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A Special Focus on Africa's Critical Minerals*

Enhancing Sustainability in Africa's Critical Minerals Sectors

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1. Introduction

Critical minerals mining in Africa plays a crucial role in the global economy, supplying essential resources for advanced technologies. The continent is endowed with abundant deposits, nearly 30 per cent of the world's share of vital minerals, including cobalt, lithium, manganese and graphite, which are indispensable for producing electric vehicles and renewable energy systems. The demand for critical minerals for these technologies is projected to increase fivefold over the next decade.

The mining sector already plays a crucial role in the economies of many Sub-Saharan African (SSA) countries, significantly contributing to their Gross Domestic Product (GDP), export earnings, government revenues and employment opportunities. This sector has the potential to drive further economic growth and development across the continent. However, the production and extraction of minerals are highly geographically concentrated, which poses challenges related to resource scarcity, supply chain diversification and sustainability (IRENA, 2023).

The majority of countries in Africa dependent on critical minerals mining are classified as least developed countries. This sector is mainly 'buyer-driven' and highly labour intensive, relying on small-scale and artisanal mining practices which often involve hazardous working conditions and exploitation (Kanyinji and Tembo, 2019). Consequently, nearly all mining countries in Africa face similar economic, social and environmental sustainability challenges, including governance issues, human and labour rights, and environmental degradation (Table 1).

Addressing these issues through international regulations and sustainable mining initiatives is essential for harnessing Africa's mineral wealth responsibly. Proper management and ethical practices can ensure that critical minerals mining contributes positively to both local and global development. This issue of *Trade Hot Topics*, the second of a two-part series, focuses on some of the main sustainability challenges and proposes different ways to address them.

2. Economic sustainability in the mining sector

2.1 Responding to volatile commodity prices

The mining and minerals market has always been prone to supply or demand disruptions that cause fluctuations in commodity prices. This vulnerability stems primarily from the concentration of mining and mineral supply, with only a few countries and mining companies responsible for extraction and

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Table 1. Economic, social and environmental sustainability issues in Africa's mining sector

a. Economic sustainability	b. Social sustainability	c. Environmental sustainability
• Governance issues • Political and price instability • Overreliance on mining • Unregulated mining • Tariff escalation in importing countries	• Illegal mining and control of militia • Adverse health impacts and poverty • Weak labour rights, child labour • Gender discrimination	• Fossil-fuel intensive, high carbon emissions • Air pollution from dust • Water contamination • Water- and resource- intensive

processing. Such extreme concentration renders global markets more susceptible to disruptions from domestic or global shocks. For example, South Africa, which holds over 90 per cent of global platinum reserves, experienced a mining strike in 2014, which reduced global platinum supply by 25 per cent. This resulted in a surge in platinum prices from around US$1,400 to $1,500 per ounce (Stoddard, 2014).

In 2021, a military coup in Guinea, home to the world's largest bauxite reserves, caused the price of aluminium to surge to its highest level in 13 years (Krippahl, 2021).[1] Similarly, in 2022, the world's largest nickel-producing company, China-based Tsingshan Holding Group Co., sold its production short, anticipating a fall in nickel prices. When the expected price drop did not occur, the producer had to repurchase significant amounts of nickel. As a result, the London Metal Exchange suspended nickel trading for one week, as the price skyrocketed from US$30,000 to $100,000 per tonne in a single day (Farchy et al., 2022).

In recent years, the COVID-19 pandemic, rising inflation and the Russia–Ukraine conflict have disrupted the global energy market. The resulting heightened volatility in prices caused by various demand and supply shocks pushed metals and mining prices to new levels in 2022 (Els, 2023).

The volatility of prices of metals and minerals has significant impacts on the long-term economic growth of African countries, with 45 out of 54 classified as commodity export-dependent (UNCTAD, 2023). Such high volatility can lead to greater fluctuations in government finances, resulting in stop-start public investment (Mohammed et al., 2023), affect the profitability of private investments and, potentially, undermine mineral and extraction activities. For example, a downturn in mineral prices directly affects export earnings in mineral export-dependent countries, reducing government revenue streams and potentially hindering their ability to meet debt obligations. Conversely, when prices rise, governments may take on more debt to fund infrastructure projects with the expectation that high prices will persist, thereby exacerbating debt levels (UNCTAD, 2023). Price volatility can also cause inflation and result in social unrest.

Mineral-dependent African countries can, however, take various steps to mitigate the impacts of price volatility through several measures. For example, the United Nations Conference on Trade and Development (UNCTAD, 2023) suggests establishing commodity exchange markets for minerals, similar to those already in place for agricultural products across Africa, such as the East Africa Exchange. These platforms facilitate the trading of contracts, enabling the purchase of fixed quantities at future dates, thereby allowing traders to hedge against price increases and effectively manage price volatility. In the long term, countries need to diversify the economy beyond mineral extraction and processing and promote other industries and sectors to reduce dependence on mineral exports.

2.2 Countering tariff escalation and restricting exports

Although Africa is well integrated into upstream global value chains for critical minerals, primarily by supplying unprocessed raw materials (Andreoni and Avenyo, 2023), African countries seeking to move up the value chain may face trade barriers. This may include import tariffs imposed by developed countries on processed or semi-processed products. Moreover, the new generation of tariffs, such as the EU's recently introduced Carbon Border

1 The price of aluminium rose to a record $3,000.

Adjustment Mechanism (CBAM), and other trade-related environment measures, tied to greenhouse gas emissions, could directly affect sectors such as steel and aluminium processing (European Commission, 2023). They could extend to other mineral sectors as well. Exports by Mozambique and South Africa would be heavily exposed to the current CBAM (Vickers et al., 2021).

