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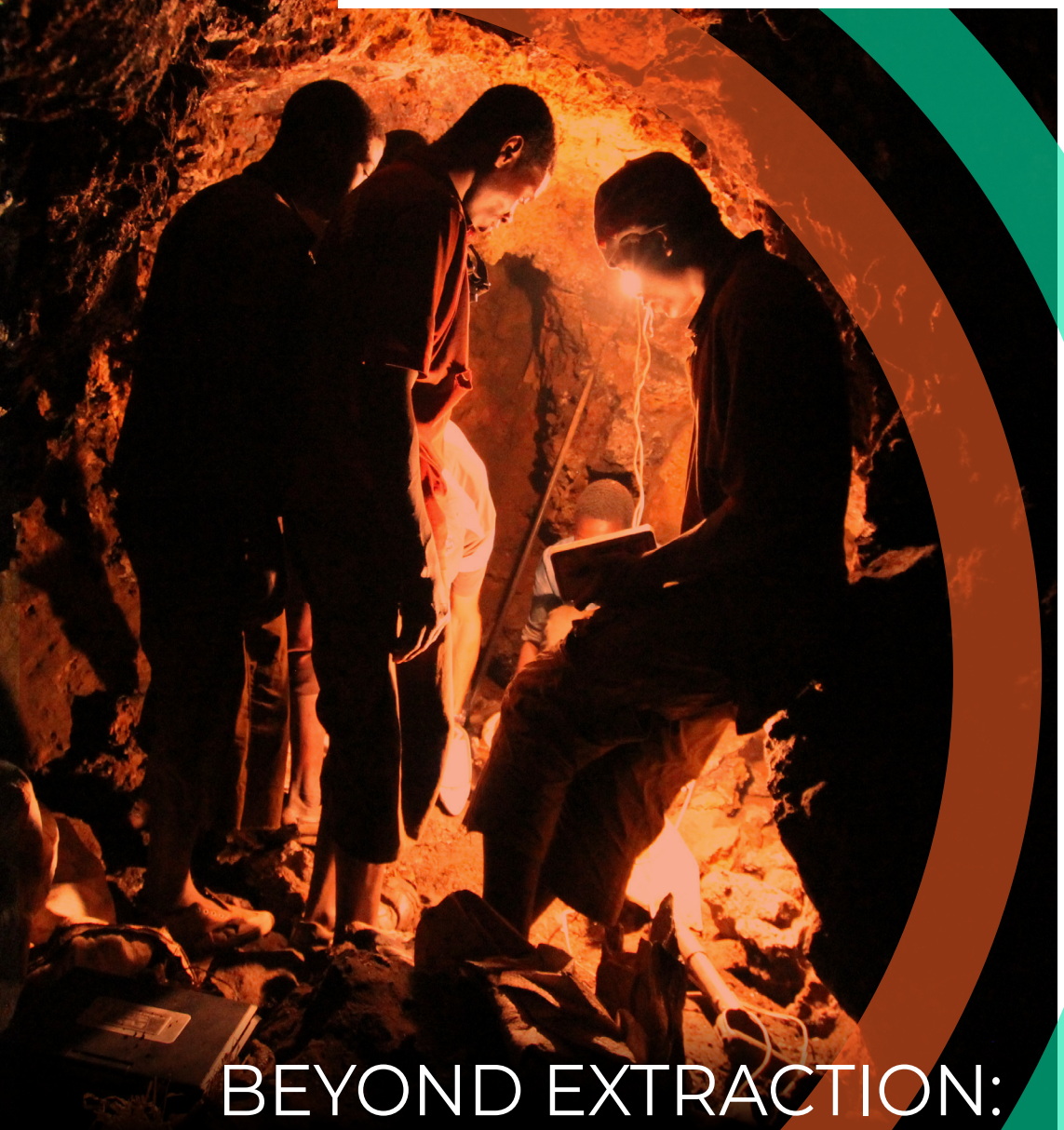

BEYOND EXTRACTION: VALUE ADDITION FOR AFRICA'S CRITICAL MINERALS

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Introduction

Many of the metals and minerals required for the global green energy transition are located in African countries. These resources pose significant policy challenges notably how best to capture the national economic and wider development benefits of the associated value chains. while at the same time managing the inevitable social and environmental costs of natural resource extraction. African countries are actively pursuing an agenda for wider participation in mineral value chains, specifically midstream – including beneficiation (which goes from mineral ores to concentrates), and/or processing (which goes from a concentrate to a semi-finished product) – and downstream (including battery cell assembly). This preoccupation has led to regional strategies and national plans, as well as more immediate policy decisions such as export restrictions on unprocessed material. In response, international actors have begun to provide technocratic support to improve understanding of the specific challenges and requirements for developing mid-and downstream mineral value chain participation in Africa.

