.5*	601.2	672.0	619	637
Nickel \t	*5.4*	14,259.7	14,300.0	14,300	14,690
Palladium \kg	*16.1*	13,934.6	13,481.0	14,214	14,639
Platinum \kg	*11.3*	16,459.9	16,500.0	16,954	17,462
Rhodium \kg	*3.6*	1,461.1	1,551.0	1,505	1,550

Table 19 Mining Sector Output (thousand tonnes) Source: MoFEDIP, ZIMSTAT

Foreign Exchange (FX) and Inflation

Historically, Zimbabwe has grappled with insufficient foreign exchange reserves; allocation of the scarce foreign currency; exchange rate management; management of money supply growth; high inflation induced by monetization of fiscal deficits and inflation expectations. Thus, short-term stabilization policies have dominated the macroeconomic policies design stabilize the economy and lay the foundation for long term economic growth and development. In 2019 government reintroduced the local currency which had been abandoned in 2009 when the economy dollarized, through Statutory Instrument 142 of 2019[16] along with other monetary reforms to stabilize the exchange rate. The Government further introduced a new Foreign Exchange Trading System (the Dutch auction rate system)[17] on 23 June 2020 to foster transparency and efficiency in the trading of foreign exchange. The introduction the foreign exchange trading system managed to temporarily stabilize the official exchange rate at US$1 to throughout the months of July to November, while the parallel market exchange rate premium, which had risen to more than 300% when the auction was introduced has fallen to less than 10%, a tolerable parallel market premium based on international best practice (GoZ, 2021). This in turn, anchored inflation expectations and slowed down the increase in prices witnessed before June 2020.

However, the instability of the exchange rate characterized by the divergence between the official exchange rate and parallel market rate have kept recurring. Inflation has continued to raise even when the other macroeconomic fundamentals were stable due to the pass through from the exchange rates which have anchored the high inflation expectations. Thus, the Zim dollar kept depreciating as depicted by the exchange rate that changed during the weekly auctions18 and in the process inducing skyrocketing

[16] S. I. 142 of 2019 Reserve Bank of Zim (Legal Tender) Regulations, 2019 -1.pdf (veritaszim.net)

[17] Foreign Exchange Auction Trading System (rbz.co.zw) and EXCHANGE-CONTROL-RV175.pdf (rbz.co.zw).

[18] See Exchange Rates (rbz.co.zw) and Official And Unofficial Market Exchange Rates - Zimpricecheck

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prices. In this regard, the stabilisation of the exchange rate and reducing its pass-through to inflation has been the major pre-occupation of fiscal and monetary authorities over the period 2020 to 2023. Authorities have focused on tightening fiscal and monetary policies and moral suasion directives to influence the market particularly retailers who were accused of profiteering. The 2024 budget statement acknowledged that domestic prices have relatively been stable since the third quarter of 2023, as reflected by month-on-month inflation which declined from 12.1% in June 2023, to 4.5% in November 2023. The annual headline inflation declined from 30.9% in June 2023 to 21.6% in November 2023. In the outlook, annual inflation is expected to remain on the decline and is projected to end the year 2023 slightly below 20%. Annual inflation to end the year 2024 is projected to be slightly above 10%, premised on the effectiveness of the tight monetary and fiscal policies being pursued by Government (GoZ National Budget Statement, 2023). High inflation undermines savings mobilization and restrict the availability of investible funds as real interest rates become negative, thus undermining domestic investments which are supposed to act as a magnet to attract foreign direct investments.

Sovereign debt

Zimbabwe has been in debt distress since the year 2000, when the country first defaulted on its external obligations to the International Financial Institutions (IFS). The defaults resulted in the country being denied access to external financing by IFIs and other traditional multilateral and bilateral creditors. Consequently, Zimbabwe has not been able to access funding from traditional bilateral and multilateral creditors. The constrained access to external finance partly contributed to a decline in economic activity witnessed between 2000 and 2008. The low growth trajectory during the crisis period affected the country's debt carrying capacity and its ability to service debt. Prior to the 2000 crisis, Zimbabwe had a clean record of servicing its debt. Thus, it can be said that Zimbabwe's debt problem was not a result of imprudent borrowing, but merely reflects growth crisis, which compromised the sources of debt servicing, as measured by exports and or government revenues (Chigumira. et.al. 2018)[19].

The accumulation of external payment arrears resulted in the International Monetary Fund (IMF) declaring the country ineligible for the general resources account of the IMF financing window (IMF, 2001). Equally the same, other multilateral institutions, notably the World Bank and the African Development Bank (AfDB) and traditional creditors from the Paris Club also suspended disbursements of existing loan facilities and declared the country ineligible for new loans. The country has not been able to receive Official Development Assistance (ODA) from traditional creditors as well as balance of payments (BOP) support from the IMF. The country had been relying on semi concessional financing mainly from China as depicted by the exchange rate that changed during the weekly auctions. The lack of access to long-term capital has led to significant infrastructural deficiencies in the economy, thereby militating against the country's growth efforts. In particular, the road, rail, air, water, and energy systems have deteriorated significantly owing to under-investment in the sectors. This has forced several projects to be suspended or cancelled. Additionally, underlying fiscal constraints have undermined government's ability to inject meaningful investment in infrastructure and public service delivery (Chigumira at.al. 2018)

The Government of Zimbabwe Public Debt Report (2023) records that the total Public and Publicly Guaranteed (PPG) debt stood at US$17.7 billion, as at end September 2023, of which external debt amounted to US$12.7 billion (72 per cent) and domestic debt of US$5.0 billion (28 per cent). Of the total external debt stock, the bilateral and multilateral debt amounted to US$9.1 billion, of which 76% are principal arrears, interest arrears and penalties. The overall total stock of PPG external debt decreased

[19] An assessment of arrears clearance web (1).pdf (zepari.co.zw)

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from US$12.8 billion in December 2022, to US$12.7 billion in September 2023. This was mainly due to the decrease in liabilities on the RBZ balance sheet by US$684.8 million (GoZ 2023).

The accumulation of external debt payment arrears since 2000, has resulted in the attraction of penalties on Zimbabwe's PPG external debt. The average interest rate for the PPG external debt portfolio is 6.3 per cent, with multilaterals averaging 4.16 per cent, while bilateral creditors average 4.4 per cent. The average penalty interest rate for multilateral creditors is 6.6 per cent, while for bilateral creditors it is at 6.2 per cent. The highest penalty rate for bilateral creditors is 12.2 per cent, from the French COFACE, while the highest penalty rate for multilateral creditors is 10.5 per cent from the European Investment Bank (EIB). The penalties have exacerbated Zimbabwe's external debt overhang position due to the prohibitive penalty rates, hence the need to urgently resolve the country's external debt distress situation (GoZ, 2023)[20].

The Government, in December 2022, established a Structured Dialogue Platform (SDP) with all its creditors and Development Partners, to institutionalize structured dialogue on economic and governance reforms to underpin Zimbabwe's Arrears Clearance and Debt Resolution process. The success of the Arrears Clearance and Debt Resolution process is critical for the country to unlock new external financing. The country's sustainable economic recovery agenda requires the support of Development Partners and International Financial Institutions, through a comprehensive Arrears Clearance and Debt Resolution process.

Foreign Direct Investment

Foreign direct investment and diaspora investments are considered as possible financing options underpinning the National Development Strategy (NDS1) together with fiscal revenues, loans, grants, public entities own resources, private sector resources and public private partnerships (PPPs). Foreign direct investment inflows into the country have generally been steadily increasing following a deep in 2020 first quarter, reaching a peak of US$95.8 million in the fourth quarter of 2022.

[20] Public Debt Report -Zimtreasury- ZPDMO – Parliament of Zimbabwe (parlzim.gov.zw)

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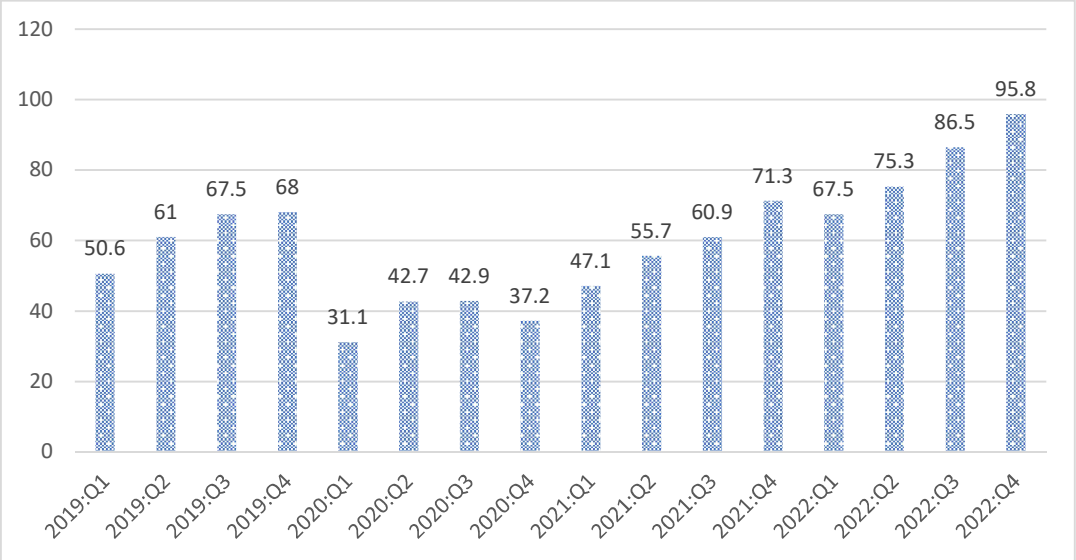

Figure 13 Foreign Direct Investment inflows (US$M)[21]

Similarly, during the period January to September 2023, Zimbabwe Investment Development Agency (ZIDA)[22] managed to draw investors from 38 countries and licensed investors increased to 469 from 178 recorded during the same period in 2022. To expedite the pace of economic transformation, Government seeks to upscale the doing business reforms that address the various legislative and administrative bottlenecks. This will be complemented by other reform measures under the Structured Dialogue Platform, for debt and arrears clearance as well as tax revenue and administration reforms already underway.

Trade agreements

Zimbabwe is a founder Member State of the Southern African Development Community (SADC), having been one of the nine countries that formed the Southern African Development Coordination Conference (SADCC) in Lusaka, Zambia, in April 1980. SADCC transformed into SADC in 1992 with the signing of the SADC Treaty in Windhoek, Namibia[23]. Zimbabwe also belongs to the 21-nation Common Market for Eastern and Southern Africa (COMESA) that seeks to promote regional integration through trade and the development of natural and human resources for the mutual benefit of all people in the region. COMESA provides for reduced duties on imports from member countries subject to certain rules of origin. Zimbabwe has bilateral trade agreements with Namibia, Botswana, and South Africa. Zimbabwe also signed the interim Economic Partnership Agreement (EPA) under the Eastern and Southern African (ESA) bloc with the European Commission in 2009. The EPA offers duty-free and quota-free market access to all exports from ESA countries who are signatories to the EPA. In addition, Zimbabwe officially joined the African Continental Free Trade Area (AfCFTA) in February 2020 which aims to create a single continental market for goods and services, eventually leading to the establishment of a Customs Union[24]. All these trade agreements open a huge market for Zimbabwe's manufactured exports. Thus, investing in

[21] Source: RBZ (2023) and National Budget Statement (2023)
[22] Home - ZIDA (zidainvest.com)
[23] Zimbabwe | SADC
[24] Zimbabwe - Trade Agreements

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increased capacity for value added minerals and mineral based manufacture exports have ready markets in regional and continental trading blocs.

Restrictions on imports/exports

Import substitution has been identified in NDS1 as one of the key strategies for foster sustainable balance of payments and domesticating key value chains that will ultimately propel export led growth in the medium to long term. This also entails reviewing of tariff and non-tariff measures to enable importation of critical raw materials and capital goods. To consolidate external sector stability, a combination of export orientation and import substitution strategies are being prioritized by government particularly where the country has competitive advantage. Export orientation, strategies are focused on promoting export products and export markets diversification. These strategies are being complemented by enhancing export promotion activities, market access negotiations, and institutional capacity building of trade promotion organizations[25].
Acceleration of value addition and beneficiation of agriculture and mining production is one of the macroeconomic objectives of NDS1. The focus on value addition and beneficiation is viewed as a strategy to transform the economy from a producer and exporter of primary commodities to a producer and exporter of differentiated value-added products. Currently Zimbabwe's export basket has a high concentration of primary commodity exports dominated by minerals and raw tobacco. In this regard Government, is promoting investment in value addition to transform Zimbabwe's economic structure from one highly dependent on the export of minerals and agricultural raw materials to an economy trading high value processed goods. Thus, the focus of value addition and beneficiation has led government to ban the export of some designated unprocessed products.

Pleas had been made over the years for mining companies to engage in value addition to the minerals before they are exported to increase the revenue generated from mineral exports. This culminated in a series of statutory instruments by the Minister of Mines and Mineral Development in which the export of raw base minerals was prohibited and only allowed in certain circumstances. Under the Base Minerals Export Control Act [Chapter 21:01], the Minister is empowered to put in place rules regulating the export of base minerals. In July 2022, the Minister issued an order banning the exports of unprocessed granite through the Mines and Minerals (Prohibition Order of Exportations of Unprocessed Granite Notice, 2022). A further statutory instrument was put in place banning the export of un-beneficiated lithium through Statutory Instrument 213/2022. This was repealed a few weeks later and replaced by the Base Minerals Export Control (unbeneficiated Base Mineral Ores) Order, 2023, which was gazetted on 6 January 2023 as Statutory Instrument 5/2023. In terms of this Order, a written permit issued by the Minister of Mines and Mining Development is required before one can export un-beneficiated base mineral ores. This was primarily directed at the lithium sector, given the rush towards the mining of this mineral that hit the country in 2022[26].

To mitigate the adverse effects of the volatility of international commodity (i.e. metal) prices the Government in the 2024 budget is prioritizing measures to intensify value addition and beneficiation, particularly of minerals and agricultural products, in order to increase the value of export receipts, as well as insulate the economy against the volatility of international commodity prices.

[25] These include the ZimTrade, Zimbabwe Tourism Authority, the Competition and Tariffs Commission, Standardization bodies and the Zimbabwe International Trade Fair Company.

[26] Mining Laws and Regulations Report 2024 Zimbabwe (iclg.com)

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The extraction, beneficiation, and value addition of critical minerals like lithium are expected to drive the growth of the mineral and quarrying sub-sector to meet the GDP growth targets as envisaged in NDS 1 and 2024 Budget Statement. For example, Prospect Lithium Zimbabwe commissioned a $300 million lithium processing plant in Zimbabwe on 5 July 2023. The plant which will process 4.5 million metric tons per year of hard rock lithium into concentrate for export, began initial processing in April 2023 and has since then, and exported close to 30,000 tons. This equates to US$40 million in revenue generation in Zimbabwe[27]. Lithium as expressed by the country's President at the commissioning of the plant is viewed as the mineral of the present and the future as its beneficiation and value addition is expected to position the country as an emerging and competitive player in the global lithium value chain. Global demand for lithium has surged in recent years because of its use in electric car batteries. As a result, Zimbabwe has drawn investors in battery minerals from Canada, the United Kingdom, and Australia, although China remains the dominant player[28].

3.3. Political context for in-country financings

Vines (2023) observed that geopolitical competition in Africa has intensified in 2022, particularly among great powers such as China, Russia, the US, and the EU but also by middle powers such as Turkey, Japan, and the Gulf states. He further noted that international competition to secure Africa's critical and strategic minerals and energy products intensified in 2022 and that decarbonization is becoming a driver of resource nationalism and geopolitical competition in certain African mining markets, home to large deposits of critical 'transition minerals' such as copper, cobalt, graphite, lithium, or nickel[29].

Rouget (2023) also observed that, as a supplier of many of the world's critical minerals for the energy transition, the continent and its mining sector are also increasingly at the heart of geopolitical competition. This is already triggering a wave of interest from major geopolitical players, most visible in the US's re-engagement with African producers such as Zambia and Congo (DRC). Graphite, lithium or rare earths deposits, for example, were cited as seeing increased exploration activity and competition from Chinese and Western off takers. Rouget (2023) further observed that economic pressures will shape the risk environment for Africa's mining investors in many ways. As a critical source of tax revenue, foreign exchange and formal employment, miners will find it hard to escape the spotlight. Government will expect large taxpayers to increase their contribution to fiscal revenue and job creation. Binding fiscal constraints will reduce state support for large mining operations.

EIU (2023) also noted that African mining ventures, especially those in Botswana, the Democratic Republic of Congo (DRC), Namibia, Nigeria, Sierra Leone, South Africa, Tanzania, Zambia and Zimbabwe, could receive more attention should Western based mining companies and commodity traders increasingly shun Russian supplies of copper, cobalt, diamonds, gold, iron ore, manganese, nickel, platinum, palladium, tungsten, uranium, vanadium and zinc, among other products[30].

[27] Zimbabwe Commissions $300M Lithium Processing Plant (energycapitalpower.com)
[28] See Chinese mining company opens lithium processing plant in Zimbabwe | Africanews
[29] Africa in 2023: Continuing political and economic volatility | Chatham House – International Affairs Think Tank
[30] Things to watch in Africa in 2023 (eiu.com)

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The emerging political risks highlighted above will combine with the country specific risks to determine the risk profile that the investors in critical minerals must grapple with. The country has enjoyed relative peace and stability that have attracted mining investor with a long-term view. The period leading to, and post national elections have in the past have political uncertainties. Instances of disputed polls and politically motivated violence have also increased country political ratings in the past which adversely affected investor perception.

Since 2017 the government has adopted an engagement and re-engagement policy with the mantra that Zimbabwe is open for business.

The Indigenization and Economic Empowerment Act [Chapter 14:33] of 2007, section 3 (1) which stated that, *"The Government shall, through this Act or regulations or other measures under this Act or any other law, endeavor to secure that— (a) at least fifty-one per centum of the shares of every public company and any other business shall be owned by indigenous Zimbabweans*" has generated negative publicity and risk of appropriation which have been a deterrent to investors in all sectors of the economy.

Government through budget statements have tried to clarify policy and dispel negativity associated with the policy. This resulted in amendments to the Act in 2011; 2016; 2018 (through section 42 of the Finance (No. 1) Act, p.20)[31] and section 36 of Finance (No.2.) Act, 2020[32], p.136. In 2021 Indigenization and Economic Empowerment Act [Chapter 14:33][33], was updated capture all these amendments. Section 3 (1) of the updated Act state that, "*The State shall, by this Act, or through regulations under this Act or any other law, secure that at least fifty-one per centum of the shares or other ownership interest of every designated extractive business, that is to say a company, entity or business involved in the extraction of such mineral as may be prescribed by the Minister in consultation with the Minister responsible for Mines and the Minister responsible for Finance shall be owned through an appropriate designated entity (with or without the participation of a community share ownership scheme or employee share ownership scheme or trust, or both)*".
Government also implemented the ease of doing business reforms which culminated in the establishment of ZIDA as a one stop investment centre as part of measures to boost investor confidence.

