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## ANALYTICAL NOTE

### SUB-SAHARAN AFRICA

Digging for Opportunity: Harnessing  
Sub-Saharan Africa's Wealth in Critical Minerals

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## Digging for Opportunity: Harnessing Sub-Saharan Africa’s Wealth in Critical Minerals

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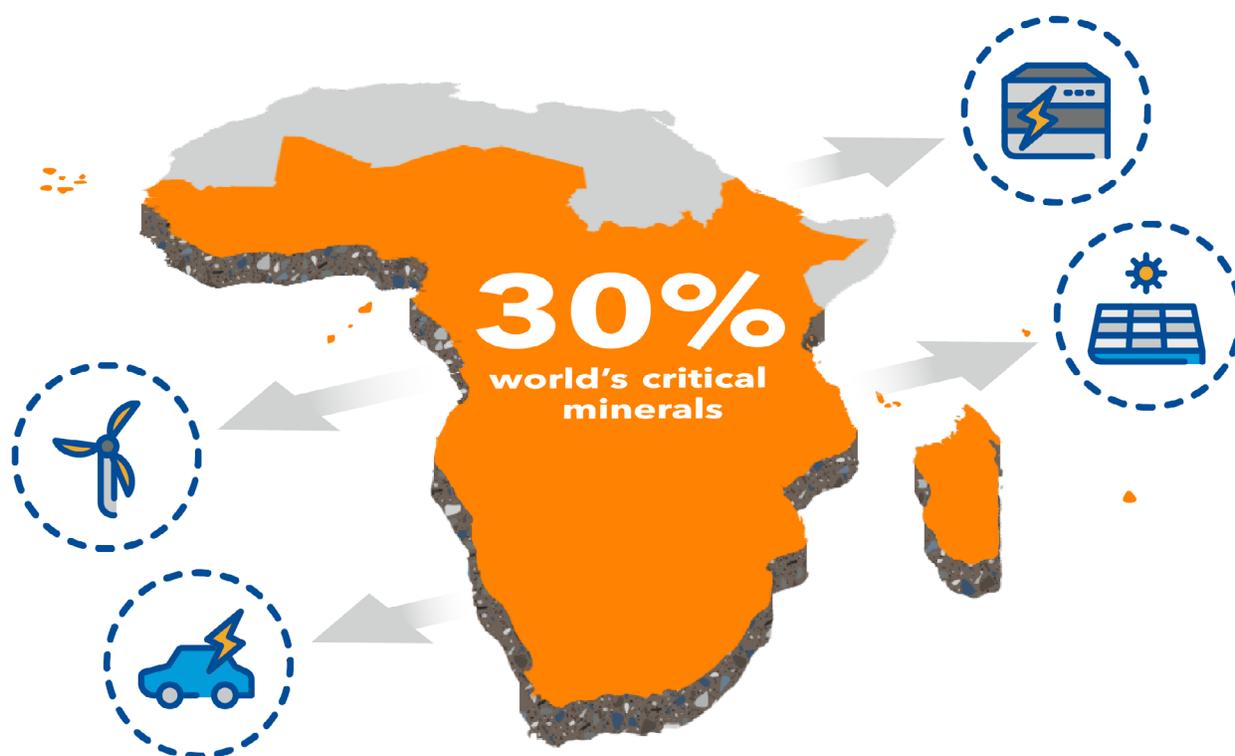
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# Digging for Opportunity: Harnessing Sub-Saharan Africa's Wealth in Critical Minerals

Sub-Saharan Africa, home to 30 percent of the world's critical minerals, is on the brink of a major transformation with the global move towards clean energy. Whereas the extraction of select minerals could boost the region's GDP by 12 percent or more by 2050, advancing beyond exporting raw materials to developing processing industries presents an even larger opportunity. A regional strategy built on cross-border collaboration and integration can leverage the diversity of minerals and create a larger, more attractive regional market for much-needed investment. Moreover, structural reforms at the country level to nurture domestic firms in processing and supporting industries, while steering clear of inward-looking industrial policy, will amplify the gains from these minerals. Unlocking this potential can drive broader economic development, encourage technology transfer, and ensure sustainable, higher returns from the region's critical mineral resources. Be it extraction or processing, this transition requires sound fiscal regimes and policies to manage these gains responsibly.

