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Financial Benefit-Sharing Issues for Critical Minerals:

Challenges and opportunities for producing
countries



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**Financial Benefit-Sharing Issues for Critical Minerals:
Challenges and opportunities for producing countries**

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Executive Summary

Background

This note aims to contribute to the work of the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF) on critical and strategic minerals for the energy and digital transition,¹ focusing on financial benefit sharing. It will help answer the question of whether current fiscal approaches and policies align with national strategies, including ensuring that mineral-rich developing countries collect an appropriate share of the financial benefits arising from critical minerals across the value chain and, if not, what needs to change.

While the financial benefit-sharing challenges and opportunities in the extraction and processing of critical minerals are not fundamentally different from the commonly known challenges facing mining revenue collection in general, some nuances require further investigation. This paper seeks to identify these nuances in the key features of critical minerals and the new challenges and opportunities that they present to fiscal regulation.

Why Revenues From Critical Minerals Matter to Developing Countries

Revenues from critical minerals matter to mineral-rich developing countries for several reasons:

- The additional revenue potential of critical minerals in a period where demand growth is expected to outpace supply is significant.
- The window of opportunity for mineral-rich countries to capitalize on the potential additional revenues is limited.
- Critical minerals have offered additional impetus for mineral-rich countries to think about financial and economic benefits more broadly, including by locking in value downstream.
- Supply chains are under increasing pressure for diversification, which could mean that traditional ways of making acreage attractive must adjust to political decisions.
- Many of the challenges of designing and administering a mining fiscal regime for critical minerals are not new and should be considered according to the established principles of fiscal regime design and implementation.

Framing the Challenges and Opportunities for Financial Benefit Sharing

It is useful to consider the risks and opportunities that the energy transition presents to countries seeking to optimize their financial benefit-sharing outcomes from the production of these minerals. This can be done in the context of specific features that frame these emerging challenges and opportunities that countries could face and the strategies they

¹ See United Nations Conference on Trade and Development (2023) for useful background on the “twin transition for global value chains: green and digital.”



could adopt as they try to optimize their financial benefits from critical minerals, amongst other policy objectives. They include

- geological context, which focuses on the nature and location of natural mineral endowments;
- the refining and processing capability of the country; and
- economic considerations, which range from key development indicators to revenue management capabilities.

Challenges for Financial Benefit Sharing

Given the anticipated demand and supply mismatch for critical minerals and the expected price increase as a result, the overarching challenge for the source countries of these minerals is one of suboptimal financial benefit sharing. Essentially, the primary challenge surrounds the possibility that they could miss a potentially limited window of opportunity to benefit from the additional revenues. This challenge could manifest in several ways, and the following have been considered in this note:

- **volatile and often less-than-transparent mineral prices:** Increasingly volatile mineral prices may complicate fiscal regime design, implementation, and revenue management. Also, the opaque and sometimes oligopolistic nature of some metals markets, particularly those that have been categorized as playing important roles in the energy transition, such as bauxite and cobalt, poses a challenge for governments seeking to ascertain the actual value of the minerals they trade as well as project future revenues.
- **oversupply risk:** There is a risk that the availability of substitutes, in a market where significant investment has been made to increase the supply of critical minerals, will lead to downward pressure on critical mineral prices, as these supply volumes catch up with, and possibly exceed, demand. There is also a risk—albeit a low one—that deep seabed mining, in the event of minerals being extracted, both at the country level and in the case of international waters, could minimize the need for new land-based mining in some cases.
- **impact of alternative financing arrangements on government revenues:** Financing methods such as metals streaming and royalty financing are gaining popularity in the mining sector. For many governments, these financing methods are relatively new, and there are several issues to consider, some of which are not necessarily unique to these forms of financing. They include
 - an absence of clear legislative guidance on whether the streaming or royalty transaction should be treated as debt for tax purposes and therefore attract withholding tax;
 - lack of transparency in the financing arrangements, specifically how the price of the mineral is determined and the knock-on effect on government revenues;
 - a risk of transfer pricing abuse; and
 - artificially reduced taxable income through base erosion and profit shifting.



- **limited community benefit from the increased demand for critical minerals:** The prospects of increased mineral operations near local communities and high public expectations require governments to pay more careful attention to the design and implementation of community benefit-sharing mechanisms in the era of critical minerals. An important consideration is how to ensure that fiscal benefits flow back to and include local communities more directly. The IGF Future of Resource Taxation handbook considers how communities could benefit financially from mining operations. One of the ideas proposed is a development turnover tax. Many countries already have community benefit-sharing mechanisms in place, and there is no need to duplicate efforts where these exist already.
- **impact of carbon pricing on mining revenues:** Another consideration is the potential cost implication involved in accessing certain importing markets due to carbon pricing mechanisms, such as the EU's Carbon Border Adjustment Mechanism (CBAM). Although the overall risk in this regard is low, introducing carbon pricing by mineral-rich countries would help reduce or, in some cases, potentially eliminate payments under the Carbon Border Adjustment Mechanism and help address climate change.

Opportunities for Financial Benefit Sharing

As demand for critical minerals grows and as more acreage licensing activity is anticipated, it can be argued that some producing countries are presented with an opportunity to rethink how they benefit financially from mineral extraction. The opportunities include:

- **reevaluating the role of the state in financial benefit sharing from mining:** The growing strategic and economic importance of critical minerals arguably changes the bargaining position of mineral-rich countries and presents their governments with an opportunity to further maximize benefits from the mining sector. Such opportunities include greater state involvement in the sector. However, greater state participation in mining requires more stringent safeguards to monitor and direct governments' management of revenues emanating from the mining sector and the vehicles it uses to access this revenue. If poorly designed and implemented, expanded state participation could result in adverse unintended consequences, including corruption, operational inefficiency, and knock-on impacts on investor confidence.
- **increasing financial and economic benefits through value addition:** Developing economies with critical mineral resources may have the opportunity to increase their financial benefits by building or enhancing their downstream processing capacity. The growth in demand for critical minerals offers an opportunity for mineral-rich countries to lock in value domestically, and fiscal tools can be used—and indeed have been used—in this regard. Some of these tools include export restrictions, investment allowances, and variable royalty rates targeted at mineral processing and have had mixed results in implementation.
- **reconsidering the use of fiscal incentives as an investment promotion tool:** The increased demand for critical minerals, which could result in some producing countries having more bargaining power than previously, could offer an opportunity to remove overly generous, poorly targeted fiscal incentives. Whereas in the past, incentives have largely been used to encourage investment in mineral extraction (the upstream part of the business), this could be a moment for countries to think more about incentivizing processing, or value addition more broadly, through such measures as performance-based incentives to increase processing capacity.



