



Mapping Africa's Critical Energy Transition Minerals: Corridors, and Processing Plants

ABSTRACT

This policy brief explores the Southern African Development Community (SADC) region's potential to support the global transition to a low-carbon economy through its vast endowment of Critical Energy Transition Minerals (CETMs; hereinafter critical minerals), including chromium, cobalt, copper, graphite, lithium, manganese, platinum group metals (PGMs), and rare earth elements (REEs). These minerals are critical for renewable energy technologies, electric vehicles (EVs), and battery storage. Despite the region's rich mineral resources, challenges such as uneven exploration, regulatory barriers, and infrastructure limitations hinder the development of operational mines. Key logistics infrastructure (like ports and rail corridors) facilitates mineral exports, but inefficiencies impact competitiveness. The policy recommendations call for the creation of an open-access mineral data repository, increased funding for geological surveys focused on lithium, REEs, and nickel, and enhanced exploration funding through public-private partnerships, aligned with global resource classification standards.

1. INTRODUCTION

The SADC region is poised to play an important role in the global green transition due to its endowment of Critical minerals (CETMs) essential for clean energy technologies. However, the full potential of the region's critical minerals remains underdeveloped, with significant gaps in exploration, processing and infrastructure that hinder economic value addition and local beneficiation. This policy brief provides a comprehensive overview of critical minerals deposits in the SADC region, their exploration status, and existing processing facilities. It also highlights key mineral hotspots and examines infrastructure networks, including ports and railway corridors. By identifying gaps in exploration and beneficiation, this brief aims to inform policymakers, investors, and industry stakeholders about opportunities for

developing integrated value chains within the SADC region

2. KEY TERMS

Mineral Occurrence: Naturally occurring concentration of a mineral or group of minerals, which may or may not be of economic value. This represents the initial stage in the exploration process.

Mineral Deposit: A concentration of one or more minerals that is sufficient to potentially be economically extractable. Mineral deposits may be identified through geological exploration studies.

Mineral Resource: A concentration of minerals that has been identified and estimated through exploration and drilling and is considered to have potential for economic extraction. Resources are classified into different categories based on confidence levels in geological information (inferred, indicated, or measured).

Mineral Reserve: A subset of the mineral resource that is economically feasible to extract, based on detailed evaluation including feasibility studies, technical studies, and market conditions. Mineral reserves are classified into proven and probable categories, reflecting confidence in the extraction process and financial viability.

Critical Energy Transition Minerals: Minerals that are essential for the low-carbon transition, enabling renewable energy, energy storage, and decarbonisation technologies. Facilities: In the context of this policy brief, facilities include mines, processing plants, smelters and refineries.