## Sub-Saharan Africa can supply the clean energy transition...



...and benefit more from its mineral wealth

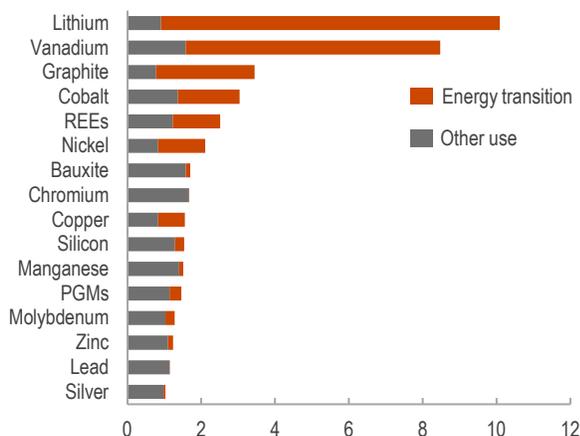
## Sub-Saharan Africa can be a key player in the clean energy transition ...

The global push to mitigate climate change is driving a significant demand for critical minerals, vital for transforming the energy system and developing low-emission technologies. Integral to this transition are electric vehicles, and renewable energy generation, both requiring more minerals than traditional fossil-fuel technologies. For instance, electric vehicle battery production relies heavily on critical minerals such as lithium, nickel, manganese, and cobalt. Renewable technologies, including solar panels and wind turbines, require minerals like bauxite (a precursor to aluminum), copper, silicon, and platinum-group metals, among others. The demand for these critical minerals, already gathering pace in recent years, is expected to surge in the coming decades. The latest International Energy Agency (IEA) 2050 Net Zero Emissions (NZE) scenario (IEA 2023) predicts a doubling and tripling of demand for nickel and cobalt, and a tenfold increase in demand for lithium between 2022 and 2050 (Figure 1).

Sub-Saharan Africa, estimated to hold about 30 percent of the volume of world's proven critical mineral reserves, is crucial for their supply. The region already significantly contributes to the production of minerals like cobalt, graphite, manganese, platinum-group metals and chromium. The Democratic Republic of the Congo dominates the global cobalt market with over 70 percent of global output and approximately 50 percent of the world's proven reserves (Figure 2). Key manganese producers include South Africa, Gabon, and Ghana, collectively accounting for over 60 percent of global production. Although not currently a major lithium producer, Zimbabwe, alongside the Democratic Republic of the Congo and Mali, holds substantial yet-to-be-explored lithium deposits.

**Figure 1. Increase in Global Demand of Energy Transition Minerals**

(Ratio of 2050 to 2022 demand under a net zero emissions scenario)

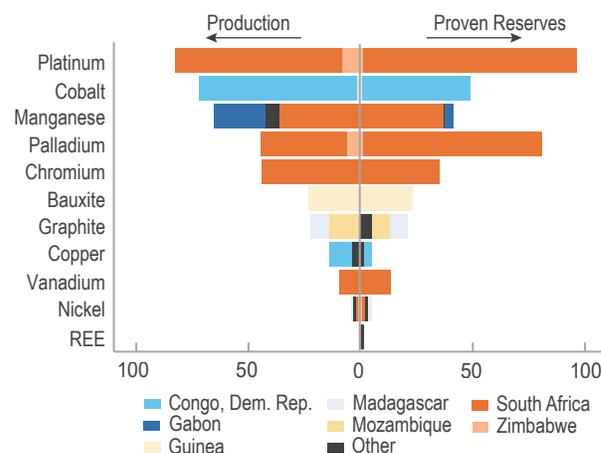


Sources: International Energy Agency (IEA) World Energy Outlook (2023); and IMF staff calculations.