[31] finance act 2018.pdf (veritaszim.net)

[32] 64549-L Finance Act (No. 2.) 2020 Gold.indd (veritaszim.net)

[33] Indigenisation & Economic Empowerment Act Updated Jan 2021.pdf (veritaszim.net)

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4. Assessment of social, environmental, and governance challenges

4.1 Country-level assessment and context

4.1.1. Context

The country's Vision 2030 seeks to ensure sustainable mining by stakeholders through a well governed mining sector which is ethically inclusive, environmentally friendly, and socially responsible and appreciated by surrounding communities. In the wake of the United Nations Conference on Climate Change (COP, 26)[34] held in Glasgow, countries committed to ambitious net zero and decarbonization targets. This placed a focus on Environmental Social and Governance reporting by mining sector enterprises given their high carbon footprint and environmental impact. The need to comply with ESG reporting is placing pressure on companies to significantly change their business model and recalibrate the risks attached to their operations. Compliance of ESG reporting is being seen as a good corporate citizenship; a requirement to access funding from ESG focused institutional investors and a protection of investments by avoiding material financial risks arising from climate change, worker disputes, human rights issues in supply chains and poor corporate governance.

A myriad of reporting frameworks that are used by companies internationally to prepare ESG reports, include the Global Reporting Initiative (GRI), Sustainability Accounting Standards Board (SASB) and the Taskforce on Climate-related Financial Disclosures (TCFD) recommendations among others. All these frameworks give companies a leeway to adapt the standards that suit their industry. However, the World Economic Forum (WEF) has developed a consultation Discussion Paper entitled Towards Common Metrics and Consistent Reporting of Sustainable Value Creation[35].The Discussion Paper seeks to provide a general framework for companies to demonstrate their long-term sustainability; a framework that integrates financial metrics along with relevant non-financial criteria such as ESG considerations, gender equality, compensation practices, supply chain management, and other activities.

The European Union (EU) has also issued a set of 13 exposure drafts of European Sustainability Reporting Standards (ESRSs) for companies located in EU member states. These standards introduce extensive new disclosure requirements that apply to most listed and large companies located in the EU, including large European subsidiaries of foreign parent companies[36]. In April 2021, the European Commission adopted a legislative proposal for a Corporate Sustainability Reporting Directive (CSRD) that requires companies within its scope to report using a double materiality perspective in compliance with European Sustainability Reporting Standards (ESRS) adopted by the European Commission as delegated acts[37]. KPMG (2022) observed that success in the long run will become increasingly dependent on defining

[34] COP stands for Conference of the Parties, the countries that signed the United Nations Framework Convention on Climate Change (UNFCCC) which was adopted in 1992.

[35] WEF_IBC_ESG_Metrics_Discussion_Paper.pdf (weforum.org)

[36] EU publishes exposure drafts of sustainability standard - KPMG Denmark;

[37] First Set of draft ESRS - EFRAG

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success in more than just financial terms, requiring the need to look more holistically at stakeholder returns, including governments, communities, and employees.

In Zimbabwe, Statutory Instrument 134 of 2019 sections 400 under Sustainability reporting, requires companies that are listed on Zimbabwe Stock Exchange (ZSE) to produce an ESG report which shows how mining companies are addressing social, economic, and environmental related concerns in the areas which they are operating. The Statutory Instrument (SI) further states that the issuer must disclose its sustainability policy, including mitigation of risks, sustainability performance data and other material information which deepens stakeholders' understanding of corporate performance. The issuer is expected to provide a balanced and objective view of their performance by including both positive and negative impacts on environment and society, how it relates to its stakeholders and contributes to sustainable development.

Section 401 of the SI highlights that the ZSE encourages the adoption of internationally accepted reporting frameworks, such as the Global Reporting Initiatives (GRI) Sustainability Reporting Guidelines or Standards, in disclosing the company's sustainability performance. Section 402 state that some issuers operate in industries that are extremely sensitive to environmental and social issues such as oil and gas, mining and metals sector with high environmental and social exposure and impacts that warrant specialized reporting frameworks for meaningful assessments of organizational risk and performance. Such companies are required by the ZSE to adopt industry-specific reporting framework or (b) the GRI Sector Supplements for selected industries; or (c) such internationally and nationally recognized reporting frameworks.

Overall, the issue of ESG reporting is still new phenomena in the mining sector in Zimbabwe. For example, Caledonia Gold mine published its first ESG report in 2021[38] which covers the period 1 January 2020 to 31 December 2020. The company noted in the preamble of the report that, this inaugural report was an important step towards improving communications on the Company's approach to ESG topics, as well as providing an update on the company's performance in this vital area of the business. While the Company was not reporting to any industry framework this ESG was its attempt to implement the principles of responsible mining. The report mapped each significant topic to relevant global and industry frameworks and standards to ensure applicability and a comprehensive reporting foundation. The company also recognized that this was an ongoing process which was evidenced by the publishing of the 2021 ESG report[39].

Zimplats, a leading platinum mining company, in its Integrated Annual Report integrates material aspects of the Group's environmental, social and governance impacts with the operational and financial performance of the business[40]. Furthermore, its operations are also covered in the parent company Implats South Africa's integrated ESG report[41] Bindura Nickel Corporation Limited, a fully integrated Nickel

[38] CMCL-ESG-REPORT-FINAL.pdf (wp-caledoniamining-2020.s3.eu-west-2.amazonaws.com)
[39] ESG-Report-2021-FINAL.pdf (wp-caledoniamining-2020.s3.eu-west-2.amazonaws.com)
[40] 2022-INTEGRATED-ANNUAL-REPORT.pdf (zimplats.com)
[41] ESG-spreads.pdf (implats-ir.co.za)

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producer which is engaged in the mining and extraction of Nickel and the production of Nickel by-products (Copper and Cobalt) also reports on ESG issues within its annual report[42]. The Company's annual report for 2022 includes an extensive section on Sustainability Reporting which focuses on the identification, quantification and reporting on the impacts that BNC's sustainability efforts have achieved from its operations in the past and will achieve in the future.

Despite the few cases on ESG/Sustainability reporting cited above, adoption and implementation of ESG reporting in the mining sector is still in its infancy the full realization of its benefits is affected by the lack of a common framework of reporting among other challenges. It is expected that the results of the country wide Government Audit on Responsible mining that was conducted May and June 2023, will bring to the fore the weaknesses within the mining operations with regards to ESG issues as well as pro-offer remedial measures. The Multi-Ministry, Departments and Agencies involved in the Responsible Mining Audit was coordinated by the Ministry of Mines and Mining Development.

World Energy Investment (WEI, 2022)[43] observed that, prices for important energy transition minerals and metals have been on a sustained upward march since the start of 2021. WEI (2022) further highlighted that the prices for lithium and cobalt more than doubled in 2021 and those for copper, nickel and aluminum all rose by around 25-40%. The surge in cathode material costs increases the cost of Electric Vehicle (EV) battery packs. Cathode material include lithium, nickel, cobalt, and manganese.

Michael *et al* 2022, also observed that the recent price spikes for critical minerals have triggered a marked increase in investment in mineral exploration and production. The increase in mineral exploration and production exposes significant risks associated with the environmental, social and governance (ESG) impacts of mining projects. Michael *et al* 2022, further highlighted that these include risks associated with geopolitical tensions, armed conflict, human rights violations, bribery and corruption, emissions, water stress and loss of biodiversity. These types of impacts can erode public support for mining projects, and will face increasing scrutiny from downstream industries, investors, and civil society, potentially leading to short-term production disruptions and stark local and international resistance to mining investments. This may in turn limit the supply of crucial minerals and metals, potentially derailing clean energy transitions. In this regard, the surging investor interest in exploring and mining critical minerals in Zimbabwe, with lithium being the front runner, need to be properly managed to avoid exposure of companies to ESG-related regulatory, ethical, and reputational criticisms.

Carbajal Glass (2022) using the micro-geopolitics of organized crime' (MGPOC) framework examined how and why organized crime groups (OCGs) around the globe develop illicit economies associated to natural resources. The foundational premise underlying the MGPOC is that OCGs vie for contested resources-rich territories, transport routes, and access to national and international markets to secure strategic hubs of illicit wealth, influence, and power, thus creating conditions for large-scale violence primordially at a local scale. Using Zimbabwe lithium as a case study Carbajal Glass (2022) highlighted potential risks in

[42] BNC-AR-2022.pdf (minedocs.com)
[43] World Energy Investment 2022 (windows.net)

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Zimbabwe's lithium industry represents of wider danger of conflict onsets over natural resources. The paper concludes that the way lithium is sourced will determine whether this energy transition supports peaceful, sustainable societies in countries like Zimbabwe or, instead, will pose a serious threat to human vulnerability.

4.1.2. Mineral/mining policies, industry policies

The Zimbabwe mining sector faces many challenges related to ESG, These include weak governance, environmental degradation, social conflicts, fiscal leakages and low productivity. To address these issues and promote sustainable development of the mining sector, Zimbabwe need is working towards implementing a comprehensive and coherent mineral policy framework that aligns with the best practices and standards of the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF). According to a 2015 assessment by the International Institute for Sustainable Development (IISD), Zimbabwe has made some progress in developing its legal and policy framework for mining, but there are still significant gaps and inconsistencies that need to be addressed. For example, Zimbabwe has not adopted a clear mineral policy document that outlines its vision, objectives and strategies for the mining sector. The Mines and Minerals Act of 1961 is still being updated to address the current realities and challenges of the sector. The Environmental Management Act of 2002 provides some provisions for environmental protection, but it is not well enforced and monitored. The fiscal regime for mining is complex and opaque, with multiple taxes, fees and royalties that create uncertainty and inefficiency. The socioeconomic benefits from mining are not equitably distributed among different stakeholders, especially the local communities affected by mining activities. The mine closure and post-mining transition are not adequately planned and funded, leading to environmental liabilities and social problems. The Artisanal and Small-scale Mining (ASM) sector is largely informal and unregulated, posing serious risks to the environment, health and safety of miners and communities.

These challenges notwithstanding, there is a growing number of local communities and villagers in lithium rich areas of Zimbabwe that are participating in lithium mining and trading activities, attracted by quick money and forced by limited (formal) job opportunities in the country. This is despite the illegality of artisanal mining in Zimbabwe." By November 2022, reports indicated that an estimated 5 000 artisanal miners, fortune seekers and foreigners were involved in mining and trading lithium at Sandawana Mine"[44].

4.1.3. Mining regulations

The allocation of mining licenses in Zimbabwe is governed by various laws and regulations, such as the Mines and Minerals Act [Chapter 21:05], the Environmental Management Act [Chapter 20:27], and the Mining (General) Regulations. These laws and regulations establish the rights and obligations of mining title holders, as well as the procedures and fees for acquiring and maintaining mining titles. The mining

[44] IPIS Briefing – Summer 2023, by Zimbabwe Environmental Law Association (ZELA) *'Chinese dominance in Zimbabwe's lithium mines: Potential risks, vulnerabilities and opportunities in the critical minerals sector'.* https://ipisresearch.be/weekly-briefing/chinese-dominance-in-zimbabwes-lithium-mines-potential-risks-vulnerabilities-and-opportunities-in-the-critical-minerals-sector/

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industry is administered by different authorities and functionaries, such as the President, the Minister and the Ministry of Mines and Mining Development, the Mining Affairs Board, and the Environmental Management Agency. The mining titles that can be obtained in Zimbabwe include prospecting licenses, mining leases, special mining leases, special grants, and sites. The type of title depends on the mineral, the location, and the size of the area to be mined. The allocation of mining licenses is subject to various conditions and restrictions, such as environmental impact assessment, indigenous ownership requirements, beneficiation and export controls, and land rights.

Since 2018 Zimbabwe re-focused its attention on maximizing the mining industry's potential, through re-structuring its policies and regulatory framework to improve investment and productivity. For example, the amendments to the Finance Act which came into effect on the 1st of January 2022 brought changes to the royalty rates in platinum and gold. Significant to the changes is the allowance for a 3% royalty rate on gold where global prices are below one thousand two hundred United States Dollars (US$1200) per ounce, this is a significant review from a flat 5% royalty rate that did not factor in the fluctuations in the price.

4.1.4. Taxation and royalties

Royalties are calculated on the gross fair market value or face value of the invoice issued either by the local designated entity (MMCZ, Fidelity Refiners and Printers) or as per an internationally recognized pricing standard such as applicable to platinum (London Metals Exchange). Below are the prevailing royalty rates as applicable from the 1st of January 2022.

Mineral	Method	Rate of Mining Royalty
Platinum	Concentrate- 85% of price on London Metal Exchange on the date of the transaction	2.5%
	Concentrate- 85% of price on London Metal Exchange on the date of the transaction	2.5%
Base metals	Invoice value by MMCZ	2 %
Coalbed Methane	Invoice value by MMCZ	2%
Coal	Invoice value by MMCZ	1%

Table 20 Royalty rates as applicable from the 1st of January 2022[45]

On the 4th of November the President published a Statutory Instrument, the Presidential Powers (Temporary Measures) (Amendment of Reserve Bank of Zimbabwe Act and Finance Act) Regulations, 2022 [SI 189 of 2022][46], which requires miners to pay royalties partly in kind, partly in foreign currency and

[45] Extracted from Finance Act No. 7 of 2021

[46] S.I. 189 of 2022 Presidential Regulations.indd (veritaszim.net)

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partly in local currency. Royalties for platinum, lithium, and other minerals prescribed by the Reserve Bank in a statutory instrument must be paid:

- 50 per cent in kind, in a form and purity or quality prescribed by the Reserve Bank in a statutory instrument,
- 10 per cent in foreign currency (in cash), and
- 40 per cent in Zimbabwe currency.

Royalties for other minerals must be paid:

- 50 per cent in foreign currency (not necessarily in cash), and
- 50 per cent in Zimbabwe currency.

The Statutory Instrument also amends the Reserve Bank of Zimbabwe Act to permit the Bank to keep reserves of diamonds, platinum, and lithium. The Bank is given power to make statutory instruments specifying other minerals that may be kept as reserves.

4.1.4. Land-use and mineral rights

Land-use and mineral rights in Zimbabwe are governed by various laws and regulations, which aim to balance the interests of different stakeholders, such as the state, the land owners, the miners and the environment. Some of the key laws and regulations that affect land-use and mineral rights in Zimbabwe are:

- The Mines and Minerals Act [Chapter 21:05], which vests the right of searching and mining for and disposing of all minerals, mineral oils and natural gases in the President, subject to the provisions of the Act. The Act also regulates the acquisition, transfer, encumbrance and relinquishment of mining rights, as well as the environmental and social aspects of mining activities.
- The Environmental Management Act [Chapter 20:27], which provides for the protection and management of natural resources and the environment, as well as the prevention of pollution and environmental degradation. The Act also requires an environmental impact assessment to be conducted for any project that may have an adverse impact on the environment, including mining projects.
- The Land Acquisition Act [Chapter 20:10], which empowers the state to acquire any land for a public purpose, such as resettlement, urban development or mining. The Act also provides for the payment of compensation to the former owners of the acquired land.
- The Communal Land Act [Chapter 20:04], which regulates the use and occupation of communal land by rural communities. Communal land is vested in the President, who may allocate it to district councils or rural district councils for administration. The Act also prohibits any person from prospecting or mining on communal land without the consent of the rural district council concerned.

Land-use and mineral rights in Zimbabwe are therefore subject to various legal frameworks that may create conflicts or synergies among different actors. For instance, mining rights may take precedence over farming rights in some cases, depending on the type and location of the mineral resources, as well as the public interest involved. However, there are also opportunities for co-existence and collaboration

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between miners and farmers, such as through land-sharing agreements, joint ventures or corporate social responsibility initiatives. Furthermore, land-use and mineral rights in Zimbabwe are also influenced by political, economic, and social factors that may affect the implementation and enforcement of the laws and regulations.

4.1.5. Environment

The **Environmental Management Act (EMA)** [Chapter 20:27] **of 1996**, is concerned with the overall management of the environment and with the implementation of policies and protocols to ensure the sustainability of resources. This Act t] provides for the establishment of the National Environmental Council, Environmental Management Agency, Environment Management Board, and the Standards and Enforcement Committee. It also stipulates general principles of environmental management, quality standards, environmental plans, environmental impact assessments and audits. Section 4 of this Act outlines environmental rights and principles of environmental management while Section 5 defines the general functions of the Minister of Environment and Tourism. Under this Act, the Minister may delegate to the Environmental Management Agency or National Environment Council such of his functions as he thinks fit.

Other key legislation governing the environmental regulation in Zimbabwe's mining sector include:

- Water Act [Chapter 20:24],
- Forest Act [Chapter 19:05],
- Agricultural Land Settlement Act [Chapter 20:01],
- Communal Land Act [Chapter 20:04],
- Parks and Wild Life Act [Chapter 20:14], and
- Rural Land Act [Chapter 20:18]

These legislations are intended to promote sustainable management of natural resources and protection of the environment, prevention of pollution, preparation of environmental plans and establishment of government agencies such as the Environmental Management Agency and the Environment Fund.

All exploration, reconnaissance, and mining operations must be approved by the Environmental Management Agency (EMA) and an Environmental Impact Assessment Certificate must be approved before any of these operations may commence. As part of the EMA requirements, plans must be submitted outlining how tailings and other waste products will be stored and how the area will be rehabilitated and returned to its original state once the operation is complete.

Environmental Regulations

, All mining activities need to adhere to the regulations of the EMA and obtain an Environmental Impact Assessment Certificate prior to the commencement of operations.

The EMA (Hazardous Substances, Pesticides, and other Toxic Substances) Regulations, 2007, prescribe standards and regulations for hazardous substances and hazardous waste.

The EMA (Control of Alluvial Mining) Regulations, (2014); and the Importation and Transit of Hazardous Substances and Waste, Regulations, 2009; the Environmental Impact Assessment & Ecosystems

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Protection Regulations, 2007; the Effluents and Solid Waste Disposal Regulations, 2007; the Atmospheric Pollution Control Regulations, 2009 and the Control of Hazardous Substances, General Regulations, 2018) provide for the control of alluvial mining, the import and transit of hazardous substances and waste, environmental impact assessments and ecosystems protection, effluents and solid waste disposal, atmospheric pollution control and the control of hazardous substances respectively.