3. CRITICAL ENERGY TRANSITION MINERALS HOTSPOTS

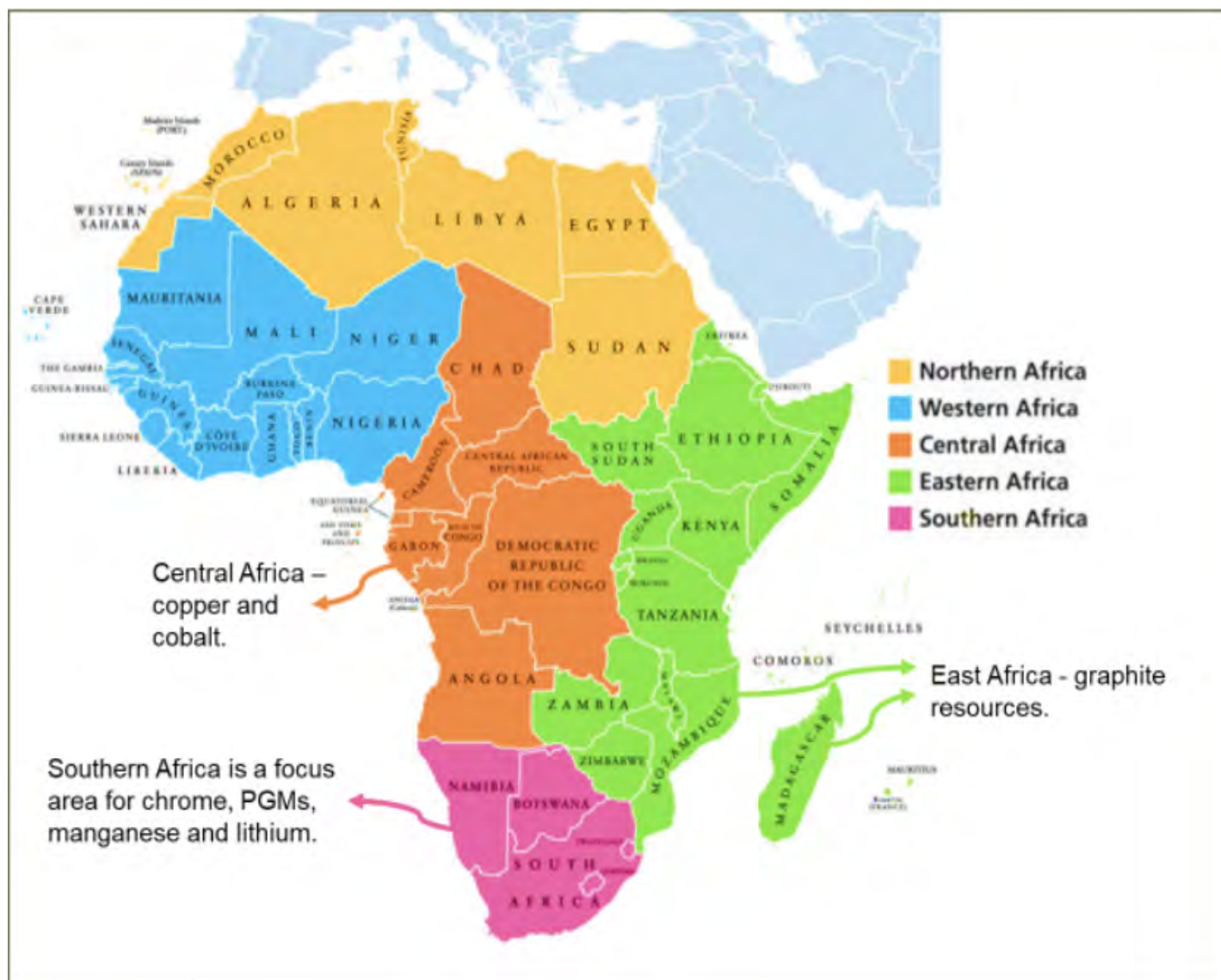


Figure 1: Map reflecting the key areas of Critical Energy Transition Minerals (CETMs) occurrences.

Southern Africa is a focus area for chrome, PGMs, manganese, lithium, copper and cobalt resources. More recently, East Africa has emerged as a major source of graphite resources (refer to Figure 1).

4. MINERAL EXPLORATION AND FACILITIES

The data presented as follows provides a reasonable representation of identified critical minerals deposits, exploration, extraction and facilities. It does not include artisanal and small-scale mining (ASM) as it is difficult to quantify operational magnitudes.

Refer to the [Atlas \(weblink\)](#) to visualise the interactive geographical distribution of information presented below. In addition,

Figure 2 provides a summary of the distribution of deposits and associated facilities in the SADC region.

Chromium

Known chrome resources are concentrated in and around existing operations in South Africa and Zimbabwe. These operations conduct minimal exploration and expansion. (Table 1) illustrates that there are limited new exploration projects for chrome resources although chrome deposits have been identified and mines and processing plants already exist.

Table 1: Chrome deposits, exploration activity and mines or facilities in African countries.

Country	Mineral Deposits	Exploration Activity	Mines / Facilities
Botswana			5
DRC			
Madagascar	5		2
Malawi		1	
South Africa	28	7	29
Zimbabwe	39		8
Total	72	8	90

Cobalt

The ratio of identified cobalt deposits, to exploration activity and existing mines and facilities reflects the agility of the cobalt market. Despite the mineral being mined for several decades, there is still aggressive investment in exploring for new opportunities within this market (Table 2). The Democratic Republic of Congo (DRC), followed by Zambia are prominent localities for cobalt exploration and mining.

Table 2: Cobalt deposits, exploration activity and mines or facilities in African countries.

