



# CRITICAL MINERALS AND THE ENERGY TRANSITION

A FRAMEWORK FOR SUSTAINABLE DEVELOPMENT  
AND SUPPLY CHAIN RESILIENCE IN THE G20



November 2025  
**CENTRE FOR AFRICA AND  
NEAR EAST STUDIES**

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# ACKNOWLEDGMENTS

This report was prepared by the Centre for Africa and Near East Studies (CANES) as an independent expert submission to the Think20 (T20) track under South Africa's G20 Presidency. The authors acknowledge the role of the T20 process in enabling structured engagement on global governance priorities and providing the platform through which this work was advanced.

The authors recognise the Institute for Global Dialogue (IGD) and the Institute for Pan-African Thought and Conversation (IPATC), the official T20 convenors, for their stewardship of the broader policy dialogue. The leadership of Dr Philani Mthembu, Executive Director of IGD, and Professor Siphamandla Zondi, Director of IPATC, ensured the effective organisation of the T20 process and supported the submission of this report within that framework. CANES is grateful for the collaborative contributions of Prof Fredrick Ogenga: Director: Centre for Media & Security Studies, Rongo University, Bilal Bassiouni: CEO and Founder of CANES, Dr Alex Rusero: Head of International Relations, Africa University, Busisipho Siyobi: Head of Resource Governance & Climate Change Programme, Good Governance Africa, Prof Fidelis Allen: Director: Centre for Politics at University of Port Harcourt , and Davie Malungisa: Senior Advisor Natural Resource Governance & Climate Change , Southern Africa Resource Watch , in the preparation of this report.

The preparation of this report benefited from the authors' engagement with ongoing debates on mineral governance, industrial development, and global economic reform across academic, policy, and practitioner communities. These exchanges informed the refinement of the report's analytical focus and strengthened its relevance to current G20 discussions.

The views presented in this publication are those of the authors.

## Citation:

Ogenga, F., Bassiouni, B., Rusero, A., Siyobi, B., Allen, F., and Malungisa, D. 2025. Critical Minerals and The Energy Transition: A Framework for Sustainable Development and Supply Chain Resilience in the G20. Centre for Africa and Near East Studies (CANES).

# LIST OF ABBREVIATIONS AND ACRONYMS

<b>AFCFTA</b> – African Continental Free Trade Area	<b>IRA</b> – United States Inflation Reduction Act
<b>AFDB</b> – African Development Bank	<b>IRENA</b> – International Renewable Energy Agency
<b>AFREC</b> – African Energy Commission	<b>ISO</b> – International Organisation for Standardisation
<b>AFRIPOLI</b> – Africa Policy Research Institute	<b>JV</b> – Joint Venture
<b>AGMS</b> – African Green Minerals Strategy	<b>LME</b> – London Metal Exchange
<b>AMDC</b> – African Minerals Development Centre	<b>MoU</b> – Memorandum of Understanding
<b>AMREC</b> – African Mineral Resource Classification and Management System	<b>MOUF</b> – Minerals-Oriented Upstream Finance (Pillar IV analytical framework)
<b>ASM</b> – Artisanal and Small-Scale Mining	<b>MRA</b> – Mutual Recognition Agreement
<b>AU</b> – African Union	<b>MSP</b> – Minerals Security Partnership
<b>AUC</b> – African Union Commission	<b>MVA</b> – Manufacturing Value Added
<b>AUDA-NEPAD</b> – African Union Development Agency – New Partnership for Africa’s Development	<b>NGO</b> – Non-Governmental Organisation
<b>AWS</b> – Amazon Web Services	<b>NMC</b> – Nickel-Manganese-Cobalt Cathode Chemistry
<b>BCG</b> – Boston Consulting Group	<b>OECD</b> – Organisation for Economic Co-operation and Development
<b>BNEF</b> – Bloomberg New Energy Finance	<b>PAP</b> – Pan-African Parliament
<b>CAA</b> – Customs Administrations and Authorities (corridor context)	<b>PGII</b> – Partnership for Global Infrastructure and Investment
<b>CSR</b> – Corporate Social Responsibility	<b>PPP</b> – Public-Private Partnership
<b>DBSA</b> – Development Bank of Southern Africa	<b>R&amp;D</b> – Research and Development
<b>DFI</b> – Development Finance Institution	<b>RECS</b> – Regional Economic Communities (e.g. SADC, ECOWAS, EAC)
<b>DRC</b> – Democratic Republic of the Congo	<b>REE</b> – Rare Earth Elements
<b>EC</b> – European Commission	<b>RoO</b> – Rules of Origin
<b>ECDPM</b> – European Centre for Development Policy Management	<b>SADC</b> – Southern African Development Community
<b>ECOWAS</b> – Economic Community of West African States	<b>SAIIA</b> – South African Institute of International Affairs
<b>EIA</b> – Environmental Impact Assessment	<b>SCO</b> – Standards Conformity Office (national)
<b>EITI</b> – Extractive Industries Transparency Initiative	<b>SDGs</b> – Sustainable Development Goals
<b>EMDEs</b> – Emerging Markets and Developing Economies	<b>SPS</b> – Sanitary and Phytosanitary Measures (referenced analogically in standard harmonisation)
<b>EPA</b> – Economic Partnership Agreement	<b>SSA</b> – Sub-Saharan Africa
<b>ESG</b> – Environmental, Social, and Governance	<b>TBT</b> – Technical Barriers to Trade
<b>EU</b> – European Union	<b>TMEA</b> – TradeMark East Africa (now TradeMark Africa)
<b>FDI</b> – Foreign Direct Investment	<b>TRQ</b> – Tariff Rate Quota
<b>GBA</b> – Global Battery Alliance	<b>UNECA</b> – United Nations Economic Commission for Africa
<b>GDP</b> – Gross Domestic Product	<b>UNCTAD</b> – United Nations Conference on Trade and Development
<b>GIZ</b> – Deutsche Gesellschaft für Internationale Zusammenarbeit	<b>UNEP FI</b> – United Nations Environment Programme Finance Initiative
<b>GVC</b> – Global Value Chain	<b>UNGP</b> – United Nations Guiding Principles on Business and Human Rights
<b>HS Codes</b> – Harmonised System Codes (Customs Classification)	<b>USGS</b> – United States Geological Survey
<b>IaH</b> – In-Africa Harmonisation (proposed framework)	<b>VAT</b> – Value Added Tax
<b>IAEA</b> – International Atomic Energy Agency	<b>WCO</b> – World Customs Organisation
<b>IBC</b> – International Battery Council (industry body)	<b>WTO</b> – World Trade Organisation
<b>ICMM</b> – International Council on Mining and Metals	
<b>ICT</b> – Information and Communication Technologies	
<b>IEA</b> – International Energy Agency	
<b>IFC</b> – International Finance Corporation	
<b>ILO</b> – International Labour Organisation	
<b>IMF</b> – International Monetary Fund	
<b>IPR</b> – Intellectual Property Rights	

# EXECUTIVE SUMMARY

Africa's critical minerals endowment is indispensable to the clean-energy transition; yet, current supply-chain governance, trade rules, and verification regimes keep most value, decision-making power, and data control outside the continent. A G20 cooperation agenda should therefore move beyond security of supply to rule-sharing that incorporates African institutions directly into global standard-setting, traceability, and certification. Practically, decision-making for African regulators in EU and OECD working groups must be prioritised. For green industrialisation in Africa, the G20 must catalyse a shift from exports to beneficiation, precursors, and component manufacturing by aligning finance with the African Green Minerals Strategy (AGMS) and the AfCFTA regional value chains.

Priority actions include a G20-Africa Green Minerals Investment window, co-governed by Afreximbank, AfDB, AFC, and DBSA, that proposes first-loss guarantees for cross-border processing, a compliance cost-sharing facility for ESG and traceability audits, and FX hedging and currency-swap tools. Corridor-level governance (Lobito, North–South, Maputo) should be advanced through harmonised axle-load standards, a single-window customs system, and corridor regulators with real authority over scheduling, safety, and dispute resolution. Importantly, this should be directly linked to midstream plants for renewable energy to cut emissions and costs.

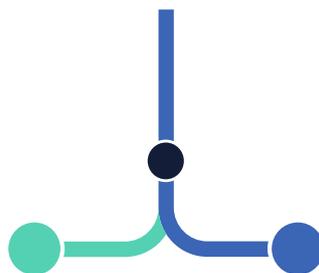
Trade policy under G20 cooperation should tackle tariff escalation on processed goods, promote plurilateral arrangements on EV and battery rules compatible with WTO norms, and institutionalise policy pre-notification to reduce volatility from export bans and quotas.

At its core is a human-centred approach to sustainable development. As such, community rights and ESG performance remain a key requirement, particularly in fostering FPIC practices, contract and payment transparency, credible grievance mechanisms, and circular-economy requirements must be incorporated in all G20-related deals. South Africa's G20 presidency can anchor a G20–Africa Framework on Mineral Governance that ties these elements together, co-authored standards, investable corridors, shared verification systems, and people-centred protections. This is to enable a Just Energy Transition that delivers both global resilience and African prosperity.

# SETTING THE SCENE

Scholarly literature reveals a considerable focus on the hidden economic potential of critical minerals in Africa, a reality brought about by developmental deficits and value chain challenges, as well as natural resource governance and environmental fragility, affecting the well-being of mining regions. The latter raises questions about best practices for resource benefit sharing, environmental protection, and development for and with indigenous communities, as well as the conflict dynamics that arise from these efforts.