Note: The chart shows the IEA's projected increase in mineral demand (in quantity terms) broken down by sector as a ratio of 2050 to 2022 demand, under the IEA's net zero emissions transition scenario. REE = Rare Earth Elements; PGMs = Platinum Group Metals.

**Figure 2. Sub-Saharan Africa: Share in World Production and Reserves, 2022**

(Percent of global)



Sources: United States Geological Survey (USGS); and IMF staff calculations.

Note: Other includes countries whose sum of production and reserves shares is less than 10 percent; Reserves refer to the part of the resource base that could be economically extracted or produced at the time of the determination. REE = Rare Earth Elements.

## ... with revenues from critical minerals poised to rise significantly over the next two decades.

Under the 2050 NZE scenario, the global market for critical minerals is poised for a significant upswing. Global revenues from the production of just four key minerals—copper, nickel, cobalt, and lithium—are estimated to total \$16 trillion over the next 25 years (in 2023-dollar terms). This boom bodes well for sub-Saharan Africa. The region stands to reap over 10 percent of these cumulated revenues—nearly \$2 trillion in 2023-dollar terms. Countries

with significant mineral reserves like the Democratic Republic of the Congo and South Africa, but also smaller countries like Guinea (bauxite), Mali (lithium), Mozambique (graphite), Zambia (copper), and Zimbabwe (nickel, platinum) are poised to benefit from this clean energy transition-induced mining boom.

In contrast, [the forecast for the region's fossil fuel revenues paints a less rosy picture](#), presenting significant fiscal challenges for current fossil fuel exporters. Estimated at \$625 billion over the next 25 years in current dollar terms, these revenues are modest at best, reflecting sub-Saharan Africa's smaller slice of global fossil fuel reserves and declining demand for fossil fuels on the path to net zero.

This is further compounded by the higher carbon intensity (by 70 to 80 percent on average) and steeper extraction cost (by 15 to 20 percent on average) associated with the region's fossil fuels (Leke, Gaius-Obaseki, and Onyekweli 2022; Vásquez 2022), dimming the region's appeal for oil and gas investors.

However, the potential for significant revenue from critical minerals hinges on developments in commodity prices, which can be highly volatile, and technological changes (Boer and others 2021). Fast-paced technological advancements, particularly in the field of electric vehicle batteries, could render certain minerals obsolete. [Thus, prudent and transparent resource management, and strategic fiscal planning are vital to successfully navigate these uncertainties and harness the region's mineral resources.](#) For oil-exporting nations in the region, the shift away from fossil fuels requires a strategic recalibration of their economic and fiscal policies, underscoring the imperative of diversification in the face of global energy transitions ([October 2022 Regional Economic Outlook: Sub-Saharan Africa](#)).

**Table 1. Sub-Saharan Africa: Estimated Cumulated Real Revenues from Production of Selected Critical Minerals and Fossil Fuels, 2024–50**

	Historical, 1999–2022		Under Net Zero Scenario, 2024–50	
	(2023 Billion US\$)	(SSA Percent of World Total)	(2023 Billion US\$)	(SSA Percent of World Total)
<b>Selected Minerals</b>	<b>297</b>	<b>8</b>	<b>1,934</b>	<b>12</b>
Copper	200	8	662	10
Nickel	38	5	293	5
Cobalt	56	54	880	66
Lithium	3	3	99	5
<b>Fossil fuels</b>	<b>3,523</b>	<b>5</b>	<b>625</b>	<b>3</b>
Oil	2,805	6	508	4
Natural gas	279	2	52	2
Coal	438	4	65	3

Sources: International Energy Agency; and IMF staff calculations.

Note: Price projections (in real terms, deflated by US CPI) are based on analysis from the October 2021, World Economic Outlook, Special Feature on Commodities Markets, which assume \$30 per barrel of oil, \$1.50 per million British thermal units for natural gas, and \$40 per metric ton of coal. The selected critical minerals are: copper, nickel, cobalt, and lithium. Mineral price projections based on Boer, Pescatori and Stuermer (2023). Quantity projections are based on IEA (2023) net zero energy transition scenario. The Sub-Saharan Africa share is inferred from data on mineral and fossil fuel reserves.