Other licence requirements for the mining sector include Waste Disposal Licences, Effluent Discharge Licences, Emission Licences, and Import/Export Licences for controlled substances. In addition to these, the closure obligations of the holder of a reconnaissance right, exploration right or mining right need to be adhered to, including restoring the land to its original state and removing any hazardous structures, equipment, and disused surface pipes, pump stations, and facilities.

4.1.6. Societal and community aspects, cultural heritage

Zimbabwe has a very rich cultural heritage in terms of its traditions, beliefs, values, languages, arts, crafts, monuments, landscapes, and sacred sites. Though mining can also have positive effects on cultural heritage through provision of economic opportunities and improving the living standards of the communities, mining has been observed to affect Zimbabwe' cultural heritage in several ways that includes:

- Displacing communities from their ancestral lands and disrupting their social cohesion and sense of belonging.
- Destroying or damaging cultural heritage sites, such as historical buildings, archaeological remains, rock art, burial grounds, and sacred places.
- Altering the natural environment and landscape that is part of the cultural heritage of the communities.
- Affecting the transmission and preservation of intangible cultural heritage, such as oral histories, rituals, ceremonies, festivals, and knowledge systems.

Therefore, mining in Zimbabwe should take into account the cultural heritage of the affected communities and ensure that it is respected, protected, and promoted. Mining should also seek to minimize the negative impacts and maximize the positive impacts on cultural heritage. This can be achieved by:

- Conducting comprehensive and participatory cultural heritage impact assessments before starting any mining project.
- Developing and implementing mitigation measures to avoid or reduce the adverse effects on cultural heritage.
- Establishing mechanisms for consultation, dialogue, and grievance redress between the mining companies, the government, and the communities.
- Providing compensation and benefits for the affected communities and ensuring that they share in the profits of mining.

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- Supporting the documentation, safeguarding, and revitalization of intangible cultural heritage among the communities.
- Investing in the restoration, conservation, and enhancement of cultural heritage sites.
- Encouraging the participation and empowerment of the communities in the management and stewardship of their cultural heritage.

4.1.7. Public health and safety

Some of the health issues associated with mining in Zimbabwe include environmental pollution, occupational accidents/injuries and social disruption. Several authored have noted release of harmful substances such as mercury, cyanide, dust and heavy metals into the air, water and soil, affecting the health of workers and surrounding communities. Exposure to these pollutants can cause respiratory diseases, skin infections, neurological disorders, cancer and birth defects. Mudimbu and Meck (2018) conducted a study on the health impacts of artisanal and small-scale gold mining (ASGM) in Zimbabwe and found that most miners and residents reported symptoms that can be attributed exposure to elements released during mining. A considerable number of the CRM bearing pegmatite are located within greenstone belts e.g. the Arcadia lithium project is located within the Harare-Shamva greenstone belt, thus since the pegmatites are intrusive bodies that cut across the greenstone belts the impacts observed by Mudimbu and Meck 2018 are likely to be experienced when mining CRMs.

Zimbabwe has and is still experiencing occupational injuries/fatalities encountered during digging, blasting, crushing, transporting and working underground. These activities can result in mine collapses, explosions, falls, electrocutions, fires and other accidents that can injure or kill workers. According to Singo et al. (2022), the prevalence of accidents and injuries among ASGM workers in Zimbabwe was 35.0% and 25.7%, respectively. The study also identified several risk factors for injuries, such as being male, being 18–35 years old, working long hours and lacking personal protective equipment (PPE). Maponga and Meck 2003 also noted that mining in Zimbabwe was also affecting the livelihoods, culture and well-being of local communities in various ways by displacing people from their land, creating conflicts over resources, increasing migration and prostitution, disrupting traditional norms and values, and reducing social cohesion. These social changes have negative impacts on mental health, family stability, gender relations, human rights and social justice. Leuenberger et al. (2021) explored the community perceptions of health impacts of industrial mining in three sub-Saharan African countries, including Zimbabwe, and found that most participants reported negative impacts such as loss of land, income and identity, increased violence and crime, decreased trust and solidarity, and reduced quality of life.

4.2 Mining practices *vs.* Environmental, Social and Governance (ESG) goals

Zimbabwe's National Development Strategy (NDS1, 2021-2025) highlights that, weak governance in the mine sector is the major limiting factor to the development of the sector. Critical minerals were not explicitly provided for in the current Mines and Minerals Act. The Mines and Mineral Bill (2022) which seeks to the current Mines and Minerals Act [Chapter 21:05] has several objectives including, the

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introduction of the concept of the concept of “strategic minerals” to which special conditions by mutual agreement between the Minister and the State will attach[47]. Under clause 6 the Bill proposes that the Minister should have power, after consultation with the Mining Affairs Board, to declare any mineral to be a “strategic mineral”. Minerals attain special status owing to factors such as short-supply, controls, cost-factor, and strategic utility. In the case of Strategic Minerals, such minerals are important for the defense industry and other strategic industries like energy, nuclear and space.

4.2.1 Environmental challenges

The government requires mining companies to comply with various environmental regulations, including the submission of environmental impact assessments and the implementation of mitigation measures to minimize the impact of mining activities on the environment. Similarly, Mining companies are also required to consider the social impact of their activities and engage with local communities. However, there are very few regulations specifically governing environmental accounting in the Zimbabwean mining sector. The government has not provided enough financial and human resources for research and development of environmental accounting practices, nor have government organizations monitored and controlled the activities of mines in a meaningful way.

4.2.2 Socio-economic issues

The rise in demand for critical minerals and the resultant increase in mining activities within the critical minerals value chain in Zimbabwe present a range of social and environmental risks and challenges that need to be managed. Increasing mining activities can lead to increase carbon emissions, water use, deforestation, environmental pollution, and waste management challenges. These challenges Zimbabwe is already grappling with and the rush for critical raw material is likely to exacerbate this. Furthermore, critical mineral rush without proper environmental impact assessments can adversely affect community livelihoods. Commencing mining without proper mining closure and rehabilitation plans can result in physical environments being left in a state of dereliction, causing a host of ecological, health and safety risks to the community, livestock, and property. Mining and mineral processing activities may also adversely affect the quality of water resources within the mined areas. Thus, adoption of climate-smart mining practices by the Zimbabwe, will avert the negative impacts from increased mining activities that potentially can adversely affect vulnerable communities and the environment, and endanger progress on tackling climate change.

4.2.3 What would be the best practices for a responsible mining?

It is important to adopt best practices for a responsible extraction of CRMs in Zimbabwe that can ensure the sustainability and inclusiveness of the mining sector. Some of the best practices for a responsible extraction of CRMs in Zimbabwe are:

- Domesticating of African Mining Vision (AMV) - a comprehensive framework that fosters sustainable and inclusive development of Africa's mineral resources.

[47] Mines & Minerals Bill.pdf (veritaszim.net)

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- Implementing The African Minerals & Energy Resources Classification and Management System (AMREC) together with the Pan African Reporting Code (PARC) code named AMREC-PARC which is tailored specifically to the African context and aligned with the principles and goals of the AMV and which was developed within the framework of the United Nations Framework Resource Classification (UNFC).
- Implementing the principles and standards of the Extractive Industries Transparency Initiative (EITI), which promotes the disclosure and verification of information on revenues, contracts, licenses, and ownership in the extractive sector. This can enhance the accountability and transparency of the mining industry and prevent illicit financial flows and tax evasion.
- Adopting the guidelines and criteria of the Responsible Minerals Initiative (RMI), which provides tools and resources for companies to identify and address risks in their mineral supply chains. This can help to ensure that the extraction of CRMs does not contribute to conflict, human rights abuses, or environmental harm.
- Applying the framework and indicators of the Sustainable Development Goals (SDGs), which set the global agenda for achieving social, economic, and environmental progress by 2030. This can help to align the extraction of CRMs with the national and regional development priorities and to monitor and evaluate the impacts and outcomes of the mining activities.
- Engaging with the local communities and stakeholders, such as civil society organizations, indigenous groups, women, and youth, who are affected by or involved in the extraction of CRMs. This can foster a participatory and inclusive approach to decision-making and benefit-sharing in the mining sector and to address the grievances and concerns of the affected parties.
- Investing in the capacity building and innovation of the mining sector, such as improving the skills and knowledge of the workers, enhancing the efficiency and safety of the mining operations, diversifying the mineral products and markets, and promoting the circular economy and green technologies. This can increase the competitiveness and resilience of the mining sector and reduce its environmental footprint.

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5 Business network between the European Union and Zimbabwe

There are business networks and trade relations between Europe and Zimbabwe in the minerals sector. Zimbabwe is known for its vast mineral resources and has attracted investment interests from various European countries. The European Union (EU) has been a significant player in promoting business networks between Europe and Zimbabwe in the minerals sector. The EU has been supportive of efforts to enhance responsible mining practices and to stimulate investment in Zimbabwe's mineral industry. The EU has also provided financial assistance for capacity-building programs aimed at improving governance and transparency in the extractive sector. All these are well detailed in the Zimbabwe Multi-Annual Indicative Programme 2012 – 2017.

Additionally, individual European countries, such as Germany, United Kingdom, and France, have established business networks and trade relationships with Zimbabwe in the minerals sector. These networks often facilitate trade and investment opportunities, collaboration on mining projects, and the exchange of technical expertise. Moreover, there is a need to attract more European mining companies to invest in Zimbabwe's mineral sector, particularly in Critical Minerals. These investments have led to joint ventures, technology transfers, and knowledge sharing between European and Zimbabwean companies. Overall, while the business networks between Europe and Zimbabwe in the minerals sector exist, it is essential to consider the context of changing political and economic dynamics that may influence these relationships.

While it is not easy to provide an exhaustive list of all EU-supported mining projects in Zimbabwe, a few examples that have received EU support in the mining sector can be traced. These projects aim to promote responsible mining practices, enhance governance, and support sustainable development in Zimbabwe's mining industry. Here are a few examples:

Zimbabwe Environmental Law Association (ZELA) supported by EU produced a good list of potential and existing lithium minerals projects shown below. The EU has provided support to ZELA, a local civil society organization, to foster more transparent and accountable governance in the extractive sector. ZELA works to promote responsible mining practices and engages in advocacy for sustainable mining policies.

5.1 Assessment of the upstream and downstream business ecosystem

5.1.1 Context, formal and informal players

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In the Zimbabwe mining sector, formal players typically refer to large-scale mining companies or operations that are officially registered with the government and comply with all regulatory requirements. These players often have significant financial resources, employ modern technology and machinery, and adhere to strict environmental and labor standards. Formal players in Zimbabwe's minerals sector include the following: Government-owned mining companies (e.g. Zimbabwe Mining Development Corporation), Large-scale mining companies (local and international), Mineral processing companies, Geological survey and exploration companies, Mining equipment suppliers and manufacturers, Investment and finance institutions involved in mining projects, Regulatory bodies and government agencies (e.g. Ministry of Mines and Mining Development).

This study identified key formal institutions and stakeholders and categorised them into six groups namely: government departments; parastatals; private organizations; mining companies and other stakeholders. These are described in turn as follows:

Government Departments

Several government departments and parastatals are key in the minerals industry. Most of the government departments and parastatals that are directly related to mining fall under the Ministry of Mines and Mining Development (MMMD). The departments are responsible for regulating the minerals sector, administering mining laws, providing mining related services and information on the mining industry. The departments are also responsible for the safety and health inspectorate function as well as reviewing license applications. Some of the government departments and parastatals are discussed below.

- **Department of Metallurgy**:

The Department of Metallurgy, popularly known as the Government Metallurgical Laboratory, monitors and audits mineral processing operations in Zimbabwe. Some of the services provided by the department include extractive metallurgy, physical metallurgy, ceramic metallurgy, analytical metallurgy, monitoring of mineral exports, pollution abatement in the mining and metallurgical industries and applied research in extractive, physical and ceramic metallurgy.

- **Department of Mining Engineering:**

This department is entrusted with providing engineering related services to the mining sector. The Department's roles include monitoring of mining operations; enforcement of mining explosives regulations; mechanical and electrical engineering; ventilation and environmental control; mine survey; and mine engineering. The department is also expected to empower small-scale miners through provision of appropriate technologies and loan facilities. It manages the Mining Industry Development Fund (MIDF) and conducts statutory examinations for the mining industry.

- **Department of Mining Promotion and Mining Development:**

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The major functions of the department include coordinating mineral policy planning and development, promoting investment in the mining industry from both local and foreign investors, monitoring and supervising the performance of mining parastatals and state companies. The department is also expected to compile and analyse national mineral production statistics, monitor marketing of minerals (including imports of minerals and minerals bearing products into the country). The other tasks for the department include keeping an up to date record of new and old mines about their production levels, employment and revenue trends as well as evaluating possibilities for the development of value added processing of minerals. This department is also responsible for the development of small-scale mining into medium or large-scale mining enterprises.

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- **Department of Mining Law and Administration:**

The Department of Mining Law and Administration is also referred to as the legal services department. Its major role is to enforce the provisions of the Mines and Minerals Act (Chapter 21:05) and other appropriate legislations. It is also responsible for granting mining rights, registration of custom millers, initiating legislation and recommending amendments, presiding over miner/ farmer and miner/ miner disputes and keeping an accurate database for all registration, cancellation and production. Curbing of leakages of gold/ precious stones is also one of this department's mandates. The department also offers legal services to the Ministry.

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- **Department of Geological Survey:**

Mapping the geology of the country and generating information on mineral resources potential of the country are the major tasks of the Department of Geological Survey. However, this department also provides technical, consultative and advisory services on mining geology and mineral exploration to the industry and small-scale miners. It also provides the public with information on mineral exploration and exploitation, collates and archives national geological information, and maintains current and potential mineral deposit databases.

Parastatals

The three parastatals regarded as stakeholders for the minerals industry are Zimbabwe Mining Development Corporation (ZMDC), Minerals Marketing Corporation of Zimbabwe (MMCZ) and Fidelity Printers and Refiners. The first two falls under MMMD whilst the last falls under the Reserve Bank of Zimbabwe.

- **Mineral Marketing Corporation of Zimbabwe:**

Minerals Marketing Corporation of Zimbabwe (MMCZ) was established in 1983 and is an exclusive agent for marketing and selling of all minerals produced in Zimbabwe except silver and gold. It also provides advisory services, promotion of investments in mining related activities and national mineral resource accounting. The Corporation searches for markets on behalf of producers, negotiates, enters and administers the implementation of sales agreements on behalf of the customers. It is also responsible for the physical movement of the product from the mine location to the point of sale. The mineral resource accounting throughout the value chain, that is, from extraction of ore up to the final sale of the product is conducted by the MMCZ inspectorate division. MMCZ also has projects, which include chrome ore claims, gold project, gold roasting plant, granite claims and a diamond cutting and polishing factory.

- **Zimbabwe Mining Development Corporation:**

Zimbabwe Mining Development Corporation (ZMDC) was established in 1982 by an Act of Parliament to engage in prospecting, exploration and mining on behalf of the Government. Through its ownership of various mines around the country, it is involved in mining of diamonds, gold, platinum, graphite, emeralds, tin, copper and asbestos. It also has joint ventures with other mining houses for diamond, platinum, uranium and graphite mining.

- **Fidelity Printers and Refinery:**

Fidelity Printers and Refinery is a security printing and gold refinery company wholly owned by the Reserve Bank of Zimbabwe. It produces all security documents including currency, passports, examination papers, travellers' cheques, Commercial Bank cheques, passbooks and a wide range of other government security documents. The mining related aspect of Fidelity Printers and Refinery is the refining of gold and silver. Whilst all the other minerals are sold through MMCZ, Fidelity Printers and Refinery is the sole authorised buyer and exporter of gold in Zimbabwe.

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Private Organisations

- **Chamber of Mines of Zimbabwe:**

The Chamber of Mines of Zimbabwe (CoMZ) is a private sector voluntary organization established in 1939 by an Act of Parliament. Its primary objectives Zimbabwe Economic Policy Analysis and Research Unit (ZEPARU) 23 are to advocate and lobby in order to promote, encourage and protect the interests of the players in the mining industry in Zimbabwe.

- **Geological Society of Zimbabwe:**

The Society is a body corporate under the common law of Zimbabwe. Its objectives are to promote the science and practice of geology and execute all issues conducive to the advancement of earth science. It thus promotes geological research, teaching, exploration and mining in Zimbabwe. It acts as a forum to exchange knowledge and practices on geological issues.

- **Association of Mine Surveyors of Zimbabwe:**

The association provides professional representation to government, industry and educational organisations on mine surveying issues. Some of its objectives are to promote interest in mine surveying, advance the science and practice of mine surveying, establish a system of grading of mine surveyors in relation to their qualifications and promote mutual interest with allied disciplines. The association is affiliated to the Chamber of Mines of Zimbabwe.

- **The Association of Mine Managers of Zimbabwe:**

This is an association of qualified people who are, or have been, employed in senior operational positions in the mining industry. The association discusses matters of common interests, and its members attend and participate in technical seminars to maintain competencies, provide support to peers and influence industry outcomes. It promotes the study of mining and allied disciplines and has representation in Zimbabwe School of Mines Academic Board, Chamber of Mines of Zimbabwe and the Board of Examiners for the Full Blasting Licenses and Mine Manager's Certificate of Competences

Mining Companies formal and informal

It's important to note that both formal and informal players play distinct roles in the Zimbabwe mining sector, and efforts are being made to formalize and regulate informal mining activities while ensuring that formal mining operations operate responsibly and sustainably.

Informal players, on the other hand, usually consist of small-scale miners, artisanal miners, and unregistered mining operations. They may operate without official permits, use rudimentary tools and methods, and often work in remote or unregulated areas.

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Zimbabwe is noted for its unique geology which is host to a variety of economic minerals. The number of mining companies in Zimbabwe is estimated at between 800 and 900 (Jourdan et al, 2012)[48]. Most of the mining companies are members of the Chamber of Mines. However, many companies are small and artisanal companies owing to the nature of the deposits they exploit, which in most cases are small

Zimbabwe hosts a sizeable number of Artisanal and small-scale miners (ASM) with the number of artisanal and small-scale miners is estimated to be 500,000 (Kahwai, 2013)[49]. There are other mining syndicates and cooperatives, local communities involved in small-scale mining activities, unregistered traders of minerals and unregistered mining. These are also members of small scale miners associations, which include Zimbabwe Artisanal and Small Scale for Sustainable Mining Council (ZASMC), Zimbabwe Women in Mining, Gold Miners Association of Zimbabwe (GMAZ) and the Zimbabwe Miners Federation.

While informal players may contribute significantly to the overall production of minerals, their activities can also be associated with environmental degradation, unsafe working conditions, and lack of proper legal protections for workers.

