



THE  
AFRICAN  
CLIMATE  
FOUNDATION

**GEOPOLITICS OF  
CRITICAL MINERALS  
IN RENEWABLE ENERGY  
SUPPLY CHAINS**



## THE CONTEXT

Addressing the climate change crisis calls for an accelerated deployment of renewable-energy technologies – solar panels and wind turbines – as well as a shift towards electric vehicles (EV) (Bainton et al., 2021). The manufacturing of these technologies, however, relies on the availability and supply of different types of critical minerals. Lithium, nickel, cobalt, manganese and graphite are crucial to battery performance, longevity and energy density. Rare earth elements (REEs) are essential for permanent magnets, which are vital for wind turbines and EV motors. Electricity networks need a huge amount of copper and aluminium, with copper being a cornerstone of all electricity-related technologies (IEA, 2021). The production of lithium and cobalt may increase by 500% by 2050 to meet clean energy demand alone. The bottom line is that clean-energy technologies and related infrastructures require more minerals (World Bank, 2017 and 2020).

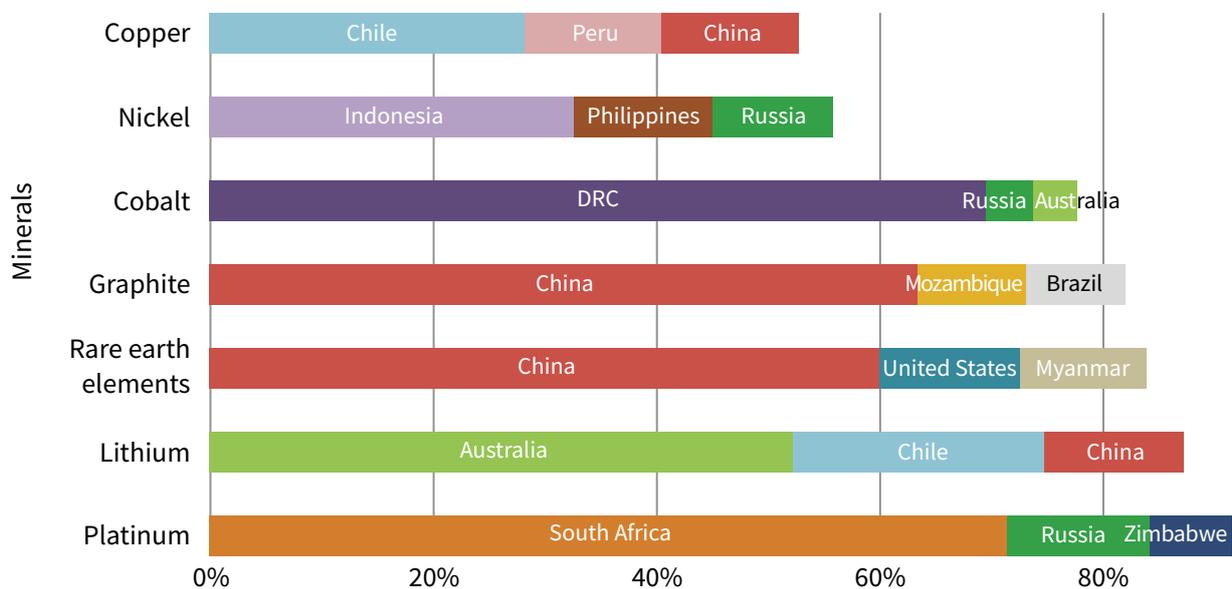
This growing demand for critical minerals is also fuelled by the increasing role of information and communications technology (ICT) and of digital technologies in industrialisation (UNIDO, 2020). Digital devices (and their components) such as computers, mobile phones and networks (and microchips, integrated circuits and fibre optical cables) are made of ‘functional elements’ including gallium, germanium, indium, (REEs), selenium, tantalum and tellurium (UNCTAD, 2020). Soaring prices of critical minerals and REEs already reflect an increasing global demand. For example, in global markets, the price of lithium has more than tripled since 2010, going from US\$180 to US\$17 000 per metric ton in 2021 (Statista, 2022).

*Lithium, nickel, cobalt, manganese and graphite are crucial to battery performance, longevity and energy density.*