Box 1. Export restrictions on critical minerals and World Trade Organization law

Despite the increasing number of export restrictions globally and in Africa, the compatibility of these measures with World Trade Organization (WTO) law has long been the subject of legal dispute. The EU has brought three separate cases before WTO Panels to question the legality of imposing export restrictions on minerals. Two cases have been against China's export bans on raw bauxite, coke and magnesium (in 2009) and rare earth metals (in 2012). The third and the most recent case was against Indonesia's ban on raw nickel exports in 2021.

Indonesia contended that its export prohibition on raw nickel was exempt under Article XI:2(a) of the General Agreement on Tariffs and Trade (GATT), stating that it was a temporary restriction applied to prevent an 'imminent critical shortage' of an 'essential product'. The Panel ruled that a mere imbalance between supply and demand was not sufficient to demonstrate a critical shortage. Indonesia plans to appeal this decision (WTO, 2022).

On the other hand, China, in both its cases, invoked the general exceptions under Article XX of GATT to justify its restrictions.[2] It relied on:

- Article XX(b) – China argued that its export ban was necessary to protect human, animal or plant life and health owing to pollution caused by mining activities. However, the Panel and the Appellate Body (AB) ruled that it had failed to demonstrate that its restrictions would lead to a reduction in pollution in the short or long term and assist in improving the health of people (WTO, 2009).
- Article XX(g) – China contended that its measures aimed to conserve exhaustible natural resources and were imposed in conjunction with restrictions on domestic production or consumption. Nevertheless, the Panel and AB determined that 'conservation' did not allow China to adopt measures to control the international market for a natural resource. Additionally, they ruled that the overall effect of China's restrictions was to encourage domestic extraction and secure preferential use of resources by Chinese manufacturers (WTO, 2012).

Although the rationales for imposing restriction in these cases were different, in each instance both the Panel and the AB held that the export restrictions were incompatible with WTO laws.

Export restrictions on critical raw materials have increased fivefold since 2009, with over 13,000 restrictions by 2020 (Kowalski and Legendre, 2023).[3] These measures affect approximately 10 per cent of global exports of critical raw materials (see Box 1). To counteract these tariffs and to increase the value of domestic mineral industries, many countries have imposed export restrictions on critical minerals (see Box 2). These restrictions take the form of export tariffs and taxes, or even complete bans and prohibitions on exporting unprocessed minerals.

Box 2. Learning from Indonesia's ban on unprocessed nickel exports

Indonesia, the world's largest holder of nickel reserves, implemented a ban on the export of unprocessed nickel ores in 2014, mandating domestic processing. Export licences were granted exclusively to companies committed to building a smelting facility. Following a budget deficit in 2016, the ban was temporarily suspended, and then reinstated in 2020.

2 While Article XX of GATT provides a list of exceptions to the general rules of trade liberalisation and the rules of the WTO, it caveats these by stating that the invoking Member cannot use these measures if they constitute 'arbitrary or unjustifiable discrimination' or a 'disguised restriction on international trade.'

3 India, Argentina, Russia, Vietnam and Kazakhstan were the top five countries after China in introducing export restrictions on critical minerals during the 2009–2020 timeframe (Kowalski and Legendre, 2023).

Initially, the ban resulted in short-term loss of export earnings of nearly US$4.5 billion, the disappearance of 30,000 mining jobs and a reduction of $270 million in government revenues (Terauds, 2017). However, it has proven successful in achieving its long-term aim of attracting new investments, totalling more than $15 billion in 2022, into the processing industry. As a result, the number of smelters has increased from two before the ban to 13 by 2020 (Huber, 2021).

Indonesia's long-term goal is to develop a full electric vehicle supply chain, including battery production. Recently, carmaker Hyundai opened a plant to assemble electric cars, and Korean company LG Energy Solutions is building a battery cell plant valued at US$1.1 billion (Hyundai, 2021). Tesla is attempting to finalise an investment deal, and CATL, the largest battery manufacturer in China, has already invested in the country.

While Indonesia has seen success since the ban was imposed, it has also faced challenges. Refining activities have resulted in environmental and social costs, as new smelting techniques produce substantial waste compared with traditional methods (IRENA, 2023). Indonesia also faces legal risks, as the WTO Panel ruled in favour of the EU's challenge to the export ban's compatibility with WTO law (Box 1). Indonesia intends appealing this ruling.

African countries have been encouraged to impose export restrictions to 'take advantage of their minerals' (AfDB, 2023). In 2022, Zimbabwe, home to Africa's largest lithium reserves, imposed a ban on raw lithium ore exports to boost local job creation and revenue (Gbadamosi, 2023). Last year, Ghana and Namibia banned the export of all unprocessed critical minerals, including lithium, rare earth minerals, cobalt, manganese and graphite (Nyaungwa, 2023). More recently, Tanzania announced its intention to ban exports of raw lithium ore in 2024 (Anyango, 2023).

Export restrictions in other countries can also have positive implications for Africa's mineral industry. For example, China, the world's largest producer of graphite, imposed restrictions on graphite exports in 2022 (Baskaran, 2023). This shifted the focus of Western markets to Mozambique, Madagascar and Tanzania, Africa's largest graphite exporters. Recently, the USA announced a conditional loan of up to US$150 million to boost mining and processing of graphite at a facility in Mozambique (IER, 2023).

Export restrictions alone may not guarantee support for downstream processing industries in Africa. Mineral processing typically involves significant amounts of energy, requiring both generation and transmission capacity as well as infrastructure, elements that many African countries currently lack. Processing activities also require a skilled labour force and substantial capital investment. Therefore, it is crucial that these restrictions are accompanied by efforts to attract investments and capital and enhance infrastructure to build more sophisticated local supply chains (IRENA, 2023).