Country	Mineral Deposits	Exploration Activity	Mines / Facilities
Botswana		1	3
DRC	27	21	20
Madagascar	2	2	2
Namibia		2	
South Africa	1		8
Tanzania	2	4	
Zambia	10	12	17
Zimbabwe		2	10
Total	42	44	60

Copper

Copper is a key economic indicator due its widespread use in various industries. This consistent demand for copper has led to several countries exploring for copper

resources. The DRC and Zambia, however, are central to copper resources in the SADC. Both countries have translated a significant portion of their copper deposits into extractable material or mines (Table 3).

Table 3: Copper deposits, exploration activity and mines or facilities in African countries.

Country	Mineral Deposits	Exploration Activity	Mines / Facilities
Angola	2	3	
Botswana	2	2	
DRC	13	11	46
Madagascar		3	
Mozambique	1	5	
Namibia	11	15	8
South Africa	7	7	15
Tanzania	1	2	3
Zambia	18	15	40
Zimbabwe	5	2	9
Total	60	65	75

Graphite

Exploration and development of graphite resources are concentrated in selected countries on the African continent (Table 4). Madagascar has been a key player in developing its graphite deposits into mines. Tanzania has however been emerging in graphite exploration with several graphite projects showing potential for economic extraction. Other countries (such as Mozambique, Namibia and Zimbabwe) have also shown initiative in developing graphite resources.

“Copper is a key economic indicator due its widespread use in various industries.”

Table 4: Graphite deposits, exploration activity and mines or facilities in African countries.

Country	Mineral Deposits	Exploration Activity	Mines / Facilities
Madagascar	14	9	4
Malawi		2	
Mozambique		5	2
Namibia		1	1
South Africa	2		
Tanzania		14	
Zimbabwe	2	2	1
Total	18	33	8

Lithium

Namibia and Zimbabwe are key countries in the development of lithium mineral resources in the region (Table 5). Whilst Zimbabwe is historically well-known for its lithium reserves, Namibia is an emerging producer, through expansion and utilisation of its existing mining infrastructure.

Table 5: Lithium deposits, exploration activity and mines or facilities in African countries.

Country	Mineral Deposits	Exploration Activity	Mines / Facilities
DRC	2	4	
Madagascar	1	1	
Mozambique	4		
Namibia	3	3	2
South Africa	1	1	
Tanzania		1	
Zimbabwe	2	4	1
Total	13	14	3

Manganese

South Africa is host to world-renowned manganese resources, which have translated into mining and downstream activities. In addition, Zambia is a notable player in the development of manganese deposits, with Botswana positioned in the exploration of

potential manganese deposits.

Table 6: Manganese deposits, exploration activity and mines or facilities in African countries.

Country	Mineral Deposits	Exploration Activity	Mines / Facilities
Botswana	3	2	
DRC	1	1	
Namibia	1		1
South Africa	20	3	9
Zambia	1		3
Total	26	6	13

Platinum group metals

PGM mining in South Africa and Zimbabwe has a long history, with South Africa also positioned as the world's leading supplier of platinum. Whilst there is a significant number of identified PGM deposits in South Africa, exploration activity is not aggressive. There are several existing mines and facilities associated with PGMs, both active and inactive.

Table 7: PGM's deposits, exploration activity and mines or facilities in African countries.

Country	Mineral Deposits	Exploration Activity	Mines / Facilities
Botswana	2	1	4
Madagascar		1	
South Africa	49	27	118
Zimbabwe	8	2	10
Total	59	31	132

Rare earth elements

Africa is emerging as a key player in the development of REE resources, with several projects at different stages of development. Countries focusing on REE resources include Namibia, Malawi and South Africa.