Other Stakeholders

There are other stakeholders whose operations directly affect or are directly related to the mining industry. These include the Zimbabwe National Water Authority(ZINWA), Environmental Management Agency(EMA), Parliamentary Portfolio Committee on Mines and Energy, Rural District Councils (RDC), Standard Association of Zimbabwe (SAZ) and suppliers of mining equipment and consumables. Mining activities are also required to commence with the knowledge and approval of RDCs. There are other stakeholders whose operations directly affect or are directly related to the mining industry. These include the Zimbabwe National Water Authority(ZINWA), Environmental Management Agency(EMA), Parliamentary Portfolio Committee on Mines and Energy, Rural District Councils (RDC), Standard Association of Zimbabwe (SAZ) and suppliers of mining equipment and consumables.

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7 It's important to note that both formal and informal players play distinct roles in the Zimbabwe mining sector, and efforts are being made to formalize and regulate informal mining activities while ensuring that formal mining operations operate responsibly and sustainably.

[48] Jourdan P, Chigumira G., Kwesu I., Chipumho E. (2012). Mining Sector Policy Study, Zimbabwe Economic Policy Analysis and Research Unit (ZEPARU), Harare.
[49] Kahwai S (2013), Opportunities in the Mining Sector, Presentation made during a workshop organised by the Ministry of Higher and Tertiary Education on Diaspora Engagement, Double Tree Hotel, Dallas, Texas 25 May 2013

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5.1.2 Relationships at local or regional levels

The EU's engagement in the Green Economic Growth Priority Area is also taking place in the context of negotiations to conclude a comprehensive and more ambitious Economic Partnership Agreement (EPA) with Zimbabwe together with the other five, Eastern and Southern African (ESA) countries who signed the interim EPA. This provides for trade and investment opportunities between EU and Zimbabwe as well as between Zimbabwe in the critical minerals. The promotion of investment in Africa is a topical issue now also in the context of the African Continental Free Trade Area (AfCFTA). Zimbabwe is a member of Common Market for Eastern and Southern Africa (COMESA) and Southern African Development Corporation (SADC).

The relationships at local and regional levels for the Zimbabwe minerals sector are influenced by various factors, including Zimbabwe's signing of the Economic Partnership Agreement (EPA) with the European Union under the Eastern and Southern Africa (ESA-EPA) framework. As a member of Regional Economic Communities (RECs) such as the Southern African Development Community (SADC) and having ratified the African Continental Free Trade Area (AfCFTA) agreement, Zimbabwe's minerals sector is interconnected with regional and continental trade dynamics.

At the local level, the mining industry in Zimbabwe is impacted by government policies, regulatory frameworks, and local community engagement. The relationships between mining companies, local communities, and local authorities play a significant role in shaping the overall dynamics of the minerals sector.

On a regional level, Zimbabwe's participation in the SADC framework influences trade, investment, and cooperation in the minerals sector with other SADC member states. The SADC Protocol on Mining and the SADC Free Trade Area framework as well as SADC Industrial Development Strategy and Master Plan contribute to regional trade dynamics for minerals, impacting Zimbabwe's relationships with its neighbors. Furthermore, the ratification of the AfCFTA agreement creates additional opportunities and challenges for Zimbabwe's minerals sector. It opens up the potential for increased trade in minerals within the African continent, leading to partnerships and collaborations with other African countries in the mining industry.

Overall, the relationships at local and regional levels for the Zimbabwe minerals sector are shaped by a complex interplay of policy frameworks, trade agreements, and collaborative efforts within the local and regional contexts.

5.1.3 Overview of the local or regional clusters

There are several local mining clusters in Zimbabwe, with the most prominent ones being in the regions of Mashonaland Central, Mashonaland West, and Midlands. These clusters are known for their rich deposits of gold, platinum, diamonds, and other minerals.

Moreover the Southern African Development Community (SADC) region has several mining clusters for critical minerals, some of which are linked with Zimbabwe. The main regional mining clusters in the SADC region include:

- Copperbelt in Zambia and Democratic Republic of the Congo (DRC): This region is known for its large copper reserves, and some of the minerals extracted here are critical for various industries.

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- Bushveld Complex in South Africa: This area is rich in platinum group metals (PGMs) and chromium, which are critical minerals used in various industrial applications.
- Matabeleland in Zimbabwe: This region is known for its rich deposits of gold, platinum, and other critical minerals, making it an important mining cluster in the SADC region.
- Kibara Belt in Tanzania and DRC: The Central African Mesoproterozoic Kibara belt in Katanga (DRCongo) and Karagwe (Tanzania) forms a metallogenic province that hosts a variety of granite-related mineralization, rich in cassiterite, columbite–tantalite, wolframite/ferberite, spodumene and beryl. This region is also rich in graphite and lithium'.

These mining clusters are important for the extraction of critical minerals in the SADC region and are often linked with Zimbabwe due to the country's significant mineral reserves and mining activities.

5.2 Building new B2B relations

Building new B2B relations in the Zimbabwe mining sector requires a strategic approach and includes gaining a comprehensive understanding of the Zimbabwe mining industry, the key players, mining regulations, current projects, and potential opportunities etc. It also requires attending industry events and conferences: participate in mining conferences, trade shows, and networking events in Zimbabwe. These events provide an excellent platform to meet industry professionals, potential partners, and government officials. The following examples are some of the key events in Zimbabwe:

- **Chamber of Mine annual mining conference & golf tournament:** This is an annual event that provides a platform for industry leaders, government, investors and financiers opportunity to interact and discuss key matters relevant to the development of the mining industry.
- **Mining industry supplier's forum:** This platform brings mining companies, suppliers and other related industries to discuss pertinent issues related to the entire mining value chain, including enhancing linkages in the mining industry.
- **Chamber of Mines jumbo golf tournament:** The Jumbo Golf tournament is a prime golfing tournament is a prime golfing tournament targeting the mining industry. It is an event that provides the opportunity for networking and building relations. There are also other golf tournaments held by individual mines during the course of the year that can be of key importance in b2b networking.

There are other events that are key for networking and provide opportunity to engage in conversations, exchange contact information, and meet or follow up with interested parties.

It is also vital to leverage on local business networks by tapping into local business networks and industry associations in Zimbabwe already mentioned in this study. These organizations can provide valuable insights, introductions, and support in navigating the local business landscape. Join relevant associations, attend their meetings, and actively participate in their activities and establish relationships with key stakeholders: Identify key stakeholders in the Zimbabwe mining sector, such as mining companies, suppliers, contractors, and government agencies alluded to earlier.

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5.3 Promoting local content and enabling mining cluster actors

Zimbabwe hosts a number of institutions that are key to building national local content and enabling mining clusters

Relevant institutions for the development of a Zimbabwe-focused critical minerals network

Tertiary institutions

There are several tertiary institutes offering training for the minerals industry and these include universities, polytechnic colleges, government institutes and independent institutions.

- **Universities**

Among the universities that offer tertiary education relevant to minerals industry are Midlands State University, University of Zimbabwe, and Bindura University of Science and Technology.

Midlands State University offers degrees in Chemical and Processing Engineering, Mining and Mineral Processing Engineering, Surveying and Geomatics. The departments that offer mining related degrees at the University of Zimbabwe are Mining Engineering, Metallurgy, Geoinformatics and Geology. At the Bindura University of Science and Technology, the Earth Science Department offers mining related degrees.

- **Institute of Mining Research**

The role of the institution is to enable the sustainable development of mining and related sectors in Zimbabwe through innovative and responsive research, further education, training and consultancy services. The mining community may also obtain advice and assistance by utilising the extensive facilities of the Institute of Mining Research, which is partially funded by government. The institution carries out research in mineral economics, mineralogy and metallurgy.

- **The Zimbabwe School of Mines**

This training institution was established by a Presidential Charter in 1994 although its existence dates back to 1926. Its mandate is to provide technical education and practical training for people who wish to enter the mining industry. The school provides in-house training services for professional mining personnel, mining related information and consultancy services to industry. It also offers distance learning and assists Government in manpower planning and development as is related to mining and related industries. The school is a regional institution that serves the SADC mining industry. It offers competency-based training and hands-on mining courses and support services. Several stakeholders among them the University of Zimbabwe, Chamber of Mines and Geological society are involved in the curriculum development and quality of training at the institute

- **Zimbabwe Institute of Legal Studies**

The Zimbabwe Institute of Legal Studies (ZILS) is an independent institution offering skilled manpower and vocational training for the law and forensic science. Their one year certificates and three year

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diplomas in Mineral law and Policy are mining related thus making the institution a stakeholder for minerals sector.

- **The Zimbabwe Diamond Education College**

The Zimbabwe Diamond Education College, which was established in 2010 as a direct response to the discovery of diamonds in Zimbabwe, provides knowledge and skills to enter the diamond industry. Its mission is to impart skills for the diamond industry, add value to the diamond industry, encourage investment, empower Zimbabweans and reduce unemployment. It is also involved in defining unit standards for evaluating proficiency in the various aspects of the diamond industry as well as make links with the outside world. The college also organises workshops for various stakeholders on awareness and aims to influence policy.

- **Polytechnics**

The polytechnic colleges dotted around the country offer engineering courses that are relevant to mining. The Kwekwe Polytechnic, which is located in Midlands, one of Zimbabwe's richest provinces in terms of minerals, has tailormade courses which are designed to help small scale and artisanal miners who constitute the bulk of this gold mining province but who also engage in other minerals.

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6. Energy and digital transition: develop a strategy for the EU and Africa Partnership

The AfricaMaVal project aligns with the strategies that aim to achieve Zimbabwe's Vision 2030, as well as the global goals of the Sustainable Development Goals (SDGs) and Africa Agenda 2063. These strategies focus on finding local alternatives to imports by developing local value chains based on Zimbabwe's own strengths. The effective implementation of the country's development agenda relies on the wise use of mineral resources, which are essential for other countries' responsible sourcing. Therefore, it is important to ensure that local co-development is sustainable and follows the best Environmental, Social and Governance standards.

The mining sector of Zimbabwe is one of the key drivers of growth, along with the agriculture sector. Hence, the need for Zimbabwe to leverage its mineral resources for growth and development is urgent. This requires a comprehensive assessment of the whole mining sector value chain. In 2018, the Government of Zimbabwe launched a national modernization and industrialization program to achieve an Empowered and Prosperous Upper Middle-Income Economy by 2030 (Vision 2030). To this end, the Government developed the National Development Strategy 1 (NDS1) a 5-year Medium Term Plan for the period 2021-2025, and is in the process of crafting NDS2 for the period 2026-2030. These plans aim to realize the country's Vision 2030, while also addressing the global goals of the Sustainable Development Goals (SDGs) and Africa Agenda 2063.

The National Priority Areas for Zimbabwe as it strives to become an upper middle-income society by 2030 include: Governance; Value Chains and Structural Transformation; Environmental Protection, Climate Resilience and Natural Resource Management; and Social Protection. The country's policy direction is to increase investment in the mining sector to achieve a US$12 billion mineral economy by 2023.

The government is also promoting mineral value addition to transform the economic structure of the country from one highly dependent on the export of minerals and agricultural raw materials to an economy trading high value processed goods.

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7. Opportunities for responsible investments

The country's policy thrust is to boost investment in the mining sector to achieve US$12 billion mineral economy by 2023. The government is also promoting mineral value addition to transform the economic structure of the country from one highly dependent on the export of minerals and agricultural raw materials to an economy trading high value processed goods.

Exploitation of critical minerals are poised to play a significant role in national security, economy, renewable energy development and infrastructure. Minerals such as aluminium, lithium, copper, nickel, and rare earths are critical minerals whose extraction, beneficiation and value addition will play a pivotal role in the economic development and transformation of Zimbabwe. Graphite and lithium for example are critical whose demand will depend on the requirements for battery storage in the low carbon transition. Furthermore, critical minerals that are both "high-impact" and "cross-cutting" will be used in a wide range of technologies and a great amount of them will be required to meet projected demand in a low-carbon world. Manganese is another critical mineral present in Zimbabwe which is increasingly being used as a lower-cost substitute to some other metals in battery chemistry. It is also used to improve steel quality. Increased foreign investment interest in critical minerals, high prices and strong global demand for critical minerals are defining the investment dynamics in these minerals in Zimbabwe.

Apart from investment in extraction of ore, government's investment thrust is also on beneficiation and value addition of extracted minerals. For example, the platinum mining process entails extracting the ore from the ground and crushing it. The crushed ore is typically processed using a flotation system to separate platinum bearing rock from waste rock. This platinum matte is concentrated, and then sent to a refinery for smelting in South Africa. In 2019 Zimbabwe opened at the Unki Mine to facilitating smelting of platinum within the country.

Platinum is highly recyclable, and as products, which contain platinum or other platinum group metals (PGMs) reach their end-of-life, the PGM-content can be extracted through a process of smelting and refining. Thus, **investment in building smelting and refining capacity within the country** facilitates growth of the circular economy. The circular economy advocates designing products to be more durable, repairable, and recyclable, maximizing the reuse of materials and therefore ensuring they are kept in circulation for as long as possible. It seeks to reduce waste and reinforces the importance of managing impacts and consuming fewer resources to deliver sustainable outcomes, lowering both demand for raw materials and the environmental impact associated with obtaining them. Sustainable metals management and the recycling of PGM-containing end-of-life products is becoming an increasingly important focus where platinum is used in the technological solutions needed to combat climate change. As these are scaled up, there is a growing emphasis on the need to ensure that the critical minerals required are supported by manufacturing processes and supply chains that are "circular" (World Platinum Investment Council, 2023) .

Investing in Zimbabwe's mining sector presents a promising opportunity for businesses and investors seeking to tap into the country's rich natural resources and growing economy. The thrust of Vision 2030 and one of the objectives of NDS1 is to accelerate beneficiation and value addition and move away from

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exports of raw and semi-processed minerals. **Eight minerals targeted for beneficiation** are platinum, chrome, lithium, nickel, diamond cutting and polishing, copper, gold, and coal, with strengthening of linkages along the mineral value chain.

The NDS1 highlights the need to **invest in value addition to transform Zimbabwe's economic structure** from one highly dependent on the export of mineral and agricultural raw materials to an economy trading high value processed goods. To achieve increased and sustained growth in the mining sector, priority within NDS1 Period has been placed on improving the ease of doing business in the mining sector.

The NDS1 highlights that, Zimbabwe has 19 of the world's rare earth minerals. To designate these strategic assets and direct investment into their exploitation, the Government pronounced that it would expedite the formulation of Rare Earth Minerals Policy during the NDS1 period. Table 20 shows Government's envisaged economic transformation which can arise through investment in industrial processing and production of goods and services from rare earth resources such as neodymium, lanthanum, cerium, praseodymium, and gadolinium, among others. Manganese is increasingly being used as a lower-cost substitute to some other metals in battery chemistry.

Rare Earth Mineral	Uses
Neodymium	Used in the manufacture of powerful magnets, computer hard drives, wind turbines and hybrid cars
Lanthanum	Used in the manufacture of carbon lighting applications such as cameras and telescope lenses
Cerium	Used in the manufacture of catalytic convertors and some crude oil refining
Praseodymium	Used in the manufacture of aircraft engines and special glasses
Gadolinium	Used in X-ray and MRI scanning systems and manufacture of refrigerators which do not emit greenhouse gasses such as CFC's or chlorofluorocarbons
Yttrium, Terbium, Europium	Used in the manufacture of memory chips for computers, televisions, and other visual display devices, which different colors. Europium was also important in the manufacture of control rods used in nuclear reactors.

Table 21 Rare mineral value chains targeted by Zimbabwe government[50]

The GoZ (2018) also highlighted that effective exploitation of Zimbabwe's diverse underground mineral resource endowment will be enhanced through concerted investment in geological surveys and mineral exploration. Investment opportunities outlined on the Zimbabwe Investment Development Agency (ZIDA) in the mining sector includes extraction of gold ore to bullion processing; cutting diamonds; base metal (nickel, copper, iron, and cobalt), recovery from the platinum group of minerals (PGMs), Coal to Coke; Phosphate to fertilizer; and Chrome to ferrochrome.

[50] Source: Government of Zimbabwe 2020 p. 105

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Lithium which has attracted world attention as a critical mineral in production of electric vehicles (EV) and other clean technologies gadgets presents has recently emerged as a major investment opportunity in Zimbabwe.

Cabinet recently approved the Lithium Ore Policy and issued Statutory Instrument 57 of 2023, based on the following principles:

1. Any individual or entity owing a lithium concession can mine lithium ores for either: (i) processing at its own Approved Processing Plant (APP), or (ii) for sale to those with Approved Processing Plants locally.

2. Any individual and or entity wishing to process lithium ores will be required to construct an Approved Processing Plant locally;

3. Ore movement permits for lithium ores will only be issued where such ores are destined for a local Approved Processing Plant;

4. Lithium ores can only be stored at the mining site where such ores were mined, or at an approved for local Approved Processing Plant;

5. Any entity will require a Lithium Ore Purchase License to buy ores from miners. A local Approved Processing Plant will be a condition for obtaining the Lithium Ore Purchase License.

6. all players in the lithium sector, whether miners or holders of Approved Processing Plant, shall submit a summary of monthly reconciliations of ore movements to the Ministry of Mines and Mining Development; and

7. For any material to qualify as a concentrate for approval for export, it shall meet the minimum set technical specifications and the minimum selling price as set by the Minerals Marketing Corporation of Zimbabwe on a regular basis

Zimbabwe is burgeoning lithium hub with several lithium mining and processing projects that are at various stages of development (see section 2). Increased participation in lithium production provides huge opportunities for Zimbabwe to participate in the lithium value chain not only through the EV but other renewable energy projects that require storage facilities in the form of lithium batteries. Further, through lithium production, there is scope for technology transfer to Zimbabwe that would boost lithium processing capacity locally.

The Zimbabwe investment Authority (ZIDA) is **targeting to mobilize US$4bn in foreign direct investment** by end of 2023. ZIDA's investment promotion is leveraging on Zimbabwe's vast mineral resources and the Government's beneficiation and value addition policy especially on Lithium. The Government policy on beneficiation and value addition is expected to influence investors to direct capital into plants and equipment for beneficiation. For example, investors in the lithium sector are committing resources in beneficiation as evidenced by the commissioning of the Prospect Lithium Zimbabwe spodumene, Platinum and tantalum processing plant with a total capacity of 4.5 million tonnes per year (The Herald, 2023). ZIDA is also targeting in its investment promotion resource and market seeking investors. Resource

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seeking investors have been identified to be mostly from European and Asian markets, with a focus on renewable resources uptake and mineral extraction. The strategy is focused on licensing investors to develop and operate within Zimbabwe and add value to the resources extracted (Financial Gazette, 2023).

Financial instruments and investment funds

Depending on the scope of the critical minerals mining project there are **several funding options that can be explored** including loan/debt and equity financing.

