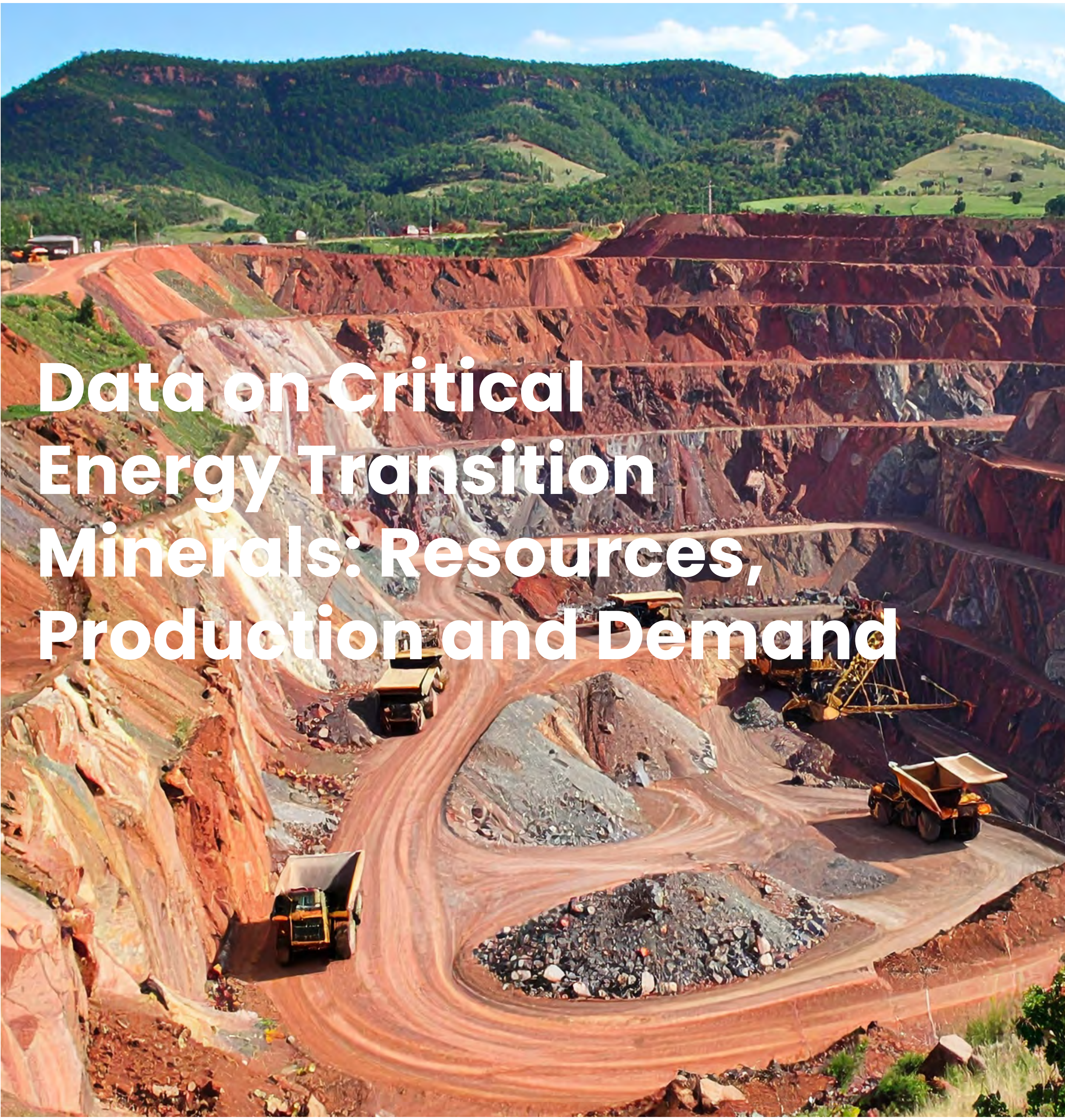
SARW
Southern Africa Resource Watch

Data on Critical Energy Transition Minerals: Resources, Production and Demand



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ABSRACT

This policy brief examines Critical Energy Transition Minerals (CETMs; hereinafter critical minerals) resources in the Southern African Development Community (SADC) region, emphasising their role in the global transition to green energy. It explores the region's vast resources of minerals such as platinum group metals (PGMs), rare earth elements (REEs), graphite, cobalt, lithium, chrome, manganese, and copper, which are crucial for technologies like solar, wind, batteries, and electric vehicles (EVs). The brief assesses global mineral reserves, production trends, and the challenges facing both global and SADC-specific supply chains, including geopolitical tensions, environmental issues, and technological limitations. It also highlights rising demand, particularly driven by the adoption of clean energy technologies, and provides policy recommendations for the region. Key recommendations include enhancing infrastructure, establishing a critical minerals certification scheme, facilitating technology transfers, securing preferential trade agreements, ensuring regulatory stability, and creating a Critical Energy Transition Minerals Investment Fund. These measures will strengthen SADC's role in global supply chains, promote local beneficiation, and support a sustainable critical minerals economy.

1. INTRODUCTION

As the world transitions to renewable energy, the demand for critical minerals continues to increase. With the SADC region being host to many of these critical minerals, the region has an opportunity to harness its resources for economic growth, industrialisation, and sustainable development. The critical minerals which are emphasised within this policy brief include PGMs, REEs, graphite, cobalt, lithium, chrome, manganese, and copper because of their application in green energy technologies such as solar, wind, battery storage and EVs.
This policy brief compiles data on the critical minerals, focusing on existing known resources and production levels within the context of global demand. By examining global trends in critical minerals supply and demand, this policy brief offers policy recommendations to ensure that the SADC region remains competitive in the evolving global green economy.