Therefore, this section contributes to two interrelated central discussions.



The increasing need to secure clean energy supply chains and build capacity to prevent profit shifting by large companies to use extractive revenues for sustainable development and;

The salience of natural resource governance to confront supply chain challenges/obstacles, restore/protect the environment, which is the key to reducing fragility and preventing conflict.

These discussions would inform interventions that ensure green manufacturing and competitiveness in African mining and mineral processing industries, promoting sustainable development. Nevertheless, given the prevailing global epistemic power relations, these discussions must be extraordinary, leading to a total philosophical reset of the foundational architecture of the critical mineral extraction political economy, which cannot be divorced from colonial and neo-colonial legacies regarding the idea of Africa and its new scramble therein.

The global scramble toward renewable energy and technological sustainability has reignited renewed interest in critical minerals. Lithium, cobalt, nickel, and rare earth elements have become the new lifeblood of the 21st century, in similar, if not greater, proportion to what oil and gold were in the 20th century. This has engineered and geared innovations such as electric vehicles, wind turbines, and solar panels. Yet, the so-called clean energy revolution threatens to repeat the same old story of extraction and exploitation that the global south, in general and Africa, in particular, know all too well. Beneath the gleaming rhetoric of sustainability lies a deep continuity of coloniality—a persistence of structures that privilege Western capital and expertise while relegating Africa and the Global South to the role of suppliers of raw materials, rarely of finished products or transformative value.

The governance of critical minerals is therefore not a neutral or technocratic issue. It is a political and ethical one, bound up with the historical injustices of resource extraction that have defined Africa's relationship with global capitalism. For centuries, the continent has been the quarry of empires-colonial and postcolonial alike-its mineral veins tapped to sustain distant industrial revolutions while its people remain trapped in poverty and on many occasions, unending conflicts. From the diamond fields of Kimberley to the cobalt mines of Congo, the story has been one of exploitation without empowerment, wealth without welfare and extraction without transformation. That continuity remains visible in the 21st century, even as the discourse shifts from fossil fuels to "green" minerals.

What the G20 calls "supply-chain resilience" too often masks a scramble to secure uninterrupted access to Africa's resources. Such frameworks are rarely designed with justice, reciprocity, or sovereignty in mind. The same actors who once dictated the price of copper and gold now dictate the price of lithium and cobalt. Africa finds itself at risk of becoming the "green colony" of the twenty-first century-its soil rich, but its people poor, conflict-ridden, and its minerals indispensable, yet its voice muted. The global supply-chain governance structures, dominated by Northern capital, reproduce asymmetrical relationships that perpetuate dependency and technological marginality.

Africa's predicament is not one of scarcity but of systemic exclusion. The continent holds the minerals that power the world's green dreams, but is denied the means to process, refine, and own the full value of its resources. The global frameworks that claim to promote sustainability are often silent on justice and blind to history. They ignore the fact that the infrastructures of global trade, finance, and technology were designed to keep Africa in the role of a raw material provider. The result is that the continent exports its minerals at a low cost, imports technology at a high cost, and remains trapped in a cycle of extraction and dependency.

The just energy transition for the Global South cannot be achieved through mere participation in existing frameworks. It demands a fundamental reconfiguration of those frameworks themselves. The so-called green transition must be a just transition-one that heals rather than deepens the wounds of the past. For Africa, this means reclaiming agency over its resources, insisting on local beneficiation, and demanding genuine technology transfer and partnership.

The logic of extraction must give way to the logic of empowerment. If the G20 is sincere about global sustainability, then it must acknowledge that sustainability without justice is hypocrisy. It cannot be just for the world to be clean while Africa remains insecure and dirty, both literally and economically.

The decolonial turn offers Africa a philosophical and strategic compass. It calls for a rupture from the colonial matrices of power that have long structured global relations. This is not about isolationism; it is about equity and dignity. An Afrocentric approach grounded in Ubuntu-our shared humanity-reclaims Africa's agency to define the terms of its engagement with the world. Africa must no longer be positioned as the passive supplier of resources but as a co-architect of the global energy future. This requires bold leadership, environmental stewardship, conflict sensitivity, visionary policy, and continental solidarity. Africa's critical minerals should serve African development first, and global sustainability second-not the other way around.

A just and sustainable framework for critical minerals must therefore integrate local beneficiation, environmental accountability, community participation and peacebuilding. It must transform mining from an extractive enterprise into a developmental one. It must link the mines of Katanga to the factories of Johannesburg, the laboratories of Nairobi, and the ports of Dar es Salaam. The real measure of success will not be how much lithium Africa exports, but how much of its value Africa retains. The global energy transition will either become a vehicle for Africa's rebirth or another chapter in its exploitation.

The time has come for Africa to renegotiate its place within the global order. The continent must refuse to be the quarry of the world's green revolution. It must instead assert its agency as a sovereign actor in shaping the ethics, economics, security and governance of the energy transition. Only by breaking free from the yoke of asymmetrical relations and reclaiming the epistemic and material sovereignty stolen over centuries can Africa transform its mineral wealth into human wealth, fostering peace and security. This is the essence of the decolonial turn-a reawakening of Africa not as a supplicant begging for inclusion but as an equal partner demanding justice and mutual respect.

# PILLAR I: LOCAL VALUE ADDITION AND INDUSTRIALISATION

The world stands at a crossroads. Either the clean-energy transition reproduces the extractive inequalities of the past, or it becomes the foundation of a new global critical minerals architecture that is compliant with the ethic of justice, reciprocity, and solidarity. Africa's critical minerals hold the key not only to powering the planet but to redefining humanity's moral compass. The choice is clear. The question is whether the world has the courage to embrace it.

In the current age of much talk about the transition to renewable energy, the struggle for critical minerals has become real. Countries blessed with these resources, especially in Africa, have been admonished to see the greater value of their resources by transcending simple extraction "*pit to port*" to local processing, refining, and manufacturing. Unfortunately, the benefits of hindsight suggest that the colonial state in many developing countries, including those in Africa, had no plan or desire for this local addition to the value chain, as the export of primary products was the mode and approach that defined that economy. In the post-colonial era, this shift was intended to foster industrialisation, retain economic benefits locally, and create jobs.

The unanswered question of whether mineral resources are a curse or blessing is based on many multisystemic factors, including decades of negative outcomes of extractive regimes that fail to benefit resource-rich countries. Scholars have argued that resource-rich countries' status as exporters of primary goods is part of the curse as externally driven extractive activities only contribute to different dimensions of problems with implications for conflict, growth and development. Against this background, this pillar explores the necessity of the value chain and the industrialisation of Africa through processing, refining, and manufacturing in the age of energy transition and access to critical minerals.

## Processing, Refining and Manufacturing

Imagine a world with Africa playing a major role of manufacturing and exporting most of its products to countries within and outside the continent without having to depend on importation of goods manufactured with raw materials from the continent. This is the desire of many African scholars who have realised how damaging the unenviable position of the continent being the Global North's destination for primary products.

With 1.3 billion people, the continent stands prepared within the African Continental Free Trade Area framework, and a thriving manufacturing sector will boost the chances of sustainable development. This will be a departure from years of the Global North shaping the continent to remain the source of raw materials. Reliance on the Global North for finished products has disrupted the continent's tradition of value addition. First, it was the slave trade that saw human resources shipped to the Americas. European adventures into the continent for raw materials to meet the needs of the European industrial revolution meant the destruction of the culture of value addition. Subsequently, colonialism and neo-colonialism emerged with the same goal. The current era of rare mineral quest follows the same trajectory of keeping the continent under the power and control of external forces from the Global North. These forces have been suppressing value addition in Africa for close to 500 years.



Source: Adobe Stock

Africa remains blessed with numerous minerals (See Fig. 1), which, instead of leading to the continent's development, have contributed to its decline. The struggle for the control of these resources involving foreign companies from the Global North and China has set many African societies on “fire”. The paradoxical situation of abundant resources and outcomes of violent conflict and poverty on the continent clearly shows the seriousness of reversing the trend from this present resource dispensation and manufacturing of modern technological devices.

Ideally, minerals should lead to development and reduce the risk of violent conflict. However, in reality, the Democratic Republic of Congo, Nigeria, Sierra Leone, Angola, Zimbabwe, South Africa, and Sudan are examples of countries with abundant resources and conflict outcomes. The DRC is rich in cobalt, copper, and coltan. Nigeria has substantial oil reserves, in addition to numerous other minerals. Sierra Leone is rich in diamonds, Angola’s oil, Zimbabwe’s diamond fields, and South Africa’s mining sector have remained sources of intense conflicts. Finally, Sudan’s oil wealth has been a major source of violent conflict between the south and north, leading to a split in 2011 that created South Sudan

African leaders can transform the continent with policies that focus on creating added value for these minerals by following the part of processing, refining, and manufacturing them. This can be achieved by the intentional development of the capacity to process minerals into higher-value products, such as batteries and hydrogen, attracting investments, and encouraging initiatives that support recycling and industrialisation in the Global South. To achieve this transformation, African countries must invest heavily in education and training programmes to build a skilled workforce capable of operating advanced processing facilities. In addition, governments should promote local technology for manufacturing goods. Creating a conducive business atmosphere through streamlined rules, tax incentives, and improved infrastructure will be important for attracting both domestic and foreign investments in the mineral processing sector.