Applicants to issue equity on the United States Dollars denominated Victoria Stock Exchange require a minimum subscribed capital of USD3 million (not less than 10m shares); satisfactory profit history for the preceding 3 years; at least 30% of the shares to be held by the public; minimum number of shareholders a) 50 in respect of equity shares; b) 25 in respect of preference shares; c) 10 in respect of debentures.

Furthermore, blended financing options, which combine concessional public finance with non-concessional private finance and expertise from the public and private sector, special-purpose vehicles, non-recourse project financing, risk mitigation instruments and pooled funding structures can also be utilized.

7.1 Identification of individual exploration, mining and refining projects

Each project to be proposed was supposed to fulfil the following minimum requirements..

- **Credible ECRM resource estimate available**;
- **Sufficient availability of credible project-specific information on economics and ESG features**. This typically refers to studies such as scoping studies, preliminary economic assessments, pre-feasibility and feasibility studies (JORC, NI43-101, PERC, SAMREC, CIM, SME, etc.-compliant as far as possible), environmental and social impact assessments, permit details and supporting documents, company reports containing project-specific information, credible internal reports (that may not be published) or credible third party reports (e.g., independent audits);
- **The project operator is seeking investment or financing**;
- **Part of the project's current or anticipated future ECRM production is potentially available to the EU industry**.

Obtaining detailed information to be presented as fact sheets has been challenging as most companies are not willing to volunteer information which is not public. Some of the information mount to conducting due diligence that can only be conducted through a B2B process yet some of the information can be sensitive and protected under the confidentiality clauses of agreements with the Government.

Notwithstanding, for Zimbabwe, many local owners of lithium projects in early development stages have promising economic prospects, but lack the financial means to conduct scoping studies, preliminary economic assessments and data collection for code compliant resources. Though these projects do not

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have reliable ECRM resource estimates, mining and production activities are ongoing and potential is significant. These small-scale miners are looking for investment to enhance their production and ESG performance. These small-scale mines could be attractive for European industry off takers. AfricaMaval can assist in securing such projects. The following example projects are suggested for AfricaMaVal WP7 presentation. This suggestion is based on the observation that small scale miners, rather than large scale mines, are operating lithium projects in Zimbabwe.

Project	Operator	Commodity	Address/contact	Location	Status	Reserves/ Resources
Rudolphia	Jelous Hlanganiso	Lithium	Dean Matienga	36K UTM 0230000,8038000	Mining ongoing	Data not made public
Eunice II	Jelous Hlanganiso	Lithium		36K UTM 0326680,803822	Mining ongoing	Resource not made public

Table 22 Info on projects to be presented as opportunities for investments in Zimbabwe

7.2 ASM sector country profiles

According to Chimonyo *et al* 2020, Moyo & Chambati 2013, Spiegel & Mwita and Zimunya & Dube 2019 the artisanal and small-scale mining (ASM) sector in Zimbabwe is a significant contributor to the country's economy.

The overall ASM sector is estimated to employ at least 1.5 million people in Zimbabwe and the sector remains largely informal with few mining organizations officially registered and recognized as formal entities. The ASM sector is largely focused on gold production (representing 70% of the sector), in addition to other commodities such as chromium or semi-precious stones. Minerals like tin, tantalum and tungsten have records of past production, but less information on more recent activities is available. However, the increased market demand and prices of lithium, led to a rise of the ASM sector involvement in lithium production, although larger scale production of lithium had been occurring for several decades. Reportedly, the lithium rush has led many ASM miners to move to lithium mining, however the sector has faced challenges in accessing formal markets. The government ban on raw lithium ore and base metals exports, put in place as an effort to retain value from minerals mined in Zimbabwe, based on stakeholders' observations has exacerbated the informality of the sector, leading to increased smuggling and trade through informal channels. As a result, greater capturing of lithium production by the ASM sector and access to value addition facilities have been raised as points of attention. The government has expressed its intention to formalize the ASM sector and provide a systematic governance framework that recognizes its strategic value and potential for sustainable development. The ASM sector also needs to improve its safety, health and environmental standards, as well as its linkages with other actors in the mining industry such as large-scale miners, traders, brokers, service providers and regulators.

A comprehensive overview on the ore deposits and production parameters of ECRMS currently recovered by artisanal and small-scale mining in Africa is already available as part of the AfricaMaVal deliverable 1.4.

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While a more detailed analysis of the ASM sector role in the production of ECRMs in Zimbabwe, including major challenges and investment opportunities on production, social, governance and environmental impacts and value chain, will be available as part of AfricaMaVal deliverable 7.2.

The artisanal sector is at present illegal and thus not regulated, yet the Government has been considering developing an Artisanal and Small-Scale Mining Policy. Experience in other minerals such as gold in Zimbabwe and other African countries (DRC and Tanzania) has shown that artisanal mining in resource-rich areas has great development potential and criminalising it is counterproductive. Regulated artisanal mining would benefit local community livelihood but it needs to be properly managed and implemented with the lessons learned from artisanal mining from other minerals and countries. **An effective framework should have the right balance between regulating and supporting miners to collectively improve responsible mining practices, working conditions, environmental impact, and payment of taxes.** The Government will also have to facilitate the development of infrastructure and human resource to ensure a transparent traceability of the newly artisanally-mined lithium supply-chain. This is a potential area that can be supported by EU in order to increase ASM mined minerals accessing the EU market.

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Conclusions

Zimbabwe has the potential to produce several ECRM that includes Beryllium, Fluorspar, Lithium, Magnesium, Manganese, Niobium, PGMs, Antimony, Tantalum, Tungsten as well as other important metals like Copper, Nickel and Tin. Prospectivity and mineral high potential mapping was used in this study as a tool for CRMs assessment. Geological, geochemical, geophysical and remote sensing data was used to identify and rank areas that have a higher likelihood of hosting CRMs in Zimbabwe and the maps produced provide valuable information for land use planning, environmental management and mineral policy development.

Zimbabwe has some existing ore processing and refining capacities for CRMs, but they are not sufficient to meet the domestic and regional demand. However, the existing capacities can be leveraged on if someone wishes to venture into CRMs mining in Zimbabwe.

According to the Fraser Institute, Zimbabwe ranks low in terms of investment attractiveness and policy perception for the mining sector, indicating a need for improving the regulatory and fiscal environment. The World Governance Indicators also show that Zimbabwe performs poorly on measures of political stability, rule of law, corruption and government effectiveness. The Logistics Performance Index suggests that Zimbabwe has room for improvement in terms of infrastructure, customs, tracking and timeliness of trade. The Zimbabwe Economic Policy Analysis and Research Unit (ZEPARU) observes that the exploitation and beneficiation of CRMs in Zimbabwe face several challenges, such as data gaps, governance risks, environmental and social impacts, and limited value addition. Some of the data gaps identified by ZEPARU include the lack of reliable and updated geological information, the lack of transparency and accountability in the mining sector, and the lack of data sharing and coordination among different stakeholders. Some of the governance risks include the weak regulatory framework and enforcement capacity, environmental impacts of mining activities, and social conflicts. On the other hand, ZEPARU has identified several potential benefits of developing the critical minerals value chain, such as diversifying the economy, creating jobs, enhancing value addition, attracting foreign direct investment and increasing export earnings. ZEPARU also recommends that Zimbabwe should pursue strategic partnerships with regional and global actors, such as the Mineral Security Partnership, the European Union and China, to access markets, technology and finance for its critical minerals sector. Moreover, Zimbabwe should adopt responsible sourcing initiatives and high environmental and social standards to ensure that its critical minerals production is sustainable and inclusive of local communities

Though, the macroeconomic context for critical raw material financing in Zimbabwe is challenging it is definitely not hopeless. The country faces high inflation, low growth, fiscal deficits, debt distress, and currency instability, which undermine investor confidence and limit access to external financing. However, the government has taken some steps to reform its economic policies, such as adopting a new currency regime, implementing a staff-monitored program with the IMF, and engaging with creditors and donors. Moreover, the country has abundant natural resources, especially in the mining sector, which could attract foreign direct investment and generate export revenues. With the current efforts to address its

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macroeconomic imbalances, improve its business environment, and strengthen its governance and institutions, Zimbabwe can unlock its potential for critical raw material financing and development.

Zimbabwe is currently facing a number of social, environmental, and governance challenges that hinder its progress towards sustainable development. Some of the major challenges include deforestation, climate change, air and water pollution, land degradation, biodiversity loss, soil erosion, invasive species, overgrazing, habitat destruction, waste management, and pollution from mining. These challenges have negative impacts on the health, well-being, and livelihoods of the population, as well as on the natural resources and ecosystems that support them. Ongoing efforts to address these challenges, include strengthening of its institutional and legal frameworks, enhancement of capacity and coordination for environmental management, promoting participatory and inclusive approaches, fostering innovation and technology transfer, and leveraging partnerships with various stakeholders. Thus, there are ways Zimbabwe is endeavouring to overcome its social, environmental, and governance challenges and achieve its Vision 2030 and the 2030 Agenda for Sustainable Development.

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References

Bartholomew D S. (1996) Base Metal and Industrial Mineral Deposits of Zimbabwe. Geological Survey of Zimbabwe. Mineral Resources Series No. 22

Buchholz, P., Oberthur, T., Luders, V., Wilkinson, J. (2007) Multistage Au-As-Sb Mineralization and Crustal-Scale Fluid Evolution in the Kwekwe District, Midlands Greenstone Belt, Zimbabwe: A Combined Geochemical, Mineralogical, Stable Isotope, and Fluid Inclusion Study. Economic Geology, 102 (3). 347-378 doi:10.2113/gsecongeo.102.3.347.

Champion, D. (2019). Australian Resource Reviews: Tantalum. Geoscience Australia, Canberra. http://dx.doi.org/10.11636/9781925848298

Carbajal Glass, F. 2022. Preventing Environmental Crime and Human Vulnerability through the MGPOC Framework: The Case of Zimbabwe's Lithium Industry. Journal of Illicit Economies and Development, 4(1), pp. 34–43. DOI: https:// doi.org/10.31389/jied.141

Chigumira. G, N. Mupunga and E. Chipumho (2018), An Assessment of Arrears Clearance and Sustainable Debt Options for Zimbabwe. An assessment of arrears clearance web (1).pdf (zepari.co.zw)

Chimonyo, S., Makoni, T., & Muzerengi, C. (2020). Artisanal and small-scale mining governance in Zimbabwe: Analysis of the legal and policy framework. The Extractive Industries and Society, 7(4), 1468-1478.

DeVere Zimbabwe (2023). Foreign Currency deposits in Zimbabwe Soar. Available at: https://www.devere-zimbabwe.co.zw/news/Foreign-currency-deposits-in-Zimbabwe-soar

Du Toit A (1998) The Economic Geology of the Country around Kwekwe. Available at: https://books.google.com.na/books/about/The_Economic_Geology_of_the_Country_Arou.html?id=s2RRAQAAIAAJ&redir_esc=y

Economist Intelligence Unit (EIU, 2023), Things to Watch in Africa, Things to watch in Africa in 2023 accessed at https://country.eiu.com/article.aspx?articleid=1952522378&Country=Nigeria&topic=Economy&subtopic=Outlook&subsubtopic=Overview

Financial Gazette, US$4bln Target for Foreign Direct Investment is Achievable, Thursday, 6 July 2023,

Fraser Institute (2022). Annual Survey of Mining Companies, 2022. https://www.fraserinstitute.org/sites/default/files/annual-survey-of-mining-companies-2022.pdf

Government of Zimbabwe (2018), VISION 2030 "Towards a Prosperous & Empowered Upper Middle Income Society by 2030" Government of Zimbabwe Documents and Forms.

Government of Zimbabwe (2023) Zimbabwe Public Debt Report, https://parlzim.gov.zw/public-debt-report-zimtreasury-zpdmo/

Funded by
the European Union

Government of Zimbabwe (2023), 2024 National Budget Statement. The 2024 Budget Statement.pdf (veritaszim.net)

Government of Zimbabwe (2020), National Economic Development Strategy 1, "Towards a Prosperous & Empowered Upper Middle-Income Society by 2030", National Development Strategy Document Final web (un.org).

Government of Zimbabwe (2007), Indigenization and Economic Empowerment Act [Chapter 14:33] of 2007.

Gunn G & Benham A. (2009) Platinum. British Geological Survey. Natura Environment Research Council.

The Indigenization and Economic Empowerment Act [Chapter 14:33] of 2007 accessed at CHAPTER 14:33 (jsc.org.zw) on 12december 2023

International Energy Agency (2022), The Role of Critical Minerals in Clean Energy Transition: World Outlook Special Report, The Role of Critical Minerals in Clean Energy Transitions (windows.net)

International Institute for Sustainable Development (IISD, 2018), Six Key Factors in Formalizing the Artisanal and Small-Scale Mining, Six Key Factors in Formalizing Artisanal and Small-Scale Mining | International Institute for Sustainable Development (iisd.org)

International Tungsten Industry Association. (2005). Tungsten Uses http://www.itia.info. Default.asp?page=25

Jelsma H.A., Nesbitt R.W., Fanning C.M. (2021). Exploring our current understanding of the geological evolution and mineral endowment of the Zimbabwe Craton. South African Journal of Geology. Volume 124.1. Page 279-310.

Johan, Z., Ohnenstetter, D., and Naldrett, A.J., 1989, Platinum-group minerals and associated oxides and base metal sulfides of the Main sulphide zone, Great Dyke, Zimbabwe: Bulletin of the Geological Society of Finland, v. 61, p. 53–54.

Kaufmann D., Kraay A., Mastruzzi M., 2010. The Worldwide Governance Indicators: Methodology and Analytical Issues. World Bank Policy Research Working Paper 5430.

Kaufmann D and Kraay A. (2023). Worldwide Governance Indicators, 2023 Update (www.govindicators.org), Accessed on 10/19/2023.

LaRocca G.M. (2020) Global Value Chains: Lithium in Lithium-ion Batteries for Electric Vehicles. Available at: https://www.usitc.gov/publications/332/working_papers/no_id_069_gvc_lithium-ion_batteries_electric_vehicles_final_compliant.pdf

Leuenberger, A. (2021). Investigating health impacts and equity in communities surrounding large natural resource extraction projects in sub-Saharan Africa: a contribution to sustainable development (Doctoral dissertation, University_of_Basel_Associated_Institution).

LPI 2023 a) https://lpi.worldbank.org/international/global

Funded by
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LPI 2023 b) 2023/C/ZAF/2023/C/ZMB/2023/C/MWI/2023/C/BWA/2023

LPI 2023 c) https://data.worldbank.org/indicator/LP.LPI.OVRL.XQ?locations=ZW

Mabhiza L. (2006) An overview of PGM Smelting in Zimbabwe –Zimplats Operations, Zimplats, Selous, Zimbabwe. Southern African Pyrometallurgy 2006, Edited by R.T. Jones, South African Institute of Mining and Metallurgy, Johannesburg, 5-8 March 2006

Markwitz, V., Maier, W. D., Gonzalez-Alvarez, I., McCuaig, T. C., & Porwal, A. (2010). Magmatic nickel sulfide mineralization in Zimbabwe: Review of deposits and development of exploration criteria for prospectivity analysis. Ore Geology Reviews, 38(3), 139-155.

Mamina M T. (2019) Nickel: Demand trends and Opportunities for Zimbabwean Miners accessed at (3) Nickel: Demand trends and Opportunities for Zimbabwean Miners | LinkedIn

Maponga, O., & Meck, M. (2003). Illegal artisanal gold panning in Zimbabwe: A study of challenges to sustainability along Mazowe River. The socio-economic impact of small scale mining in developing countries. The Netherlands: AA Balkema.

Masimirembwa, M. T., & Harawa, M. S. (2019). Petrology and geochemistry of pegmatites and associated rocks from the Domboshawa area, Zimbabwe. Journal of African Earth Sciences, 150, 1-151

Master, S., Bekker, A., & Hofmann, A. (2010) A review of the stratigraphy and geological setting of the Palae-oproterozoic Magondi Supergroup, Zimbabwe – Type locality for the Lomagundi carbon isotope excursion. Precambrian Research 182, 254–273

Metals of Africa Limited (2012) Joint Venture Agreement-Changara Project. Available at: https://announcements.asx.com.au/asxpdf/20121128/pdf/42bjkcnl3nmdzx.pdf

Michaels, K.C., Maréchal, L. and Katz, B., 2022. Why is ESG so important to critical mineral supplies, and what can we do about it?

Mimosa (2023) Mineral Resources and Mineral Resources. Available at: https://www.mimosa.co.zw/operations/mineral-resources-and-mineral-reserves

Mines and Minerals Act 1961 available at CHAPTER 21:05 (jsc.org.zw)

Mining Technology (2014) RHA Tungsten Project. Available at:https://www.mining-technology.com/projects/rha-tungsten-project/#:~:text=of%20Bulawayo%2C%20Zimbabwe.-,The%20RHA%20tungsten%20project%2C%20developed%20by%20Premier%20Africa%20Minerals%2C%20is,CaWO4)%20are%20also%20present.

Mining Zimbabwe, A Closer Look at Mining Investment Opportunities Available in Zimbabwe, April 19, 2023, Issue 65, A closer look at mining investment opportunities available in Zimbabwe - Mining Zimbabwe.

Mudimbu, D., Meck, M.L.2018 Spatial Relationships between Contaminated Mining areas and Pathological States around Kadoma, Zimbabwe. In De Souza, K and Mogessie, "Geology and Mineral Information System (GMIS) Strategy to Domesticate the Africa Mining Vision at a Country Level"

Funded by
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African Minerals Development Centre – AMDC United Nations Economic Commission for Africa – UNECA, Addis Ababa, Ethiopia,

Oberthür T, Melcher F, Buchholz P, and M. Locmelis M. (2002) The oxidized ores of the Main Sulphide Zone, Great Dyke, Zimbabwe: Turning resources into mineral reserves- Mineralogy is the key

Prendergast, M. 2016. Nickel laterite deposits of the northern part of the Great Dyke. Macgregor Memorial Lecture, 68pp. http://www.geologicalsociety.org.zw/sites/default/files/news-attachments/Macgregor%20Memorial%20Lecture%202016%2020%20Prendergast%20on%20Great%20Dyke%20Ni%20Laterites-web.pdf.

RBZ (2022) Increased Gold Delivery to Fidelity Refinery (Private) Limited in 2021: *Press Statement. Available at:* https://www.rbz.co.zw/documents/press/2022/January/FGR-Appreciation-for-Gold-Deliveries.pdf

Rouget. V (2023), Political Risks in Africa's Top Mining Markets, Control Risks, Political risk issues to watch in Africa's top 8 mining markets (controlrisks.com);

Singo, J., Moyo, D., Isunju, J. B., Bose-O'Reilly, S., Steckling-Muschack, N., Becker, J., & Mamuse, A. (2022). Health and safety risk mitigation among artisanal and small-scale gold miners in Zimbabwe. International journal of environmental research and public health, 19(21), 14352.