2.3 Improving the mining investment climate

Despite its large mineral resource endowments, Africa accounts for less than 10 per cent of global mining exploration spending and less than 5 per cent of the sector's global revenue (Campbell et al., 2023). One key reason for this deficiency is the international narrative on Africa's mining industry, historically dominated by the concept of the 'paradox of plenty' (NRGI, 2015); this refers to the situation where a state possesses abundant revenue-generating natural resources but the result is often negative development outcomes. These include economic stagnation, political tensions and instability, social grievances and ecological damage (Signe, 2021).

Box 3. The Extractive Industries Transparency Initiative

The Extractive Industries Transparency Initiative (EITI), launched in 2003, is a global standard for promoting good governance in the management of oil, gas and mineral resources. Headquartered in Norway, the EITI is a multi-stakeholder non-profit organisation comprising governments, companies and civil society organisations. By joining the EITI, countries commit to disclosing information across the extractive industry value chain, including on the awarding of extraction rights, government-

generated revenue and its allocation for public benefit. More than 50 countries, including 28 African countries, have agreed to EITI Standards – a common set of rules that govern disclosure requirements.

To support implementation of the EITI Standard, each country establishes a multi-stakeholder group composed of government, private companies and civil society. Countries are subsequently assessed on their progress in meeting the requirements of the Standard through EITI's quality assurance mechanism, called 'Validation'. Countries are evaluated based on three parameters: stakeholder engagement, transparency, and outcomes and impact. This model sets minimum levels of progress, which, if not achieved, will trigger suspension or delisting.

Several African countries have benefited from this Standard. For example, Mozambique has used the EITI process to improve transparency in the management of state-owned enterprises. Similarly, Madagascar has used the process to analyse revenue generated by the government through the mining sector. Togo joined the EITI to support its objectives of attracting foreign direct investment and increasing transparency in phosphate production.

Source: https://eiti.org

Other issues include the monopolisation of natural resource rents by the state, resulting in greater income inequality and skewed distribution of incomes. To address these challenges, many African countries have attempted to enhance transparency and accountability across the mineral supply chain (Box 3).

Many African countries have also amended their mining laws to attract more investment by offering tax incentives, guaranteeing property rights and streamlining permit processes (AMCEN, 2023). For instance, Guinea has lowered property transfer fees from 2 to 1.2 per cent and reduced the time to obtain a construction permit (USDS, 2021). Botswana provides corporate tax rates of 15 per cent for manufacturing and 22 per cent for other activities, and a maximum income tax of 25 per cent; these are some of the lowest rates in the region (Brand Botswana, 2022).

Despite these efforts, technological and institutional scarcity has contributed to a lack of investment and sustained economic growth (Andreoni, 2015). Addressing this requires the more coherent implementation of development-centric policies and an enhanced capacity of the private sector to respond to government policy initiatives (Ramdoo, 2015).

Many mining companies have begun adopting Environmental, Social and Governance (ESG) strategies as investors increasingly prioritise non-financial factors. In this regard, mines reliant on capital investments have begun aligning their strategies with the International Finance Corporation's performance standards, which comprise eight categories for measuring ESG performance (Parker, 2021). Moreover, Africa's mines also use the Equator Principles as an ESG benchmark; this offers a risk management framework to identify, manage and assess social and environmental risks during project financing.[4]

3. Social sustainability in the mining sector

Mining operations for critical minerals serve as a vital source of employment and livelihoods in Africa. However, this sector faces common vulnerabilities, with miners and associated communities encountering fundamental challenges. These include the absence of licensed artisanal mining zones and the existence of illegal mining, leading to poor labour conditions, including the prevalence of modern slavery, child labour and sexual exploitation. Furthermore, corruption and unfair pricing exacerbate poverty and undermine income stability (Buxton, 2021).

3.1 Boosting the participation and formalisation of artisanal miners

The World Bank (2020) estimates that artisanal and small-scale mining (ASM)[5] occurs in about 80 countries worldwide, serving as the main livelihood for nearly 40 million people. In recent years, the sector has emerged as the most important non-farm rural source of employment in sub-Saharan Africa (Hilson et al., 2021), experiencing rapid growth as demand for critical minerals rises. Despite its

4 https://equator-principles.com/

5 ASM refers to informal mining activities conducted by individual miners or small enterprises carried out using low technology or with minimal machinery (UNEP, nd).

relative importance, artisanal mining continues to be overshadowed by large-scale mining operations.

This has resulted in a shortage of mineralised land, cumbersome bureaucratic licensing schemes and exorbitant costs associated with obtaining requisite permits, all of which perpetuate informality in the sector (Siwale and Siwale, 2017). The informal nature of artisanal mining has given rise to various challenges, including adverse environmental impacts of operations, rampant smuggling from mining sites, health and safety hazards and multiple social concerns such as child and bonded labour, and low or no wages (Arnall et al., 2021).

Formalising the sector entails integrating the informal income-generating activities of artisanal mining into the formal economy through legal, regulatory and policy frameworks. These reforms should include aspects such as permits and licensing, gender equality and standards pertaining to environment, social and labour practices. Ghana, for example, was one of the first countries in Africa to promulgate a small-scale mining law. This recognises artisanal mining as a legitimate livelihood source and establishes a framework aimed at its formalisation (Kumah, 2022).

Effective formalisation efforts should not only focus on developing comprehensive legislation to support marginalised artisanal miners but also involve providing access to capital, equipment and geological data, and facilitating dialogue between artisanal mining stakeholders and government authorities (IISD, 2018). In Tanzania, for example, the government has introduced microfinance services tailored to the ASM sector. Angola has implemented certification processes for products and diamonds produced by artisanal miners, thereby integrating them into the Kimberley Process (Tychsen et al., 2022).