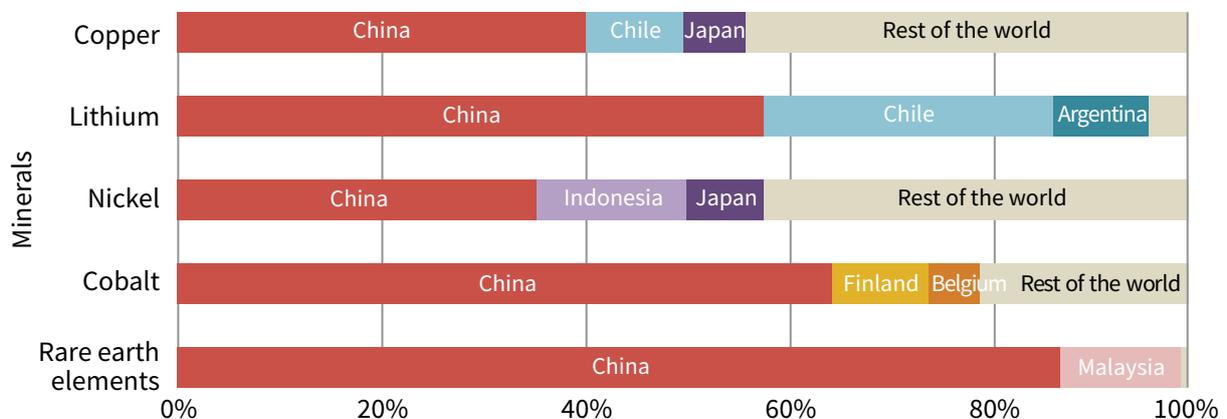
The high geographical concentration of these critical minerals (Figure 1a) – and the increasing and competing demand across countries – have spurred a renewed attention for the geopolitics of mineral rights; that is, how states acquire these rights and how they are managed by the countries in which these critical minerals are concentrated. In the cases of lithium, cobalt and rare earth elements, the world’s top three producers control well over three-quarters of global output. Since 2010, China has halved its export quotas for rare earths (Figure 1b). More recently, in 2019, China used the control on global supply of rare earths as a strategic weapon in its trade dispute with the United States of America (US). The US, the European Union (EU) and Japan have also embraced policies, such as the US’s *Prosper Africa Initiative*, to secure future access to critical minerals (Kalantzakos, 2020; Hook and Sanderson, 2021; Nakano, 2021).

**Figure 1: Production and processing of critical minerals, 2019**

*1a: Share of top three producing countries in total production for selected critical minerals, 2019*



*1b: Share of processing volume by country for selected critical minerals, 2019*



Source: IEA, 2021:30-31

The African continent is increasingly becoming a battlefield in the race among superpowers to secure access to critical minerals, with companies from China and Russia playing a major role (Cohen, 2022). As seen in Figure 1b, several African countries are endowed with large amounts of strategic critical minerals resources. For example, 70% of global cobalt production comes from the Democratic Republic of the Congo (DRC), and over 80% of the world's known platinum and manganese resources are in South Africa and Zimbabwe. South Africa is also a major supplier of ruthenium, iridium and rhodium (with the EU being particularly dependent on them). Gabon is also a major producer of manganese. Mozambique and Tanzania have significant reserves of graphite, and the DRC and Zambia are important sources of copper.

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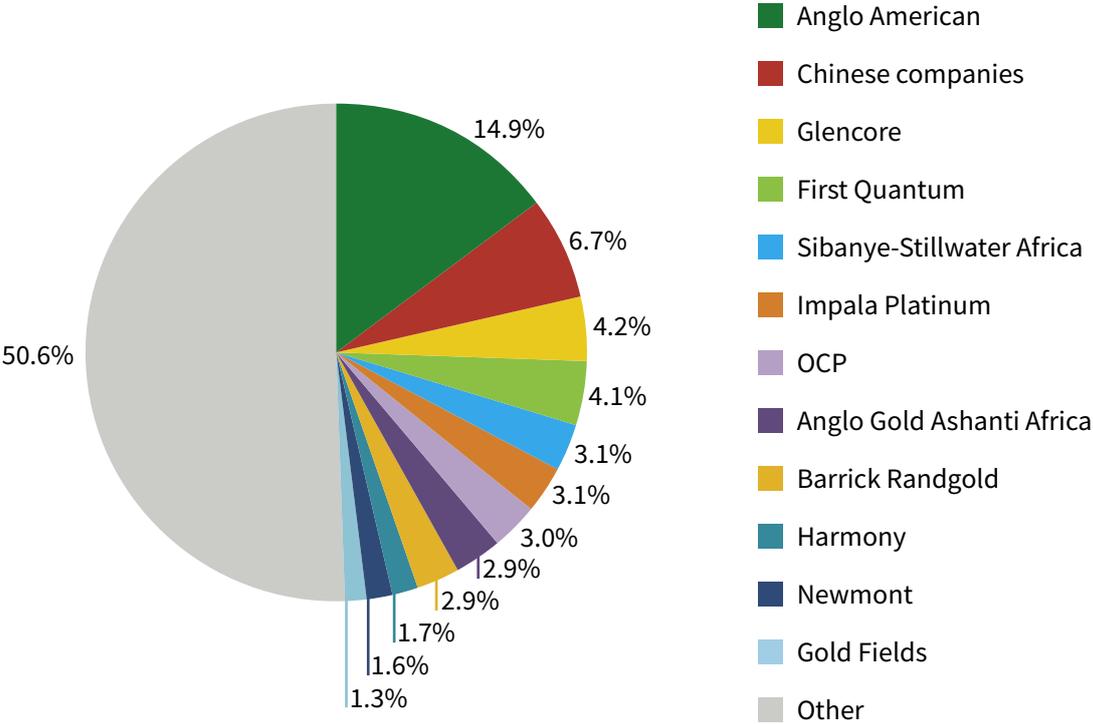
Over the last two decades, China's control over producing mines in Africa has evolved significantly (Ericsson et al., 2020). In 2010, Chinese companies operated in Ghana, South Africa, Zambia and Zimbabwe. In 2013, new copper mines were opened in DRC, and manganese production started in Gabon. Mining activities under control of Chinese companies accelerated between 2013 to 2018, to reach almost 7% of the total value of African mines by the end of the period. This figure peaks in countries like the DRC (24%) and Zambia (12%), where Chinese companies were more able than transnational competitors to bear the country risk and revamp production in high-grade copper deposits which had been abandoned by nationally owned companies (e.g. Gecamines in the DRC). In the DRC, Chinese companies control 41% of cobalt production, as well as around 28% of copper in the DRC and Zambia.<sup>1</sup>