- **developing new revenue streams from the production of co-products and by-products as well as the processing of mine tailings:** There is scope for countries to address the treatment of co-products and by-products more specifically in their fiscal policy framework. In some countries, royalty or tax laws may not clearly specify by-products and co-products altogether, raising questions about whether they are subject to tax, as well as what opportunities are available to adjust the incidence of tax burden further along the value chain. It is also necessary to consider whether the mineral is sufficiently concentrated to be economical to recover, as this will determine whether the miner is actually paid for it.

Next Steps

Governments seeking to benefit financially from the rise in demand for critical minerals must first ascertain how much revenue is at stake and identify and categorize the minerals deemed critical for their context and policy ambitions, albeit within the context of the broader global definition of criticality. These countries will also need to identify their opportunities and risks across global supply chains and define the fiscal policies that best meet their production and industrial goals while still adhering to the principles of sound fiscal governance.

The challenges and opportunities outlined in this note can each be developed further, either alone or within the context of the framework set out in Section 2 of this note. They will vary depending on the country context. What unites them, however, is a common underlying thread of optimization—the need to maximize the financial benefits from the new opportunities created, subject to constraints that are unique in scale and scope to each country.



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1.0 Why Do Revenues From Critical Minerals² Matter for Developing Economies?

1.1 Background

This work forms part of the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development's (IGF's) broader program on critical and strategic minerals for the energy and digital transition, with a focus on financial benefit sharing. It contributes to the dialogue on how to "future proof" mining fiscal regimes from boom-and-bust cycles by identifying the financial benefit-sharing challenges and opportunities for mineral-rich countries in the energy transition. It will help answer the question of whether current fiscal approaches and policies align with national strategies, including ensuring that mineral-rich developing countries collect an appropriate share of the financial benefits arising from the critical minerals across the value chain, and if not, what needs to change.

The energy transition is a significant contributor to the urgency of, and expanded global interest in, critical minerals, particularly in terms of security of supply (for consumers of products that rely on them as feedstock, such as lithium for electric vehicle battery manufacturing and copper for solar and wind power technologies) and in terms of additional revenue potential (for the resource owners, many of which are low-to-middle income countries). The rapid scale-up of renewable and digital energy technologies has amplified demand for critical minerals, and this is likely to increase price volatility as the growth in demand outpaces the discovery, development, production, and processing of additional ore volumes (Birol & Canfin, 2023). It is also expected that derived demand such as in marine applications—the use of stainless steel for subsea pipelines, for instance—and the building sector will increase significantly (Gielen, 2021).

² Defined for the purpose of this note as minerals identified as "critical" because of their importance to the energy and digital transition, their particular vulnerability to supply shortages, and the risks associated with their availability and accessibility. See IGF (2023). These minerals include, but are not limited to, bauxite, chromium, cobalt, copper, graphite, lithium, nickel, tantalum, and zinc. These minerals vary, depending on who deems them critical, but a useful list to consider is one provided by the International Energy Agency (IEA) (2023a).



For the resource owners, this supply and demand imbalance means potential additional revenues from their critical minerals. In a recent study of a subset of energy transition minerals, it was estimated that countries with these resources could raise additional annual revenues of between approximately USD 98 billion and USD 259 billion by 2040 (Deutsche Gesellschaft für Internationale Zusammenarbeit [GIZ], 2023). Within the context of such potential additional revenues, governments of mineral-rich countries are seeking to reevaluate their financial benefit-sharing systems to ensure that they can capture more of this upside through several measures, including ramping up extraction and processing of these minerals further down the value chain.

While the financial benefit-sharing challenges and opportunities in the extraction and processing of critical minerals are not fundamentally different from the commonly known challenges facing mining revenue collection in general, some nuances could require further investigation. We seek to identify these nuances in the key features of critical minerals and to identify the new challenges and opportunities they present to fiscal regulation.

1.2 Emerging Themes and Issues Shaping Financial Benefit Sharing in the Energy Transition

The additional revenue potential of critical minerals could be significant in a period where demand growth is expected to outpace supply. As highlighted above, the GIZ study estimate of additional average annual gross revenue from a selection of critical minerals is significant (GIZ, 2023).³ Under these projections, governments could collect additional tax and royalty revenues of up to USD 25 billion annually on average in the period to 2040. It is important to note that such revenues are small compared to revenues from oil and gas—net crude oil exports in 2022 from Saudi Arabia alone amounted to USD 171 billion, for example (Statista, n.d.-b)—or from existing mining operations—global copper ores and concentrates exports alone amounted to USD 93.2 billion in 2021 (World Integrated Trade Solution, n.d.). Nonetheless, these potential additional revenues remain significant, particularly for low-income countries.

However, and understandably, not all countries will benefit equally due to such factors as different geological endowments. Most of these gains in government revenues are expected to be in countries in the Latin America and Caribbean region (39%), followed by East Asia and the Pacific (34%). Europe, Central Asia, and sub-Saharan Africa are each estimated to generate approximately 10% of these additional gross revenues, with South Asia, the Middle East, and North Africa accounting for less than 1%.

The distribution of revenue potential appears to correlate with the level of economic development as well as geological endowment. The GIZ study estimates that most of the revenue will be generated in high-income and upper-middle-income countries, such as Australia, Chile, Peru, and South Africa (GIZ, 2023). Only 8% of total additional gross revenues are expected to flow to low-income countries (the low-income countries considered include the Democratic Republic of Congo [DRC], Guinea, Madagascar, and Zambia).

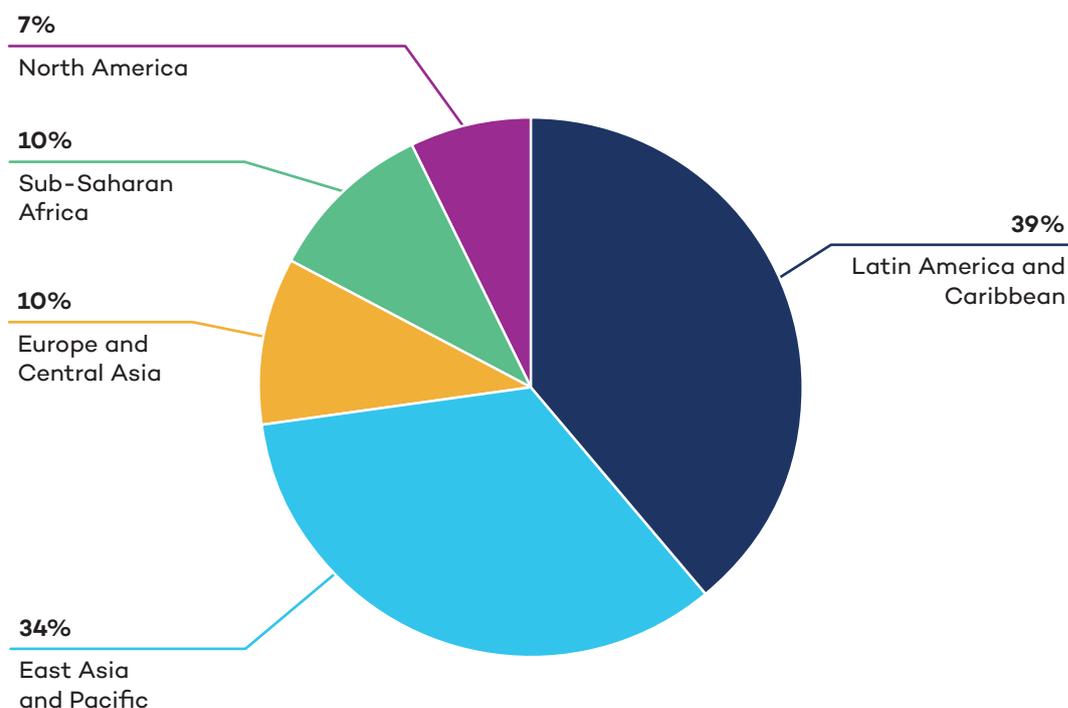
This is explained, to a large extent, by the comparatively lower share of known reserves held in the lower-income countries due, in part, to a historical lack of investment in gathering