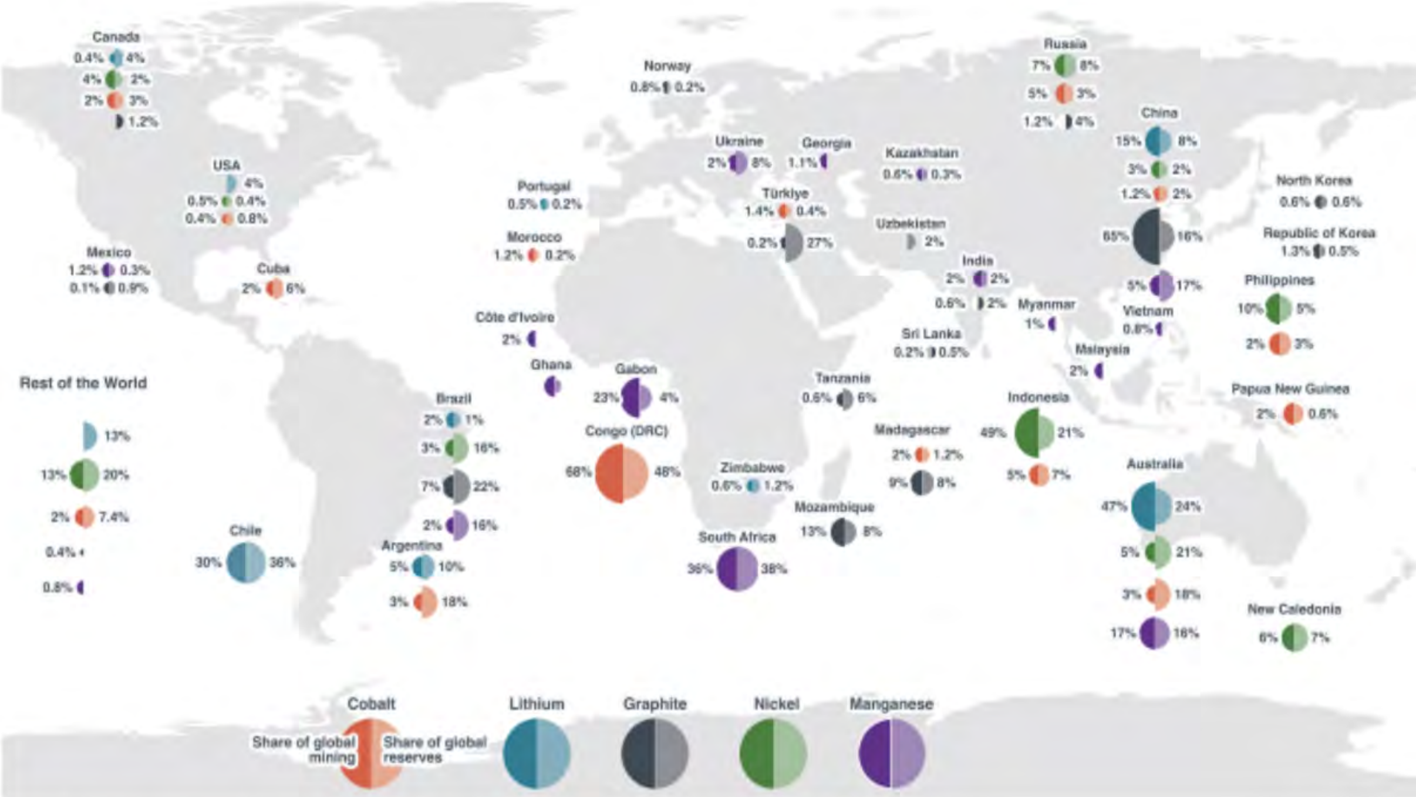
2. GLOBAL CRITICAL ENERGY TRANSITION MINERAL RESOURCES AND RESERVES

Mineral resources encompass all mineral concentrations with potential for economic extraction, whereas mineral reserves are the proven, mineable portion that meets specific economic and technical criteria. The rising demand for critical minerals can drive price increases, technological advancements and other modifying factors such as increased mineral exploration, which lead to more mineral resources falling into the mineral reserve category.

Global Reserve Distribution

Global reserves of critical minerals are concentrated in specific regions, creating both opportunities and challenges in securing sustainable supply chains. The largest reserves of these minerals are found in countries such as Australia, Chile, China, the Democratic Republic of Congo (DRC) and South Africa, among others. For instance, Australia holds the largest reserves of lithium, which is key for battery production, while the DRC dominates cobalt reserves, a mineral essential for high-performance batteries. (Figure 1) shows the global distribution of reserves for key battery minerals (lithium, nickel, cobalt, manganese, and graphite) along with the reserves of other essential minerals for a green energy transition. The map provides information on the share of global mining against the share of global reserves and hence highlights nations with potential for increased production.

Note: Countries with significant resources, but no classified reserves are not reflected here. For example, Bolivia and India hold significant lithium resources and could later emerge as key global players in lithium supply, but they lack classified reserves.



Note: Countries displayed contain more than 0.5% of either reserves or mining.

Figure 1: Global distribution of lithium, nickel, cobalt, manganese and natural graphite – reserves and mining in 2023 (source: THEICCT.ORG)

3. CRITICAL ENERGY TRANSITION MINERALS PRODUCTION

Global Production

Production data is essential to understand the actual output of critical minerals, which influences both national economies and global supply chains. Production levels of critical minerals are determined by the reserves and extraction capacities of the respective countries. The United States Geological Survey (USGS) Mineral Commodity Summaries and SADC Geological Surveys provide annual production data, detailing the output of critical minerals in Southern Africa and globally.

In the global context, China is the leading producer of REEs, accounting for around 60% of global production (USGS, 2025). Australia leads global lithium production, contributing approximately 53% of total supply, followed by Chile (24%). Chile remains the leading copper producer, accounting for about 28% of global supply. This dominance poses a challenge for other nations seeking to diversify their supply chains and reduce dependency on a single source.