This brief highlights some of the key discussion points at an event organised by Climate Compatible Growth and Chatham House on 23 September 2024. The event brought together stakeholders from government, policymakers, international organisations, African regional institutions, private sector, civil society, and academics to discuss the policy challenges and research frontiers on critical minerals value addition in Africa. The event took a multidisciplinary approach, considering Africa's critical minerals processing agenda from a variety of standpoints: geopolitical considerations, technical requirements, economic benefits, financial viability, as well as social and environmental considerations. Consistent with the Chatham House Rule, points summarised here are not attributed to any individual participants.

> "The key challenge is how best to capture the development benefits of critical mineral value chains, while managing the social and environmental consequences"

The geopolitical dimension

The international policy debate on critical minerals is framed in terms of geopolitical competition for involvement in mineral value chains, between China on the one hand, and Western and Western-aligned countries (notably the UK, US, EU, Japan, or Korea) on the other. In particular, the West has voiced mounting concerns around the concentration of critical minerals processing and other mid- and downstream value chain activities in China, and the potential risks this poses for their security of supply, against a backdrop of growing geopolitical tensions. This has prompted interest in supporting increased processing of critical minerals on the African continent, with a view to simultaneously diversifying global supply chains while supporting local economic development.

The use of the term 'critical minerals', that is those with geographical concentrated production and limited substitutions, denotes a certain geopolitical perspective. Such minerals are critical for industrialised economies in the throes of the energy transition, but are in fact not of immediate critical importance to the national development of those African countries that are endowed with them – except as potential sources of export revenues. For this reason, African

Open Pit Manganese Mine – Kuruman, South Africa

institutions prefer to refer to 'green minerals', highlighting their connection with the climate transition rather than imbuing them with any intrinsic importance.

From African nations' perspectives, the central issue is rather one of industrial policy. A growing number of African countries see the critical minerals boom as an opportunity to capture additional value for domestic economies. Hitherto, Africa has exported the lion's share of its critical minerals in the form of unprocessed concentrates – notable exceptions being Zambia's intermediate stage copper exports in the form of cathode (refined metal), DRC's exports of cobalt as cobalt hydroxide from large mining operations, and South Africa's advanced mining industry where refining and manufacturing of different minerals such as manganese for steel or Platinum Group Metals is done. For example, Zambia exported 43.9 kt of ores and concentrates [1] in 2023 compared to 185.9 kt of copper cathode [2], whereas DRC exported 408.7 kt of cobalt oxides and hydroxides in 2021 compared to just 2.8 kt of cobalt ores and concentrates [3].

However, many African countries feel constrained by the dominance of foreign direct investment in the minerals sector, which limits countries' access to their own resources, except where state-owned companies operate in the sector under production sharing agreements. A growing number of governments – notably in DRC, Ghana, Namibia, and Zimbabwe – are taking matters into their own hands by enacting robust policy reforms that indiscriminately ban exports of unprocessed minerals.

Other regions, like Southeast Asia already have experience with bans; notably Indonesia, which enacted a ban on the export of unprocessed nickel, leading to an expansion of domestic processing activity supported by Chinese companies.

While African nations' overall stance towards the background geopolitical tensions remain neutral, African governments could be more strategic and proactive in managing this geopolitical backdrop to their advantage. The presence of competing interests should strengthen Africa's negotiating hand and potentially presents new opportunities for attracting investments, demanding or negotiating transfer of technology and knowhow, and capturing greater local value addition. Nevertheless, achieving this leverage may call for closer regional cooperation and adoption of common negotiating positions. The leverage does not mean that African countries will remain unexposed to market forces, but it would at least strengthen a common position.

A central question is whether Africa's ambitions towards value addition and Western and Western-aligned aspirations for more diversified global supply chains are indeed mutually supporting and potentially reconcilable. Security of supply of unrefined or partially refined minerals depends not only on local investments in mineral processing capacity, but critically on long-term offtake agreements that govern the pattern of exports. Asian economies such as China have achieved this through state-led initiatives driving investments based on long-term interests rather than immediate profitability. Beyond China, the approaches adopted by Japan and Korea, involving a state agency signing agreements with a mining country, sharing equity, and conducting training and knowledge transfer, are particularly interesting and have proven effective.