Spiegel, S. J., & Mwita, A. (2018). Shifting formalization policies and recentralizing power: The case of Zimbabwe's artisanal gold mining sector. Society & Natural Resources, 31(5), 556-571.

SRK Consulting (2007) An Independent Technical Report on Bindura Nickel Corporation, Freda Rebecca Mine and Semkhat (Anmerosa Exploration Congo SPRL), The material assets of Mwana Africa PLC.

Tae-Yoon Kim (2022), Critical minerals threaten a decades-long trend of cost declines for clean energy technologies, Critical minerals threaten a decades-long trend of cost declines for clean energy technologies – Analysis - IEA.

The Herald, President Commissions another Signature Project, Thursday, 6 July 2023, President commissions another signature project | The Sunday News.

The Royal Mint (2023), Is Platinum a Good Investment? Is Platinum a Good Investment? | The Royal Mint.

UNCCD (2023) https://www.unccd.int/resources/knowledge-sharing-system/soil-and-terrain-digital-database-soter

Vella, A. 2023. Highlighting mineralized geological environments through a new Data-driven predictive mapping approach. PhD thesis University Orléans, France https://www2.gnb.ca/content/dam/gnb/Departments/en/pdf/Minerals-Minerales/MCP_7-e.pdf

Vines. A. (2023), Africa in 2023: Continuing political and economic volatility, Chatham House, Africa in 2023: Continuing political and economic volatility | Chatham House – International Affairs Think Tank.

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Wilson A H and Prendergast M. (2001) Platinum-Group Element Mineralisation in the Great Dyke, Zimbabwe, and its Relationship to Magma Evolution and Magma Chamber Structure. South African Journal of Geology (2001) 104 (4): 319–342. https://doi.org/10.2113/gssajg.104.4.319

Wilson, A.H. & Tredoux, M. (1990). Lateral and vertical distribution of the platinum-group elements and petrographic controls on the sulfide mineralization in the Pl pyroxenite layer of the Darwendale subchamber of the Great Dyke, Zimbabwe. Econ. Geol., 85,

WPIC_Platinum_Essentials_December_2022 (Updated Supply Demand outlook from 2024-2026 as well as initial estimates for 2027) (platinuminvestment.com) Wood, A, Dan, & Hedenquist, J. (2019).

World Bank (2020), Minerals for Climate Action: The Mineral Intensity of Clean Energy Transition, Minerals for Climate Action - The Intensity of the Clean Energy Transition (mineral-choices.com)

World Platinum Investment Council (2022), 60 Seconds in Platinum: Critical Mineral, Critical mineral (royalmint.com)

World Platinum Investment Council (2022), Platinum Essentials Updating WPIC's two- to five-year supply/demand outlook: Sustained platinum deficits, WPIC_Platinum_Essentials_December_2022 (Updated Supply Demand outlook from 2024-2026 as well as initial estimates for 2027) (platinuminvestment.com)

World Platinum Investment Council (2023), Platinum recycling and the circular economy, Platinum recycling and the circular economy - CME Group

ZEPARU. (2020). Improving Service Delivery by Local Authorities in Zimbabwe: Challenges and Opportunities. Harare: ZEPARU. Retrieved from https://www.zeparu.co.zw/sites/default/files/publications/2020-12/Improving%20Service%20Delivery%20by%20Local%20Authorities%20in%20Zimbabwe.pdf

Zimbabwe Economic Policy Analysis and Research UNIT https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://zepari.co.zw/sites/default/files/2018-03/Policy%2520Brief%2520in%2520depth%2520training%2520needs%2520assessment%2520survey%2520policy%2520brief%2520new.pdf&ved=2ahUKEwi46ZnKiIeEAxXJXUEAHbMuAy8QFnoECBEQAQ&usg=AOvVaw0PZzER8wMpRsVmvTGXa9rA

Zimplats (2022). Creating a Better Future. 2022 Integrated Annual Report.

Zimplats (2021) Creating a Better Future. 2021 Integrated Annual Report

Zimunya, T., & Dube, E. (2019). Artisanal and small-scale mining as a challenge and possible contributor to sustainable development in Zimbabwe: A case study of Shurugwi district. Journal of Sustainable Development in Africa, 21(2), 1-15.

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APPENDICES

Funded by
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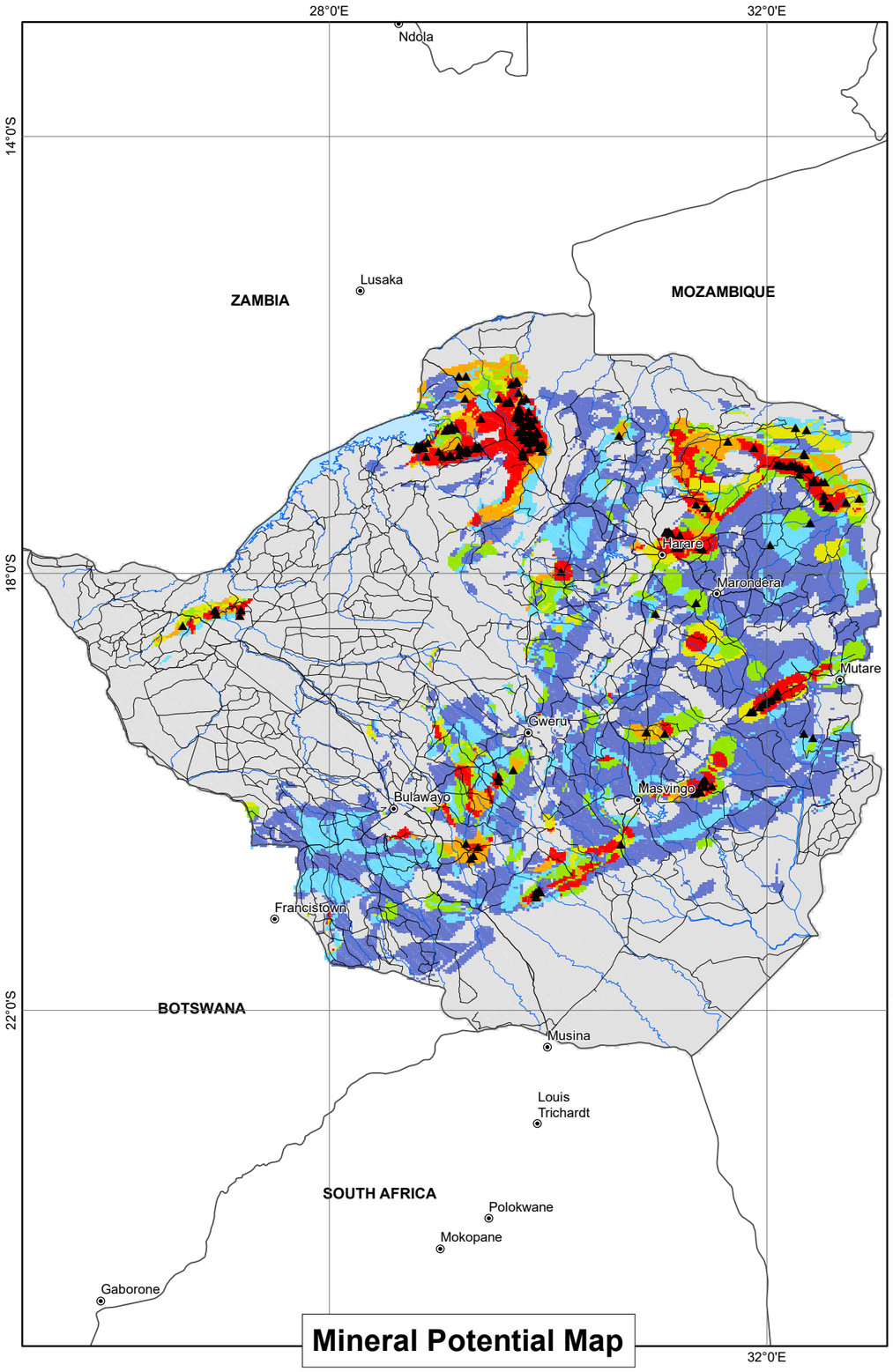
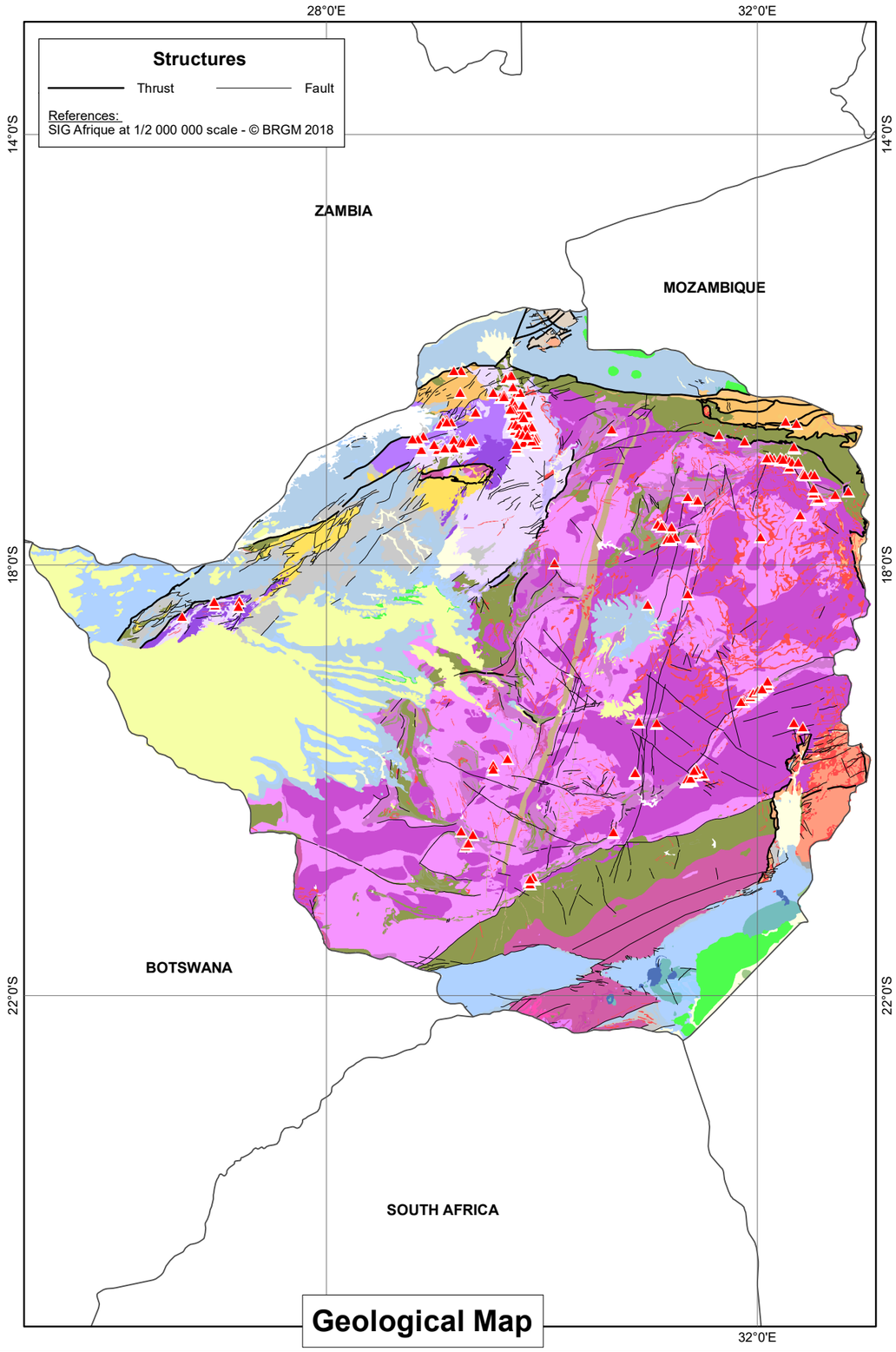
Country: ZIMBABWE

MINERAL POTENTIAL MAP - *BERYLLIUM (Be)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

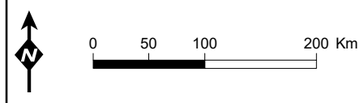
Known occurrences

Beryllium (Be)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 72099 92.17% Non-occurrence in database Non-occurrence predicted	False positive Cells: 5735 7.33% Non-occurrence in database Occurrence predicted
False negative Cells: 18 0.02% Occurrence in database Non-occurrence predicted	True positive Cells: 374 0.48% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.50
Cell size: 2250 m



Datum : WGS84 (World Geodetic System 1984)

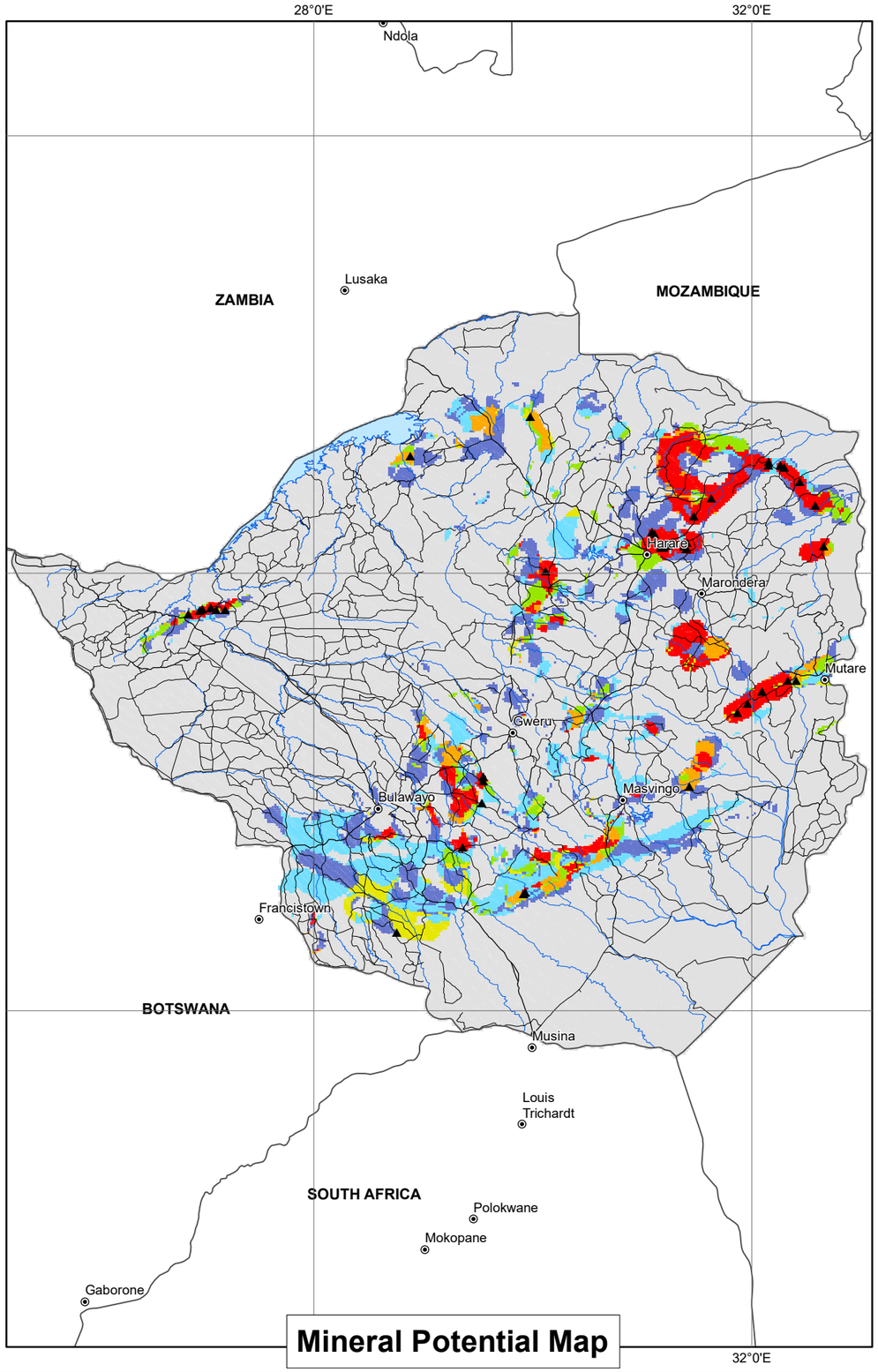
January 2024

brgm Géosciences pour une Terre durable

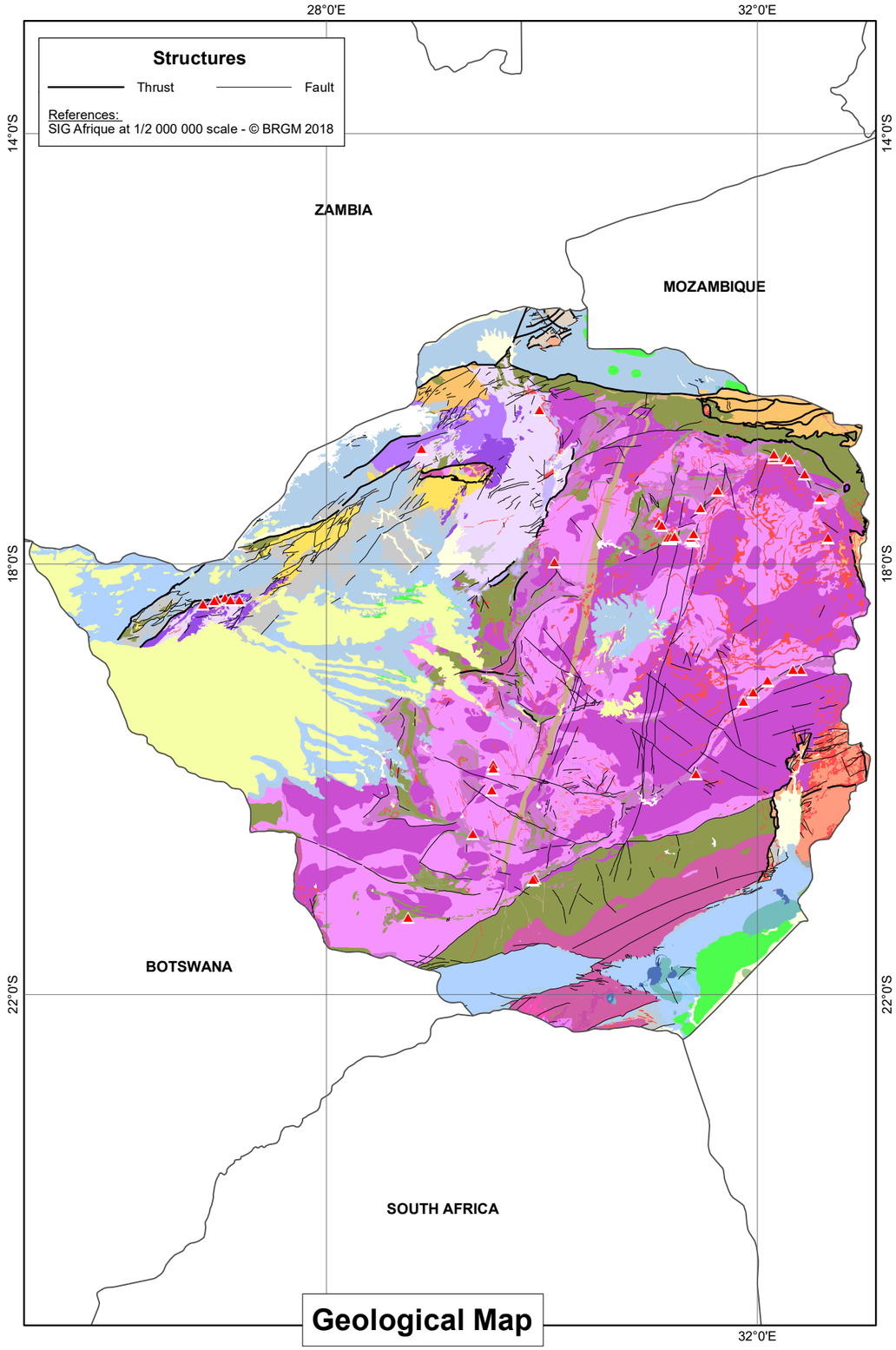
Country: ZIMBABWE

MINERAL POTENTIAL MAP - *LITHIUM (Li)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