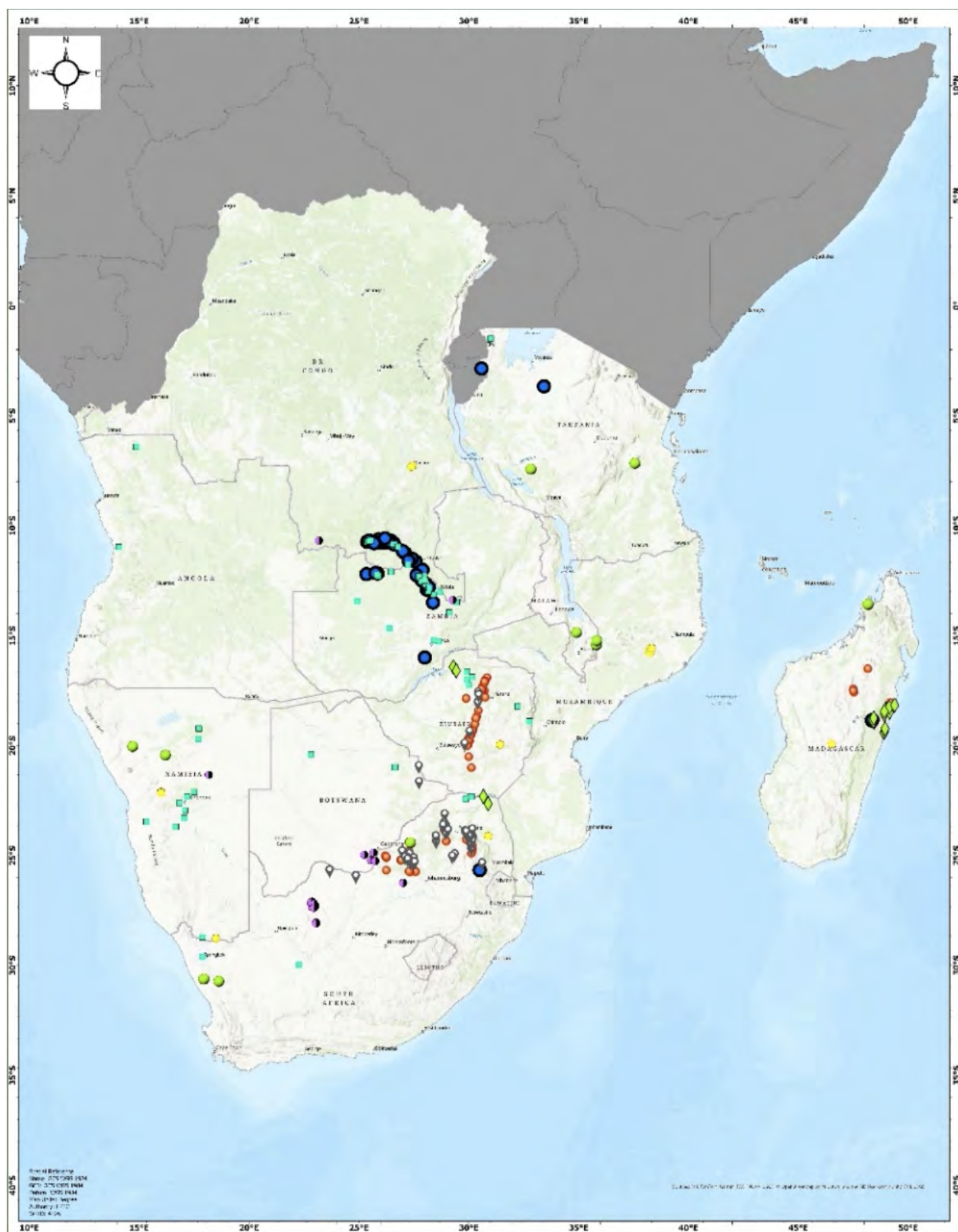


Figure 2: Map showing known Critical Energy Transition Minerals (CETMs) deposits in the SADC region.



Figure 3: Map showing mines, processing plants, smelters, and refineries in the SADC region.

Table 8: REE's deposits, exploration activity and mines or facilities in African countries.

Country	Mineral Deposits	Exploration Activity	Mines / Facilities
Madagascar	1	2	1
Malawi	3	4	
Mozambique		2	
Namibia	2	6	
South Africa	3	4	
Tanzania	2	2	
Zambia		1	
Zimbabwe		2	
Total	11	23	1

5. PORT AND RAILWAY INFRASTRUCTURE

Port Infrastructure

The mining industry in the SADC region relies on several key ports for the export of minerals, including the critical minerals essential for battery technologies and renewable energy. These ports serve as major export hubs, connecting landlocked producers to global markets.

South Africa

Durban – A key export hub for PGMs and manganese (crucial for battery technologies).