Box 4. Social sustainability measures for artisanal mining for cobalt in Democratic Republic of Congo

Democratic Republic of Congo (DRC) is the world's largest producer of cobalt, which is extracted primarily as a by-product of copper mining. While most cobalt in DRC is sourced from large-scale mining operations in the south-eastern region known as the 'Copperbelt', artisanal mining activities also play a significant role, providing livelihoods for over 200,000 miners and contributing to poverty reduction and local income growth (BGR, 2019).

Artisanal mining in DRC presents multiple challenges. Many *creuseurs*, or 'diggers,' endure harsh working conditions and exploitation by traders operating within an opaque supply chain. Lack of oversight and traceability mechanisms exacerbates these issues, with little done to ensure safety at artisanal mine sites. Amnesty International reports that, despite the presence of the Service d'assistance et d'encadrement du small-scale mining – the government agency charged with training and assisting artisanal miners – its resources and authority are often insufficient to address the sector's complexities (Gaughran, nd). The artisanal mining sector also grapples with significant labour issues, including the use of child labour, with over 40,000 children estimated to be affected. These vulnerable individuals are susceptible to exploitation, trafficking and injuries as a result of hazardous working conditions (Gross, 2023).

With global cobalt demand on the rise, there has been increased scrutiny of cobalt supply chains and of the treatment and conditions of artisanal miners in DRC. Legal action, such as a lawsuit filed in the USA against major tech companies in 2019, highlights growing awareness and efforts to hold corporations accountable for their supply chains (Klovig Skelton, 2021).

In response to these pressures, various initiatives by private companies have emerged to formalise artisanal miners in recent years. Cobalt for Development (C4D), launched in 2019 by companies like BMW, Samsung SDI, GmbH, Samsung Electronics and Volkswagen, aims to establish legal, safety and environmental measures to improve conditions for artisanal miners.[6] The Fair Cobalt Alliance, launched in 2020, aims to support artisanal miners by improving mine sites and promoting transparency, ensuring fair prices, protecting child rights, encouraging economic diversification and advocating for responsible sourcing practices across industries.[7]

6 https://cobalt4development.com/
7 www.faircobaltalliance.org/approach/

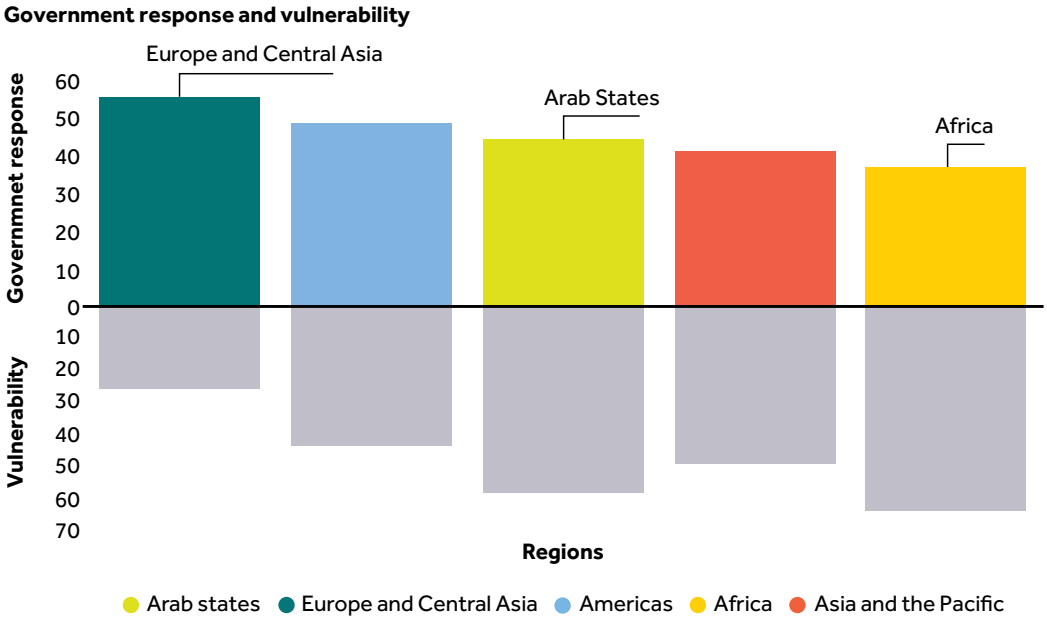
3.2 Combating labour rights issues in Africa's mining sector

Mining operations for critical minerals in Africa are marred by labour rights issues, which arise mainly because of lack of regulation, widespread illegal mining activities and insufficient traceability measures. Particularly in DRC, where cobalt and copper mining industries thrive, the artisanal and informal sectors are notorious for exploiting child labourers, who endure harsh working conditions (Lawson, 2021). African mining countries are also highly susceptible to modern slavery, driven by factors such as discrimination against minorities, ethnic and cultural groups; ongoing conflicts; political instability; and pervasive poverty (Walk Free, 2024). On the World Slavery Index, government responses to modern slavery in Africa score an average of only 36 per cent, the lowest among all regions surveyed, even though the region is the most vulnerable to modern slavery (Figure 1).[8]

Various multilateral, regional and domestic initiatives have been implemented to address these systemic labour issues in the mining sector. The UN Guiding Principles on Business and Human Rights, a cross-sectoral initiative established in 2011, provide a set of principles for businesses to ensure human rights compliance throughout their operations and supply chains, including risk assessment and due diligence (OHCHR, 2011). The International Labour Organization (ILO) has developed numerous guidelines, recommendations and conventions, such as the Safety and Health in Mines Convention of 1995, the Minimum Age Convention and the Forest Labour Convention and Protocol of 2014, to promote fair labour practices (ILO, nd). Major tech companies like Tesla and Apple have developed policies on responsible sourcing, requiring their critical minerals to be procured exclusively from suppliers that adhere to stringent environmental and social standards (IRENA, 2023).