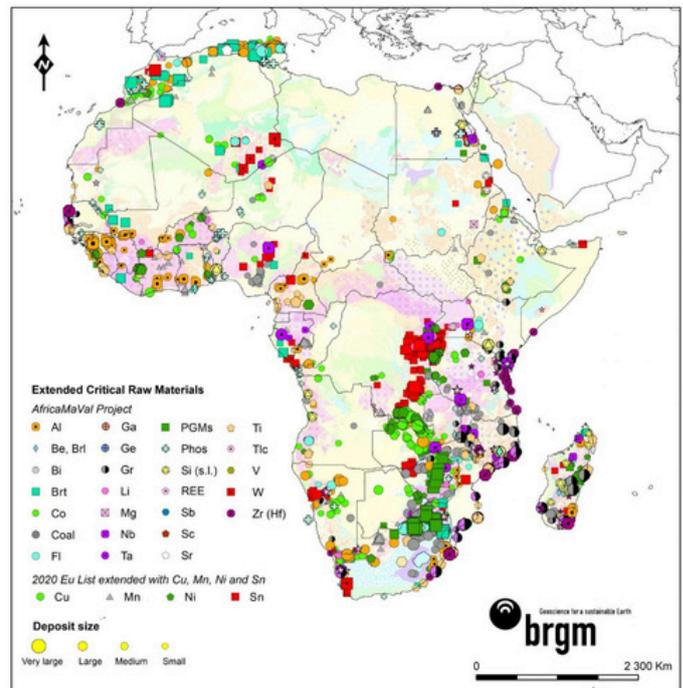


Fig 1. Raw materials in Africa.

## Supply Chain Resilience in G20 Countries

To boost supply chain resilience among G20 countries, multiple factors must be considered and implemented. First, they must reduce their dependence on single sources by looking at different regions. They should also look inwards and rely less on international supply chains. In addition, they need to promote initiatives that lead to recycling in production. In other words, a multifaceted approach is required to enhance the supply chain resilience of the G20 countries. Such diversification across regions can mitigate risks associated with single-source reliance. This entails building networks of suppliers from different parts of the world. They should reduce their reliance on international supply chains. In addition, encouraging initiatives that lead to recycling in production are crucial for developing resilient and sustainable supply chains. Innovation and manufacturing techniques emanating from such initiatives will ultimately lead to development of the Global South.

This framework aligns with global trends, where the Global North's demand for minerals, driven by technology production and renewable energy goals, necessitates a more equitable and sustainable value chain. The emphasis is on integrating resource-rich countries into the full value cycle, enabling them to benefit from industrialisation and not merely export raw materials.

The Global North's increasing demand for minerals, especially those necessary for technological advancement and renewable energy initiatives, has orchestrated a complex dynamic in the global supply chain. This is not only reshaping trade at the international front but also highlighting the need for a more equitable distribution of the benefits across the entire value chain. It is instructive and noteworthy that resource-rich countries in the Global South are now seeking to take off the toga of traditional suppliers of raw materials and look to become more actively involved in the process of industrialisation. This is why a country like South Africa is already positioning itself as a regional hub for processing, refining, and manufacturing batteries, hydrogen, and advanced materials.



Source: Adobe Stock

## PILLAR II: GREEN INDUSTRIALISATION AND SUSTAINABLE DEVELOPMENT

### Roadmap for greening Africa's industrial pathway

The success of Africa's and the Global South's transition to green economies should be centred on human development. Africa holds a substantial amount of the world's reserves of minerals, such as lithium, cobalt, nickel, rare earth elements, and platinum group metals, that are imperative to the technologies required in the global clean energy transition. This brings a moment for Africa to reorientate its geological surveys, policies and industrial strategies to prioritise minerals that meet its people's needs. Consequently, the strategic importance of these resources is reshaping global economic and geopolitical dynamics.

As such, it has reignited focus on Africa's mineral wealth, positioned the continent as a critical player in the pursuit of a Just Energy Transition and further put a spotlight on Africa's trajectory toward green industrialisation and sustainable development. More importantly, it raises important questions on equity, governance and the broader Environmental, Social & Governance (ESG) considerations as the continent balances between ensuring energy security and greening its economies in a sustainable and inclusive manner.

Continently, the AU's Green Minerals Strategy (AGMS), published in December 2024, places strong emphasis on changing Africa's role in the supply of green minerals from being raw-feedstock exporters to becoming competitive participants in downstream, value-added manufacturing and regional value chains. The strategy states a vision of "an Africa that harnesses green mineral value chains for equitable resource-based industrialisation and electrification, promoting green technologies and sustainable development."

It identifies priority segments such as battery precursors, battery cells and packs, electric-mobility, particularly two-and-three-wheelers and buses, renewable energy equipment manufacturing, and green hydrogen infrastructure.

To enable this, it brings in the role of the African Continental Free Trade Area (AfCFTA) for scaling, intra-African trade of intermediate goods and components and regional manufacturing clusters to stimulate intra-continent value chain integration. With this roadmap, it promotes beneficiation and local content requirements, where the strategy seeks to uplift job creation, technological capability, and maximise the economic dividends of Africa's green-mineral endowment outside of exporting unprocessed ores.

The AGMS acknowledges that one of the critical enablers for its successful implementation is the mobilisation of long-term finance and investment support, an area in which African development finance institutions need to play a central role. For instance, the African Development Bank (AfDB) is cited as having taken a leading role in the technical coordination of the strategy and in generating policy dialogue and investment promotion for green-mineral value chains. The strategy also envisages the establishment of a dedicated "Green Mineral Value Chain Investment Fund" through contributions from African development banks, national development finance institutions, climate-finance mechanisms and private investors to de-risk upstream and downstream investments in green-mineral processing and manufacturing.

In addition, the strategy highlights the necessity for these banks to build capacity in risk assessment, including geological, environmental, social, governance, develop blended-finance instruments, and partner with international development banks to catalyse large scale projects. This highlights the recognition that Africa's development banks must evolve from traditional extractive-sector financing roles to being active enablers of industrialisation, regional value-chains and green transition financing.

Considerations of ESG principles form a core pillar of the AGMS under the label of “Promoting Prudent Mineral Stewardship.” The strategy commits to harmonised legal and institutional frameworks across African states, aligned with the African Mineral Governance Framework (AMGF), and strengthened oversight of mining operations, biodiversity impacts, reclamation, water-risk, energy-use, and waste management. The document emphasises that the rush for green minerals must not come at the expense of environmental degradation or community rights, and that circular economy approaches (reuse, recycling of battery and EV components) must be embedded early in the value chains. This stewardship orientation signals that Africa expects to align its mineral development with its climate-resilience and biodiversity-conservation goals, thereby positioning the green minerals boom as part of a sustainable development trajectory.



Source: Adobe Stock

## **Developing a critical minerals industry to enable green industrialisation in Africa under the G20 cooperation**

Previously, African economies have been locked into exporting raw ore or low-value concentrates, while most of the profits, technology and jobs sit in refining, component manufacturing and finished products abroad. The development challenge is therefore to increase exports and more importantly, move value chains for the AGMS to be materialised.

For instance, electric vehicles and batteries illustrate this opportunity clearly. African countries supply minerals used in battery cathodes, anodes and wiring. For one, cathode minerals include cobalt, lithium, nickel and manganese and Democratic Republic of Congo (DRC) alone, produced 17 000 metric tons in 2023, accounting for an estimation of 73% of global production. Other key producers of cathode minerals on the continent include Zambia, South Africa, Madagascar, Morocco, Namibia and Uganda.

Expanding from extraction to refining and precursor production is necessary for the continent.

For instance, turning cobalt and manganese into battery-grade chemicals or producing cathode materials enables African countries to strategically develop battery corridors. This midstream capability makes way for local assembly of battery packs and EV manufacturing for buses, minibuses, and two- and three-wheelers for transportation of people and goods. Additionally, this can enable an inclusion of stronger domestic engineering and chemical industries, new standards and testing services, and a base of skillset that supports broader continental beneficiation ambitions.

Looking more closely at renewable energy industries. The development of solar PV, wind turbines and modern grids rely heavily on copper, manganese, rare earths and aluminium. As such, African countries can strategically have solar and wind farms as well as manufacturing components and infrastructure in place, particularly cables, transformers, mounting structures and towers. Practically, co-locating renewables with mineral-processing facilities makes it possible to produce copper, aluminium or steel, lowering both emissions and energy costs. As energy systems expand to cleaner sources of energy and thus become more reliable, they in turn reduce one of the key constraints on African industrial growth, that being unstable and unreliable energy supply.

Green hydrogen links mineral wealth to the decarbonisation of heavy industry and global fuel markets. Countries with rich renewable resources and platinum-group metals (PGM) reserves are better-positioned to produce hydrogen and its derivatives, such as green ammonia and green steel, while also contributing key inputs to electrolyser and fuel cell technologies. This can support new export sectors, and more importantly, used domestically to decarbonise refineries, chemical plants, cement and steel works. As such, this will assist in keeping higher-value processing on the continent under tightening global carbon rules. Around the mining sector, there is scope to develop innovation ecosystems in catalysts, fuel cells, and recycling and turn PGM mining regions into green technology hubs.

