

The minerals essential to the energy and digital transitions: An opportunity for Africa?

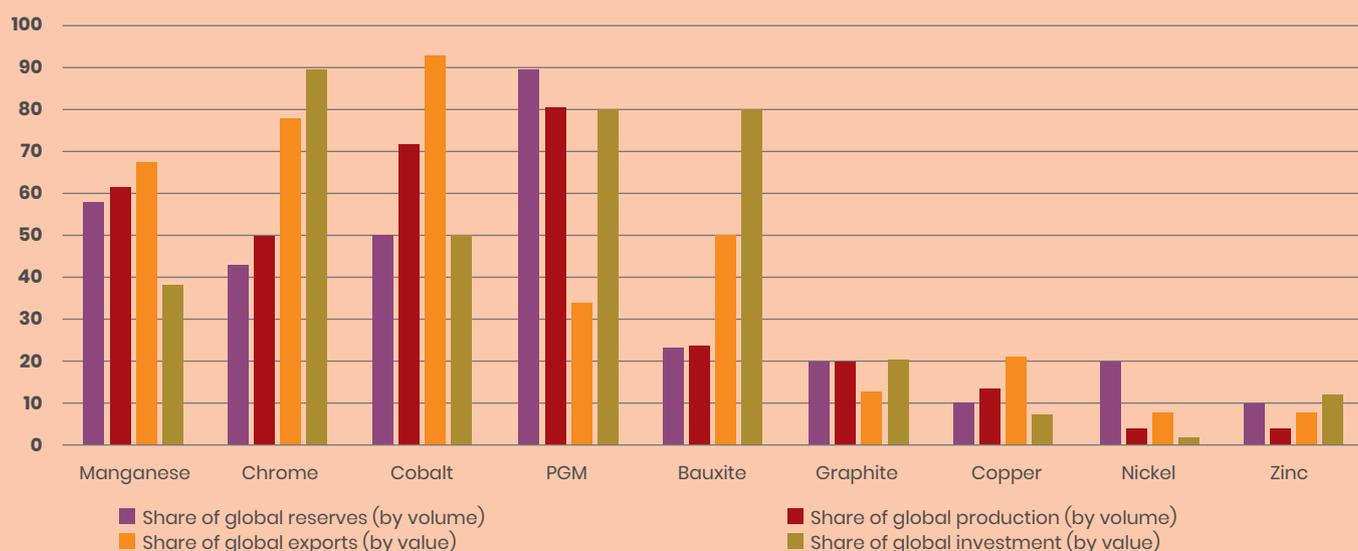
With the acceleration of the energy and digital transitions, global demand for critical minerals has grown exponentially in recent years. Africa, with its extensive and still relatively unexploited reserves, hopes to take advantage of this opportunity to support its industrialization trajectory, based on increased local processing of its minerals, and to play a greater role in international green technology value chains. However, these ambitions need to be analyzed in the light of the geological and economic realities of each project, as well as the political and environmental specificities of each country. Africa will also have to take into account the industrial risk resulting from possible rapid technological developments and the commercial risk from the rise of “green protectionism.”

Africa is an essential supplier of several critical minerals

The term “critical minerals” includes a number of minerals that are essential to building the infrastructure for the energy and digital transitions: solar panels, wind turbines, electric vehicles, touch screens, and data storage systems. Several lists of critical minerals have been created based on specific hypotheses around predictions of demand from different countries and availability. We will focus here on the following minerals: lithium, copper, cobalt, graphite, nickel, bauxite, manganese, zinc, platinum, and rare earths. Reference data produced by the United States Geological Survey (USGS) show that **Africa has a truly dominant position in four critical minerals** in particular:

- **Cobalt:** Africa is the undisputed global leader in cobalt, with over 50 % of global reserves. Several countries have resources (Madagascar, Zambia, Uganda, Morocco), but the bulk of resources are located in the Democratic Republic of the Congo (DRC). In 2020, the DRC operated the four largest cobalt mines in the world, accounting for over 70 % of global production ;
- **Manganese:** In 2022, Africa held over 58 % of global reserves. South Africa and Gabon are the world’s top two producers of manganese, contributing half of global production. Gabon is home to the world’s largest manganese mine ;
- **Chromium:** Africa is the world’s leading producer of chromium, with South Africa in the lead, followed by Zimbabwe ;
- **Platinum:** Platinum group metals (PGM) are mainly produced in South Africa, which is the world’s leading producer of palladium and platinum, with 43 % and 73 % of global production respectively (90 % of global platinum reserves are found in South Africa). Zimbabwe holds the world’s third-largest reserves.

Graph 1. Relative importance of Africa, 2018 to 2021 (%)



Source: USGS (reserves and production), UN Comtrade (exports), S&P (investment)

Africa is also present to a lesser extent in five other critical minerals.