## However, sub-Saharan Africa carries out very little higher value-added processing of minerals, ...

Most sub-Saharan African countries export critical minerals primarily in their raw form, which tend to be lower value added than processing activities. The economic disparity is evident in a simple market value comparison: raw bauxite fetches a modest \$65 per ton, whereas its processed counterpart, aluminum, commands a hefty \$2,335 per ton as of end 2023.<sup>1</sup> [Although countries in the region have deepened their involvement in the global](#)

<sup>1</sup> The raw bauxite spot price is from Mysteel Global; the aluminum spot price is from the London Metal Exchange. Both spot prices are as of December 31, 2023, Bloomberg Finance, L.P.

mineral trade and become more integrated into global value chains, they mainly focus on basic extraction (Figure 3). The Democratic Republic of the Congo, accounting for 74 percent of global cobalt mining, sends 97 percent of its cobalt exports, mostly unprocessed, to China.<sup>2</sup> Similarly, over 1,000 trucks are estimated to daily transport low-concentration, rock-form lithium from Zimbabwean mines to distant African ports, destined for China instead of undergoing local processing (Goldman Sachs 2023). This approach starkly contrasts with China and Indonesia, who have prioritized mineral processing for higher economic returns.

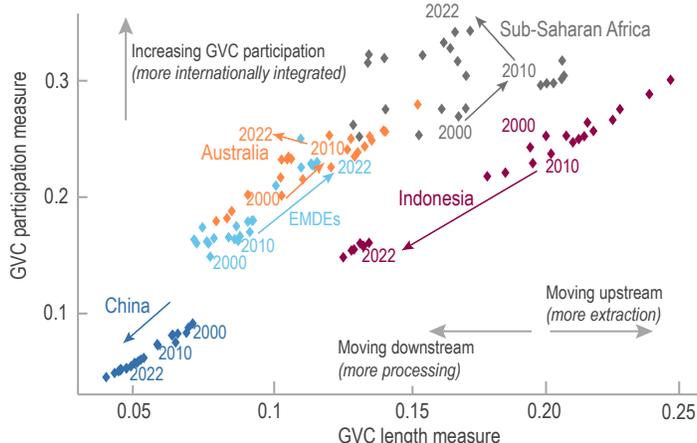
By sticking to the lower value-added stages of extraction, countries risk losing substantial benefits from processing. **Developing local processing industries could significantly boost profits, increase tax revenues, create higher-skilled jobs, and enhance positive technological spillovers.** Furthermore, transitioning from exports of raw minerals to producing refined minerals offers an opportunity for countries to diversify their economies and reduce their exposure to high price volatilities commonly associated with raw commodity markets. By diversifying in this way, countries can better protect against various economic challenges including exchange rate volatility, pressures on foreign reserves, and the financial instability commonly linked to dependency on raw commodity exports.

In their quest to harness the potential benefits of local mineral processing, various sub-Saharan African countries have implemented a range of inward-looking policies, so far, with mixed success. Currently, 17 countries in the region enforce local content regulations in mining and related activities, encompassing domestic ownership, local employment quotas, and procurement guidelines for foreign investors. **However, these policies often prove costly and challenging to enforce, sometimes resulting in inefficiency and rent-seeking behavior.** Notably, past export bans on minerals, as seen in Tanzania and Zambia, have paradoxically led to decreased local production of processed and raw minerals. A study by Fliess, Idsardi, and Rossouw (2017) on export control measures for manganese in Gabon, lead in South Africa, copper in Zambia, and chromite in Zimbabwe found that such measures, despite their intent to boost local processing, frequently fall short and may even negatively affect the industry by diminishing mineral exports. Without resolving the fundamental constraints limiting processing capacity, export controls may actually deter investment and shift mining and processing activities to alternative markets.