Richards Bay – Focuses on bulk mineral exports, including important battery metals such as nickel and lithium.

Mozambique

Beira – Facilitates exports for landlocked critical minerals producers in Zimbabwe and Zambia, particularly lithium and REEs.

Maputo – Primarily handles chrome and magnetite exports from South Africa, with an expanding role in battery metals such as graphite and lithium.

Nacala – Traditionally a coal export hub but increasingly supporting critical minerals (graphite) from Mozambique's deposits.

Namibia

Walvis Bay – A strategic gateway for copper and lithium exports from Namibia and the DRC, offering direct access to European and Asian markets.

Lüderitz – An emerging export point for Namibian lithium and REEs, supporting the country's growing mining sector.

East Africa

Dar es Salaam (Tanzania) and Mombasa (Kenya) – Critical for the export of lithium and REEs, particularly from mining projects in Tanzania.

Railways and Corridor Infrastructure

Railways and corridor infrastructure in Africa that currently support the mining industry include:

Tazara Railway (Tanzania-Zambia) links Zambia's Copperbelt to Tanzania, supporting copper and cobalt exports.

Benguela Railway (Angola-DRC-Zambia) is essential for critical minerals from the DRC and Zambia, reducing transport costs for cobalt and lithium.

Maputo Development Corridor (Mozambique-South Africa) facilitates PGM exports, essential for the hydrogen economy.

Nacala Corridor (Mozambique-Malawi) has potential for future battery metal exports, linking Malawi's REE mining projects to the coast.

Lobito Corridor (Angola-DRC-Zambia) is strategic for exporting copper and cobalt, critical for EV batteries, with ongoing upgrades for efficiency.

Opportunities



Source: US Department of State (INR, 2841, November 2023). Map adapted from artwork by Rainer Lesniewski/Shutterstock.

Figure 4: Map of the Lobito Corridor and potential trans-Africa connections.

Upgrading key trade corridors like the Lobito and Tazara railway networks is essential for improving transport efficiency of copper and cobalt, which are vital for EV battery production. In addition, countries such as Zimbabwe and Namibia are expanding rail capacity to meet the growing demand for lithium and REEs, crucial minerals for green energy technologies. Improving rail interoperability by addressing gauge mismatches in Southern and East Africa will streamline transport and lower costs.

Initiatives such as Angola's Lobito Corridor development and Mozambique's Nacala Corridor upgrades are already enhancing the transport of critical minerals. By focusing on infrastructure development and transport efficiency, Africa (and the SADC region in particular) can increase its beneficiation capacity and position itself as a more sustainable and competitive player in the critical minerals sector.

Energy Infrastructure

The SADC region's energy infrastructure is pivotal for supporting the critical minerals mining sector, but it faces challenges related to power reliability and supply. Key projects such as South Africa's Eskom grid and Independent Power Producer (IPP) projects are central to mining power, but are struggling with reliability issues. Hydropower sources such as the Inga Hydropower Project (DRC) and Kariba Dam (Zambia-Zimbabwe) are crucial but vulnerable to political instability and droughts. Mozambique's Cahora Bassa Dam exports power to neighbouring mining regions, while renewable energy projects such as Scatec Solar in South Africa and Chirodizi Solar in Mozambique offer opportunities to diversify energy sources. There is growing investment in renewables to reduce dependence on fossil fuels, along with battery energy storage systems to enhance supply stability. Off-grid and hybrid solutions, such as solar and diesel combinations, are also gaining traction, providing reliable power to

mining operations. Expanding grid infrastructure in regions such as Northern Cape (South Africa) and Katanga (DRC) will further strengthen the energy supply for the growing critical minerals mining sector. These energy initiatives and opportunities are critical for supporting the sustainable development of this sector.

6. POLICY RECOMMENDATIONS

Policy recommendations include:

- Develop an open-access, up-to-date regional mineral data repository for SADC countries to share geological information and attract investment in under-explored areas.
- Governments should increase funding for geological surveys to undertake geological mapping of untapped areas, initially focussing on lithium, REEs, and nickel.
- Increase exploration funding through public-private partnerships and align resource classification with global standards.

7. REFERENCES

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Southern Africa Resource Watch