At the regional level, African Heads of Governments have taken significant steps towards addressing labour rights issues in the mining sector. For example, they have adopted a Ten-Year Action Plan to Eradicate Child Labour, Forced Labour, Human Trafficking and Modern Slavery (2020–2030). This provides a framework for mobilising states, institutions and regional economic communities to scale up efforts to comply with the ILO conventions and achieve Sustainable Development Goal 8.7,

Figure 1. Global Slavery Index estimating vulnerability and government responses to modern slavery by region (2023)



8 Although there is no legal definition of modern slavery, it refers to situations of exploitation where a person cannot refuse or leave because of threats of violence, coercion, deception and/or abuse of power. It encompasses practices including forced labour, debt bondage, forced marriage and human trafficking (UN, nd).

as well as the African Union's Agenda 2063 to end child and forced labour. The African Mining Legislation Atlas (AMLA) supports countries by offering regulatory options and capacity-building programmes. AMLA serves as a platform for information exchange on laws and regulatory capacities in Africa, providing guidance for countries in drafting mining laws and regulations that cover labour rights issues.

Several African countries, such as Madagascar, Sierra Leone and Zimbabwe, have taken steps to address labour rights by implementing the ILO Forced Labour Protocol. The Republic of Congo enacted a domestic law in 2019 criminalising human trafficking (Walk Free, 2024). In 2020, DRC issued a zero-tolerance policy for forced child labour in the mining sector (USDS, 2023). While enacting these regulations marks significant progress, their effective implementation remains a challenge, given limited resources and knowledge, corruption and the presence of illegal militias.

3.3 Enhancing the role of women

Women make up nearly 40 per cent of the mining and ASM sectors in Africa (AMDC, 2015). They tend to gravitate towards ASM because it is usually the highest-earning job in certain regions or countries, like DRC, and requires no investment and little training or skill (IMPACT, 2023). Despite this, cultural and historical factors have restricted their participation to peripheral roles (IGF, 2018). These include the lowest-paid tasks across various stages of extraction and production, such as washing, sorting and sluicing ore. Women are also active in providing goods (such as food and drink vending, equipment sales) and services (such as transporting dirt and water, cleaning and sex work) (ILO, 2021).

In a predominantly male-dominated sector and society, women encounter various economic challenges stemming from lack of access to, use of and control over resourceful land and other productive resources, licences, finance and geological data (IGF, 2018). These inequalities often lead to women being more susceptible to price exploitation when selling minerals or even being barred from accessing certain mine sites owing to social stigmas (Leotaud, 2023). In addition, women and girls undertake the largest share of unpaid care work, which often remains invisible. This has meant that, while mining has traditionally increased men's income, it has exacerbated women's economic dependence on men, thus generating more frequent occurrences of sexual and gender-based violence (ILO, 2021).

Women also bear the brunt of environmental damage caused by mining operations. When mining operations start, it is women who often have to seek alternate sources of food, travel long distances to fetch water and firewood and receive no compensation when communities are displaced (Barry, 2022). Women are also traditionally underrepresented in mining's administrative, political and corporate spheres. For instance, according to EITI Guinea, only one woman held a management position in 2019 in 20 active mining companies (ibid.).

Empowering women and reducing gender inequalities forms an important part of the African Mining Vision, which is aligned with the AU's Agenda 2063. Several domestic co-operatives, such as the Malawi Women in Mining Association and the Association of Zambian Women in Mining, have been established to promote, empower, train and represent women miners (IGF, 2018). International non-governmental organisations like Women in Mining and International Women in Mining have supported efforts to mainstream women into the African mining sector. Countries like South Africa and Zambia have enacted domestic legislation to improve gender equality, such as the 1998 Employment Equity Act and the 2015 Gender Equity and Equality Act No. 22, respectively. These initiatives have yielded some success, with reports indicating that more women occupy top positions in Africa-based metals and mining companies compared with the global average (Kuykendall, 2023).

4. Environmental sustainability in the mining sector

The metals and mining sector is notorious for its adverse impact on the environment. Broadly, it contributes to about 10 per cent of global greenhouse gas emissions. For critical minerals, the scale of emissions varies significantly, with energy consumption and emissions being particularly significant for aluminium and cobalt (IRENA, 2023). Mining activities also demand substantial amounts of water, often jeopardising the right to water for thousands of communities nearby. In Madagascar, for example, mining companies are permitted to extract water from village wells but restrict villagers from accessing their machine-dug wells, even during periods of water scarcity (Vyawahare, 2023).

These mining activities also lead to soil erosion, contributing to land degradation, reduction in forest cover and biodiversity loss. Furthermore, dust produced by mining and transportation affects crops and infiltrates homes, causing

severe respiratory illnesses (Wormington, 2018). Moreover, the washing of ore releases toxic waste contaminating water resources, rendering it unsafe for consumption (Le Petit, 2019).

The remainder of this section explores potential solutions to enhance environmental sustainability in the mining sector.