³ The assumptions and methodology for estimating the government revenue potential are outlined in Section 5 of the GIZ report.



geological data.⁴ The analysis in the GIZ study is based on known reserves and an implicit assumption that new investments in reserve expansion would not take place—at least significantly in the period considered in the analysis—in the lower-income countries. It also assumes that the fiscal regimes of the respective countries remain the same over the period.

FIGURE 1. Share of gross revenue by region (in %)



*Note: Estimates under Announced Pledges Scenario (APS).
Source: GIZ, 2023.*

Therefore, more investment in geological and geophysical studies to identify the reserves that will be needed to meet the anticipated growth in demand is expected. However, such investment will take time to materialize. The time lag between the discovery of reserves and core activities, such as site acquisition and development, is such that mining may not actually commence for 10 to 15 years. This is an important context to consider, especially for new discoveries, in determining the manner in which the financial benefit-sharing approach is reflective of such realities and responsive to changes in circumstances.

When considered as a share of each region's GDP, Latin America, the Caribbean, and sub-Saharan Africa emerge as the regions with the most to gain from these additional revenues. In sub-Saharan Africa, the gross revenue at stake could equate to as much as 0.75% of GDP, while for Latin America and the Caribbean, the additional revenue could generate economic output equivalent to 1.2% of the region's current GDP. The potential additional revenues that could flow from critical minerals could mean a boost for GDP in the lower-income countries, particularly if their geology can be adequately mapped, and the countries are able to fully realize the potential financial and economic benefits.

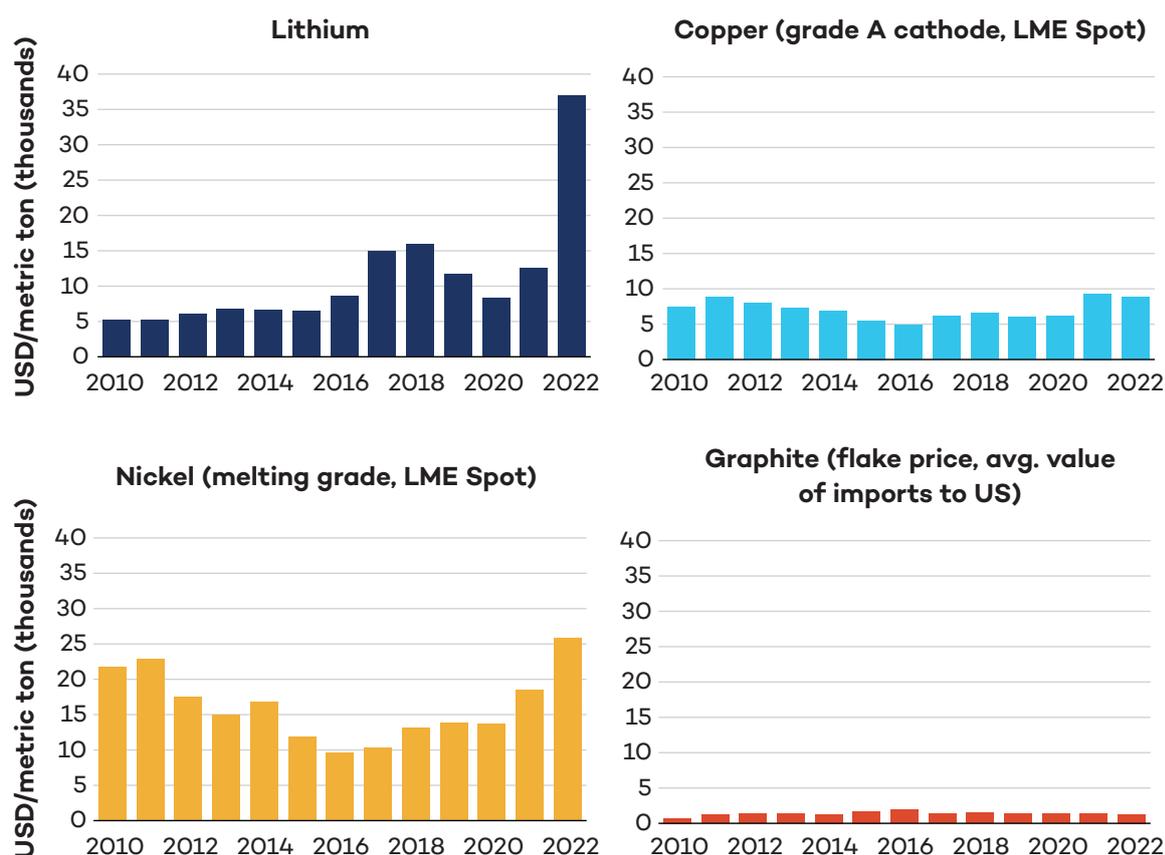
⁴ There are exceptions for some minerals, such as cobalt in the Democratic Republic of Congo.



The window of opportunity for mineral-rich countries to capitalize on the potential additional revenues is limited. The growth in demand for critical minerals is largely expected to result in significant investments in exploration and development to expand existing reserves, discover new reserves, and bring the economically recoverable ores into production. This will, in turn, place downward pressure on mineral prices and, by implication, mining profits from which mineral-rich countries can collect additional revenues.