Building critical minerals industries for green industrialisation that enables sustainable development will need to be people-centred and development of strong institutions. A 2024 study by the International Monetary Fund, points to the importance of deliberate investment in skills, research and institutional capability. Additionally, Africa risks remaining a producer and supplier of raw material in an increasingly concentrated and geopolitically sensitive supply chains.

In advancing technical and engineering skillsets in geology, mining engineering, metallurgical engineering, chemical engineering and materials science, are exploration geologists and geophysicists that are needed to map and model lithium, cobalt, nickel, graphite, rare earth and PGM deposits more accurately. While mining engineers and geotechnical experts must design operations that are productive, safe and environmentally robust, the constraints lie in mineral processing and refining. In this regard, Africa is characterised with minimal capabilities relative to its upstream strength and where achieving battery-grade and electrolyser-grade purity requires sophisticated hydrometallurgy, pyrometallurgy and process control expertise.

A 2023 discussion paper by European Centre for Development Policy Management on Africa's battery competitiveness emphasises that building local capability in refining, precursor production and recycling is the most attractive entry point into global battery supply chains. However, this is reliant on a new generation of metallurgists, chemical engineers, process control specialists and lab technologists able to run complex, low-emission plants.

Beyond processing, the developing of manufacturing and energy-system skills will enable critical minerals to translate into EV, renewable and hydrogen industries on the ground. UNECA highlight opportunities in battery pack assembly, cable and transformer production, EV components, and equipment for solar, wind and grid infrastructure. However, it points to the requirement of industrial engineers, power-systems engineers, technicians and trades capable of running gigawatt-scale factories and integrating large volumes of renewables into often fragile grids as integral in industrialising African economies.

In the hydrogen space, there a growing skills gap in electrolyser operation, hydrogen safety, and PGM-based fuel cell technologies. For one, this has prompted initiatives such as new green-hydrogen qualifications in South Africa and Technical and through Vocational Education and Training (TVET) reforms in Namibia and South Africa that explicitly target hydrogen-related competencies. As a result, these competencies are being registered with Quality Council for Trades and Occupations and further reflect how skills development is starting to be aligned with specific mineral-linked industries.

With this said, technical skills are one part of the solution and continued future-proofing of critical mineral industries requires strong governance, and ESG performance, including specialists in mining and energy law, fiscal regime design, contract negotiation, environmental management, social impact assessment and community engagement.

The World Bank, points to the importance of balanced regulatory and fiscal frameworks for advancing critical minerals industrial pathways. This pertains to contract transparency and anti-corruption provisions, local content requirements and regional trade standards. It assesses that it will be critical for attracting responsible investment and secure domestic benefits. Simultaneously, integration of artisanal and small-scale mining into formal value chains requires social scientists, rural development practitioners and extension officers that are able design realistic formalisation, health-and-safety, and livelihood programmes, that ensures a Just Transition that is inclusive and sustainable in nature.

The investment in research and development (R&D) ecosystems is essential for industrialising and greening primary and economic sectors. Recent work on African battery value chains and green hydrogen put emphasis on sustained progress is dependent on universities, public research institutes and industry labs working together on applied R&D in battery chemistries, mineral processing flowsheets, green-hydrogen applications, recycling technologies and digital traceability systems. In this regard, the African Green Hydrogen Report documents growing numbers of university–industry partnerships and public-private collaborations across South Africa, Namibia, Morocco and Kenya, while new projects explicitly aim to redesign TVET systems around hydrogen and critical-minerals industrialisation.



Source: Adobe Stock

Additionally, the skillset Africa needs is fundamentally interdisciplinary; with a focus on engineers, geoscientists and chemists able to collaborate with economists, lawyers, data scientists and social researchers in multidisciplinary teams. Therefore, investment in human and institutional capabilities will be critical alongside infrastructure development. To this end, critical minerals industries can be integral in enabling sustainable development and green industrial transformation.

Under previous presidencies, G20 declarations committed to low-carbon, climate-resilient development and highlighted the need for scaled-up sustainable finance for developing countries' transitions. As such, discussions from the current G20 presidency have pressed on prioritising dedicated Just Energy Transition (JET) financing facility that mobilise concessional finance, guarantees, and blended finance specifically for clean energy and associated value chains, including critical minerals.

To this end, South Africa's G20 strategy and related T20 policy engagements emphasise using the G20 platform to coordinate multilateral development banks, export credit agencies, and sovereign wealth funds around pipeline development for green industrial projects in Africa.

For sustainable mining and mineral-processing technologies to build on green industrialisation specifically, G20 cooperation can shape both the quantity and quality of capital that flows into Africa. As such, investment must be conditional on higher ESG standards, including decarbonised mine operations, water- and energy-efficient processing plants, robust tailings management, and community consent processes. To this end, financing of developing countries' transitions should prioritise infrastructure, processing facilities, and industrial ecosystems particularly rail, power, smelters, refineries, and downstream manufacturing that will enable African countries to effectively industrialise.

Additionally, G20 2025 cooperation must support green industrialisation through value-added mineral strategies aligned with African regional frameworks. As such, critical mineral investment should be deliberately channelled into integrated projects that connect sustainable extraction to local processing, manufacturing, skills development, and technology transfer. Through instruments like the B20 (business) and T20 (think-tank) tracks, as well as proposed G20 critical minerals frameworks, the 2025 presidency can push for financing packages that bundle mine investments with commitments to establish processing plants, R&D centres, and green industrial parks in Africa.

To advancing the Just Transition requires centring people in which needs reconciling social and ecological harms historically associated with mining activities and development. Recent investigations show that finance for transition minerals has too often driven deforestation, pollution, and human rights abuses, particularly in biodiversity hotspots and on vulnerable mining-affected communities. This has caused concern that the risk green transition reproduces old extractive injustices. Therefore, the G20 cooperation must incorporate climate justice principles, strong human-rights approaches, gender-responsive approaches, benefit-sharing, and community-driven development.

## **A human-centred approach for green industrialisation to aid sustainable development**

A just and sustainable green industrialisation framework for Africa must be rooted in the protection and fulfilment of human rights and inclusive community engagement. The pursuit of a just energy transition systems brings a two-folded challenge of harnessing its abundant mineral resources and avoiding the exploitation, environmental degradation, and exclusion that have historically accompanied resource extraction.

Central to this framework is ensuring that affected communities be consulted meaningfully and engaged in decision-making processes. This requires aligning green industrial policies with human rights instruments, including the African Charter on Human and Peoples' Rights, and integrating the United Nations Guiding Principles on Business and Human Rights to enforce corporate accountability and government oversight. A human rights-based approach ensures that industrialisation advances social justice and environmental stewardship and not replicating extractive dependency under a new green guise.

In the context of Africa's green industrialisation, mandatory disclosure of mining payments plays a pivotal role in curbing corruption and illicit financial flows and aligning the extractives industry with the continent's ambition for value-added, green growth.

The adoption of payment-to-government disclosure frameworks would bolster governments and communities' ability to hold companies and public officials accountable for licences, royalties and taxes. By making payments public, aggregated by company and by region, the link between resource extraction and local development can become more visible. This further ensures that mining becomes a driver of green industrialisation. In addition, transparent payment disclosure supports higher ESG performance by reducing governance risks and thus improves investor confidence in Africa's extractives industries.

Public engagement and broad-based access to information form a critical component for accountability. The social dimension of ESG demands meaningful community voice, participatory oversight, and transparency of project terms.

Communities and civil society must have access to mining contracts, environmental and social monitoring reports, production and export data, as well as enhanced transparent mechanisms to register grievances, participate in audits and report alleged malfeasance or non-compliance. In this way, affected and interested parties can assess whether the industrial-scale projects tied to the green transition are delivering tangible benefits, such as jobs, infrastructure, skills development. Thus, public engagement and transparency must be embedded in both regulatory and corporate practice to link mining governance with green industrial objectives and social licence to operate.

For example, Ghana illustrates how contract and data disclosure can be operationalised. This pertains to mining agreements are publicly accessible, enabling journalists, CSOs and local authorities to understand fiscal terms, environmental obligations and social commitments. International best practices and standards from IFC and ICMM sets out how credible grievance mechanisms and participatory audits should function at site level, ensuring affected communities can raise concerns about water use, tailings, resettlement, and local content. These are issues that directly shape E and S performance. Making monitoring reports and grievance outcomes public allows stakeholders to verify whether projects feeding energy-transition supply chains are also meeting community development commitments that speak to Africa's green-industrial vision.

Importantly, Africa's green industrialisation requires transparent royalty and tax regimes that are associated directly to local development outcomes and national development goals. A transparent fiscal regime ensures that when royalties, taxes and other fees are paid, a defined share reaches affected communities and local infrastructure such as roads, health services, education, processing facilities are prioritised to meet socio-economic development objectives.

In this way, revenue generated from extractives industries is connected to sustainable growth. Transparent public reporting on how those funds are used, the institutions disbursing them, and measurable outcomes, supports the social and governance dimensions of ESG. To this end, effective ESG performance aids strong structural transformation and therefore creating value and benefits for all stakeholders.