By contrast, Western economies – such as the UK, US, and EU – had preferred to leave investment

“A central question is whether Africa's amibitions towards value addition and Western aspirations for diversified global supply chains are mutually supporting”

decisions in the mineral value chains to private companies and market dynamics, with only recent changes enabling further participation. New policy measures have focused primarily on incentivising local manufacturing of clean technologies, whether through regulatory targets (EU Critical Raw Materials Act (CRMA)) or state subsidies (as in the US Inflation Reduction Act (IRA)). In the case of the IRA, there is explicit mention of upstream and mid-stream supply chains, such as mineral extraction or refining being based in the US or in countries with which the US has free trade agreements in effect. In the case of the EU CRMA, increasing and diversifying supply of raw materials is a specific aim.

Beyond such legislative measures, international partnerships have also been set up, such as the World Bank administered G7 RISE (Resilient Inclusive Supply Chain Enhancement Partnership) [4] – with its explicit focus on Africa – and the Minerals Security Partnership (MSP) – which includes as members the UK, US, and EU [5]. The MSP is “working with other export credit agencies and financial bodies to help de-risk and increase financing for critical minerals projects” [5]. More recently, the UK announced the use of Export Finance for securing critical minerals supply [6]. Such initiatives may support development of midstream processing projects in Africa, as long as bankability of investments can be ensured through suitable off-take agreements.

The economic development case

African countries are increasingly exploring the possibility of critical minerals value addition. This means not only a greater participation in the processing of minerals, but also potential for downstream linkages into battery manufacture, and possibly upstream linkages into production of equipment and reagents as identified in the African Union's Green Minerals Strategy [7]. At a global scale, mineral processing activities have so far tended to co-locate with mid- or downstream manufacturing, depending on trading relationships, required process inputs, or business models, and this has driven concentration in Asia.

At present, there is conflicting evidence regarding whether production costs of processed minerals would be lower or higher in Africa, and more generally limited availability of analytics to evaluate economic feasibility and competitiveness of such processing activities. Market factors outside of Africa also play a role in shaping Africa's competitiveness, including monopoly pricing in upstream feedstock markets, as well as tariff and non-tariff barriers in downstream export markets. Such cross-jurisdictional competition, combined with technology lock-ins associated to battery chemistry processes, affects the economic viability of new projects.

Historically, the mining sector has not been as proactive as the oil sector (for instance) in demanding that multinationals take measures to promote localisation of value chains. This is linked to the stakeholders involved, as well as different project timelines compared to the oil sector. Going forwards, governments issuing exploration and production licences to foreign mining companies could place more requirements to train the local workforce and provide transfer of technology and knowhow. Given significant skills gaps, there is no doubt that developing minerals processing and clean technology manufacturing capability in Africa will call for significant investments in human capital. Africa has a foundation of geologists and mining engineers, but moving-up the value chain will demand new skills in industrial processes and chemical engineering. However, education is needed not only at the professional level, but particularly at the technician level where there are substantial shortfalls in vocational training.

Another challenge is that Africa has been unable to harness local capital into the development of critical minerals value chains, remaining heavily dependent on foreign investors who are often reluctant to commit capital due to the low bankability of projects. In that regard, international support from development finance institutions could help to attract private investment through improved policies, provided the projects are de-risked. Governments could in parallel reshape their enabling environment including regulations and strategies.

Value addition will also make substantial demands on Africa's infrastructure networks, which are often under-developed and struggle to provide reliable and cost-effective services. Ambitious mineral processing scenarios would materially raise national electricity demand projections, requiring substantial investments in generation and transmission infrastructure. Transportation infrastructure would also see escalating demand, concentrated on the eastern and western corridors linking the Copperbelt to Dar Es Salaam and Lobito ports respectively, as well as networks within South Africa, or Namibia (Walvis Bay) to Botswana.

“Value addition will also make substantial demands on Africa's infrastructure networks”

Catumbela Bridge, Lobito – Angola

While the mining industry may be able to contribute financially to the development of dedicated power and rail infrastructure, nationally strategic infrastructure is a government remit, often entailing regional cooperation. The potential scale of energy and transport demand would likely make significant demands on public power utilities and state road or rail networks, which would be needed to create the enabling environment for bankable investments in minerals value addition. Regional or national initiatives then need to support strategic infrastructure plans underpinned by elements of both public and private investments, drawing on existing experience with public–private partnerships [8,9].