In the International Energy Agency's (IEA's) analysis of critical minerals in the energy transition, it is expected that to achieve net-zero objectives and meet the nearly four-fold anticipated increase in demand, cumulative investment of up to USD 450 billion will be needed to bring new projects online between 2022 and 2030 (IEA, 2023). These investments tend to have long lead times, and the anticipated investments in this period are expected to fall short of this requirement by as much as USD 230 billion. However, if these investments materialize in the anticipated time frame, and if the resultant supply of some of these critical minerals can meet the anticipated growth in demand, the eventual downward impact on prices could mean a potentially lost opportunity for mineral-rich countries whose financial benefit-sharing systems are unprepared for the revenue gains in the meantime.

FIGURE 2. Average annual prices for lithium,⁵ copper,⁶ nickel,⁷ and graphite⁸



Source: Adapted from GIZ, 2023; Statista, n.d.-a; International Monetary Fund, 2023; USGS, 2023.

⁵ USD per ton. Annual average prices from Statista (n.d.-a).

⁶ Grade A cathode, London Metal Exchange (LME) spot price, CIF European ports.

⁷ Melting grade, LME spot price, CIF European ports.

⁸ Flake price – average value of imports to US (value at foreign ports) (USGS, 2023).



While there is a need to ensure that governments do not miss a window of opportunity, there is also the need to manage (sometimes unrealistic) revenue expectations that could result in pressure on governments to seek unsustainable financial benefits. Where citizens have unrealistic expectations of the revenue benefits of increased mining operations, governments run the risk of being placed under increasing pressure to extract more fiscal benefits from companies than they can reasonably bear. This could impede future investment.

Governments and investors alike can better communicate the facts, challenges, and opportunities surrounding the potential additional revenue at stake, the trade-offs that could be involved vis-à-vis other factors (such as incentivizing downstream processing), and their impact on local economies. For example, there is increasing social dialogue on whether lithium and cobalt are the “new oil” (Stevens, 2021). Declarations of this nature in the media have equated the economic growth that resource-rich countries will experience as demand for minerals grows to the economic trajectories of oil-bearing Gulf states in the late 20th century. This equivalence is misleading, as the economics of lithium and cobalt (and solid minerals in general)—and the potential revenue at stake—differ significantly in scale from that of oil and gas.

Critical minerals have offered additional impetus for mineral-rich countries to think about financial and economic benefits more broadly, including by locking in value downstream. The growth in critical minerals has coincided with a resurgent increase in interest of mineral-rich countries in processing activities that capture value further down the mining value chain. They typically reflect components of the governments’ respective plans for increasing industrial output or deepening local content in the industry, particularly through ancillary services or catalyzing other sectors through targeted mineral processing activity.

The increasing demand for critical minerals, particularly energy transition minerals, creates opportunities for these countries that go beyond just the extraction of revenues at the upstream point. The strategic importance of critical minerals, particularly to the energy transition, presents the potential for a shift in bargaining power to mineral-rich countries in terms of increasing domestic processing capacity and utilizing the mineral resources for in-country industrial growth. Other factors, such as proximity to customers, transport costs, infrastructure, and location of existing facilities, will also dictate opportunities to realize value-addition goals.

These considerations are not new to mineral-rich countries, particularly in the lower- and upper-middle-income category. The African Mining Vision, for example, articulated intentions for “down-stream linkages into mineral beneficiation and manufacturing” and for “side-stream linkages into infrastructure (power, logistics, communications, water)” (African Union, 2009). Several countries have adjusted (or are in the process of adjusting) their policy and regulatory frameworks to capture more value further down the mining value chain. For example, Chile’s lithium strategy includes developing processing capacity in-country in exchange for such incentives as guaranteed access to raw lithium at agreed (possibly reduced) prices.⁹

⁹ It was announced in April 2023 that BYD, an electric vehicle maker, plans to build a lithium cathode factory in the Antofagasta region (La Republica, 2023). Similarly, in Argentina, China’s Zijin Mining Group Co. is in discussion with Camyen, a subsidiary of state-owned energy company YPF S.A., about building a plant to convert lithium into cathodes for making electric vehicle batteries (Instituto de Ingenieros de Minas del Perú, 2023).



Security of supply is increasingly important. Supply chains are under increasing pressure for diversification, which could mean that traditional ways of making acreage attractive (e.g., geological data, fiscal, and commercial terms) have to adjust to geopolitical decisions by large consumer countries. Producing countries should not only focus on the factors that will affect their ability to meet rising demand but also consider challenges and opportunities from policies and instruments that import-reliant countries enact to address their supply risks. Such policies include, but are not limited to, the U.S. Inflation Reduction Act, 2022 (IRA), which introduces several tax incentives to strengthen the USA's supply chain of critical minerals. Most notable of these is an advanced manufacturing production tax credit for companies that produce certain eligible components, including critical minerals within the United States, that are sold to third parties.¹⁰

Many of the challenges of designing and administering a mining fiscal regime for critical minerals are not new. While the increase in demand for critical minerals outstrips supply growth and creates a mismatch, it is not unusual to expect mineral-rich countries to seek revisions of their fiscal terms to capture the upside. A recent survey of mining companies revealed that this mismatch is expected to likely increase this practice (Nyer & Marchili, 2021), with tax instruments identified as a main tool for achieving this purpose. This increases the importance of strengthening mining financial benefit-sharing regimes in mineral-rich countries to avoid, among other outcomes, making decisions that could result in taxing too high—or taxing too little.

It is increasingly important to ensure adherence to the key principles of fiscal regime design and implementation. These principles are elaborated in Pillar II of IGF's Mineral Policy Framework Assessment and *The Future of Resource Taxation* handbook. They include ease of administration, economic efficiency, timing of government revenues, adaptability to changing profitability levels and market conditions, predictability for investors, and protection against tax base erosion and profit shifting. When applied effectively, these principles help balance revenue raising and other policy objectives, such as increasing processing capacity or other forms of value addition from mining operations.

¹⁰ For critical minerals in particular, the credit is equivalent to 10% of the costs incurred by the company in the production of the mineral.



2.0 Framing the Emerging Challenges and Opportunities

Challenges and opportunities for financial benefit sharing will differ for various countries or groups of countries due to different levels of importance of critical minerals, different pricing issues, and differences in a host of other features. This note uses some of these features to frame the emerging challenges and opportunities that countries could face and the strategies they could adopt as they try to optimize their financial benefits from critical minerals, amongst other policy objectives.