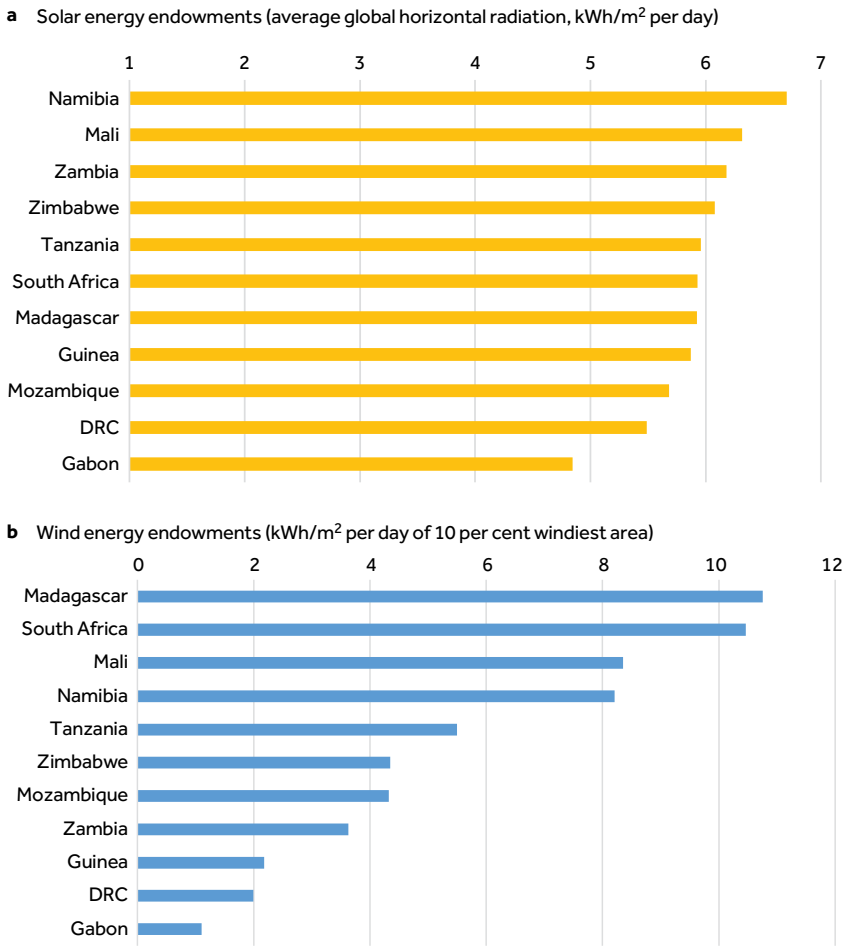
4.1 Increasing renewable energy usage and social innovation

Emissions from the mining industry can be reduced through increased investments in energy-efficient technologies and the adoption of cleaner fuels. Although the existing mining industry in Africa relies heavily on fossil fuels such as coal and petroleum, countries on the continent are endowed with vast renewable energy potential, creating scope to enable a smoother transition to clean fuels. Many significant critical minerals producers in Africa, including Madagascar, Namibia, South Africa and Zambia, have large solar and wind energy endowments (Figure 2).

Recognising this potential, various mining companies have already begun investing in renewable energy projects to power critical minerals operations in Africa. First Quantum Minerals Ltd (FQM), which operates Zambia's largest copper mines, recently announced the construction of a 530 MW wind and solar project to provide low-cost power to its mining operations. This initiative aims not only to minimise environmental impact but also to extend the mine's lifespan by 20 years (Crux, 2023). China's Molybdenum Company (CMOD) announced its intention to tap into hydropower projects and use solar energy to expand its copper and cobalt production in DRC (Daly, 2021). In Madagascar, the development of a large solar hybrid power plant has allowed one of the country's largest graphite mines to generate 33 per cent of its power requirements from renewable sources (Smith, 2023).

Furthermore, the World Bank's Climate-Smart Mining Initiative has been launched to assist resource-rich developing countries in benefiting from the increasing demand for critical minerals. This initiative aims to support the sustainable extraction and processing of minerals while scaling up technical assistance and investments in these countries (World Bank, 2019).

Figure 2. African critical mineral producers with the largest solar and wind energy endowments



Source: Commonwealth Secretariat using Global Solar Atlas and Global Wind Atlas data.

4.2 Enabling a circular economy in the critical minerals mining sector

Recycling and reusing critical minerals relieves pressure on primary supply sources and prevents associated environmental damage, as they typically consume less energy and generate lower emissions than primary extraction (Gregoir and Van Acker, 2022).

Box 5. The African Circular Economy Alliance

The African Circular Economy Alliance (ACEA) is a government-led coalition that aims to transform Africa into a circular economy that boosts economic growth, jobs and positive environmental outcomes. Developed in 2016, and formally launched at COP 23 in Bonn in 2017, ACEA provides support at national, regional and continental levels through policy development, leadership and advocacy, and support in scaling circular economy businesses and projects.

In order to achieve its objectives, ACEA identified five key industries as immediate opportunities to boost circularity in Africa. These are:

- Food systems – converting food waste to organic fertilisers;
- Packaging – recycling plastic packaging;
- Electronics – building recycling and collection facilities for e-waste;
- Fashion and textiles – converting fashion waste into commercial export markets;
- Built environment – redesigning buildings by focusing on the sustainable use of mass timber.

Its work, however, extends to other sectors as well. Recently, ACEA launched a report on increasing circularity in Africa's mining sector, which provided an overview of the state of mining in Africa, the circular economy opportunities, the role of the ASM sector and policy recommendations for governments.

Initially launched with three Commonwealth countries as founding members – Nigeria, Rwanda and South Africa, ACEA presently consists of 13 countries. Chad and Mauritius were introduced as the newest members in 2023.

Source: https://www.aceaafrica.org/about-acea and ACEA (nd).

However, the circular economy in the minerals sector faces several challenges. While Africa holds much of the world's natural reserves of these minerals, less than 3 per cent of global scrap metal recycling happens on the continent (Romco, nd). There is currently no unified ESG framework for mining and metals projects in Africa (Campbell et al., 2023), although some of the continent's largest mining companies have made efforts to adhere to US and European standards (Hiller von Gaertringen, 2023). Moreover, while copper and aluminium are 100 per cent recyclable and offer potential for enhanced circularity (Davey, 2022), the recovery of minerals like manganese and graphite from scrap and batteries, respectively, has been negligible, rendering the process unprofitable.