In other African countries, Chinese penetration has reached even higher levels, although total value of mining production is smaller (e.g. in Gabon, 25% of manganese production is controlled by China International Trust and Investment Corporation (CITIC); in Guinea and Eritrea, Chinese companies control around 40% of mining production). Moreover, in countries like Ghana, Namibia, and South Africa, while Chinese companies are present, they mainly control junior mines, and their total production is limited in comparison with the national mine production (Ericsson et al., 2020; Andreoni and Torreggiani, 2020). The lion's share of mining production is still controlled by large transnational corporations. For example, in the case of copper production, in 2018 three transnationals controlled more (or similar) shares of copper production than Chinese companies at 28% – i.e., Glencore (20%), Barrick (22%) and First Quantum (25%). In fact, Ericsson et al. estimates that corporate control over total African mine production (including all minerals, not just critical mineral and REEs) is still largely controlled by Glencore and Anglo American, whose combined shares account for two-thirds of total mining production (see Figure 2) (Ericsson et al., 2020).

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<sup>1</sup> Copper, bauxite, cobalt, zinc, gold, manganese, chromite and uranium, in that order, are the economically most important metals controlled by Chinese companies in Africa. China controlled share of African mining production is around 28% for copper, 82% for bauxite, 41% for cobalt and 40% for uranium (Ericsson, et al. 2020).

Figure 2: Corporate control over total African mine production 2018



Source: Ericsson et al., 2020:177 (first source: RMG Consulting)

More specifically for critical minerals, alongside these established players, we have also witnessed the direct or indirect entrance of new transnational corporation such as Tesla. In January 2022, Tesla signed an agreement with Australia’s Syrah Resources, which operates one of the world’s largest graphite mines in Balama, Mozambique. This is the first attempt by Tesla to ramp up its manufacturing capacity of lithium-ion batteries and reduce its dependence on critical minerals from China. It is also part of a geopolitical move by the US, which wants to build enough domestic capacity in the manufacture of batteries. More recently, in June 2022, Tesla reached a new cobalt deal with Glencore to manufacture lithium-ion batteries in Gigafactories in Berlin and Shangai (Hale, 2022).

In all these African countries, the governance of mineral rights and rents is central to the political economy of their mineral–energy complex. In most of the cases, critical minerals are extracted by international mining companies orchestrating complex global value chains and backed up politically (and, in some cases, also financially) by foreign country governments. Bilateral agreements among countries and international trade agreements provide the legal framework under which critical mineral rights have been framed and

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enforced. It is against this geopolitical scenario, and in view of the strategic role of critical minerals in the next digital and green industrial revolution, that African countries have an opportunity to leverage their resources to drive a process of sustainable and inclusive structural transformation, and leapfrog into renewable energy technologies.

Three main factors determine the potential developmental outcomes of critical minerals industry development in Africa. The first is the extent to which governments recognise the strategic value of these critical minerals for domestic and regional industrialisation and production linkages development. By locating domestic strategies as part of regional industrial development plans, African countries can exert more bargaining power and realise greater cluster and scale economies. The second main factor is the extent to which governments are not captured by particular interests and are willing and capable to negotiate mineral rights conditions as part of a domestic industrial policy for structural transformation. In this respect, the introduction of conditionalities on localisation, technology sources and complementary investments is essential. The third main factor is the extent to which governments can manage the geopolitics of critical minerals, and hence identify strategic global alliances for domestic productive development.

These three factors unfold along different production-processing value chains for critical minerals, where relationships are defined mainly by direct ‘state–companies conditionalities’, often mediated by foreign states, as well as ‘state–state conditionalities’ as part of strategic alliances. Furthermore, each critical mineral presents a different set of challenges in ensuring socially and environmentally sustainable supply and mutually beneficial outcomes across stakeholders. These conditionalities will be illustrated with references to the case of South Africa within southern Africa and, specifically, the opportunities offered by the concentration of platinum group metals (PGM), including iridium, osmium, palladium, platinum, rhodium and ruthenium.