These features include

- **geological context:** the extent to which there is increasing or declining exploration activity, the types of incentives being offered to attract risk capital for exploration activity, as well as the pace at which discoveries are being made to expand the resource and reserve base. This would also include the concentration of the desired critical mineral in the ores and the energy and resources required for further activity as the ore grades decline over the years. This also includes the relative size and scale of mining operations and the extent to which there is scope for expansion or changes in scale over time.
- **refining and processing capability:** the extent to which there is market intent or capability to refine and process the extracted ore in-country or in the region; the strength of the regulatory framework for critical minerals; whether the critical mineral is processed in-country in addition to the permitting market conditions such as would typically be identified in, or implied by, key development indicators in the country.
- **economic considerations:** the extent to which key development indicators, such as gross capital formation, energy consumption per capita, energy access per capita (including cost), affect the production of as well as demand and processing capacity for, critical minerals. **This also includes** the extent to which there is preparedness to meet growing demand for the critical minerals, to effectively manage the revenue volatility that will accompany price volatility and to effectively capture the likely additional revenues from increased demand.



Another useful way to consider framing the critical minerals challenges and opportunities that mineral-rich countries could face is by undertaking a stocktaking exercise that would include factors affecting their demand and supply. These factors include geological, economic, market, geopolitical, and regulatory considerations (Ramdoo, forthcoming).



3.0 What Are the Challenges for Financial Benefit Sharing?

Given the anticipated demand and supply mismatch for critical minerals and the expected price increase as a result, the overarching risk for the source countries of these minerals is one of suboptimal financial benefit sharing. Essentially, the primary risk surrounds the possibility that they could miss a potentially limited window of opportunity to benefit from the additional revenues. This risk could manifest in several ways. These are discussed below to identify focus areas for possible further research.

3.1 Volatile and Often Less Transparent Mineral Prices

Increasingly volatile mineral prices may complicate fiscal regime design, implementation, and revenue management. Natural resource price volatility is a problem for mineral-rich developing countries because it typically impacts government revenue and could lead to macroeconomic instability. This, in turn, could result in negative implications for GDP growth (Cavalcanti et al., 2011).

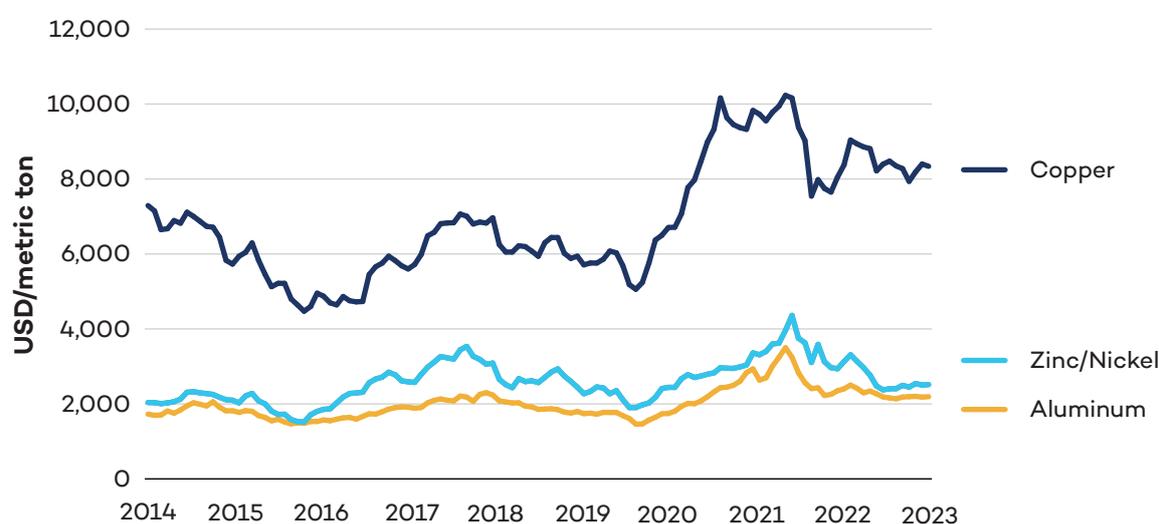
This price volatility is not unique to critical minerals, but the expected mismatch between demand growth and supply growth will likely cause prices to be even more volatile in the mid to long term. This is because a few countries dominate the production and processing of some critical minerals, rendering supply chains vulnerable to their production capacities and export policies. Furthermore, mineral prices tend to generally be more volatile than prices for traditional hydrocarbons for a variety of reasons, including the opacity of supply chains, the time lag between demand increases and the coming online of new projects (for example, 4 to 7 years for lithium, and an average of 17 for copper) (“How to Avoid,” 2023) as well as a degree of speculation in the financial markets.

Some studies suggest that prices of by-product metals and minerals are more volatile than prices of main and individual products. More than 60% of metals considered critical for the energy transition are produced as co-products or by-products. For example, cobalt is a co-product or by-product of copper and nickel mining (Bellois & Ramdoo, 2023). By inference, this could suggest that critical minerals are more susceptible to price volatility than other minerals. A 2016 study, however, found that while by-products, on average, experience



higher price volatility than main products, when analyzing monthly prices over a decade, the evidence that by-products have greater price volatility is mixed (Redlinger & Eggert, 2016).

FIGURE 3. Average monthly mineral and metal prices (USD/MT)¹¹



Source: World Bank, n.d.-b.

The issue of price volatility is not unique to critical minerals. Nonetheless, it is a matter that producing countries should pay particular attention to. It raises two questions regarding fiscal regime design and revenue management, respectively: the extent to which the financial benefit-sharing mechanism is responsive to changes in profitability (for example, whether the royalty rate changes depending on the price of the mineral) and whether there are fiscal mechanisms in place to minimize the impact of mineral price volatility (including whether such measures should vary according to mineral, thus distinguishing critical minerals).

Critical minerals may be undervalued due to a lack of transparent pricing. The opaque and sometimes oligopolistic nature of some metals markets, particularly those that have been categorized as playing essential roles in the energy transition, such as bauxite and cobalt, poses a challenge for governments seeking to ascertain the actual value of the minerals they trade as well as project future revenues. For example, cobalt prices are less transparent than those of other major metals (Manley et al., 2022). Although the London Metal Exchange, for example, publishes prices for cobalt metal, these price reports are of limited value as most countries export cobalt hydroxide and other intermediate products for which there is no quoted price (Manley et al., 2022). Lithium pricing is also challenging because of the lack of price transparency and a mature index. Moreover, lithium production comes from a small group of companies. As of 2021, only four producers controlled 85% of the global lithium supply.¹²

¹¹ Note: Aluminum – (LME), unalloyed primary ingots, high grade, minimum 99.7% purity, settlement price beginning 2005; previously cash price; Copper – (LME), standard grade A, cathodes and wire bar shapes, physical settlement price; Nickel – (LME), cathodes, minimum 99.8% purity, settlement price beginning 2005; previously cash price; Zinc – (LME), high grade, minimum 99.95% purity, settlement price beginning April 1990; previously special high grade, minimum 99.995%, cash prices.