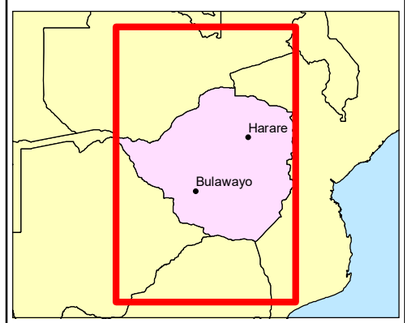
Known occurrences

Lithium (Li)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 74000 94.60% Non-occurrence in database Non-occurrence predicted	False positive Cells: 4135 5.29% Non-occurrence in database Occurrence predicted
False negative Cells: 2 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 89 0.11% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.52
Cell size: 2250 m



N

0 50 100 200 Km

Datum : WGS84 (World Geodetic System 1984)

January 2024

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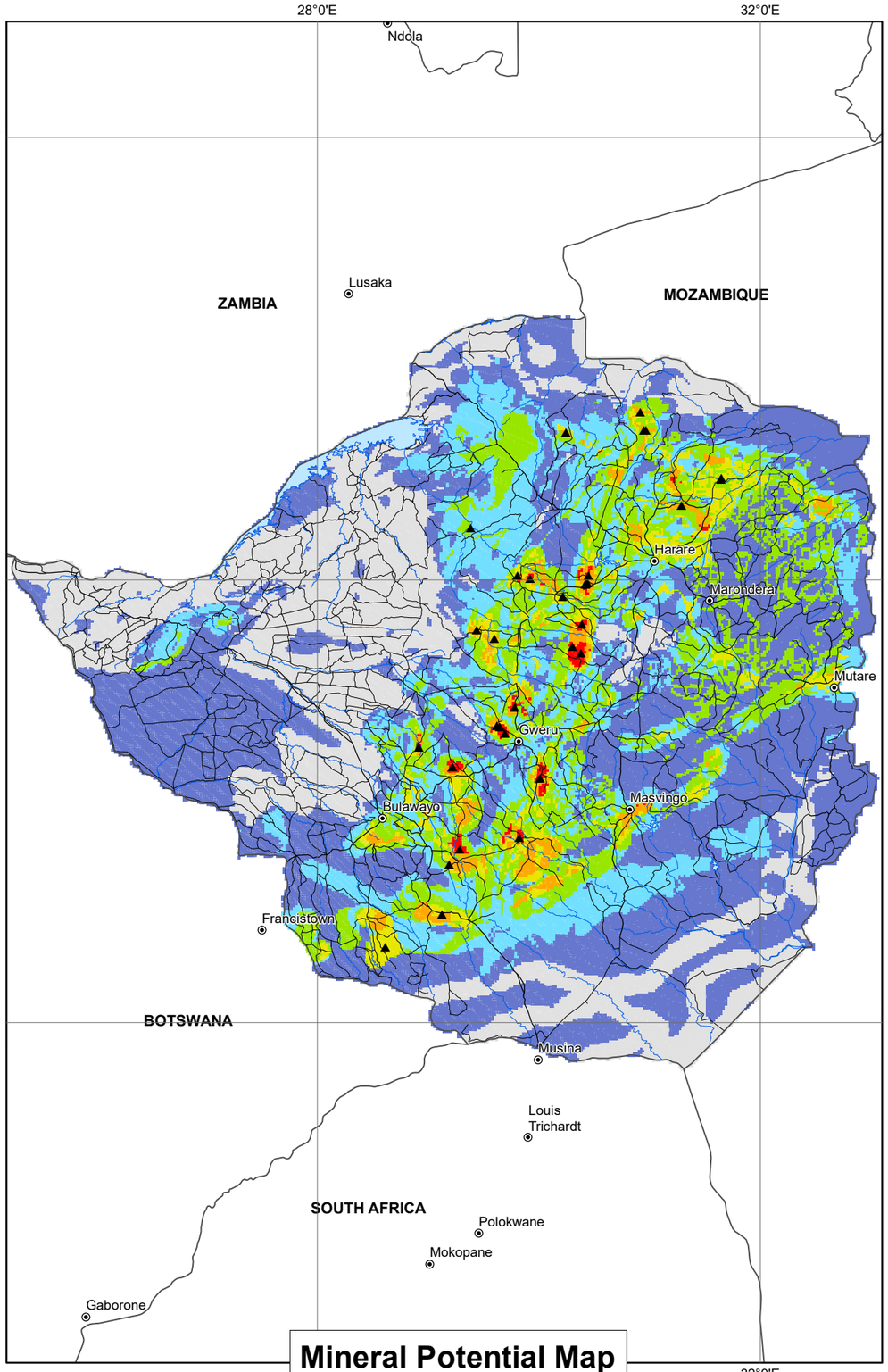
brgm

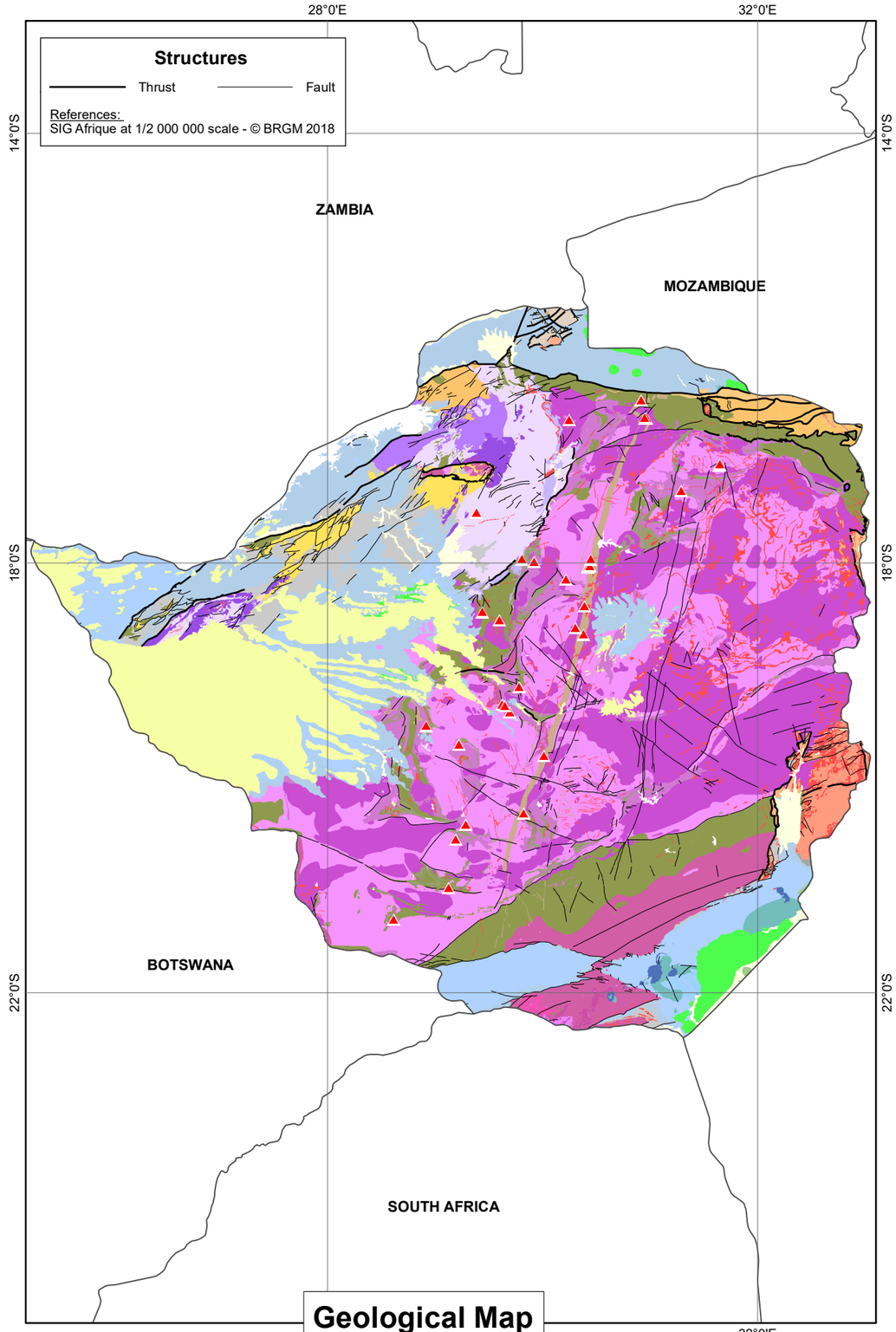
Country: ZIMBABWE

MINERAL POTENTIAL MAP - *NICKEL (Ni)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

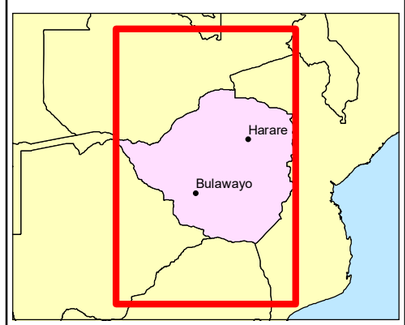
Known occurrences

▲ Nickel (Ni)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 74763 95.57% Non-occurrence in database Non-occurrence predicted	False positive Cells: 3384 4.33% Non-occurrence in database Occurrence predicted
False negative Cells: 5 0.01% Occurrence in database Non-occurrence predicted	True positive Cells: 74 0.09% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.50
Cell size: 2250 m



N

0 50 100 200 Km

Datum : WGS84 (World Geodetic System 1984)

January 2024

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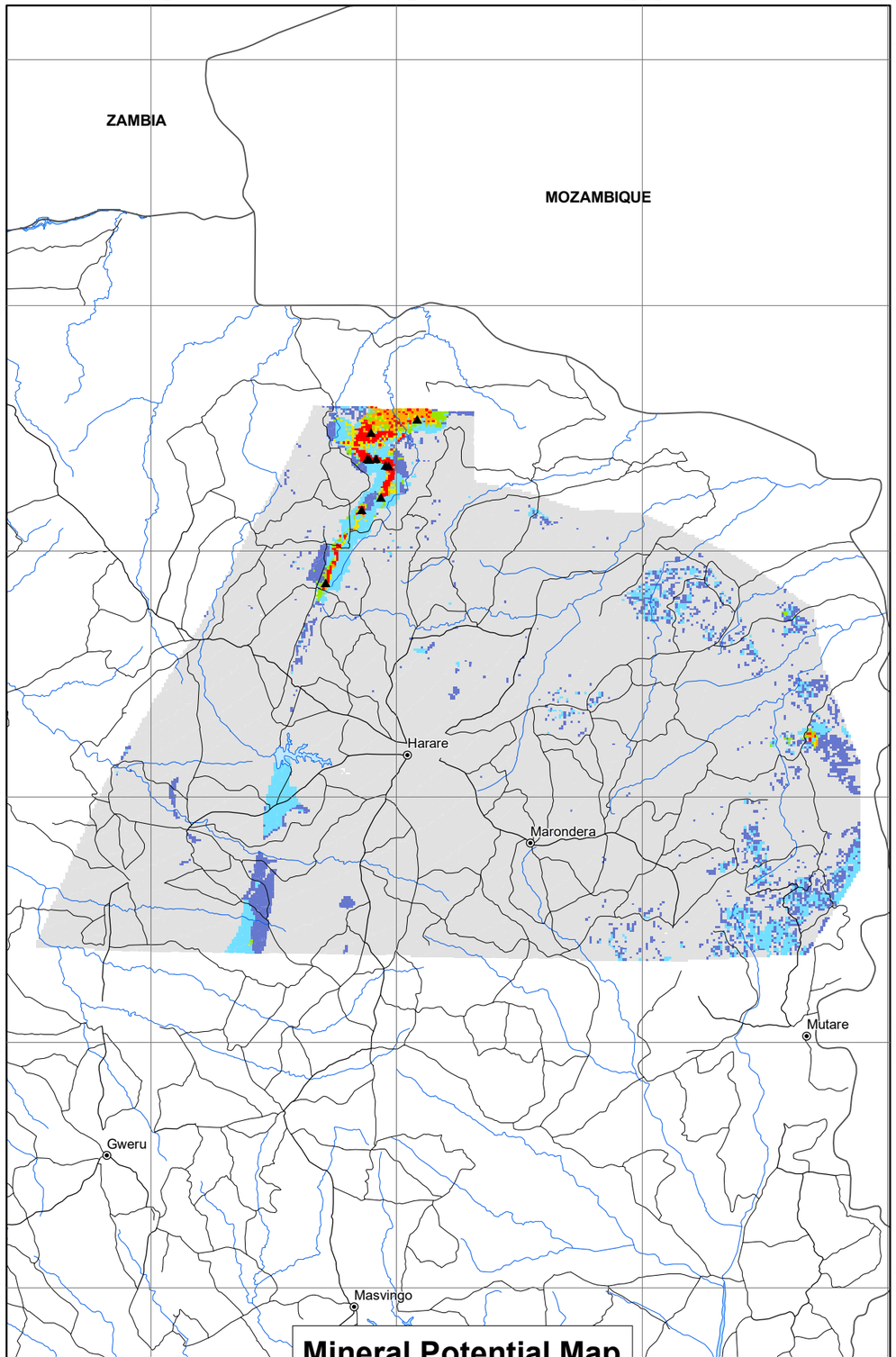
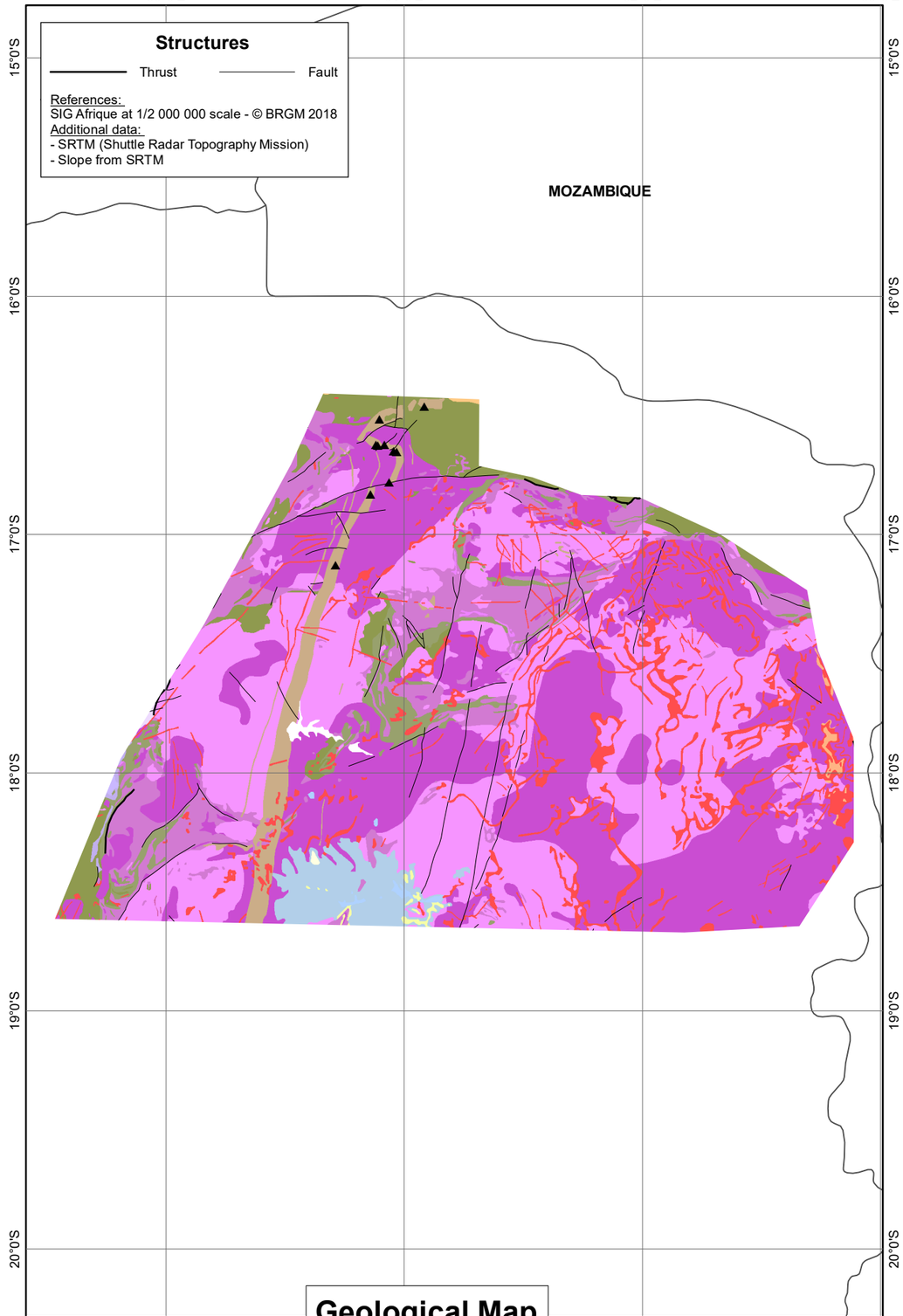
Country: ZIMBABWE (North East)