SADC Regional Production

South Africa is the world's largest producer of platinum group metals, contributing approximately 70% of global production and 40% of palladium (SADC Geological Surveys, 2023). The DRC is dominant in cobalt production, contributing around 60% of the global supply (USGS, 2025). Similarly, Zimbabwe is a significant producer of lithium, which is increasingly in demand for the EV industry.

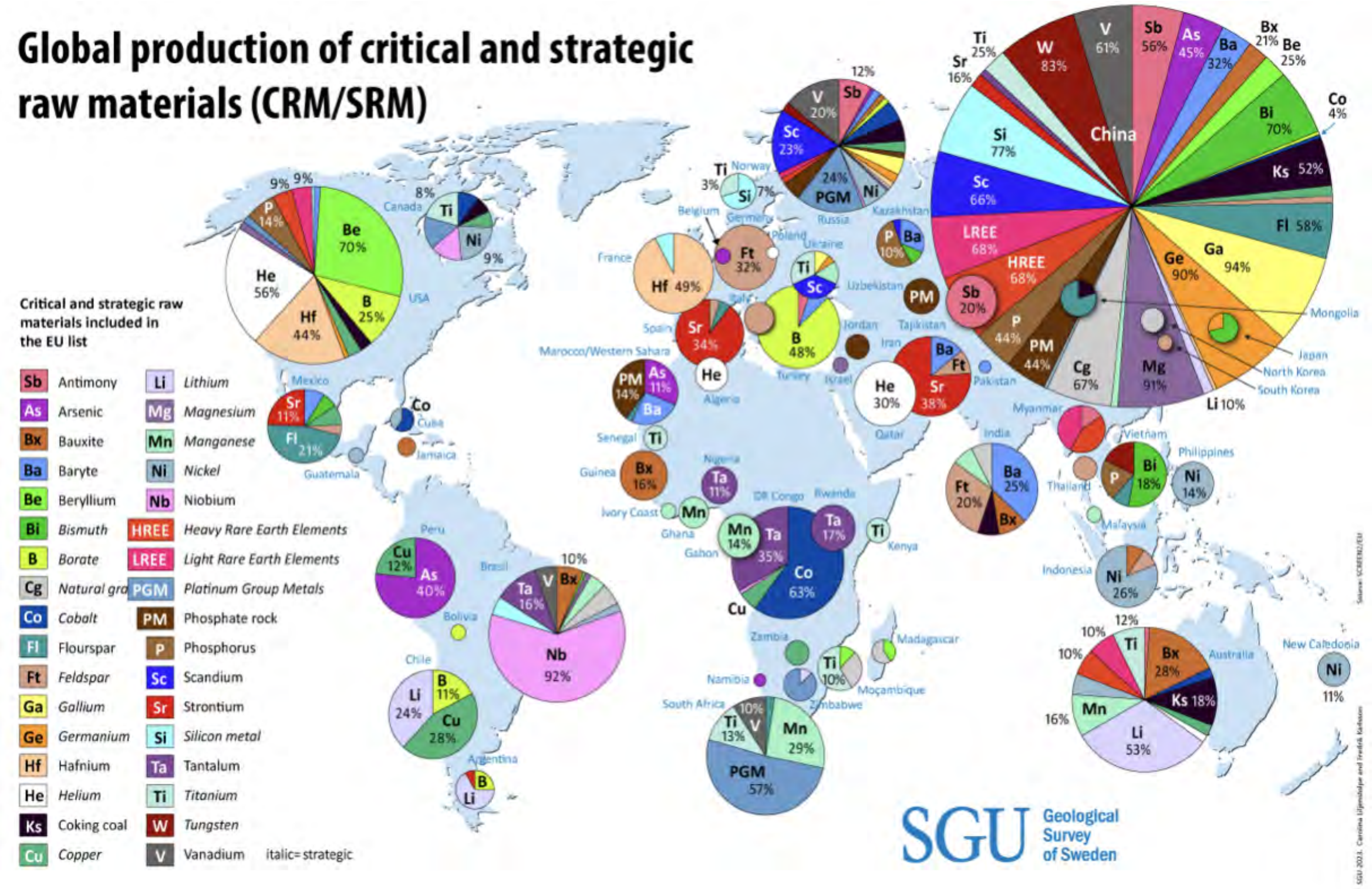


Figure 2: Global production of critical and strategic raw materials (SGU, 2023).