## PILLAR III: TRADE, POLICY, AND GOVERNANCE FRAMEWORKS

Africa faces significant challenges in exporting finished products globally. The shift to sustainable energy sources, expected to increase demand for critical minerals, is driving substantial growth in mining activities. The question is whether this era presents an opportunity to position Africa as a manufacturing hub for green technologies. The AMV, GMS, and the AfCFTA are important policy levers that encourage trade in value-added critical minerals to facilitate equitable resource-based industrialisation and development. This pillar explores the unique opportunity for African economies to increase their participation in global trade.

The opportunity to increase participation in global trade depends largely on market access under fair trade rules. Yet the situation is hardly enabling. According to the World Tariff Profiles 2024, developing economies face higher tariffs on processed goods derived from critical minerals such as cobalt, copper, graphite, lithium and nickel than on raw materials. This situation is argued by the World Trade Organisation (WTO), which, in reference to the electric vehicle chain, notes that:

“ *Developed economies tend to have lower tariffs across all stages of the EV value chain. However, their tariffs rise across the supply chain, with the highest tariffs applied to processed and finished goods. This potentially hinders the ability of developing economies to move up the value chain.* ”

The UNCTAD has correctly stated that tariff escalation – a situation in which relatively higher tariffs are applied to processed products than to raw materials – affects value chains, such as the electric vehicle value chain. The structure of the global trade system still locks African critical mineral producers into producing raw critical minerals, unless radical changes are made. But for now, the reality is that intense geopolitics will determine the future of international trade relations.

### Why Africa Risks Being Locked-in as a Perpetual Supplier of Raw Materials?

The structure of global trade continues to mirror centre-periphery trade patterns, in which Africa exports raw materials and imports finished goods. In this system, the supply of critical minerals has been subjected to rules and policy regimes that make African critical mineral producers perpetual suppliers of raw materials for processing and industrial use in developed countries. Higher tariff escalation on finished products hinders value-added exports, as it poses a structural barrier to economic development. This problem intensifies when taxes on value-added or finished goods exceed those on raw materials, hindering industrial growth in developing economies. This situation often keeps these countries as raw material suppliers, restricting opportunities to add value, create jobs, and diversify their economies.

The United States' Inflation Reduction Act, enacted in 2022, exemplifies protectionist trade policies primarily geared toward securing critical raw materials for Western powers. The US subsidy regime is instructive. Under the Inflation Reduction Act, the amount is approximately \$369 billion. Equally key are provisions regarding state interventions to incentivise the manufacturing and sale of Electric Vehicles (EVs) on both the demand and supply sides. On the demand side, it is important to explore the local content requirements under which the IRA has a tax incentive (up to \$7,500) for households to purchase an EV. On the supply side, American manufacturers enjoy tax breaks when producing (part of) the batteries for electric cars. What is key is that both incentives link to North American assembly and local component specifications for EVs and batteries. In this regard, these incentives are trade-distorting and undermine the competitiveness of African exports of finished critical goods.

## Export Restrictions

In December 2023, the Government of China announced export restrictions on rare-earth processing technology. This has been followed by an expansion of restrictions targeting defence and chip users, as well as the announcement of rules requiring compliance from foreign rare-earth producers that use Chinese materials. China controls 60% of global rare earth production and approximately 90% of processing capacity. It also implemented a ban on graphite exports. Furthermore, trade tensions and conflicts have been intensified. In these developments, tensions have risen on the geopolitical front.

Some African governments, such as Zimbabwe and Namibia, have implemented export controls or quotas to promote domestic processing or influence global cobalt prices (in the DRC), with varying success. Unlike with oil, governments have resorted to stockpiling and export restrictions (in the DRC and China), as well as in Botswana, Zimbabwe, and Namibia, among other countries. In early 2025, the DRC unilaterally suspended cobalt exports. This has been replaced with a quota system that has tightened cobalt supply with significant effects. The system has driven price volatility and prompted shifts in sourcing strategies across global markets.

The cooperation agreement between the DRC and Zambia, supported by UNECA and the African Export-Import Bank (Afrexim bank), marks a significant milestone. However, progress has been slow since its launch in 2022. The two countries are key producers of critical minerals. The DRC produces about 70% of the world's cobalt, a vital component in lithium-ion batteries used for electric vehicles, computers, and mobile phones.

Zambia, Africa's second-largest copper producer, supplies roughly 800,000 metric tonnes annually - an essential mineral for electrification and energy storage. In this context, this collaboration holds great promise for leveraging these resources to develop green technologies.

It has seen the establishment of trade facilitation infrastructure, such as SEZs, to support export-oriented manufacturing. This development was expected to create a regional value chain for critical minerals. Still, the lack of investment - i.e., capital - means that trade policy alone will not yield significant results in adding value to Africa's critical minerals.

## Regional Value Chains: Harmonising Policies for Regional Integration

In the multilateral context, WTO disputes have concerned restrictions on local content. Regional value chains present a feasible pathway for establishing regional industrialisation hubs. Nevertheless, there is a need for coherent and harmonised regulations to support regional value chains. The AfCFTA offers an opportunity to advance value chains, such as those for battery-electric vehicle manufacturing (Protocol on Trade and Investment Value Chains). Achieving policy coherence and harmonised regulations across regional blocs like SADC and the AU is essential to attract investment and facilitate cross-border trade. This integration must also address energy scarcity through mechanisms such as power pools, such as the SADC Power Pool.

Additionally, prospects for green industrialisation are abundant, especially considering hydroelectric power from the Grand Inga Projects which has received renewed interest from the World Bank – (Off-takers and Power Purchase Agreements) – side-streams. Effective coordination between trade and climate change policies is crucial when discussing the energy transition. Within the African context, it is vital to harmonise trade and environmental policies, enabling Africa to take a leadership role in green industrialisation. The absence of a climate change protocol in the AfCFTA should be recognised as a significant lacuna.

Africa's role in shaping global policy shifts and diversifying trade relationships is crucial to avoiding over-reliance on single partners like China. The race to secure strategic advantages in green technologies has intensified. Whilst discussions are centred on green technologies, there are other two critical areas that beg for attention: First, increasingly so, critical minerals (including rare earth elements for magnets) have become central for manufacturing high-performance magnets, batteries, and electronic components that power everything kept to powering Artificial Intelligence servers (i.e., operation of Data Centres), and cooling systems.

Secondly, critical minerals remain vital to the Defence and Security industrial complex. Trade wars and geopolitics have thus become prominent features in the supply and governance of critical minerals within global value chains. In 2024, the US and the EU enacted measures that appear to be counter- or retaliatory actions against China's concentrated production and supply capacity of critical minerals. In the US, the Biden Administration's initial steps included import bans and subsidy schemes to counter China. This was followed by the US involvement in the Lobito Corridor and the signing of the Mineral for Security Agreement between the DRC, Rwanda, and the US government.

Understanding how the Organisation of the Petroleum Exporting Countries (OPEC) member nations coordinate to manage oil supply and demand is crucial. This cooperation has notably bolstered their bargaining position. These countries have a network of state-owned oil companies that compete with major international oil firms, enabling governments to safeguard their strategic interests through their petro-industrial structures. Conversely, such a coordinated approach has not been adopted in the critical minerals sector. As a result, producer nations need to collaborate and assert their interests more effectively in global negotiations.

Given the vitality of green minerals to the transition to clean energy, Africa must leverage this strategic advantage in international trade and climate discussions to secure financial, technological, and capacity-building support from developed countries. It is imperative to enhance the governance framework of critical mineral value chains, transitioning from unilateral or plurilateral policies to a rule-based system under the WTO. Recommendations provided by the United Nations Secretary-General's Panel on Critical Energy Transition Minerals are pivotal to these governance reforms. Nations such as Colombia are advocating for a multilateral binding treaty concerning critical minerals. The objective of this treaty is to improve traceability throughout the entire supply chain of critical minerals, encompassing extraction and recycling processes.

Furthermore, cooperation and technology transfer are essential. This involves exploring the introduction of facilitatory intellectual property mechanisms for technology transfer similar to those used during the Covid-19 crisis, to promote inclusive green industrialisation. Closer to sources of the critical minerals, efforts should focus on boosting the negotiation power of land-linked communities affected by mining by harmonising laws on meaningful consultation and consent.



Source: Adobe Stock

At the community level, non-state actors focus on promoting inclusive participation supported by laws such as environmental regulations that uphold Free, Prior and Informed Consent (FPIC) and are protected by international human rights law. This legal framework has empowered communities, with NGOs providing training to enable participation in public consultations on mining projects. In the context of the energy transition, communities near mines have gained influence, although power imbalances still limit their involvement in negotiations. There have been significant cases of greenwashing as corporations mask ESG violations under glossy reports, the victimisation of rights defenders and unfair compensation levels for mining-impacted communities. This emphasises the importance of international principles such as the UNGP, regional mechanisms, and special procedures. These are complemented by private standards like the GRI and the Equator Principles, which advocate for community engagement.

Frontline communities have contended with rights violations such as forced evictions and river pollution - exemplified by the Kafue River in Zambia – breach ESG standards and are particularly troubling. The Kafue River spill was caused by a severe acid leak from a Chinese-owned copper mine in Zambia, contaminating a key river and sparking worries about lasting environmental damage and potential risks to millions.