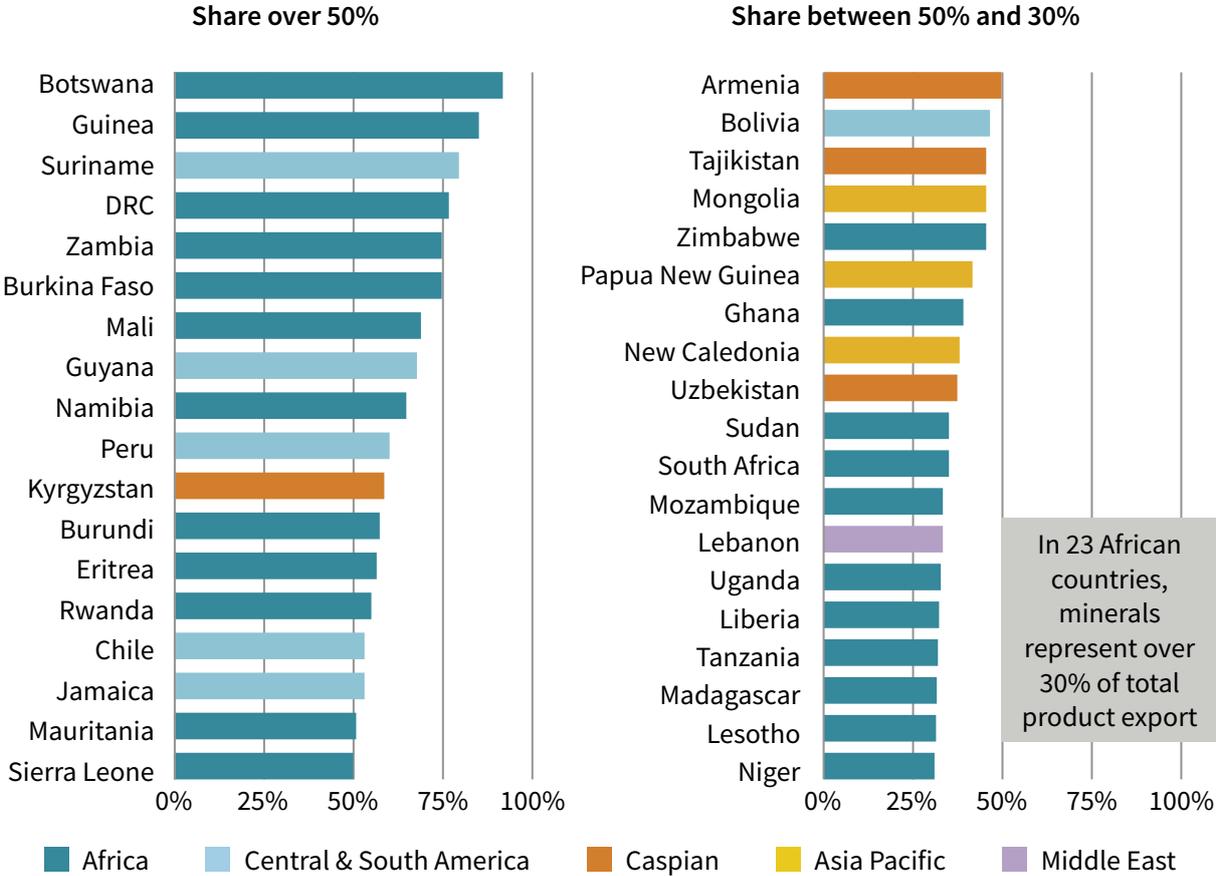


## POLITICAL ECONOMY OF CRITICAL MINERALS AND SUSTAINABLE INDUSTRIAL DEVELOPMENT IN AFRICA

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Across developing economies, especially in Africa, the mineral–energy complex is central to the countries’ political economy (Page and Tarp, 2020). Exports of mineral and metals account for over 30% of total product export for 23 African countries, reaching peaks of over 75% for countries like Botswana, the DRC and Zambia (Figure 3). Furthermore, for many countries the mining sector is the main source of foreign direct investment (FDIs) and a major stream of mineral rents on which governments depend. Most governments collect revenues through a combination of royalties and corporate income tax, and sometimes with the state taking a non-controlling ownership stake in projects where they receive dividends from corporate profits. The management of these rents is challenged by widespread tax competition among countries and profit-shifting by multinational companies (IMF, 2021). Moreover, governments have traditionally struggled to collect and direct these mineral rents toward a structural transformation agenda and broader diversification of the economies (Hirschman, 1977). There are historical cases showing how an abundance of mineral resources does not have to lead to a ‘resource curse’ (Andreoni, 2016); however, in most African countries, the mining sector has so far played a limited transformative role if looked at from a structural transformation perspective (Andreoni et al., 2021a). Even in the case of South Africa, a country with a diversified ecosystem of technologically advanced mining equipment companies, the development of this manufacturing sector has been challenged by both domestic and global power asymmetries along value chains and by increasing global concentration trends (Andreoni et al., 2021b).

Figure 3: Mineral and metals dependence (share in total product export), 2019



Source: IEA, 2021:227

In 2009, the African Union (AU) put forward the *Africa Mining Vision* to ensure that Africa utilises its mineral resources strategically for broad-based, inclusive industrial development. This vision prioritised several intervention areas including: (i) improving the quality of geological data; (ii) improving contract negotiation capacity; (iii) improving the capacity for mineral sector governance; (iv) improving the capacity to manage mineral wealth; (v) addressing Africa’s infrastructure constraints; and (vi) elevating artisanal and small-scale mining.

However, implementation has been slow and there is a low level of awareness of the framework among key stakeholders in the mineral sector (Oxfam, 2017). At national level, while governments have increasingly introduced local content requirements, their implementation and enforcement have been limited, and conditionalities have been mainly attached to loosen local content requirements without significant strategic vision. Recently, African governments’ awareness of the strategic value of critical minerals for domestic and regional industrialisation and production linkages development has been growing. In countries like South Africa, for example, it is becoming increasingly clear that moving away from coal towards an energy system powered by renewables will require the development of a material-supplying system (Andreoni et al., 2022). As stressed by both government and businesses in the recent African Mining Indaba in 2022 in Cape Town, PGM and hydrogen are central for energy transition projects (NBI, 2021; Mackay, 2022). This increasing awareness, however, has not at this stage translated into a targeted industrial policy with clear directionality and implementable conditionalities.