### ... as the region faces major obstacles in developing mineral processing.

More generally, the region faces a myriad of challenges in establishing processing industries. A major hurdle is securing financing for countries eager to build factories for mineral processing. Public finances have been especially under strain, given the string of recent shocks. But money is only part of a larger puzzle. Domestic firms in the region lag behind in the know-how and expertise needed for the leap to sophisticated, more value-enhancing processing. The region's lack of infrastructure and energy system, too, looms as a sizable impediment

**Figure 3. Varying Degrees of Integration in Mining and Quarrying Production Stages, 2000-22**



Sources: Eora Global Supply Chain Database; and IMF staff calculations.

Note: The GVC length index measures the distance to final demand. The shorter the distance, the more downstream the country is in the production process, and vice versa. The GVC participation index measures the degree of integration in international supply chains. The larger the number, the more internationally integrated an economy's industry is. Calculation of GVC measures follows Aslam, Novta, and Rodrigues-Bastos, 2017. EMDEs = emerging markets and developing economies excluding China and sub-Saharan Africa; GVC = global value chain.

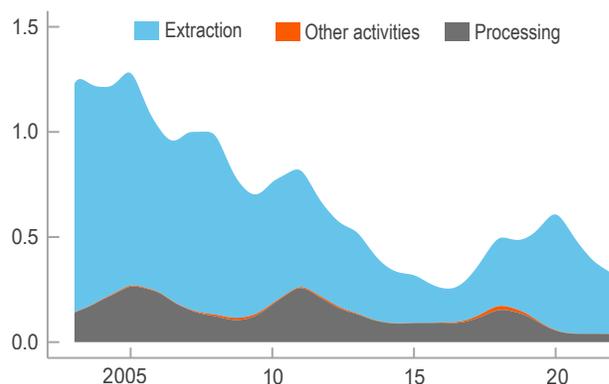
<sup>2</sup> IEA, 2019 mining data; 2020 trade (by value) figures from Chatham House Resource Trade Database.

especially given the dearth of public financing. Beyond meeting the high energy demands of processing plants,<sup>3</sup> a comprehensive transport network—trains, containers, trucks, and ample storage space, all integrated with custom port facilities—is vital for the efficient movement of bulk minerals.

Foreign direct investment (FDI) could address some of these complex challenges. It offers much-needed capital to construct and upgrade processing facilities, but also a gateway to advanced technology and expertise. Greenfield FDI, which establishes new operations from the ground up, is especially impactful. It spurs technology transfer, job creation, and skills development. Moreover, FDI often reflects a foreign investor's long-term commitment, leading to enduring economic benefits. Between 2016 and 2022, sub-Saharan Africa drew about 13 percent of announced global greenfield FDI projects in metals and minerals annually, but 73 percent went towards extraction and only 26 percent, on average, towards manufacturing and processing.<sup>4</sup> Multinationals—a significant source of FDI—not only seek stable sources of raw material but also sizable markets to sell the processed critical minerals. Thus, the absence of a substantial regional market in sub-Saharan Africa makes local processing investments less enticing.

**Figure 4. Sub-Saharan Africa: Greenfield FDI Projects in Metals and Minerals: Capital Expenditure, 2000-22**

(Share of sub-Saharan Africa's GDP, percent)



Sources: fDi Markets; World Economic Outlook; and IMF staff calculations.

Note: Other activities include sales, marketing and support, education and training, research and development, and logistics and distribution.

## Regionally coordinated policies to help establish a processing industry.

Sub-Saharan Africa's wealth in critical minerals presents an opportunity to pivot from exporting raw materials to developing processing industries to capture more value-added benefits. **A regional policy approach that leverages the diversity in minerals and pools resources can tackle challenges more effectively than isolated efforts.** At the country level, structural reforms can complement these regional efforts, nurturing domestic firms in both the processing sector and its supportive industries. This will amplify the collective benefits of the region's critical minerals.

In particular, countries can enhance regional integration and coordinate regulations on critical minerals to make the region more attractive to investors.