Source: Adobe Stock

Notably, in the DRC, between 15 and 30 per cent of cobalt is mined informally by artisanal miners and cooperatives, often without proper human rights and environmental safeguards - resulting in child labour, occupational hazards, gender-based violence, and environmental harm. For instance, cobalt mining in the DRC - which accounts for about 70 per cent of the world's cobalt supply - is connected to serious human rights issues. These include harsh working conditions, such as exposure to forced labour and child labour. According to a study commissioned by the US State Department about forced labour:

“

*The main indicators of involuntariness are being unable to refuse to do hazardous work, being subjected to abusive overtime requirements to which they have not agreed, and deceptive recruitment. The main indicators of coercion are restrictions on workers' movements, abuse of worker vulnerability, and withholding of wages or other promised benefits.*

”

In artisanal mining, a largely manual method of extraction, injury or illness rates are nearly twice as high for workers in both small- and large-scale cobalt mining, due to falling rocks and tool accidents.

Considering the above, the establishment of resilient and sustainable critical minerals supply chains is of strong geopolitical interest to many governments, as supply chains for critical minerals are susceptible to disruptions. The fact that critical minerals are often sourced far from the countries that consume them, and that external shocks along the value chain are many, creates a complex picture. To address supply chain disruptions, several governments established the Minerals Security Partnership (MSP) in June 2024.

Led by the US, MSP is a collaborative effort based on principles that support responsible development in the critical minerals sector. Its main goals include keeping high environmental, social, and governance (ESG) standards, promoting sustainability, and sharing prosperity. This has been followed by the G7 Critical Minerals Action Plan of July 2025, which commits the members to building standards-based markets and developing a roadmap to “...establish a set of criteria that constitute a threshold for standards-based markets.”

A key recommendation is to encourage member countries to enhance social safeguards tailored to their specific risk levels and to ensure that their national and regional critical mineral strategies adhere to international best practices. These problems threaten human rights and the principles of the Just Energy Transition, highlighting the need for stricter ESG enforcement.

In the era of green mineral-driven industrialisation, African governments see the importance of boosting trade cooperation to spread clean technologies and bring manufacturing closer to green mineral extraction sites. The G20 offers a platform for this, and more engagement is needed as South Africa transfers the Presidency to the US. The World Bank highlights that producer countries, such as the DRC, can leverage their natural mineral resources, including cobalt, to meet development objectives, reduce poverty, and promote shared prosperity. However, stalled progress in international trade negotiations casts doubts on multilateralism and the hope for an equitable, rule-based, predictable and non-discriminatory trading system.



Source: Adobe Stock

## PILLAR IV: SUPPLY CHAIN RESILIENCE AND STRATEGIC COOPERATION

### Mapping the Power Structure of Mineral Supply

Over 87% of global refining capacity for key energy transition minerals—cobalt sulphates, lithium hydroxide, natural graphite anode material, and manganese sulphate—is located in three jurisdictions: China, the European Union (EU), and Indonesia. These midstream centres do not simply transform raw inputs; they set market-entry specifications, control acceptance criteria for impurities, and define qualifying thresholds for product certification. For instance, China controls approximately 98% of global manganese sulphate refining capacity, according to data validated in the IEA 2025 market review, while Indonesia’s downstream industrial policy now enables it to control over 50% of the world’s nickel sulphate trade through vertically integrated operations. African jurisdictions, despite possessing over 30% of global critical mineral reserves, remain absent from the pricing and acceptance system.

Market participation is structured through voluntary but de facto mandatory compliance frameworks. The EU Battery Regulation, which has been operational since 2023, mandates the collection of lifecycle carbon footprint data, compliance with due diligence reporting standards, and progressive requirements for recycled content. These regulations, enforced through digital product passports, implicitly favour economies that house the data infrastructure and institutions responsible for audit validation. African producers must therefore meet high compliance costs without direct participation in the rule-setting process. Similar external authority is exercised through the Global Battery Alliance’s (GBA) traceability system, whose primary nodes of operation are in Europe and East Asia. Data uploads, audit verification, and benchmark standards are calibrated in jurisdictions outside the producer region, effectively subordinating supply participation to consumer-led metrics.

The control over logistics further consolidates the power imbalance. Corridors such as the North–South Corridor (linking the Democratic Republic of the Congo to the South African ports of Durban and Richards Bay), the Lobito Corridor (from Zambia and the Democratic Republic of the Congo to Angola’s Atlantic port), and the Maputo Corridor (serving South Africa, Mozambique, and Zimbabwe) operate under fragmented regulatory ecosystems. Technical specifications, such as axle-load limits (18 to 22 tonnes), rail gauge compatibility (Cape gauge vs. standard gauge), and stockyard loading times, vary across jurisdictions and are often codified in concession agreements governed by English law, which assign liability to the mineral shipper in the event of a cross-border delay. These structural differences enable private port and rail concessionaires to extract high fees for demurrage, while the scheduling risk remains with the exporter.

Financial institutions reinforce the imbalance through risk-pricing and maturity discrimination. African logistics and processing infrastructure projects face average interest rates that are between 350 and 600 basis points higher than comparable OECD assets of equal technical quality. For example, a dry bulk stockyard facility proposed in Beira, Mozambique, was priced at 14.5% annual interest despite insurance and sovereign guarantees. These disparities arise from country risk premiums that penalise the unpredictability of inter-jurisdictional customs clearance and informal procedural bottlenecks. Most African rail and port infrastructure operate under contracts with take-or-pay clauses, obliging exporters to bear losses even when state-side regulatory delays occur. Without structured risk-sharing mechanisms and credit enhancements calibrated for corridor-specific operational risk, producers are systematically disadvantaged in trade.

Data authority completes the cycle of external control. While verification protocols exist, including the OECD Due Diligence Guidance and the Extractive Industries Transparency Initiative (EITI) Standard, the platforms that aggregate, validate, and transmit such data are based in consumer jurisdictions. African regulators do not maintain sovereign registers for processing-origin certificates, traceability attestations, or carbon intensity declarations. In practice, this means that even when a shipment meets technical and sustainability requirements, the documentation validating those claims must pass through systems administered externally. This leaves producer countries vulnerable to disqualification on procedural or documentation grounds, rather than on substantive product characteristics.

Control, therefore, resides not in who owns the resource but in who manages the flow, verification, and scheduling. Without direct authority over standards, logistics coordination, audit systems, and capital structuring, African and other Global South mineral exporters will remain locked in extraction-based trade models. Reversing this condition requires relocating decision-making power into African institutions with legal mandates, technical capacity, and recognised jurisdictional authority. This necessitates a strategic redirection of investment into rule-setting and system-building functions, rather than merely increasing processing capacity.

### **Lobito – Investment Without Operational Sovereignty**

The Lobito Corridor has been positioned as a flagship infrastructure intervention for African mineral exports. Backed by over \$1.3 billion in public and private capital from the United States International Development Finance Corporation, the European Union’s Global Gateway, and the Africa Finance Corporation, the corridor spans 1,300 km of rail and road from the port of Lobito in Angola through the mineral-producing Katanga region of the Democratic Republic of the Congo and into the Zambian Copperbelt. Its stated purpose is to expedite the export of copper, cobalt, and other transition minerals to Europe and North America.

Yet despite its strategic positioning and political attention, the corridor exposes fundamental institutional weaknesses. It remains governed by three distinct national regulatory systems. Axle-weight limits differ by jurisdiction, with Angola permitting 56 tonnes and Zambia enforcing 48 tonnes, which affects permissible loadings across borders. There is no integrated corridor authority or supranational mechanism to resolve investment disputes, harmonise customs procedures, or issue corridor-level standards on environmental, social, and labour compliance.

Furthermore, the concession of the Lobito rail line to a private consortium (Lobito Atlantic Railway, comprising Trafigura, Mota-Engil, and Vecturis) has not been accompanied by a corridor-level investment code or operational charter. Each government negotiates financing, approvals, and operational rules on a bilateral basis. This results in legal and regulatory misalignment that weakens throughput and increases costs.

## Why the Security-of-Supply Model Fails

Prevailing approaches to mineral supply governance remain shaped by security-of-supply paradigms. These approaches, whether through bilateral offtake agreements, strategic reserves, or allied sourcing pacts, aim to guarantee material access for industrial economies. They do not address the asymmetries embedded in the system's architecture.

Since 2020, industrial economies have intensified their efforts to reduce reliance on single-source suppliers, particularly for lithium, rare earths, graphite, and cobalt. The European Union's Critical Raw Materials Act (2023) and the United States' Inflation Reduction Act (2022) both mandate supply diversification and incentivise localised processing. However, this strategy substitutes geographies without altering systemic design. It leaves unchanged the location of financial decision-making, standard-setting, and verification authority.

Bilateral agreements provide temporary stability but do not correct governance asymmetry. Examples include Japan's 2022 agreement with Namibia for rare earth offtake, and the European Commission's 2023 MoU with the DRC and Zambia. These arrangements channel funding and technical support for extraction, and occasionally for laboratory or pilot-scale processing, but rarely involve institutionalised participation in rules, monitoring protocols, or product-certification frameworks. For instance, the Zambia–EU deal includes language on “sustainable and responsible supply,” yet does not provide Zambia access to EU technical committees on material validation or ESG audit criteria. Producer economies are thus structurally excluded from the regimes that govern the very outputs they produce.