Nonetheless, recycled materials constitute a major proportion of the global supply for many materials. Nearly 40 per cent of copper is produced from recycled materials (IBIR, 2021). South Africa alone trades roughly 150,000 tonnes of copper scrap worth nearly US$45 million, annually (Pope, 2023). However, rising instances of copper infrastructure theft and illegal exports have led the South African government to implement an export ban on ferrous and copper scrap shipments (Taylor, 2023).

Recycling mineral scrap can also create new economic sectors, boost productivity and drive growth in countries that are not significant mineral producers. In 2022. Swiss mining company Glencore partnered with Moroccan mining company, Managem, to produce cobalt from recycled battery materials in Morrocco (Jamasmie, 2022). Romco Metals, a London-based company, established an aluminium recycling factory in Nigeria in 2015. Recycling around 1,500 tonnes of aluminium per month, the factory has created 5,000 new jobs. Romco plans to expand by building new factories in Ghana and across Africa by 2025 (Dewast, 2022).

However, recycling critical minerals is an energy-intensive process that requires large amounts of fossil fuels, resulting in high carbon emissions (Dewast, 2022). Furthermore, with companies like Apple and Electra pledging to use 100 per cent

Table 2. Various critical raw materials supply chain traceability standards, guidelines and initiatives

International organisations and guidelines	Multi-stakeholder sustainable reporting systems	Mineral-specific guidelines/ standards	'Battery passport' proposals
• International Council for Metals and Minerals, 1998 • OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas, 2016 • Global Battery Alliance, 2017 • London Metals Exchange Responsible Sourcing Requirements, 2019	• Towards Sustainable Mining (TSM) • Global Reporting Initiative (GRI) • Responsible Minerals Initiative (RMI) • Initiative for Responsible Mining Assurance (IRMA) • Extractive Industries Transparency Initiative (EITI) • Certifying of Raw Materials (CERA 4in1)	• Aluminium Stewardship Council • Fair Cobalt Alliance • Responsible Cobalt Initiative • The Copper Mark	• EU Electronic Exchange System • Global Battery Alliance battery passport • London Metals Exchange Passport

recycled cobalt and lithium, countries such as DRC, which rely heavily on mining, may see their importance diminish over time (Simmons, 2023).

Subsequently, achieving circularity in this sector can also involve effective management of clean and wastewater. The mining industry is the second-largest water user in South Africa, after agriculture, and companies can improve wastewater management by implementing storage and filtration systems to reduce dependence and optimise water usage (ACEA, nd).

4.3 Supply chain traceability initiatives

Despite the lack of a comprehensive ESG framework for mining activities in Africa, governments, agencies and businesses have developed several initiatives, regulatory frameworks and standards to address the increasing sustainability and environmental challenges associated with critical mineral supply chains (Table 2). The first such initiative by mining companies was the International Council for Metals and Minerals in 1998, while the most widely referenced international standard is the Organisation for Economic Co-operation and Development (OECD) guiding principles. These principles provide companies with a supply chain due diligence framework for sourcing minerals from conflict-affected and high-risk areas (IRENA, 2023). They have been integrated into several regulatory frameworks, including those in the EU, USA and DRC. Furthermore, all metals traded on the London Metals Exchange were brought under mandatory due diligence following the OECD's guidance (ibid.).

There has been a notable increase in the number of initiatives aimed at enhancing transparency and promoting responsible sourcing throughout the critical minerals supply chain. Among these, the GRI stands out as one of the most widely used global reporting systems, supporting mining companies in managing environmental and social risks (Fonseca et al., 2012). As an independent international organisation, this has developed standards that enable organisations to report on environmental impacts of mining operations in a credible and transparent way (Kaikkonen et. al., 2022). The TSM initiative was the first sustainable mining standard to require site-level assessments. Similarly, the RMI encompasses auditing and certification programmes, supply chain due diligence tools and capacity building initiatives for suppliers (IRENA, 2023).

Efforts have been made to create a continent-wide framework for ESG standards, such as the African Development Bank (AfDB) Integrated Safeguards System and climate safeguard decision-making tools. These tools enable the evaluation of green mineral projects and offer guidance for enhancing robustness (AfDB, 2023). However, effectively addressing ESG challenges requires collaboration between the public and private sectors to set clear goals and targets. This includes fostering public-private partnerships to enhance resource and knowledge sharing (Modise, 2023).

Box 6. Creating a uniform global mining standard

The mining sector has seen a plethora of sustainability standards and traceability requirements, which have different levels and are managed by different organisations. In order to create a single global consolidated mining standard, four large mining organisations launched the Consolidated Mining Standard Initiative. The Copper Mark, the International Council for Metals and Minerals (ICMM), the Mining Association of Canada (which launched the TSM Standard) and the World Gold Council aim to create a standard that takes the best attributes of each organisation's standard and develop a single global standard that could be implemented regardless of commodity, geography or size. The aim of this standard would be to declutter the mining standards landscape and create a more inclusive and transparent standard with larger industry participation to drive impact and raise the bar on ESG performance.

This proposed standard would have the widest coverage of any voluntary responsible mining standard, with 80 companies in 60 countries worldwide participating in its initial implementation. A draft of this standard is expected to be released later in 2024 and will be open to stakeholder engagement and feedback through public consultation.

Source: ICMM (2023).