The above-mentioned trends in global and SADC regional production are graphically presented in (Figure 2) with a more detailed distribution.

CHALLENGES IN PRODUCTION

Supply Chain Concentration and Geopolitics

Critical minerals are heavily concentrated in a few countries, with China dominating REE refining (~90%) and lithium-ion battery production (~70%) (IEA, 2024). The DRC supplies over 60% of global cobalt (USGS, 2025). Trade restrictions and geopolitical tensions, such as US-China disputes, disrupt supply chains.

Environmental and Social Issues

Mining requires vast amounts of water and energy, causing deforestation, pollution, and displacement (IEA, 2024). Child labour and unsafe working conditions persist in artisanal cobalt mining in the DRC (Mo Ibrahim Foundation, 2022).

Technological and Infrastructure Limitations

Refining and processing capabilities are heavily centralised in China, limiting other nations' ability to add value (USGS, 2025). Recycling remains underdeveloped, with less than 5% of lithium, cobalt, and REEs being recovered (IEA, 2024).

Price Volatility and Investment Risks

Critical minerals experience up and down cycles, discouraging long-term investment (World Bank, 2024). High capital costs and regulatory hurdles slow down new mining projects.

Infrastructure Deficiencies

Poor transport networks and reliance on costly road transport affect mineral exports from landlocked countries. Power shortages, including South Africa's load-shedding, disrupt mining operations and processing facilities (IEA, 2024).

Policy and Governance Issues

Regulatory changes and ownership laws deter investors (World Bank, 2024). Illegal mining and corruption reduce revenue and environmental compliance.

Limited Beneficiation and Value Addition

Most PGMs, cobalt, and lithium are exported raw, with minimal local refining (USGS, 2025). Countries lack downstream industries, such as battery manufacturing or copper wire production (World Bank, 2024).

Environmental and Social Issues

Mining regions face water shortages (e.g., Botswana, Namibia and South Africa) (IEA, 2024). Community displacement and conflicts over land rights are common, especially in the DRC's cobalt sector (Mo Ibrahim Foundation, 2022).

Technological Gaps

Automation and digital mining adoption remain low (World Bank, 2024).

	Chromium	Cobalt	Copper	Lithium	Nickel	PGMs	REEs
Solar photovoltaic			▲				
Wind	►		▲		►		▲
Hydro	►		►				
Geothermal	▲				▲		
EV Batteries / grid storage		▲	▲	▲	▲		▲
Hydrogen					▲	▲	►
▲ **High Demand**			► **Medium Demand**				

Table 1: Mineral demand for green energy technologies (Source: Adapted from IEA (2021).

4. DEMAND

The International Energy Agency (IEA) estimates that reaching the goals of the Paris Agreement would quadruple mineral, specifically critical mineral, demand by 2040. To meet this demand, the mining industry needs to invest approximately $1.7 trillion over the next 15 years. This demand is driven by critical minerals such as those highlighted in (Table 1).

Global Demand for Critical Energy Transition Minerals

The IEA (2021 & 2022) highlights that the increasing adoption of renewable energy technologies such as wind, solar, and EVs will require significant quantities of critical minerals (Figure 3). For example, while a conventional car may only require copper and manganese, an EV requires copper, lithium, nickel, manganese, cobalt, graphite and some amount of REEs as a baseline. Mineral demand for clean energy technologies would rise by at least four times by 2040 to meet climate goals, with particularly high growth for EV-related minerals (Figure 4).