Moreover, these models exacerbate fiscal instability as many African states remain reliant on royalties and export taxes from unprocessed minerals, whose international prices fluctuate with global inventory levels and shift in consumer-side policies.

Between 2022 and 2024, gallium and germanium prices collapsed by over 40% within six months of Chinese export restrictions, as buyers diversified and price speculation intensified. During the same period, African exporters of manganese ore experienced margin contractions due to logistics backlogs and demurrage penalties, with no price floor mechanisms in place. The absence of institutional frameworks to stabilise earnings or allocate risk has rendered producer budgets vulnerable to volatility not of their own making.

Instead of building multi-jurisdictional processing ecosystems, the security-first model encourages states to compete for refining investment through tax incentives and streamlined permitting. This disincentivises regional integration and leads to duplication rather than complementarity. It also creates a race to the bottom in environmental and fiscal standards. For example, proposed processing plants in Tanzania and Zimbabwe operate under divergent royalty treatments and emissions thresholds, even though they aim to serve overlapping regional markets. Without coordinated regulatory baselines and harmonised incentives, such competition erodes long-term system integrity.

In contrast, a rule-sharing model is premised on institutional symmetry. Rather than duplicating industrial capacity across borders, it distributes regulatory, financial, and technical authority, allowing all participants to shape the system's operating logic. This includes co-drafting compliance standards, sharing risk data, and jointly managing verification platforms. Under such a model, producer states participate in defining what constitutes “sustainable extraction,” how emissions are measured and verified, and which facilities meet global certification thresholds. It also involves co-ownership of the digital and physical infrastructure, such as blockchain-based traceability, standard-setting committees, and certification clearinghouses, through which compliance is documented and audited.

The AU's African Minerals Development Centre (AMDC) provides technical frameworks for harmonising environmental, fiscal, and disclosure standards. The African Green Minerals Strategy formalises this logic, outlining instruments for coordinating policy across resource corridors and aligning national investment regimes. These initiatives offer the basis for structured rule-sharing if backed by binding mandates and recognised by global certification bodies. The core requirement is not technology or capital, but legitimacy and operational interoperability.

When risk, responsibility, and authority are distributed, disruptions in one geography do not paralyse the entire chain. Shared rules allow for flexible redirection of flows, mutual recognition of permits and audits, and coordinated release of strategic reserves. For Africa, participation in such systems offers predictable access to finance, stable off-take terms, and agency over the definition of value in mineral trade.

## **Regional Integration as the Engine of Resilience**

Africa's mineral-producing states are structurally fragmented by infrastructure regimes and regulatory systems that remain largely uncoordinated. This fragmentation prevents the emergence of investable, reliable supply systems that could support regional beneficiation and embed African institutions into global mineral governance. Institutional interoperability across transport corridors, standardisation of rules, and regulatory authority are not peripheral matters of logistics—they are the mechanism through which African states can shift from passive extraction to active governance within supply chains.

The African Continental Free Trade Area (AfCFTA) provides the legal structure to support harmonised mineral governance. Its Rules of Origin protocols permit cumulative processing, whereby value added across multiple African states can be treated as domestic under AfCFTA provisions. This allows, for example, lithium processed in Zimbabwe and converted into a cathode precursor in South Africa to qualify as African-origin content. However, without physical infrastructure and shared operational standards, the legal possibility remains underutilised.

The Lobito Corridor, stretching from the Copperbelt through Zambia and the Democratic Republic of the Congo to the Angolan port of Lobito, is now backed by a \$1.3 billion investment package under the Partnership for Global Infrastructure and Investment (PGII). While the rehabilitation of track and customs modernisation are underway, the corridor remains governed by separate national regulators, divergent axle-load standards, and unaligned border protocols. Cross-border coordination failures lead to cost escalation, particularly when weighing stations, axle-load enforcement, and rolling-stock interoperability are not harmonised.

Investment-grade predictability requires both capital and binding operational alignment. A corridor-level regulator with delegated authority over scheduling, technical standards, safety compliance, and dispute resolution would substantially reduce delivery risk and enhance the creditworthiness of the parties involved. The Southern African Railways Association offers a preliminary model but lacks enforcement powers. What is required is a Corridor Operations Protocol (COP), embedded into national regulatory systems, that defines handover procedures, demurrage terms, and permissible load variance across jurisdictional boundaries.

These legal instruments must be accompanied by shared risk structures. No corridor can operate effectively if storage, trans-shipment, and blending capacity are missing or underfunded. Yet such assets, such as inland stockyards, sealed transfer silos, and automated sampling stations, remain unbankable without credit enhancement. The Africa Finance Corporation (AFC), Afreximbank, and the Development Bank of Southern Africa (DBSA) have each piloted forms of corridor-linked investment facilities. However, no joint vehicle yet exists to underwrite the performance of system assets that operate across multiple borders. A dedicated Corridor Infrastructure Guarantee Facility, jointly capitalised and structured around AfCFTA-aligned corridors, would fill this gap. Guarantees should be conditional on compliance with environmental and audit standards defined under the African Green Minerals Strategy.

Regulatory interoperability must extend to the management of permits, audits, and emissions disclosure. At present, a concentrator in Zambia and a refinery in Namibia would be subject to differing environmental disclosure templates, water-use reporting metrics, and verification timelines. These discrepancies deter integrated operations. The African Green Minerals Strategy includes provisions for regulatory convergence, including a shared template for lifecycle emissions reporting and a pan-African registry for ESG audits. Adoption remains partial. For interoperability to function effectively, national regulators must cede specific areas of authority to regional bodies, enabling the mutual recognition of permits and audits.

## Cooperative Governance through the G20

Existing multilateral platforms, such as the G7-led Minerals Security Partnership, the EU's Critical Raw Materials Board, and the US–Australia–Japan trilateral coordination initiatives, are oriented around consumer priorities. They shape the taxonomies of “criticality,” the terms of environmental compliance, and the distribution of resilience funding, without structured input from producer economies. Rectifying this imbalance requires more than diplomatic presence; it requires the construction of formal, binding frameworks that embed African institutions into the architecture of rule-setting, risk allocation, and standard development.

South Africa's 2025 G20 presidency presents an opportunity to establish such a framework. Unlike past summits, which positioned mineral security as a supply-side coordination issue, this presidency can recast governance authority itself as the object of cooperation. The AU's permanent G20 membership, secured in 2023, provides the institutional foothold to operationalise this shift. A dedicated G20–Africa Framework on Mineral Governance would be the instrument through which this rebalancing is enacted.

The first component of the framework must be institutional parity in standard development. African regulators and technical agencies must be seated as co-decision-makers in bodies that define sustainability metrics, audit protocols, and traceability requirements.

This includes participation at the working level in the European Union Battery Passport Working Groups, the OECD Responsible Minerals Implementation Committees, and the ISO technical committees on mining and processing standards. Co-authorship of rules ensures that traceability is not a tool of exclusion, but a platform for validated participation.

Second, the framework must establish mutual recognition protocols for certification. African due diligence platforms that conform to baseline international norms, such as those implemented through the African Green Minerals Strategy, should receive automatic equivalence in G20 markets. This includes ESG audits, carbon footprint declarations, and human rights compliance reports issued by accredited African institutions. Equivalence would reduce duplication, lower transaction costs, and create a legal basis for African auditors and certifiers to operate in global supply systems as recognised authorities.

Third, the framework should fund and host a joint investment screening and risk-mapping platform. At present, investment pipelines are compiled bilaterally or through donor-aligned consortia. This produces duplication and gaps. A shared platform-managed jointly by the African Union Commission and the G20 Development Working Group-would consolidate bankable projects in logistics, processing, and compliance infrastructure. Screening would be based not on alignment with consumer priorities but on system contribution: throughput reliability, emission reduction, and corridor performance. Investment risk assessments would be calibrated to corridor-specific conditions and processed under shared criteria.

Fourth, the framework must formalise a policy-notification mechanism. Currently, tax changes, export restrictions, and quota reallocations are often announced unilaterally, with a disruptive impact on supply stability. A G20–Africa protocol would establish a confidential pre-announcement window for policy shifts, enabling early modelling and response. This mechanism would not limit sovereignty but enhance credibility and reduce market volatility. It would include standardised templates for notification, impact assessments co-validated by independent technical bodies, and an optional mediation window before implementation.

Finally, the framework must include a permanent coordination node within the G20 Development Working Group, co-chaired by South Africa and the AU Commission. This node would coordinate inputs from AfCFTA, corridor regulators, African development finance institutions, and continental audit bodies. It would track implementation, update compliance status, and ensure real-time data exchange across systems. Without a central node, policy alignment remains episodic and reactive.

## **Building Coordinated Financing and Risk Allocation Mechanisms**

Producer economies absorb disproportionate exposure to price volatility, project delay, political shocks, and compliance costs without equivalent access to instruments for risk-sharing or mitigation. Financing frameworks remain aligned with consumer priorities and project types that reflect external processing norms. To correct this imbalance, a coordinated approach to risk allocation is necessary. One that embeds African development finance institutions into upstream project assessment, corridor underwriting, and rule-compliance validation.

The financing landscape for critical minerals is shaped by a small number of public-private alliances. The Minerals Security Partnership (MSP), the EU's Global Gateway, and the US International Development Finance Corporation (DFC) channel concessional finance toward strategic mineral assets. However, these programmes prioritise alignment with home-country industrial strategies rather than African regional integration. For example, MSP project criteria prioritise high-purity oxide output destined for cathode manufacturing, often overlooking midstream projects that serve intra-African processing chains.