While the mining sector and critical minerals development have not delivered their transformative potential yet, in most African countries the ‘dark side of the energy transition’ (Marin and Goya, 2021) has become increasingly visible: local pollution of soil, air and water; the disposal of toxic residuals; intensive use of water and energy (IEA, 2021); work and environmental risks; child labour and sexual abuse (Sovacool, 2021); and corruption and armed conflict (see Table 1). These problems are also at the core of the political economy of these countries and state legitimisation in the face of geopolitical pressures. These social and environmental problems are doomed to become increasingly unsustainable given the increasing pressure on critical minerals extraction from the major industrialised economies.

**Table 1: Selected sustainability challenges related to critical minerals for energy transition**

Areas of risks		Description
Environment	Climate change	<ul style="list-style-type: none"> <li>• With higher greenhouse gas emission intensities than bulk metals, production of energy transition minerals can be significant source of emission as demand rises.</li> <li>• Changing patterns of demand and types of resource targeted for development pose upward pressure.</li> </ul>
	Land use	<ul style="list-style-type: none"> <li>• Mining brings major changes in land cover that can have adverse impacts on biodiversity.</li> <li>• Changes in land use can result in the displacement of communities and the loss of habitats that are home to endangered species.</li> </ul>
	Water management	<ul style="list-style-type: none"> <li>• Mining and mineral processing require large volumes of water for their operations and pose contamination risks through acid and mine drainage, waste water discharge and the disposal of tailings.</li> <li>• Water scarcity is a major barrier to the development of mineral resources: around half of the global lithium and copper production are concentrated in areas of high water stress.</li> </ul>
	Waste	<ul style="list-style-type: none"> <li>• Declining ore quality can lead to a major increase in mining waste (e.g. tailings, waste rock); tailings dam failure can cause large-scale environmental disasters (e.g. Brumadinho dam collapse in Brazil).</li> <li>• Mining and mineral processing generate hazardous waste (e.g. heavy metals, radioactive material).</li> </ul>
Social	Governance	<ul style="list-style-type: none"> <li>• Mineral revenues in resource-rich countries have not always been used to support economic and industrial growth and are often diverted to finance armed conflict or for private gain.</li> <li>• Corruption and bribery pose major liability risks for companies.</li> </ul>
	Health and safety	<ul style="list-style-type: none"> <li>• Workers face poor working conditions and workplace hazard (e.g. accidents, exposure to toxic chemicals).</li> <li>• Workers at artisanal and small-scale mine (SAM) sites often work in unstable underground mines without access to safety equipment.</li> </ul>
	Human rights	<ul style="list-style-type: none"> <li>• Mineral exploitation may lead to adverse impacts on the local population such as child or forced labour (e.g. children have been found to be present at about 30% of cobalt ASM sites in the DRC).</li> <li>• Changes in the community associated with mining may also have been an unequal impact on women.</li> </ul>

Source: IEA, 2021:9

Governments across African countries are therefore challenged from multiple directions, with conflicting claims and trade-offs which in many cases are exacerbated by lack of effective regional coordination. By locating domestic strategies as part of regional industrial development plans, African countries could exert more bargaining power and realise greater cluster and scale economies. The United Nations Economic Commission for Africa (UNECA) has identified several opportunities for the development of regional value chains that cut across central Africa into east and southern Africa for battery-minerals and electric-vehicles. In February 2021, in the Africa Business Forum, the establishment of an African Battery Alliance was launched, a regional development model which has been already developed for batteries and hydrogen technologies across Europe.

In March 2022, the DRC joined the EAC. While EAC laws and regulations will take time to come into effect, this move could play an important role given the DRC's major role in mining of critical minerals, the new trade and port routes opened, and the aspiration of the entire region to develop its limited industrial base and provide jobs for its growing population (e.g. Tanzania alone is expected to reach 90 million by 2030).

South Africa is the country in the continent where some of these opportunities are materialising rapidly – namely, in the development of a lithium-ion battery (LIB) value chain for sustainable mobility and just transition. Moreover, given its central role in the Southern African Development Community (SADC) region, there is potential for regional industrial integration of these minerals, notably through the implementation of the SADC Industrialisation Strategy and Roadmap 2015–2063, and the recent implementation of the African Continental Free Trade Agreement (AfCFTA). The SADC countries produce graphite (Mozambique and Tanzania), nickel (Botswana and Zimbabwe), titanium (Mozambique and Madagascar), among other minerals.

A recent report by Trade & Industrial Policy Strategies and the United Nations Industrial Development Organization (TIPS and UNIDO, 2021:64) points out that ‘mining of multiple LIB-relevant minerals, such as manganese, iron ore, nickel, and titanium, is already underway in [South Africa and] the region. Mineral beneficiation for battery production, while limited, is also present in the country, with existing pockets of excellence in manganese and aluminium and interesting developments in lithium, nickel and titanium. Importantly, battery manufacturing (off imported cells) and battery refurbishing (second-life batteries) is a booming opportunity with many firms operating in this space, leveraging unique expertise and intellectual property, notably in the development of battery management systems. By contrast, cell manufacturing, while explored at the R&D level, is yet to be proven commercially viable in the country. Similarly, the development of recycling is still early days in the country. The bottom line is that while pockets of technological capabilities and productive opportunities exist in South Africa, the value chain is still emerging and remains disarticulated, with different levels of development along the chain. Outside South Africa, domestic technological capabilities in mining value chain are limited to some extraction activities and processing of concentrates; however, high-value downstream activities such as manufacturing of batteries are almost not existent.’