Recent initiatives have aimed to trace the battery supply chain from inception to completion. These 'battery passports', such as the one proposed by the World Economic Forum's Global Battery Alliance, offer a digital platform for exchanging data among all authorised stakeholders throughout a battery's life cycle (Kaikkonen et al., 2022).

Digital technologies like blockchain can be used to enhance transparency across the mining value chain and, thereby, ensure ethical and sustainable standards are met (Skillings, 2023). For example, Minexx is a mineral traceability platform offering expertise and financing, focusing exclusively on artisanal miners in Africa. Currently operating in Burkina Faso, Ghana, Nigeria and Rwanda, Minexx creates a marketplace where it vouches for miners and buyers and conducts mine assessments to verify the miner's information and ensure they receive the correct price for their minerals. All site inspection information and transaction values are stored on the blockchain to ensure transparency (Abiodun, 2023).

Artificial intelligence and automation can further reduce environmental damage caused by mining firms, as well as reduce operating costs and boost productivity. UNCTAD estimates that automation of processes such as loading, hauling, crushing and drilling has the potential to reduce fuel consumption, while adopting driverless technologies could lead to a 10–15 per cent reduction in fuel use and an 8 per cent reduction in maintenance costs (UNCTAD, 2019). The Syama gold mine in Mali, owned by Australian company Resolute, is the world's first fully automated mine, with workers using three-dimensional modelling of the mine and fibre optic cables to manage and monitor activities. It also provides an opportunity for workers who perform traditionally labour-intensive activities to undergo specialised and technical training for operating automated mining equipment (Cuffari, 2019).

5. Conclusion

With its existing share of mineral reserves and boasting the largest shares of untapped critical mineral reserves in the world, Africa can take further advantage of this potential by unlocking new opportunities through digitalisation for safety, sustainability and efficiency as one avenue to fast-track gains. Efforts to promote more environmentally sustainable mining processes can be boosted by focusing on circularity and recycling of scrap minerals, and by managing resources effectively, investing in energy-efficient technologies and making the most of Africa's wind and solar energy endowments.

Africa can also leverage the African Continental Free Trade Agreement (AfCFTA) to address its challenges related to access to finance, effective co-ordination and scaling up its climate change efforts. By integrating ESG requirements into African trade policies through the AfCFTA, regional co-operation can be fostered, trade and environmental policies can be harmonised, data transparency and standardisation can be increased and businesses can be encouraged to adopt more sustainable practices across the continent (Modise, 2023).

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International Trade Policy Section at the Commonwealth Secretariat

This Trade Hot Topic is brought out by the International Trade Policy (ITP) Section of the Trade Division of the Commonwealth Secretariat, which is the main intergovernmental agency of the Commonwealth – an association of 56 independent countries, comprising large and small, developed and developing, landlocked and island economies – facilitating consultation and co-operation among member governments and countries in the common interest of their peoples and in the promotion of international consensus-building.

ITP is entrusted with the responsibilities of undertaking policy-oriented research and advocacy on trade and development issues and providing informed inputs into the related discourses involving Commonwealth members. The ITP approach is to scan the trade and development landscape for areas where orthodox approaches are ineffective or where there are public policy failures or gaps, and to seek heterodox approaches to address those. Its work plan is flexible to enable quick response to emerging issues in the international trading environment that impact particularly on highly vulnerable Commonwealth constituencies – least developed countries (LDCs), small states and sub-Saharan Africa.

Scope of ITP Work

ITP undertakes activities principally in three broad areas:

- It supports Commonwealth developing members in their negotiation of multilateral and regional trade agreements that promote development friendly outcomes, notably their economic growth through expanded trade.
- It conducts policy research, consultations and advocacy to increase understanding of the changing international trading environment and of policy options for successful adaptation.
- It contributes to the processes involving the multilateral and bilateral trade regimes that advance more beneficial participation of Commonwealth developing country members, particularly, small states and LDCs and sub- Saharan Africa.

ITP Recent Activities

ITP's most recent activities focus on assisting member countries in their negotiations in the World Trade Organization and various regional trading arrangements, undertaking analytical research on a range of trade policy, emerging trade-related development issues, and supporting workshops/dialogues for facilitating exchange of ideas.

Selected Recent Meetings/Workshops Supported by ITP

25–28 June 2024: Commonwealth Secretariat-UNCTAD-Mission of Nepal session on Mainstreaming trade in LDC development strategies: New perspectives and approaches at the WTO Global Review of Aid for Trade in Geneva.

29 January 2024: Hybrid event to launch joint report with UNCTAD on Harnessing Intellectual Property Rights for Innovation, Development and Economic Transformation in LDCs. Keynote speakers were the Secretaries-General of the Commonwealth and UNCTAD and the Director-General of WIPO.

15–16 November 2023: Commonwealth Secretariat-WTO-IISD workshop in preparation for the WTO's 13th Ministerial Conference. The workshop, hosted in Kigali, Rwanda, was attended by senior trade and fisheries officials and technical experts, who discussed Africa's interests, priorities and strategies in multilateral and regional trade.

15 September 2023: Commonwealth Secretariat-Cardano Foundation session on Unlocking the Power of Blockchain for Carbon Accounting in Supply Chains at the WTO Public Forum in Geneva.

5–6 June 2023: Commonwealth Trade Ministers Meeting at Marlborough House, London. During the Ministerial Breakfast, the Secretary-General launched the book on Sustainable Production and Trade: Perspectives from the Commonwealth, covering the cocoa, fisheries, forestry, and textiles and garments sectors.

21 March 2023: Public event on Assessing the Business and Trade Dimensions of the 2022 Birmingham Commonwealth Games, in partnership with the UK's Department for Business and Trade. The event reflected on the legacy of the Commonwealth Games and explored how businesses can capitalise on the trade and investment relationships established during the Games.

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