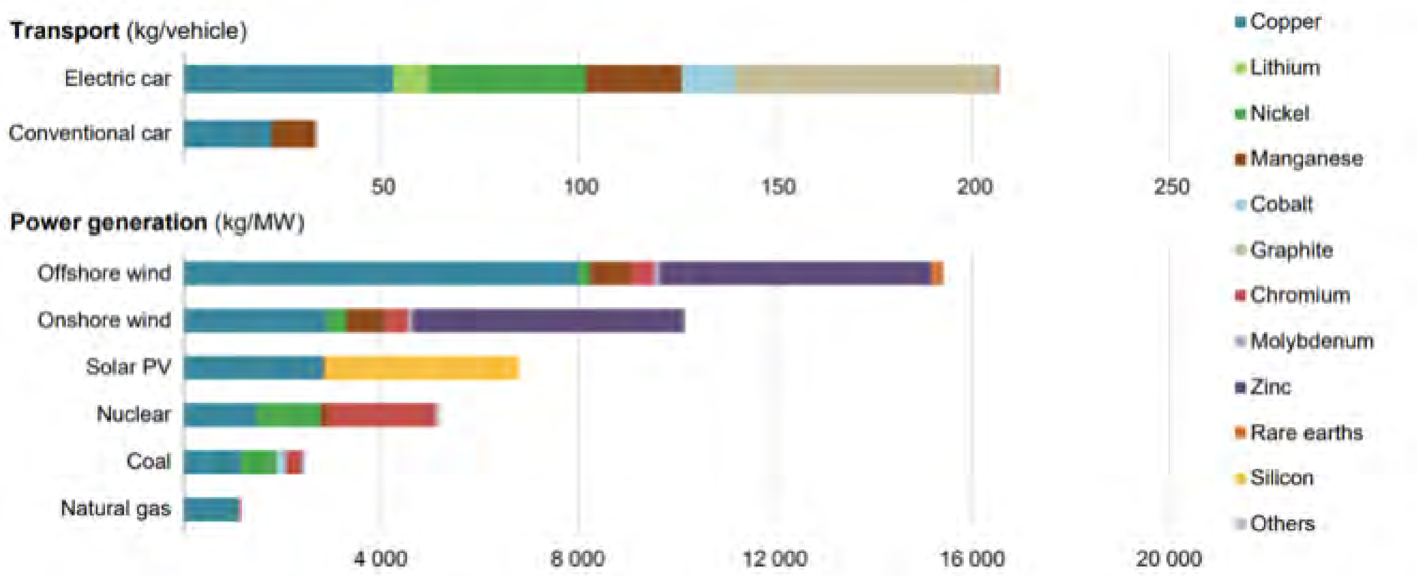


Figure 3: Minerals used in selected clean energy technologies (IEA, 2022)