A potential barrier to advancing value addition in Africa is the significant economies of scale involved in the associated industrial processes. This means that some African countries may lack the requisite volume of mineral production to be able to process cost-effectively and compete in global markets. African regional institutions have been encouraging cross-border approaches that would allow production from multiple countries to be processed at a single larger facility. For example, Tanzania has announced its intention to become a mineral processing hub in East Africa. This flies in the face of the recent spate of national unprocessed mineral export bans noted above, and would call instead for a single African free trade area for minerals (in harmony with the existing African Continental Free Trade Agreement) with a common external tariff and regional unprocessed mineral export ban.

Achieving such cross-border collaboration is likely to be challenging given multiple barriers to regional cooperation, including physical,

financial, and/or regulatory. A limiting factor is that the African Union (unlike the European Union) lacks the legal power to harmonise and enforce policies at the national level. Furthermore, tensions may arise between African countries regarding how the benefits of regional value addition would be distributed nationally. The new Africa Union's Strategy on Green Minerals (and its Economic Community of West African States (ECOWAS) equivalent called the Model Mining and Minerals Development Act) represent a step in this direction. Prior regional cooperations attempts were made, for example in the SADC [10]. But the only concrete (though yet unrealised) example of regional collaboration related to battery manufacturing to date is the signature of a binational agreement between the DRC and Zambia to collaborate on the development of battery manufacturing capabilities.

Another issue that Africa faces in the development of value addition capabilities is the technology risk surrounding future battery chemistry developments that could potentially reorient the demand for minerals. For example, there are already discussions about sodium potentially replacing lithium in future batteries, which could significantly affect future demand for lithium and the return on associated investments. Nevertheless, downstream manufacturing plants are highly inflexible, which leads to a high degree of lock in when it comes to battery chemistry. Moreover, the time horizon required for the development of new battery chemistry options is incompatible with climate deadlines. As a result, it can be expected that Africa's endowments of lithium and cobalt will continue to be in strong demand until at least 2040 [11] and beyond 2030 [12] respectively.

The social and environmental license

Mining and minerals processing activities can carry a wide range of major environmental and social consequences. On the environmental side, these include air, water, and soil pollution, water scarcity, deforestation, biodiversity conservation, and land-use change, as well as mismanagement of waste and seismic and noise events. In social terms, mining leads to worker injuries and fatalities as well as population displacement and wider social disruption including human rights abuses. An illustrative example is the Zambian province of Kitwe, where landslides and building corrosion due to sulphur acidity have been experienced as a result of mining activity.

It is therefore important that these wider environmental and social consequences of mining and processing be accurately and objectively quantified through independent feasibility studies. Countries should focus on minerals value chain participation that brings net social benefits (over and above associated social costs), rather than narrowly pursuing value addition and export revenues irrespective of environmental and social damages.

Environmental analysis of mining projects should extend across the entire lifecycle, including mine closure considerations and costing of desirable remediation measures. This should go beyond the existing costing of large-scale mine closures, which are typically considered, and also include artisanal and small-scale mining (ASM) and country-level remediation using national environmental protection funds. Such analysis may provide further evidence on the real benefits and consequences of mineral value addition.

Incorporating environmental constraints into the permitting processes for new mines and processing facilities is particularly important but has proved challenging due to overlapping

jurisdictions and accountabilities between ministries or misaligned incentives. Solutions could include conducting national-level integrated planning, which some countries have tried doing, such as Zambia's Presidential Delivery Unit.

The carbon footprint of mining and mineral processing is a question of increasing interest to governments and markets. African countries differ significantly in their ability to harness low-carbon energy for the minerals sector. In future, with mechanisms such as the EU's Carbon Border Adjustment Mechanism, the ability to certify clean energy along the mineral supply chain could become a competitive advantage.

The mining sector also poses significant governance challenges. Examples provided across African countries show significant variation in royalty and tax regimes facing the mining sector and policy instability due to constant policy changes. These regimes pose difficulties when considering regional integration. Policy reliability could be sought by creating a stable policy regime at inter and intragovernmental levels.

Unresolved questions

Finally, discussions helped to highlight the many unresolved policy questions that demand future attention from the research community. The questions are broadly subdivided by topic for ease of understanding.

Geopolitical

- Does locating critical minerals processing capacity in Africa combined with increased mineral extraction really contribute to security of refined mineral supply for Western and Western-allied countries due to offtake arrangements?
- What can be learnt from comparative analysis of Japanese/Korean/Chinese approaches to securing critical minerals supply chains based on strong state intervention and clear offtake arrangements, compared with US/EU market-oriented approach?
- Should African countries move from national export bans to regional export bans? What national and regional policy frameworks best serve the interests of African countries?