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The development of the lithium-ion batteries value chain can follow at least four pathways: (i) battery manufacturing; (ii) mineral refining; (iii) cell manufacturing; and (iv) battery recycling. Each of them can be integrated over time. The TIPS-UNIDO study noted that developing battery manufacturing and mineral refining is ready for scale-up, while cell manufacturing and recycling could be explored in the medium to long term, provided they prove to be economically sustainable. These industrial and technological development pathways are, however, dependent on the developmental governance of critical minerals – that is, the extent to which governments are not captured by particular interests, and are willing to, and capable of, negotiating mineral rights conditions as part of a domestic industrial policy for structural transformation. The promotion of domestic productive capabilities has to take into account the fact that critical minerals-based industries are dominated by a few global giants.

China is the dominant player in manufacturing LIBs, with three-quarters of production capacity. Panasonic and Contemporary Amperex Technology (CATL) are the leading manufacturers of LIBs, while the cell manufacturing market is dominated by LG Chem, BYD Auto and Panasonic. Similarly, the supply of cathodes, anodes, separators, electrolytes and electrolyte salts is concentrated in a few countries (China, Japan, South Korea and the US) and a limited number of firms. Correspondingly, looking at patents related to climate-change mitigation in transport and LIBs in particular, the landscape is heavily dominated by a few countries (the US, Japan, Germany, South Korea, France, China and the United Kingdom) (TIPS and UNIDO, 2021).

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## DEVELOPMENTAL GOVERNANCE OF CRITICAL MINERALS IN AFRICA VIA INDUSTRIAL POLICY

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Creating and capturing value from critical minerals requires a developmental governance framework, government capabilities to design and implement it, and a developmental distribution of power and interests' alignment which makes its enforcement feasible (Andreoni et al., 2021a). At the core of any industrial policy for inclusive and sustainable industrial development, governments need to set both 'ex-ante' and 'ex-post' conditionalities which direct, incentivise and regulate the use of natural resources. In the context of critical minerals, directing investments and shaping the mining industry development is particularly important and urgently needed, before market forces, incumbents and rents positions are further consolidated.

Conditionalities include selection, incentives as well as disciplining mechanisms. They can operate ex-ante when they define the specific conditions under which investments can be made; for example, which types of companies can invest, the risks-rewards conditions of the investment, the business model to be followed, which social and environmental standards should be followed, etc. These ex-ante conditionalities are essential, as their strategic design can reduce adverse selection in state-companies relationship, hence making enforcement and disciplining more feasible. Given that many of the companies with capabilities in processing and developing critical minerals are international, and often backed up by their governments, ex-ante conditionalities can be used to trigger a 'race to the top'.

As an example, a Sustainable Development Licence to Operate (SDLO) has been suggested (Pedro, 2021). For many years, the extractive industry focused on securing a social licence to operate as a measure to placate social tensions and mitigate environmental damage at the operational level, mostly from local communities and other stakeholders. SDLO 'repositions the license to operate from the immediate site-specific project needs to instead approach this as an inter-connected global system anchored on the need to foster shared value creation and promote just transitions [...] It's anchored on joint responsibility and on the quadruple-bottom-line approach to measure success not only on the basis of financial returns but also on the observance of the highest environmental, social, and governance standards.' standards.' (Pedro, 2021). Such ideas recognise how these conditionalities must be more stringent and go far beyond corporate social responsibility (CSR) minimum standards.

A mix of ex-ante and ex-post conditionalities can be also introduced by the government to give directionality to business technology decisions, incentivise as well as discipline their sourcing and localisation decisions, and reward complementary investments. In the mining sector, state–company relationships have been often framed in terms of localisation policies. Various policy instruments aimed at increasing local use of locally available products and services have been used in the traditional mining industry, and could be further adapted and developed for critical minerals if purposefully designed.

One of the key objectives of local content and capacity building policies in countries hosting mining operations is the development of upstream supply chains at the domestic level to respond to procurement needs of mining companies in core and non-core products and services. Local content requirements obviously influence the procurement strategies of both mining companies (e.g., first-level procurement) and original equipment manufacturers (OEMs) (e.g., second-level procurement) and might lower barriers for local companies to enter, upgrade and consolidate along the supply chain. If properly formulated, implemented and monitored, they can effectively reduce competitive pressure from imported inputs for local suppliers and create immediate employment opportunities. Otherwise, the risk is that they can end up undermining these objectives in the long run: on the one hand, if poorly designed and enforced, they might lead to potential distortions, penalising many leading local companies and creating pockets of unproductive rents-capture for a small group of players; on the other hand, if their enforcement along the entire supply chain is not properly monitored, they can prove simply ineffective. To avoid such shortcomings, localisation conditionalities should be developed focusing on their ‘policy functions’ – i.e., inclusive and sustainable industrialisation – more than simply their ‘policy form’ – i.e., a certain undifferentiated threshold of local content.

In the context of South Africa, for example, suggestions have been advanced to improve local content conditionalities by linking them to export promotion (Andreoni and Torreggiani, 2020). These suggestions are articulated around: (i) the introduction of a list of specific categories of procurement reserved for local suppliers based on quantity, quality and price competitiveness parameters; (ii) selective reforms of tariff schedules; and (iii) offering domestic companies the opportunity of contributing to increasing domestic value addition, either by increasing the local content of their products and services in the domestic market or by increasing the value of their products and services in the international export market. As for the latter, companies would be allowed to import more of the products they need, to the extent that they also increase the local content value of the exported products, technology transfer or manufacturing invest in complementary segments of the value chain.