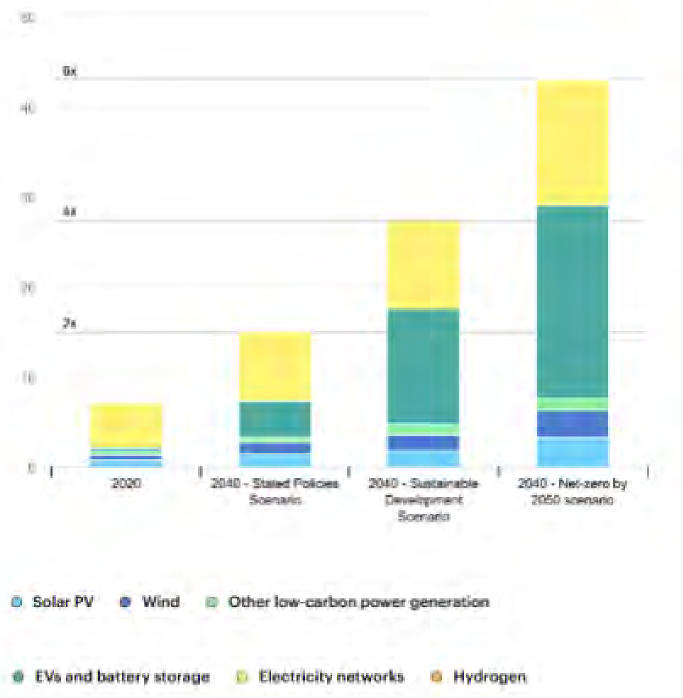


Figure 4: Growth by 2040 by sector.

Notes: STEPS = Stated Policies Scenario, an indication of where the energy system is heading based on a sector-by-sector analysis of today's policies and policy announcements; SDS = Sustainable Development Scenario, indicating what would be required in a trajectory consistent with meeting the Paris Agreement goals.

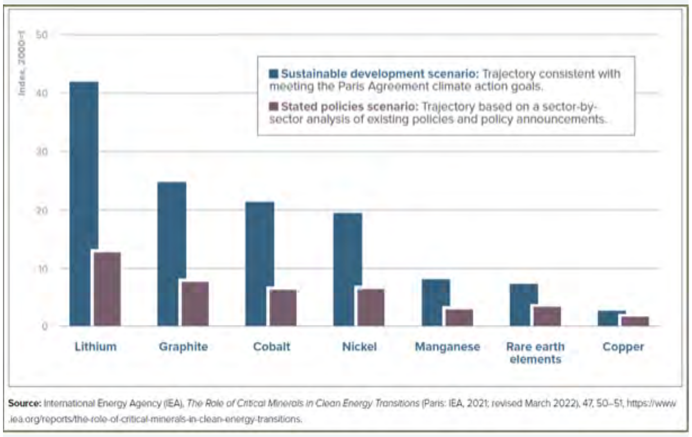
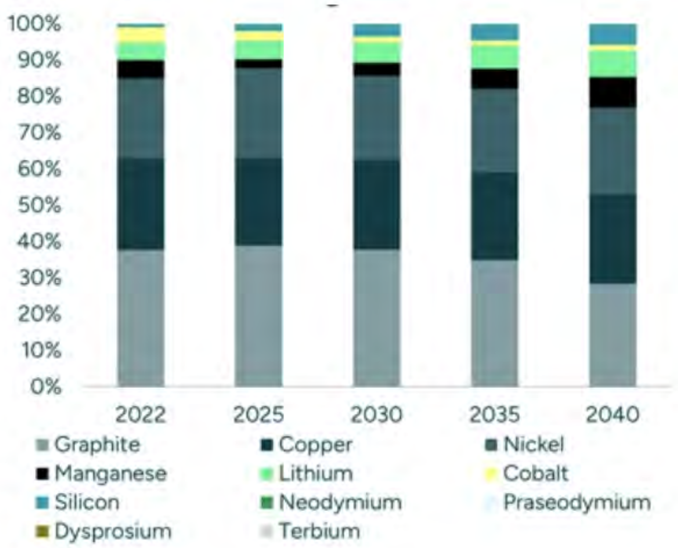


Figure 5: Projected demand for key green minerals in 2040 relative to 2020 under two scenarios: the SDS, aligned with Paris Agreement goals, and the SPS, based on current policies (IEA (2021).

The demand for critical minerals is expected to rise sharply by 2040, particularly for lithium, graphite, cobalt, and nickel, driven by the clean energy transition. Lithium shows the most significant growth, exceeding forty (40) times the 2020 levels under a Sustainable Development Scenario (SDS). While all minerals see increased demand, SDS projections are notably higher than Stated Policy Scenario (SPS) projections, highlighting the impact of policy ambition on future mineral requirements.

(Figure 6) charts show the shifting composition of critical minerals demand for EVs and grid battery storage over time.