MINERAL POTENTIAL MAP - *LATERITIC NICKEL (Ni)*

Africa MaVal



Mineral Potential Map



Geological Map

Structures

Thrust — Fault

References:
SIG Afrique at 1/2 000 000 scale - © BRGM 2018
Additional data:
- SRTM (Shuttle Radar Topography Mission)
- Slope from SRTM

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

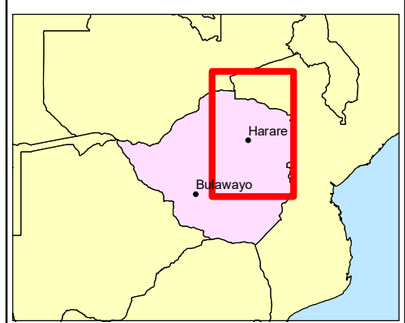
Known occurrences

▲ ▲ Lateritic nickel (Ni)
McGregor - 2016

Confusion matrix

True negative Cells: 62240 99.41% Non-occurrence in database Non-occurrence predicted	False positive Cells: 344 0.55% Non-occurrence in database Occurrence predicted
False negative Cells: 0 0.00% Occurrence in database Non-occurrence predicted	True positive Cells: 28 0.04% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.68
Cell size: 1000 m



N

0 25 50 100 Km

Datum : WGS84 (World Geodetic System 1984)

January 2024

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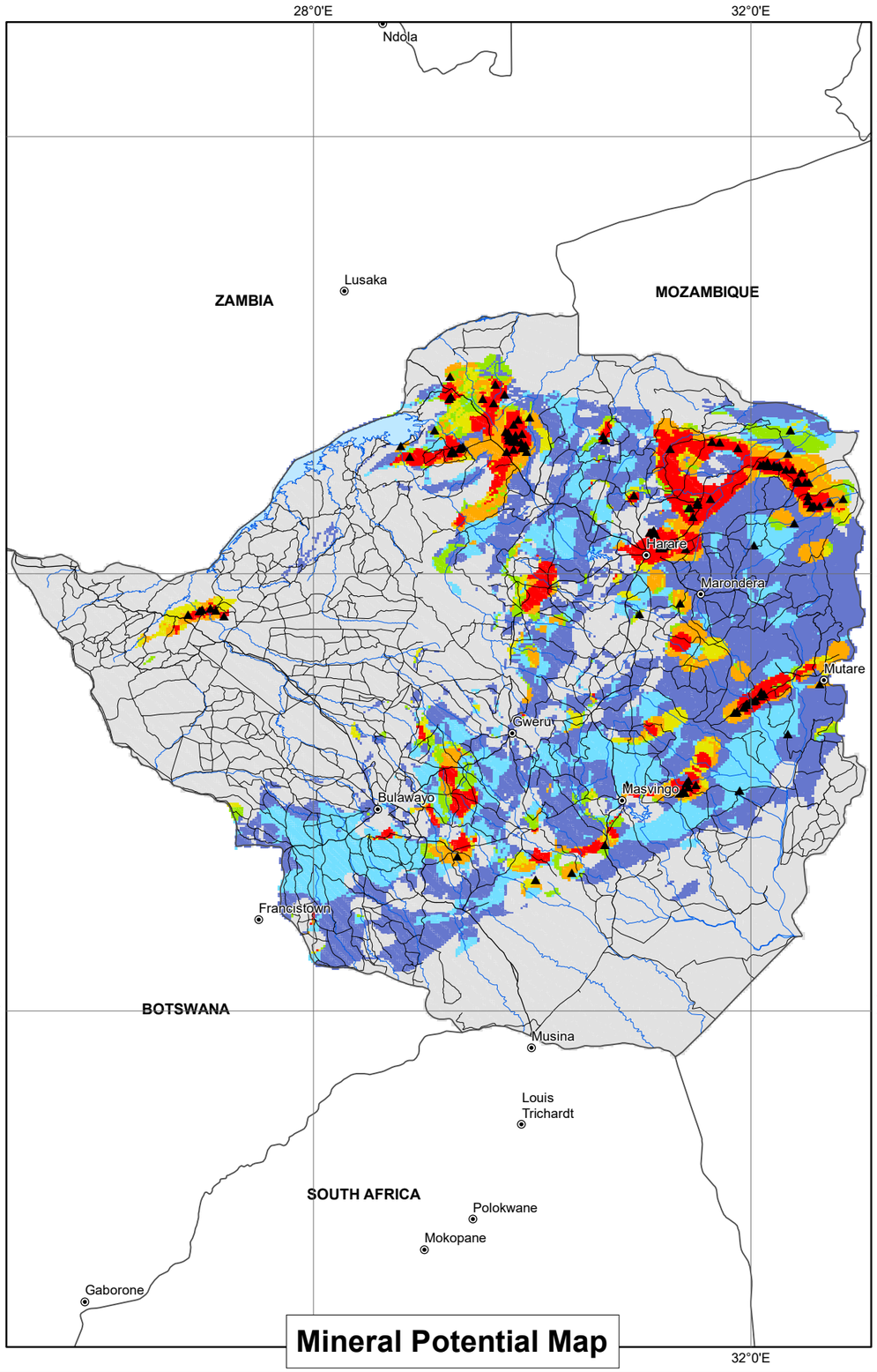
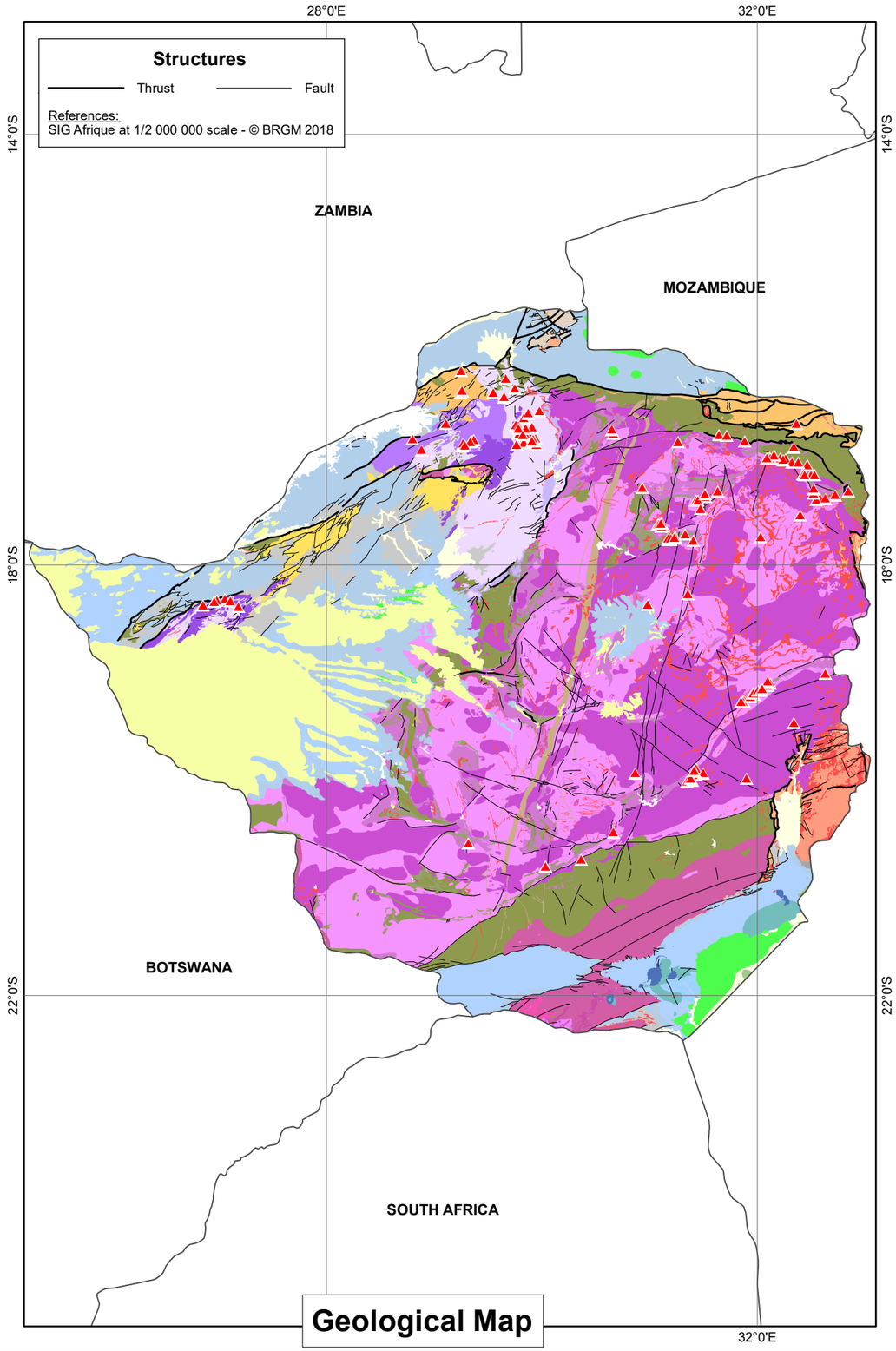
brgm

Country: ZIMBABWE

MINERAL POTENTIAL MAP - *TANTALUM (Ta)*

Africa MaVal





Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

Known occurrences

Tantalum (Ta)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 70780 90.48% Non-occurrence in database Non-occurrence predicted	False positive Cells: 7171 9.17% Non-occurrence in database Occurrence predicted
False negative Cells: 16 0.02% Occurrence in database Non-occurrence predicted	True positive Cells: 259 0.33% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.52
Cell size: 2250 m

N

0 50 100 200 Km

Datum : WGS84 (World Geodetic System 1984)

January 2024

Géosciences pour une Terre durable
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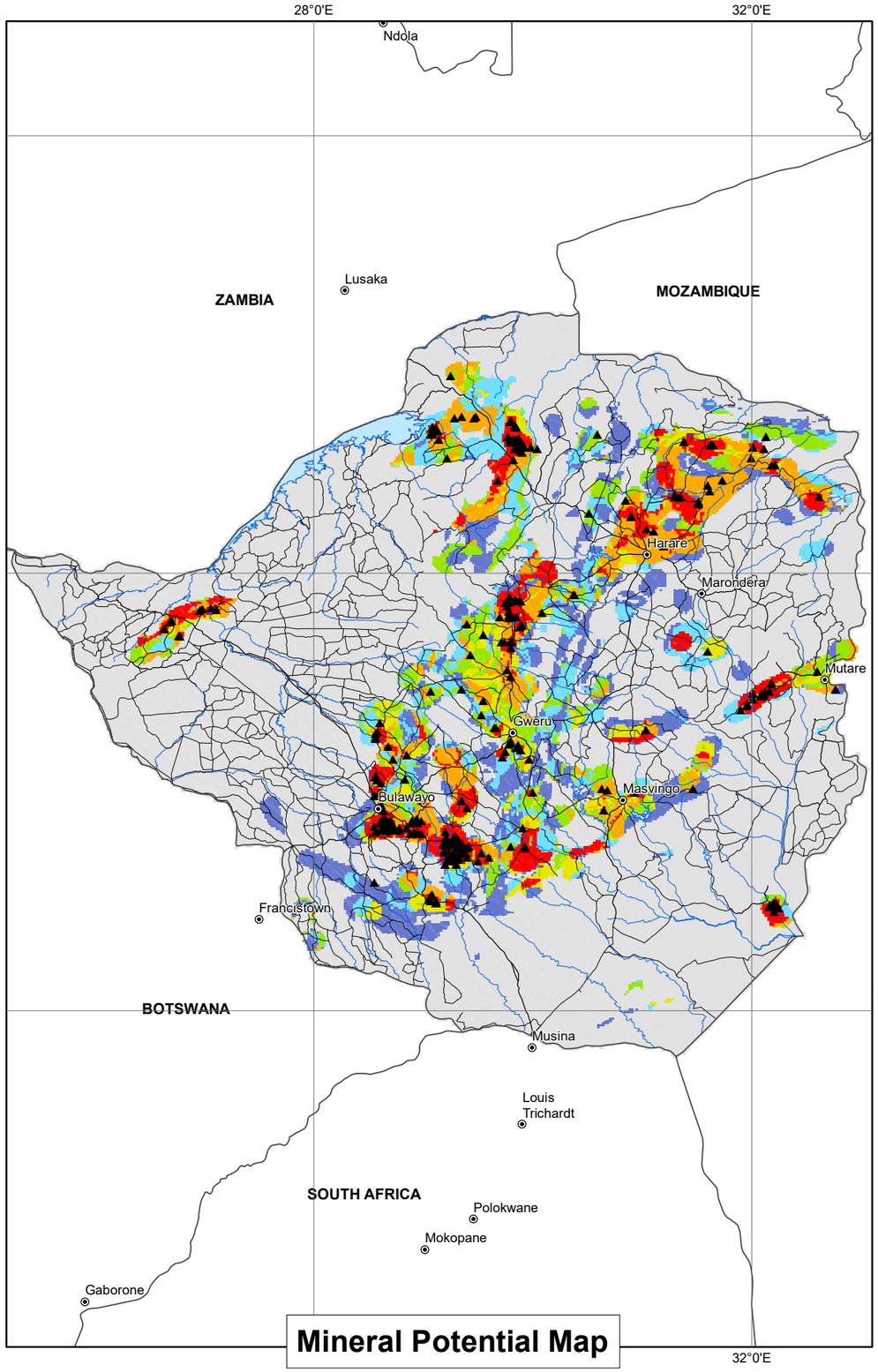
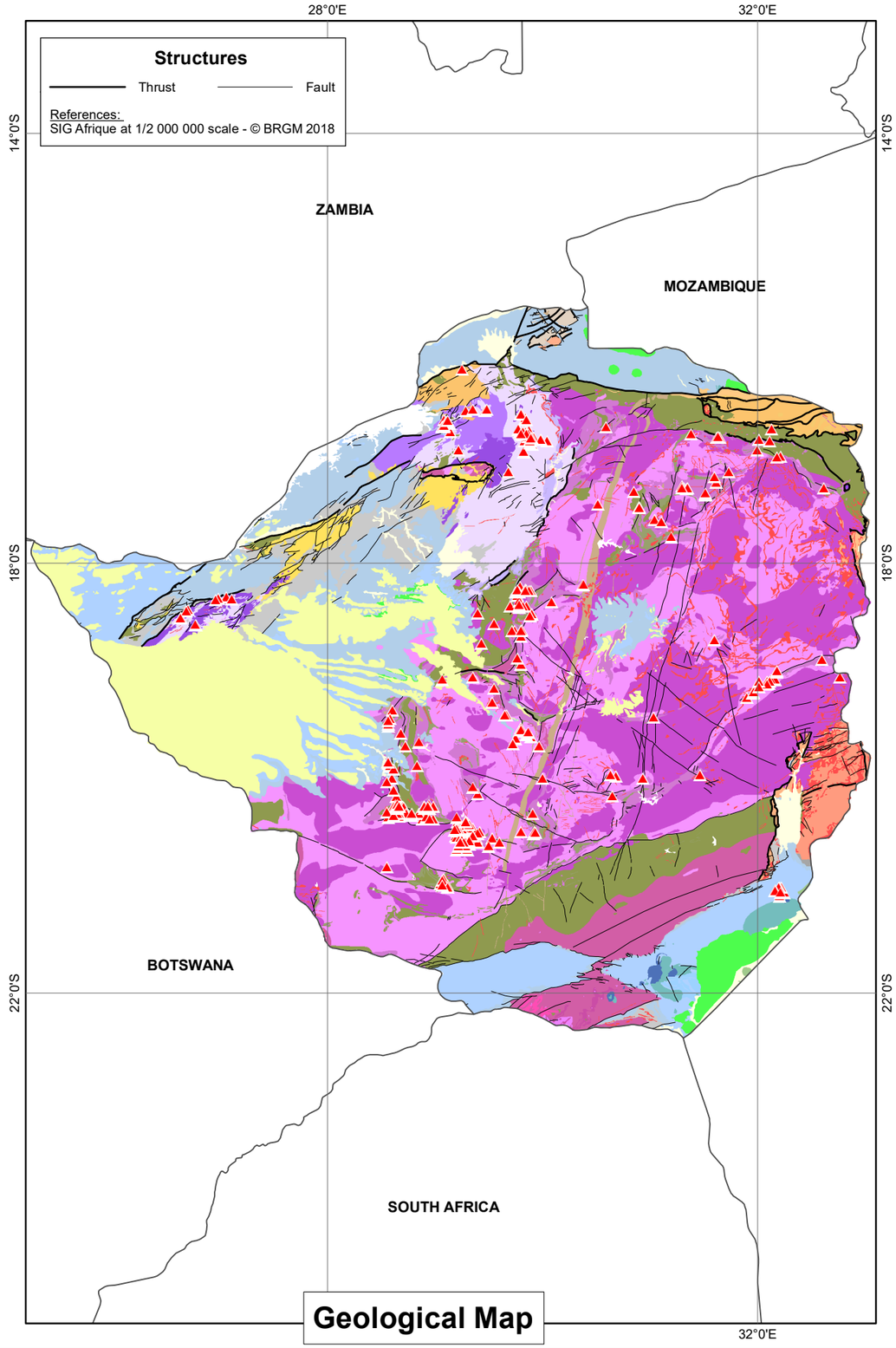
Country: ZIMBABWE

MINERAL POTENTIAL MAP - *TUNGSTEN (W)*

Africa MaVal



Mineral Potential Map



Geological Map

Legend

Score

- < 0.05
- 0.05 - 0.125
- 0.125 - 0.25
- 0.25 - 0.45
- 0.45 - 0.60
- 0.60 - 0.80
- 0.80 - 1

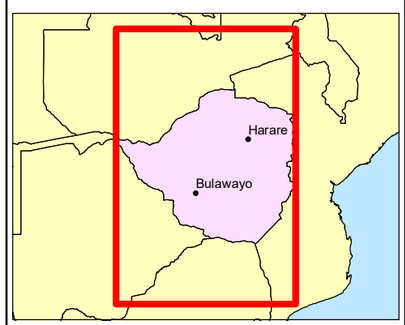
Known occurrences

▲ Tungsten (W)
SIG Afrique - © BRGM 2018

Confusion matrix

True negative Cells: 69479 88.81% Non-occurrence in database Non-occurrence predicted	False positive Cells: 8187 10.47% Non-occurrence in database Occurrence predicted
False negative Cells: 14 0.02% Occurrence in database Non-occurrence predicted	True positive Cells: 546 0.70% Occurrence in database Occurrence predicted

Best threshold (G-Means): 0.50
Cell size: 2250 m



N

0 50 100 200 Km

Datum : WGS84 (World Geodetic System 1984)

January 2024

Géosciences pour une Terre durable
brgm