- **Bauxite:** In 2022, Guinea held 23.8% of global reserves and accounted for a quarter of global production.
- **Copper:** there are significant deposits in southern Africa, in the DRC and Zambia (which hold the world's seventh- and eleventh-largest known reserves respectively), as well as in Mauritania, Mali, Morocco, and Egypt. Despite growth in copper production over the past decade, Africa accounts for just over 13% of global production. However, the DRC could become the world's second-largest producer when recently discovered mines become productive.
- **Graphite:** Africa accounts for 20% of global production and reserves, led by Mozambique. Numerous countries in East Africa (Tanzania, Madagascar) are set to become major additional producers with the opening up of several recently identified deposits in these countries.
- **Nickel:** Africa is currently a modest producer, mainly represented by South Africa and Madagascar. However, major deposits are known to exist in Tanzania and Burundi and could be exploited in the near future.
- **Zinc:** Africa accounts for just 4% of global production. South Africa accounts for 30% of African production, and its production continues to grow.

Over time, most of these projects could become a reality and operate on a permanent basis. For some less well-endowed countries, this could initially involve a modest expansion of their range of suppliers of products and services to mining companies (such as transport vehicles, spare parts, catering, and human resources). This expansion of supply could be accompanied by contractual local content requirements, which would encourage the use of local companies. While it would not necessarily have the status or economic potential of refining, this range of services would nevertheless help strengthen essential upstream local supply chains, while reinforcing the co-benefits of mining on the continent.

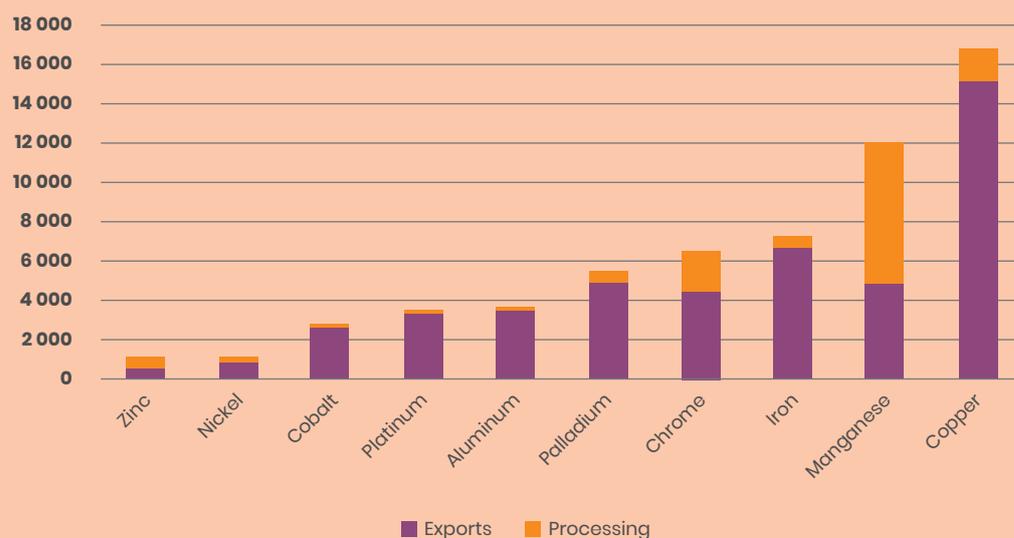
Too little mineral processing is currently carried out in Africa

With a view to deriving greater benefit from mineral resources, the development of a local mineral processing industry would enable producing countries to derive more profit from mining (which yields little in comparison with other stages of the value chain) and establish Africa's long-awaited industrialization. The example of copper is particularly illustrative of the challenges ahead.

An opportunity to use this shift in the balance of power to launch a new mineral processing agenda for Africa

The African continent's key position in particular critical minerals is prompting the governments of producing countries to offer investors the opportunity to process the minerals locally, in order to create greater added value and generate local or regional economic spin-offs. This policy dominates the agenda of the African Union's African Minerals Development Centre, which is responsible for the vision of the mining sector in Africa.

Graph 2. Production and exports in 2020 (in millions of USD)



Source: S&P and UN Comtrade

Copper processing

Little of the copper produced in Africa is exported in its raw form. The DRC and Zambia have significant capacity for smelting (the stage prior to refining). Copper is usually processed into anodes before being exported [1]. Both countries also have refining capacities.

However, this is not enough to develop processing activity, either in terms of the number of refineries on the continent or the refining capacity of the units. The cost of smelting ore (which transforms copper concentrate into metal) is currently very low internationally. This can benefit African producers who do not have their own smelters: they can send their concentrates abroad, particularly to China, for processing at a lower cost.