Financial

- What other factors restrict the flow of finance to critical minerals processing activities in Africa?
- What are the risks of asset stranding for investors in critical minerals production and processing in view of technology and market risk? How can these risks be addressed?

Technoeconomic

- What is the feasibility of further forwards (battery manufacturing) and backwards (reagents, equipment) supply chain linkages for critical mineral processing?
- What would it take to ensure that value addition in critical minerals processing benefits local economies (including locally owned projects, proper management, and good governance)?

Environmental and Social

- What is the role of artisanal mining in critical mineral supply chains?
- What are the political economy dynamics of regional cooperation on critical minerals supply chains in Africa?
- To what extent and in what ways should environmental, social, and governance (ESG) concerns shape or limit development of critical minerals?

References

[1] World Integrated Trade Solutions. (2024). *Zambia Copper ores and concentrates exports by country | 2023 | Data*. https://wits.worldbank.org/trade/comtrade/en/country/ZMB/year/2023/tradeflow/Exports/partner/ALL/product/260300

[2] World Integrated Trade Solutions. (2024). *Zambia Copper cathodes and sections of cathodes unwrou exports by country | 2023 | Data*. https://wits.worldbank.org/trade/comtrade/en/country/ZMB/year/2023/tradeflow/Exports/partner/ALL/product/740311

[3] World Integrated Trade Solutions. (n.d.). *Congo, Dem. Rep. Cobalt ores and concentrates exports by country | 2021 | Data*. Retrieved 4 December 2024, from https://wits.worldbank.org/trade/comtrade/en/country/ZAR/year/2021/tradeflow/Exports/partner/ALL/product/260500

[4] World Bank Group. (2024, May). *The RISE Partnership: Securing the Green Energy Transition is an Opportunity to Support Africa's Development*. Update Note. https://www.g7italy.it/wp-content/uploads/Annex-IV.-Update-note-on-the-Rise-Partnership_G7-FMCBG-23-25-May-2024-Stresa.pdf

[5] Minerals Security Partnership. (2022, June 14). *United States Department of State*. https://www.state.gov/minerals-security-partnership/

[6] UK Government. (2024, October 31). *UK approves use of export finance to secure critical minerals*. https://www.gov.uk/government/news/uk-approves-use-of-export-finance-to-secure-critical-minerals

[7] African Union. (2023). *Draft Africa's Green Minerals Strategy*.

[8] African Development Bank. (2023, November 17). *Public-private partnerships needed to bridge Africa's infrastructure development gap*. https://www.afdb.org/en/news-and-events/public-private-partnerships-needed-bridge-africas-infrastructure-development-gap-65936

[9] Ang'ana, G. A., & Amaeshi, K. (2024, November 22). *Public-private partnerships in Africa: The role of a strong and responsible private sector*. https://euideas.eui.eu/2024/11/22/public-private-partnerships-in-africa-the-role-of-a-strong-and-responsible-private-sector/

[10] SADC. (1992). *Protocol on Mining in SADC*. Southern Africa Development Community. https://www.sadc.int/sites/default/files/2021-08/Protocol_on_Mining..pdf

[11] Benchmark Source. (2024, August 14). *$1.6 trillion investment needed in battery industry by 2040*. https://source.benchmarkminerals.com/article/1-6-trillion-investment-needed-in-battery-industry-by-2040

[12] Fisher, H. (2024). *Cobalt Market Report Prepared by Benchmark Mineral Intelligence for The Cobalt Institute*. https://www.cobaltinstitute.org/wp-content/uploads/2024/05/Cobalt_Congress_2024-Presentation_Benchmark_Mineral_Intelligence-Harry_Fisher.pdf

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ACKNOWLEDGEMENTS

The views expressed in this brief do not necessarily reflect Climate Compatible Growth programme views, but rather aim to summarise event participant perspectives.

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Thank you as well to our event speakers for their engaging participation, to the audience for thein insights and to the Chatham House team for their support.

Thank you to **Dave Luke** (Artios) and **Andre Cabrera Serrenho** (University of Cambridge) for peer-reviewing this event briefing.

This material has been produced under the Climate Compatible Growth programme, which is funded by UK aid from the UK government. However, the views expressed herein do not necessarily reflect the UK government's official policies.

RECOMMENDED CITATION: Climate Compatible Growth and Chatham House (2024). *Beyond Extraction: Value Addition for Africa's Critical Minerals.*