¹² These companies are Chile's SQM, American companies FMC Corp and Albemarle Corp operating mainly in Chile and Argentina, and Australia's Talison. Interestingly, Talison is 49% owned by Albemarle and China's Tianqi Lithium, which takes almost all of the mine's output for processing in China (Financial Times, 2023).



The challenges highlighted above have implications for the size and timing of the potential financial benefit that could come to a mineral-rich country. Readhead et al. (2023) outline practical methods for determining the price of minerals using a transfer pricing framework, particularly for scenarios in which mineral price transparency is limited.

3.2 Oversupply Risk

High prices may increase efforts to find substitutes for certain critical minerals. There is a risk that the availability of substitutes in a market where significant investment has been made to increase the supply of critical minerals will lead to downward pressure on critical mineral prices, as these supply volumes catch up with, and possibly exceed, demand. This downward pressure on prices then limits the base from which financial benefits can accrue to the mineral-rich country that might have committed resources to increase supply.

Sustained periods of high commodity prices and concerns about future supply security are already creating an incentive for investors to look for substitutes for some critical minerals. This could reduce future demand for some of such minerals and increase demand for other minerals currently ranked lower in terms of deemed “criticality” (IEA, 2021). For example, sodium-ion, liquid metal, sodium-sulphur, and zinc-ion are all being considered as leading substitutes for lithium used in different aspects of the battery manufacturing process (Blakemore et al., 2022). The combination of increased investment in critical minerals and a shift to other materials could result in the market for some of these critical minerals being oversupplied in the specific market segments for which they are needed.

There is also growing interest in the role of recycled minerals in addressing future demand for critical minerals. While there is consensus that recycled metals will not eliminate the demand for new mineral sources, some argue that their volumes could be quite substantial. For example, the Nickel Institute (n.d.) estimates that 68% of nickel available in consumer products is recyclable.

Lastly, the volumes of critical minerals required will invariably fluctuate. There is research into developing technologies that will lower the amount of minerals used to achieve the same levels of energy efficiency. For example, battery makers use less copper in their manufacturing process (“How to Avoid,” 2023). These technologies will impact the volume of critical minerals needed and the resulting financial benefits for governments. A tapering off of, or reduction in, prices could potentially lower the financial benefits to the resource owner.

Additional supply of critical minerals in the event that deep sea mining comes online. It is estimated that an area of 4.5 million square kilometres in the eastern Pacific Ocean holds potential resources of polymetallic nodules of approximately 274 Mt of nickel and 44 Mt of cobalt, which is multiple times the global terrestrial reserves. Further, the geological nature of marine deposits is such that three or more metals can be extracted from a single site for each of the three main types of deep sea deposits. It is not implausible that deep seabed mining, in the event that minerals are extracted, both at the country level within the confines of maritime boundaries and in international waters, could minimize the need for new land-based mining (Hefferman, 2019).

However, this risk to financial benefit sharing is not considered high. Deep sea mining is some time away from being commercially realized for several reasons, chief among which are significant concerns about its environmental impacts. In July of 2023, the Canadian



government indicated its support for the continued moratorium on commercial seabed mining in areas beyond national jurisdictions (Global Affairs Canada, 2023). The European Commission also supports this moratorium until “scientific gaps are properly filled, no harmful effects arise from mining and the marine environment are effectively protected” (European Commission, 2022). There are also further technological uncertainties related to the excavation of deep sea deposits.

3.3 Impact of Alternative Financing Arrangements on Government Revenues

Financing methods such as metals streaming and royalty financing are gaining popularity in the mining sector. Metals streaming refers to an arrangement in which a company (known as the “streaming company”) pays a mining company upfront in exchange for the right to purchase a portion of the future production of one or more metals at a predetermined price (Vergara & Urrutia, 2019). Royalty financing is a financial arrangement where a company (known as the “royalty company”) provides funding to a mining operation in exchange for a percentage of the revenue generated from the sale of minerals produced at the mine. Unlike metals streaming, which involves purchasing a portion of the actual metals, royalty financing involves a share of the overall revenue generated by the mining project.

These forms of financing have often focused on the by-products of mining companies’ main operations (such as on the precious metal by-products of base metal, see McLean & Page, 2016), which are a significant source of critical minerals (see Bellois & Ramdoo, 2023; UK Government, 2023). The financing needs for investment in critical minerals mean these approaches will likely increase. An assessment of 12 metals found that streaming and royalty financing will likely generate USD 14 trillion in secondary revenues, presumably for the companies, by 2030 (Mareels et al., 2021).

For many governments, these financing methods are relatively new. There are several issues to consider, some of which are not necessarily unique to these forms of financing:

- an absence of clear legislative guidance on whether the streaming or royalty transaction should be treated as debt for tax purposes and therefore attract withholding tax;
- lack of transparency in the financing arrangements, specifically how the price of the mineral is determined and the knock-on effect on government revenues. In streaming arrangements, the streaming company has the right to purchase a share of the mine’s production at a discounted price in return for providing finance upfront. While this may be a necessary and reasonable trade-off from the perspective of the miner, the producing country may be concerned about the potential for this arrangement to reduce government revenues, depending on how taxes and royalties are calculated;
- a risk of transfer pricing abuse—under-pricing specifically—if the mining and streaming companies are related;
- artificially reduced taxable income through base erosion and profit shifting (BEPS), where, for example, streaming companies use low-tax jurisdictions to divert profits away from the country where the mine is located.



The financing of mining projects is not a new risk to the tax base. Excessive interest deductions are arguably the most significant source of tax BEPS in the sector (Devlin, 2018). However, the increase in the use of alternative financing arrangements, such as metals streaming and royalty financing, combined with the relative inexperience of policy-makers and tax administrations with such transactions, may pose a challenge to revenue collection.

3.4 Limited Community Benefit From the Increased Demand for Critical Minerals

Natural resource extraction has historically been linked to social conflicts at varying degrees of correlation and/or causality. Many new and proposed mineral operations for critical minerals are not necessarily exempt from the potential of such conflict. A survey carried out in 2022 found that 54% of critical minerals are located on or near Indigenous lands (Owen et al., 2022). This challenge has materialized in San Salvador, the capital of Argentina's Jujuy province, where Indigenous communities and social organizations demanded the suspension of all lithium projects in the province (Verma, 2023).

An important consideration, therefore, is how to ensure that fiscal benefits flow back to and include local communities more directly. The IGF *Future of Resource Taxation* handbook considers how communities could benefit financially from mining operations. One of the ideas proposed is a development turnover tax. Many countries already have community benefit-sharing mechanisms in place, such as community development funds, and there is no need to duplicate efforts where these already exist. Notwithstanding, the prospects of increased mineral operations in close proximity to local communities and high public expectations require governments to pay more careful attention to the design and implementation of community benefit-sharing mechanisms in the era of critical minerals.