- Bolstering regional integration can forge a larger and more interconnected market, enhancing the region's investment appeal. The region is uniquely poised to provide both a significant consumer base for processed minerals and a source of raw materials needed in production. For example, sub-Saharan Africa's anticipated population boom, coupled with rapid urbanization and industrialization will likely increase demand for renewable energy. Reducing trade barriers and improving connectivity through infrastructure development are crucial to facilitate the sourcing of various components from different countries. **The African Continental Free Trade Area can play a key role in this,** potentially uniting fragmented mineral markets for larger-scale operations

<sup>3</sup> The energy requirements for mineral extraction are a fraction of those for processing. For example, extracting bauxite consumes 34 kWh per metric ton, whereas refining bauxite consumes over 3,000 kWh per metric ton (according to Bosse and others, 2024).

<sup>4</sup> The fDi Markets database tracks mostly announced projects, which may reflect intentions at the date of announcement rather than effective capital invested.

and forming regional value chains that draw on both raw and processed mineral inputs.<sup>5</sup> A regional integration strategy not only taps into a rich material source but also unlocks a thriving consumer market for processed minerals and renewable energy products.

- **Countries need to collaborate on policies to create more favorable investment and business environments, prioritizing openness over protectionism.** Simplifying bureaucratic procedures and harmonizing mining regulations across borders would foster a stable, predictable investment environment. A regional approach to resource taxation alongside a well-crafted regional mining tax treaty, can decrease tax competition between countries and more effectively harness resource revenues (Bourgain and Zanaj 2020; Perry 2022). Efforts to minimize the environmental impacts of mining and processing will help unlock new funding and investment opportunities in the growing field of “green finance.” Strengthening the Africa Mining Vision, launched in 2009 by the African Union, could serve as a key framework for these regional efforts. Initial collaborative efforts might start on a smaller scale—for example, recent collaboration between the Democratic Republic of the Congo and Zambia on electric battery production for two- and three-wheeled electric vehicles for Africa. Success in these smaller regional initiatives can pave the way for larger, more comprehensive hubs for regional mineral processing and manufacturing.

**Complementing regional efforts, countries can undertake structural reforms to support domestic companies in mining and related processing sectors.** The application of local content requirements, which mandate the use of local materials and labor, should be approached with caution.

- Many countries need to reevaluate their inward-looking policies. Despite their intentions to strengthen domestic industries, these policies can often result in inefficiencies, market distortions, and increased costs. **Importantly, isolationist and protectionist policies can lead to adverse outcomes like trade disputes and retaliatory actions.**
- Adopting a broader reform agenda aimed at fostering a business-friendly environment might prove more fruitful and less fraught with adverse effects. **Reducing entry barriers and simplifying regulatory and tax frameworks can stimulate growth in ancillary sectors, boosting overall competitiveness.** A critical part of this approach is strengthening domestic financial markets and improving access to finance. Here, new fintech innovations could be helpful, particularly for small and medium enterprises and entrepreneurs. These firms often play a vital role in providing goods and services to the mining sector but face difficulties in securing traditional financing. These reforms would not only support these businesses but also bolster the wider benefits of mining.

Lastly, the adoption of robust fiscal and institutional frameworks is key to **responsibly managing the new resource windfalls**, whether from extraction or processing. Priority should be given to enhancing accountability and transparency, designing an appropriate tax regime, and implementing sound public financial management practices. This moment presents a critical window to secure future prosperity by negotiating favorable contracts and fortifying resource management strategies for the decades ahead.

<sup>5</sup> The placement of processing plants and production facilities in the electric vehicle industry is strategically influenced by the proximity to end markets and technical considerations. For instance, the high costs and safety concerns associated with transporting heavy battery packs lead electric vehicle manufacturers to locate battery production close to assembly plants. Consequently, China’s dominance in electric vehicle manufacturing has spurred its growth in metal refining capacities, positioning it as a major hub for both importing unrefined ores and producing refined metals.

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