The Africa Finance Corporation (AFC), Afreximbank, the African Development Bank (AfDB), and the Development Bank of Southern Africa (DBSA) all possess mandates to support industrial and infrastructure projects. However, coordination is limited. Disbursement criteria differ, risk assessment frameworks are unaligned, and compliance regimes vary by instrument. As a result, parallel due diligence processes increase transaction costs and delay financial closure, especially for transboundary corridor and logistics assets.

A consolidated Critical Minerals Financing Platform is required to align these instruments. It must not be a new institution but a harmonisation of existing ones under a shared screening, evaluation, and risk-sharing protocol. The platform would be hosted by Afreximbank with co-governance by the AfDB, AFC, and DBSA, and linked to the African Green Minerals Strategy's verification protocols. Screening would assess corridor contribution, emissions alignment, job creation, and regulatory interoperability. Projects would be bundled for risk pooling across different instruments, enabling first-loss guarantees for cross-border infrastructure and concessional capital for midstream integration.

Risk instruments must also address the compliance burden. ESG auditing, lifecycle emissions accounting, and traceability documentation carry high fixed costs. African producers frequently absorb these costs without upfront capital or cost-sharing mechanisms. The proposed platform would include a Compliance Risk Sharing Facility, capitalised by G20 development banks, to reimburse a portion of third-party audit costs where African verification systems meet functional equivalence. This would reduce entry barriers for smaller producers and enable African certifiers to scale.

Currency volatility is a further impediment as most mineral transactions are denominated in the US dollar, while project costs are incurred in local currencies. The platform must incorporate currency risk instruments, including local currency credit windows, swap-backed guarantees, and indexed off-take arrangements. Afreximbank's Pan-African Payment and Settlement System (PAPSS) provide the technical infrastructure, but integration with project finance structures is partial. A dedicated Currency Hedging Facility, backed by sovereign commitments and G20 liquidity support, would provide needed insulation.

Finally, the platform must institutionalise performance tracking. Monitoring corridor throughput, emissions intensity, local procurement ratios, and value retention metrics requires standardised reporting. A Data and Impact Monitoring Unit, co-administered by the AU Commission, African Peer Review Mechanism (APRM), and Afreximbank, would compile verified indicators and feed results into platform screening processes. This creates a feedback loop between finance and performance, correcting the current disconnect between funding and system-level contribution.

African mineral governance cannot succeed without risk reallocation. Financing must reflect not only project bankability but also developmental contribution and coherence of the supply system. The financial architecture must be made to serve governance objectives, not only industrial policy alignment.

## Coordinating Technology Deployment

The governance of critical minerals depends not only on who extracts and trades but on who verifies, monitors, and documents compliance. Traceability, emissions reporting, and ESG verification are enforced through technological systems that are unevenly distributed and externally administered. African states remain data providers, not data authorities. This disempowers local institutions, increases compliance costs, and introduces exclusion risks. Reconfiguring mineral governance requires a deliberate reallocation of technological authority through institutional investment, data control, and platform interoperability.

Traceability systems are now prerequisites for market access. The Global Battery Alliance (GBA) mandates digital battery passports, while the EU Battery Regulation requires full lifecycle traceability by 2026. These instruments are built on centralised digital infrastructures that African producers cannot influence. Audit trails are uploaded to platforms housed in Europe or East Asia, where validation occurs through algorithms and external verifiers. Non-participation or failure to meet evolving thresholds can result in de facto exclusion from downstream value chains, even when material quality is high.

African institutions must control the infrastructure of verification. This requires more than software deployment—it demands jurisdictional authority and legal recognition. The African Green Minerals Strategy proposes a Pan-African Verification Framework, linking national authorities into a continent-wide network of accredited audit bodies, certified laboratories, and licensed verifiers. The network would operate under shared protocols aligned with global norms but administered within Africa. Implementation depends on binding mutual recognition agreements, and the political will to enforce equivalence.

Operationally, this entails investments in laboratory infrastructure, data transmission systems, and audit personnel. Most producer countries possess mineral laboratories under geological surveys or standards authorities, but these lack accreditation to international benchmarks (ISO 17025) or fail to meet data auditability thresholds. A Verification Infrastructure Investment Facility—funded through African development finance institutions and G20 technical assistance—should target 30 priority laboratories and verification centres across strategic corridors. These facilities would receive capital for equipment, training, and digital integration into traceability chains.

Digital sovereignty is equally critical. Traceability platforms must not rely solely on external servers and proprietary software. A continental digital architecture, modelled on the African Medicines Agency’s regulatory data hub, should host audit databases, emissions ledgers, and traceability chains. This platform must integrate with external systems through API-level interoperability but be managed by African regulators. Data localisation requirements should be codified into AfCFTA standards, ensuring that compliance data remain within jurisdiction unless voluntarily shared under defined legal protocols.

Blockchain is not a substitute for authority. While some donor-funded pilots have implemented blockchain for artisanal cobalt or tin traceability, they often rely on third-party operators and create dependency on external validators. Africa’s verification infrastructure must be principle-based, not technology-led: authority must derive from legal mandates, standardised procedures, and institutional legitimacy. Where blockchain is used, it must be under African operational control and subject to local dispute resolution.

Technology transfer must be structured and rights based. Joint-venture clauses, technical assistance programmes, and donor-funded systems must include enforceable commitments on source-code access, training, and localisation. Technology deployment without ownership replicates old dependencies. G20 partnerships must fund not only tools but governance capability. This includes legal reform to recognise digital audit trails, procurement codes that prioritise open systems, and export laws that protect data sovereignty.

Verification is the infrastructure of modern trade. It determines who qualifies, who gets financed, and who is excluded. Without control over how compliance is defined, documented, and validated, African states will remain implementers of other jurisdictions' norms. Rebalancing the mineral economy requires technological authority embedded in law, infrastructure, and institutional mandates.

### Who owns traceability?

The EU Battery Regulation (2023/1542), which comes into force in February 2026, mandates the digital documentation of emissions, sourcing location, labour conditions, and end-use pathways for all battery-relevant materials. In practice, exporters from Africa must enter their data into EU-certified traceability platforms—primarily the Global Battery Alliance (GBA) Tracker or country-specific portals operated under EU jurisdiction.

Audit trails are stored on non-African servers, compliance thresholds are determined by EU or East Asian standards agencies, and access protocols are managed by third-party digital vendors. For instance, the GBA's digital passport infrastructure is currently maintained on Amazon Web Services (AWS) servers located in Germany. African national standards authorities and geological surveys are not designated as primary validators, nor are their disclosures automatically recognised under mutual equivalence clauses.

This asymmetry creates two forms of dependency;

- African producers are required to submit sensitive operational data—including environmental metrics and mine-level labour statistics—without control over storage, access, or recalibration.
- Exclusion from the traceability protocol effectively blocks market access, even when material quality and legal compliance are met. This transforms a transparency mechanism into a discretionary market gatekeeping tool.

Several pilot initiatives, including donor-funded blockchain traceability systems for Congolese artisanal cobalt and Nigerian tin, replicate the same problem. They are operated by foreign validators, structured under external standards, and lack appeal or dispute-resolution mechanisms accessible to African institutions.

This pillar has articulated a cooperative governance framework in which producer regions hold institutional authority over the systems, standards, and flows that define the global mineral economy. This shift demands re-engineering of rules, realignment of financial flows, and reconstruction of verification systems. Africa and the broader Global South must no longer serve as material providers but as co-architects of transition supply chains. This involves authority over corridors, rule-setting mandates, data infrastructure, certification systems, and financing platforms.

The proposed architecture is built on mutual recognition, shared risk, and distributed legitimacy. Supply-chain resilience must be co-produced through legal harmonisation, corridor-level governance, investment pooling, and verification autonomy. G20 coordination mechanisms must reflect this design, anchored in co-governance with African institutions.

This cooperative order does not dissolve national sovereignty. It operationalises it through joint decision-making and embedded institutional design. It offers global stability through genuine diversification and regional development through the exercise of agency. The transition to a green economy requires more than minerals. It requires governance systems that are equitable, durable, and co-authored. That is the mandate and architecture set out in this pillar.

## CONCLUSION AND CALL TO ACTION

As the first G20 held in Africa, it stands to develop a just model that builds on Africa's resilience and protects its people to realise a shared prosperity. Cooperation must entail African leaders and decisionmakers to design, invest and own standards, verification systems, and financing structures that will develop a critical minerals industry. G20 members should commit to operationalising the G20–Africa Framework on Mineral Governance, incorporating African institutions in rule-making processes, and aligning green finance with Africa's beneficiation and industrialisation goals.

Investment in shared traceability infrastructure, ESG auditing capacity, and corridor-level regulators will secure stable mineral flows and further build trust, transparency, valuable partnerships across supply chains. For the global energy transition to be sustainable, it must be just. Africa's critical minerals power the world's clean future, yet justice demands that they also power Africa's own development and innovation. A G20 cooperation framework rooted in equity, sovereignty, and solidarity can transform critical minerals to a foundation for green industrialisation and sustainable development. This is the moment for the G20 to act, as partners enabling transformation. A fair, inclusive, and just transition is attainable.

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