3.5 Impact of Carbon Pricing on Mining Revenues

Another consideration is the potential cost implication involved in accessing certain importing markets due to carbon pricing mechanisms such as the EU's Carbon Border Adjustment Mechanism (CBAM). Canada, the United Kingdom, and the United States are contemplating similar measures.¹³ Carbon tariffs of this nature impose an additional tax on imports based on the estimated carbon dioxide emitted during the production process, particularly during mineral processing.¹⁴ Although the EU's CBAM does not target raw commodities, countries that intend to export minerals after some level of value addition through processing could fall within the ambit of this measure and possibly others in the future. Countries seeking to take advantage of the anticipated increase in demand for critical minerals must thus factor in this additional cost toward accessing some foreign markets.

It is argued that the CBAM increases the potential of making mineral-rich countries that export the affected materials to the EU (or other countries that could adopt such mechanisms) worse off unless they introduce carbon prices equal to the EU's.

This overall risk in this regard is low. According to the World Bank Carbon Pricing Dashboard, many of these countries are lower-income countries and are currently not considering carbon

¹³ See Chapter 11 of Readhead et al. (2023).

¹⁴ For further reading on the operation of the CBAM, see Gore et al. (2021).



pricing measures (World Bank, n.d.-a). The level of carbon taxation from such countries would be low. That said, the introduction of carbon pricing by mineral-rich countries would help reduce or, in some cases, potentially eliminate payments under the CBAM.

3.6 Summary of Challenges

The preceding subsections have highlighted the various challenges that countries need to consider when reviewing the application of their financial benefit-sharing systems to critical minerals. Some of these factors are new and relate more closely to critical minerals (such as the potential inclusion of deep sea minerals alongside land-based supply). Other factors (such as the difficulty of predicting future demand and supply cycles or managing the associated environmental risks of mining) are old issues. These challenges have been presented at a high level to inform further research on how they may individually and collectively affect the design of financial benefit-sharing systems for better value to the resource owners.



4.0 What Are the Opportunities for Financial Benefit Sharing?

As demand for critical minerals grows and as more acreage licensing activity is anticipated, it can be argued that some producing countries are presented with an opportunity to rethink how they benefit financially from mineral extraction. This is prompting some of these countries to reconsider their overall fiscal policies, given the opportunities that could emerge from the supply/demand mismatch. These opportunities are considered below.

4.1 Reevaluate the Role of the State in Financial Benefit Sharing From Mining

The growing strategic and economic importance of critical minerals arguably changes the bargaining position of mineral-rich countries and presents their governments with an opportunity to further maximize benefits from the mining sector. Such opportunities include greater state involvement in the sector. This is not a new consideration for the mining sector in general, although it is not as commonly practised as it is in other extractive sectors, like oil and gas. Because the energy transition requires unprecedented volumes of critical minerals for renewable energy technologies—and as this demand is expected to create a short- to medium-term supply imbalance—the expected price increase for many of these minerals could represent a shift in the balance of power to the mineral-rich countries. This shift will likely reflect in the way their financial benefit-sharing systems are designed or redesigned. More active state participation is one of such likelihoods.

In some jurisdictions, securing the supply of critical minerals is considered an issue of national security (both in terms of supply security and in the military sense, as stated in the British Government’s 2023 Critical Minerals Strategy), which necessitates greater state oversight even in producing countries to both secure more revenue for the state and to oversee the governance of supply chains more closely. It is argued that state-owned firms participating in domestic mining operations are becoming a more attractive proposition because of these growing interests. Arguments along these lines suggest that state-subsidized companies “can operate globally with greater agility, at lower margins and with longer investment timeframes, creating a disadvantage for those not subsidised” (UK Government, 2023).



However, as argued in the IGF *Future of Resource Taxation* handbook (2023), states must carefully consider the benefits and challenges of this approach to financial benefit sharing.

Some countries have already begun implementing these and other policies that increase the state's role in financial benefit sharing from mining operations, predating the increased interest in critical minerals. For example, some Latin American countries make use of state-owned mining companies—such as Codelco (copper) in Chile and LitoMX (Lithium) in Mexico—for the mining of critical minerals. Other countries, such as Brazil, have reviewed their equity participation in national resource companies with Brazil's government, for example, retaining special shares in Vale that grant the government special rights to do with the company's strategy. Countries like Mexico (which hosts the world's 10th-largest lithium reserves) have gone as far as nationalizing their lithium resources in order to increase their revenue share. Several African countries are also acquiring greater shareholding stakes in mining projects concerning critical minerals.

It must be noted, however, that greater state participation in mining requires more stringent safeguards to monitor and direct governments' management of revenues emanating from the mining sector as well as the vehicles it uses to access this revenue. It is also important to note that, if poorly designed and implemented, expanded state participation could result in negative unintended consequences, including corruption, operational inefficiency, and knock-on impacts on investor confidence that could discourage investment in the early exploration phase. For example, the Extractive Industries Transparency Initiative (2023) provides clear guidelines on the conduct of state-owned entities within the sector. The Natural Resource Governance Institute (2015) also provides some guidelines on the state's role, as has Marcel (2006).

4.2 Increase Financial and Economic Benefits Through Value Addition

Developing economies with critical mineral resources may have the opportunity to increase their financial benefits by building or enhancing their downstream processing capacity. Domestic value addition has the potential to increase employment and tax revenues, as well as a country's overall GDP. Domestically refined products could—subject to several conditions, such as cost of power and available transport and other logistics infrastructure—also reduce input costs for infrastructure and industrial development, provide good manufacturing jobs, and stimulate service sector development in host communities.

Countries may also have an opportunity to stimulate investment in downstream mineral activities by, for example, exempting refinery and associated infrastructure-specific capital goods and industrial inputs from import-related taxation, which is already widely practised. There is scope for mineral-rich countries to cautiously incentivize investment in infrastructure through targeted industrial policy measures. The growth in demand for critical minerals offers an opportunity for mineral-rich countries to lock in value domestically, and fiscal tools can be used—and indeed have been used—in this regard. Some of these tools include export restrictions, investment allowances, and variable royalty rates targeted at mineral processing (see Box 1) and have had mixed results in implementation.¹⁵

¹⁵ The IGF *Guidance for Governments: Local Content Policies* (Cosbey & Ramdoo, 2018) highlights several case studies in this regard.