Given the mounting pressures around critical minerals, however, the setting up of these state–companies conditionalities will not happen in a geopolitical vacuum. This means that agreements between African governments and international companies will be often mediated by global superpowers, their geopolitical interests and national security priorities. The lack of coordination and fragmentation among African countries has played in favour of global superpowers so far. A shift towards bilateralism, instead of multilateralism, and stringent international trade and investments regimes reducing policy space in developing countries have been dominant features of the last two decades (Andreoni et al., 2018). This is why state–companies conditionalities can only be effective to the extent that multilateral state–state conditionalities and bilateral strategic alliances across regional economies are introduced.



## EMERGING GEOPOLITICS OF CRITICAL MINERALS AND NEW STRATEGIC ALLIANCES

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Critical minerals have gained centre stage in geopolitics, especially in the increasing competition between the US and China (Kalantzakos, 2020). Specifically, China's strategic control over global critical mineral supply chains (midstream and downstream capacities in particular), and absolute dominance in REEs, are perceived in the US as two of the largest strategic vulnerabilities of the US and her allies since the Arab oil embargo-triggered energy security crisis of the 1970s (Cohen and Grant, 2021). REEs used in consumer electronics and military equipment are available worldwide, but deposits containing economically usable concentrations are less common, thus reducing the number of financially feasible extraction projects. Similar narratives, although more nuanced, have been raised in the EU and Japan. While the US appears most concerned about import dependence that can be exploited geopolitically, the EU and Japan appear primarily concerned with the effects of supply disruptions on their industrial competitiveness (Nakano, 2021). Critical minerals, REEs in particular, have become a matter of national economic and military security, fuelled by anti-China rhetoric.

In recent years, the 'critical minerals' geopolitical space has been shaped by, and framed within, a series of offensive and defensive initiatives led by global industrial superpowers. In the US, in 2019, on the back of the President's Advisory Council on Doing Business in Africa (PAC-DBIA) report of 2017, the *Prosper Africa Initiative* was launched. The report emphasised that efforts by US companies to secure business contracts in the mining critical mineral sector across Africa were being undermined by foreign competitors, mainly China, and its *Belt and Road Initiative* (BRI). This initiative was substantially re-launched and re-framed in 2021, given the lack of progress and uptake from US companies. In July 2021, the Biden administration announced that it will 'reimagine' *Prosper Africa* to expand US-African business cooperation also in light of the 100-Day Supply Chain Review. Under the renamed *Africa Prosper Build Together Campaign*, Biden requested US\$80 million to focus on clean energy, women and equity, and transportation infrastructure.

China has taken the lead on the African continent. China has enjoyed trade relations with African nations for decades, starting with Beijing's support of anti-colonial movements during the Cold War. These relationships evolved into trade ties, FDI and infrastructure projects. The US's US\$80 million investment is marginal compared to the Chinese investment into Africa of US\$60 billion; however, it is not simply a matter of quantum. China has adopted a more strategic approach, both internationally through the BRI, and nationally with the formation of national champions with a global dominant position.

The BRI has opened the way to important investments and acquisition of mining sites. For example, in 2016 the Chinese company China Molybdenum bought the Tenke and Fungurume copper and cobalt mine in DRC from the US company Freeport-McMoRan for US\$2.65 billion. With the increasing demand for these critical minerals, in 2021, China Molybdenum controls more than one-tenth of the world's cobalt. This was made possible thanks to the strategic acquisition of the gigantic deposit in the DRC (Hook and Sanderson, 2021). At the domestic level, the industry has also been consolidating along the value chains of critical minerals. Notably, in December 2021, China's main mineral mining company China Minmetals Rare Earth Co. announced a merger with two other firms, Chinalco Rare Earth & Metals Co. and China Southern Rare Earth Group Co., creating a global force in the strategic industry (Daly, 2021).

Other minor actors are operating on the African continent. For example, the Russian private security contractor Wagner has capitalised on mineral and mining operations sales. The Wagner group uses its military tactics to support governments in times of conflict – and in return has benefited from lucrative mining deals and special diplomatic status within countries. Russia plans to continue to spread its influence within the region through Private Military Companies (PMC) operations (Cohen, 2022). Geopolitical competition has centred in Northern and Western Africa, where China and Russia are mining and processing REEs. Other global powers – EU and Japan – are catching up with some bilateral and regional-multilateral initiatives, though their presence is significantly less relevant.

For African economies, this evolving scenario presents both threats of a new wave of colonisation driven by global energy transition, but also opportunities to leapfrog into sustainable industrialisation. No individual countries on the continent have the power to shape this evolving geopolitical scenario, although strategic alliances at the regional level structured around state–state conditionalities can prevent a race to the bottom characterised by social and environmental exploitation. State–state conditionalities should not be limited to contain damage. They should be thought in view of a national, regional, and continental agenda for inclusive and sustainable industry-led structural transformation. The same superpowers that present a new colonisation threat can play a developmental supportive role via technology transfer, investments and infrastructure development, if state–state conditionalities are strategically managed.