Zambia and the DRC process only a small proportion of their copper production. Furthermore, while mining production increased in the 2010s, the share of exports of semi-finished products declined. In 2017, exports of semi-finished products accounted for less than 2 % of Zambian copper exports by value. For the DRC, they were less than 0.5 %, compared with over 4 % between 2003 and 2005. South Africa is a smaller copper producer than Zambia and the DRC, but it exports more semi-finished products.

A continent not (yet) ready for battery production

The ambitions of some African countries extend to batteries for electric vehicles. Battery value chains will be more viable if there is a local market. Unfortunately, poor financial accessibility and a lack of infrastructure mean that the African market for electric vehicles is likely to remain limited for many years to come.

In the African market, there is greater potential for two- and three-wheeled electric vehicles, which use lithium, iron, and phosphate batteries. Industries based on battery chemistry could thus become viable. The required investment in cell manufacturing plants could

be facilitated by support for national manufacturers, new lithium discoveries, and regional coordination on lithium refining. Battery production projects are being developed in the DRC–Zambia–Zimbabwe area, with the aim of creating two- and three-wheeled electric vehicles for Africa.

Policies to encourage processing

Controlling exports

The challenge for the continent is to develop local mineral processing in order to create more added value in African economies. The strategy adopted by some African countries is to try to force the hand of mining companies by imposing restrictions on the export of unprocessed raw materials in order to favor local downstream industries. The number of restrictions similar to those imposed on bauxite and iron in Guinea, for example, or on raw chrome and lithium in Zimbabwe, has increased in Africa since 2009: there were almost 2,500 restrictions (export bans, quotas, taxes, or licenses) in 2021, compared with 1,000 in 2009.

Fliess *et al.* (2017) analyze the use of export control measures for manganese in Gabon, lead in South Africa, copper in Zambia, and chromite in Zimbabwe. The results suggest that these export restrictions intended to promote local processing are not effective. In addition, these measures can sometimes damage the overall performance of the industries as a result of the decline in exports of extracted minerals.

Promoting special economic zones (SEZs)

One major obstacle to local processing is finance: states need to attract investors to build factories, as is the case in Zimbabwe. Direct revenues could be higher if several countries joined forces to develop genuine reference industries. This is the context in which projects to create SEZs are emerging. Over the last ten years, dozens of new SEZs have been created to meet the needs of the mining industry.

[1] The DRC was even contemplating banning exporters of raw minerals.

In South Africa, for example, the Platinum Valley Initiative is looking to revolutionize the production of hydrogen fuel cells in Africa. The United Nations Economic Commission for Africa (UNECA) and the African Export-Import Bank (Afreximbank) recently signed a framework agreement to establish an SEZ for battery and electric vehicle production in the DRC and Zambia.

Growing the local market

An additional challenge to the emergence of a processing industry is the lack of a local market sufficiently large to justify creating and developing processing units and local value chains. No single African country possesses all the minerals required for battery production. Pooling their mineral supplies could help achieve the scale required. The agenda of the African Continental Free Trade Area (AfCFTA) could provide an attractive framework for such processing.

By supporting intra-African trade in processed minerals, the AfCFTA could also help advance Africa's industrialization and reduce its dependence on imported commodities.

But major obstacles in terms of infrastructure

The high energy requirements of processing plants represent a major obstacle for many African countries. Would the development of a local processing industry with an international outlook be to the detriment of the population's needs? While extraction consumes relatively little energy (34 kWh per metric ton for bauxite, for example), the processes that transform the ore into refined products are usually very energy-intensive (over 3,000 kWh per metric ton of refined product for bauxite, according to Farjana *et al.*, 2019). This is why most large mineral refineries are located in places where energy is available and inexpensive: for example, hydroelectricity in Brazil and Canada, coal in Australia and China, and natural gas in Bahrain and the United Arab Emirates.

The other obstacle is inadequate overland transport. Transporting minerals in bulk involves high costs and specific logistics chains (trains, containers, trucks, storage areas, specialized port facilities, inspection and customs gates, etc.). Transport networks in Africa are often old or non-existent and need to be restored or created from scratch to support current traffic and absorb new, very large flows of minerals.

Conclusions and recommendations

The African continent's prospects for value creation are encouraging, but they cannot be taken for granted. To succeed, the continent needs to strengthen its position on the mineral raw materials market, exploit its comparative advantages (notably its low greenhouse gas emissions), and improve its infrastructure, energy systems, and general investment conditions.

Africa faces two emerging risks, however. The first of these is an **industrial risk** arising from possible rapid technological developments, particularly in the field of batteries. The other is a **commercial risk** from the rise of "green protectionism" within the major economies, expressed in particular through the Inflation Reduction Act (IRA) in the United States and the Critical Raw Materials Act in the European Union. These initiatives to favor domestic industries could put African countries at a disadvantage. Alliances therefore need to be built both between African countries and at the international level. Europe, Japan, and the United States are making increasing numbers of offers of "win-win" partnerships that will have to be judged over time.

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