Mineral Demand for EVs



Mineral Demand for Grid Battery Storage

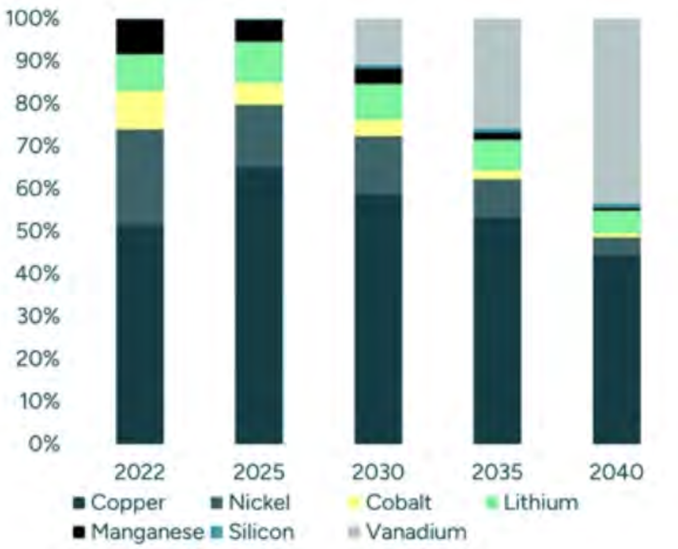


Figure 6: Projected critical minerals demand for EVs and grid battery storage from 2022 to 2040, expressed as a percentage of total demand under a base case scenario (https://lithiumharvest.com/knowledge/green-energy-transition/critical-raw-materials/).

For EVs, graphite and nickel dominate the demand, with notable contributions from lithium, cobalt, and REEs (neodymium, praseodymium, and dysprosium). Over time, the proportion of graphite remains substantial, while lithium and other critical raw materials (CRMs) gain prominence.

In contrast, grid battery storage sees a significant shift, with lithium, and to some extent, silicon, gaining importance by 2040, replacing the earlier reliance on manganese, nickel, and cobalt. This transition reflects the increasing adoption of lithium-based battery technologies in grid storage applications and the evolving material requirements for sustainable energy systems.

Growing Demand for Critical Energy Transition Minerals in the SADC Region

The SADC region is experiencing growing demand for critical minerals, for application in renewable energy and clean technologies. Some applications which drive the demand of critical minerals in the SADC region are as follows:

Lithium and cobalt are crucial for lithium-ion batteries used in EVs and energy storage systems, making them increasingly important as the region expands its EV market and renewable energy infrastructure.

Nickel, essential for high-energy-density batteries, is expected to see rising demand with greater EV adoption.

Botswana is advancing its role in the green energy transition, with its first battery-grade manganese mining project producing high-purity manganese sulphate for EV batteries.

South Africa's abundant PGMs are vital for green hydrogen production, a growing clean energy sector, with the European Union (EU) granting $35 million to support South Africa's green hydrogen initiatives.

Manganese Metal Co's refinery in South Africa, is the world's only non-China-based producer of high-grade electrolytic manganese metal (EMM) and the largest refinery of 99.9% selenium-free EMM, used in batteries for EVs.

As SADC strengthens the green technology sector, these minerals will play a critical role in the region's green energy transition (SAIIA, Reuters).

POLICY RECOMMENDATIONS

Policy recommendations include:

Improve the supporting infrastructure for the critical minerals industry.

A critical minerals certification scheme should be established to ensure environmental, social and governance (ESG) compliance, attracting responsible investment in the SADC region.

Facilitate technology transfers by strategically partnering with global firms and other entities to build local expertise in refining and manufacturing.

The SADC region can secure preferential trade agreements for green minerals through establishing co-investment agreements with leading global and local refining hubs to support domestic processing and market access.

Ensure a stable and predictable environment to encourage long-term investments.

Establish a Critical Energy Transition Minerals Investment Fund to de-risk projects, leverage carbon credits and green bonds for funding.

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