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## SUMMARY

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Critical minerals are the material backbone of the new techno-energy paradigm, playing an essential role in the manufacturing of digital and sustainable energy technologies and infrastructures. Several African countries are endowed with large deposits of critical minerals and REEs. If strategically managed, these natural resources can offer African countries a unique opportunity to kick-start a process of sustainable and inclusive structural transformation and, in some cases, leapfrog into renewable-energy technologies. In this policy brief we have stressed how three main factors will determine the potential developmental outcomes of critical minerals industry development in Africa. Governments across Africa must recognise the strategic value of these critical minerals for domestic and regional industrialisation, but also the fact that transnational companies and industrialised countries are exercising their geopolitical influence and power to control critical minerals. The exploitation of these critical minerals, in both upstream and downstream industries, are scale- and capital-intensive investments requiring significant organisational and technological capabilities. Without developing some of these capabilities, the value from critical minerals will remain captured by major international players.

Various types of conditionalities on localisation, technology sources and complementary investments should be introduced as essential components of a new resource-powered and industry-led structural transformation vision for Africa. This vision must be translated in a joined-up approach to industrial policy that incorporates energy and mining sector strategies, as well as leveraging state regulatory and competition policy powers<sup>2</sup>. While ex-ante and ex-post conditionalities can direct, incentivise and regulate the use of natural resources, the enforcement of these conditionalities will be only feasible if developmental coalitions are built and their interests aligned around critical mineral for structural transformation. For African governments, this means locking domestic and international companies' interests to domestic projects of beneficiation, investments in domestic technological capabilities development, and indigenous innovation along the entire mining value chain. It also means targeting co-location of industrial investments around

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<sup>2</sup> In a similarly highly concentrated setting, the one of digital platforms, we advance an entrepreneurial-regulatory state framework to shape and govern the process of value creation, capture and extraction – see Andreoni and Roberts (2022).

mining sites, building on new value propositions leveraging mining resources, abundant renewable energy potential and growing markets. For example, with the increasing role of green hydrogen, African countries might become ideal sites for advancing a new critical minerals-renewable energy complex. Joint ventures and co-ownerships of mining sites for critical minerals should focus on the potential for inclusive and sustainable industrialisation of these resources, more than simply short-term royalties.

State–companies conditionalities can only be effective to the extent that multilateral state–state conditionalities and bilateral strategic alliances across regional economies are introduced. As shown, the increasing multi-polarity in the geopolitics of critical minerals provides African countries more leveraging power. This leveraging power is essential to negotiate developmental conditions with transnational companies, whose presence in African countries is mediated and financially backed up by nation states. Regional-level initiatives across existing African trade blocks could play an important role. However, fragmentation of interests and divisions have prevailed so far, even in those blocks which have reached higher levels of integration on paper; the East African Community (EAC) is an example.

We can expect that a mix of state–companies and state–state conditionalities at both the global and regional levels will shape the new architecture for the extraction and development of critical minerals. Moreover, the increasing demand for critical minerals driven by digitalisation and renewable energy will likely open the way to a new commodity boom cycle. The extent to which – differently from the past – this new cycle will fuel domestic consumption and imports vis-à-vis domestic productive investments, jobs and export will be critical for many African countries. Inter-temporal trade-offs must be managed and, alongside industrial, energy and competition policies, an important role will have to be played by macroeconomic and trade policies to manage the impact of such commodity cycle.

*The extent to which – differently from the past – this new cycle will fuel domestic consumption and imports vis-à-vis domestic productive investments, jobs and export will be critical for many African countries.*

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## ABOUT THE AFRICAN CLIMATE FOUNDATION (ACF)

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The African Climate Foundation, established in 2020, is the first African-led and -based strategic grantmaker and think-tank working at the nexus of climate change and development in Africa.

## ABOUT THIS SERIES

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The ACF commissioned a series of expert briefs undertaken for its Energy Access and Transitions Programme, focused on specialised topics on the political economy of Africa's power sector transformation, and the opportunities and challenges for scaling renewable-based electrification.

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## ABBREVIATIONS AND ACRONYMS

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<b>ACF</b>	African Climate Foundation
<b>AfCFTA</b>	African Continental Free Trade Agreement
<b>AfDB</b>	African Development Bank
<b>AU</b>	African Union
<b>BRI</b>	Belt and Road Initiative
<b>CSR</b>	Corporate social responsibility
<b>DRC</b>	Democratic Republic of the Congo
<b>EAC</b>	East African Community
<b>EU</b>	European Union
<b>EV</b>	Electric vehicles
<b>FDI</b>	Foreign direct investment
<b>IEA</b>	International Energy Agency
<b>ICT</b>	Information and communications technology
<b>IMF</b>	International Monetary Fund
<b>LIB</b>	Lithium-ion battery
<b>OEM</b>	Original equipment manufacturers
<b>PAC-DBIA</b>	President's Advisory Council on Doing Business in Africa
<b>PGM</b>	Platinum group metals
<b>PMC</b>	Private Military Companies
<b>REE</b>	Rare earth elements
<b>SADC</b>	Southern African Development Community
<b>SDLO</b>	Sustainable Licence to Operate
<b>TIPS</b>	Trade & Industrial Policy Strategies
<b>UNECA</b>	United Nations Commission for Africa
<b>UNEP</b>	United Nations Environment Programme
<b>UNIDO</b>	United Nations Industrial Development Organization
<b>US</b>	United States of America



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