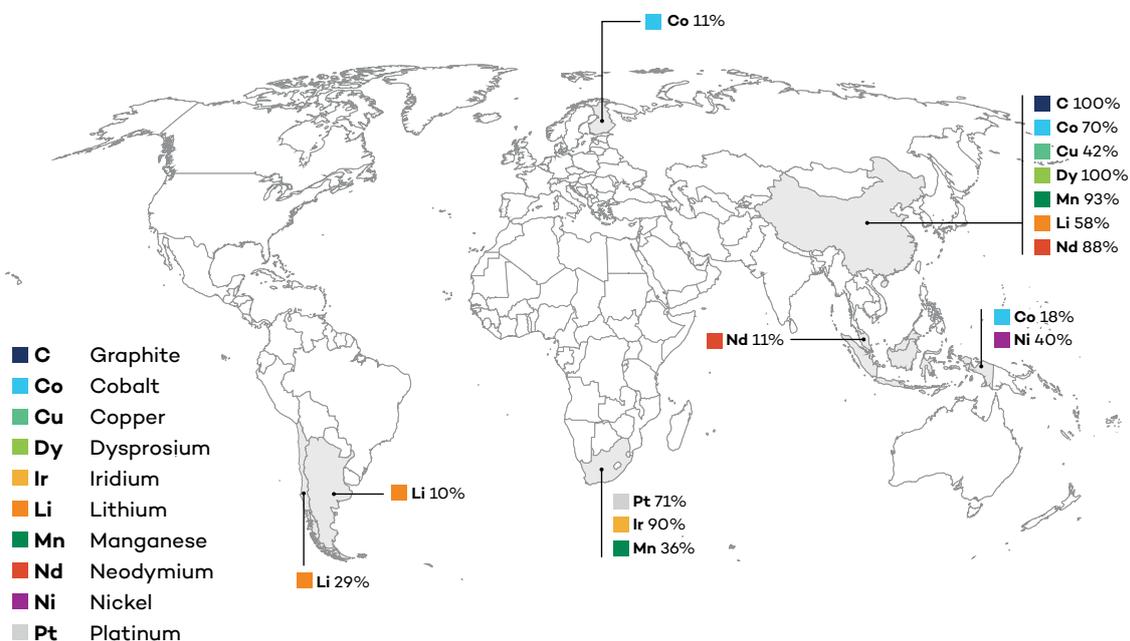


BOX 1. POLICIES AIMED AT INCREASING VALUE ADDITION

- Export restrictions – limiting the quantity or value of mineral exports to encourage domestic processing and beneficiation, using such tools as export quotas, bans, or tariffs on unprocessed minerals (e.g., Indonesia).
- Investment allowances/credits – aimed at attracting or retaining investment in mineral beneficiation, usually targeting the reduction of capital costs and using such tools as deductions or credits and accounting adjustments such as accelerated depreciation (e.g., Namibia).
- Variable royalty rates linked to beneficiation – adjusting the royalty rates based on a determined degree of, or threshold for, value addition in the mining operation through such means as higher royalties imposed on the export of unprocessed ore and lower royalties applied to processed or beneficiated products (e.g., Mongolia).

Investing in the downstream capacity of source countries may also serve the interests of market countries for critical minerals, as this would diversify the currently limited supply chains. China is presently the world's refinery for critical minerals (Hendrix, 2022). It accounts for two-thirds of the world's aluminum refining and smelting capacity, 80% of lithium refining capacity, two-thirds of cobalt refining capacity, more than 80% of graphite production and refining, and large shares of refining capacity for many other minerals (USGS, 2023).

FIGURE 4. High concentration of processing capacity in very few countries



Source: Author diagram based on data extracted from International Renewable Energy Agency, 2023.

Although the renewable energy provisions of the U.S. IRA and other policy initiatives aim to narrow China's dominant position in lithium and solar-related materials, U.S. processing capacity lags significantly, as does processing capacity in the European Union and the



advanced economies of Asia (Hendrix, 2022). There are, therefore, clear energy and national security rationales for some governments and the private sector to catalyze downstream capacity development outside China. In order to capture greater revenue margins resulting from the increase in demand for critical minerals, source countries have an opportunity to develop mineral value chains and facilitate the expansion of beneficiation activities within their jurisdictions, such as in India (see Box 2).

BOX 2. FOCUS ON INDIA: INDIA'S POTENTIAL IN THE MIDSTREAM OF BATTERY PRODUCTION

The government of India has signalled its strategic intent to grow battery cell manufacturing through its domestic industrial policy, the Production Linked Incentive Scheme for Advanced Chemistry Cell framework. Electric vehicle uptake is steadily progressing in India, supported by favourable policies, increasing consumer interest, and rising fuel costs. Investor interest is also rising, with India-headquartered electric mobility firms receiving USD 1.2 billion in funding in 2022, nearly double the amount in 2021 (OliverWyman, 2021).

Within this context, India is rising as an emerging player in the battery industry. However, if the government could increase its presence in specific areas of the supply chain, such as mineral processing and cathode production, there could be more value to be unlocked (Moerenhout et al., 2023). There is a specific opportunity in cathode material manufacturing, where minerals represent a critical cost component. India thus has a strategic imperative to develop mineral processing capabilities. This opportunity could be realized by supporting companies to localize other aspects of the battery manufacturing supply chain, including mineral processing, cathodes, and anodes.

Box 2 highlights one of several examples of countries looking to take a position further down the critical minerals value chain, whether or not they are producing countries. This is instructive for mineral-rich countries that might not have specific critical minerals but nevertheless could consider incentivizing investment in similar processing or manufacturing sectors that use critical minerals as feedstock as part of a carefully contemplated industrial strategy.

Mineral-rich countries could also foster greater collaboration toward the creation of regional critical mineral processing and manufacturing hubs, which would help nations pool financial resources, share data and skills, and spread challenges. Zambia and the DRC took a notable first step in this direction in April 2022 by signing a cooperation agreement to facilitate the development of a battery value chain. As part of greater regional collaboration, countries could explore opportunities to harmonize their mining fiscal regimes to curb harmful tax competition. The growing demand for critical minerals and the high drive of market countries to secure future supply may create the necessary political will and urgency for regions to collaborate on these matters.



4.3 Reconsider the Use of Fiscal Incentives as an Investment Promotion Tool

The increased demand for critical minerals, which could result in some producing countries having more bargaining power than previously, could offer an opportunity to rethink the use of fiscal incentives as an investment promotion tool. For a long time, overly generous and poorly targeted tax incentives have been a source of revenue loss in the mining sector (Readhead, 2018).¹⁶ The introduction of a Global Minimum Tax (GloBe) from 2024 offers added impetus for countries to reconsider their use of tax incentives (Christians et al., 2022).

GloBe rules will require that multinational companies with an annual turnover of EUR 750 million or more pay an effective tax rate of at least 15% in every jurisdiction where they operate. This will mean that some tax incentives—particularly those that are profit-based, such as tax holidays—will become redundant. This is because the tax benefit that multinational enterprises receive in one jurisdiction will remain payable in another jurisdiction that implements the GloBe rules to the extent that the tax benefit reduces the effective tax rate of that multinational enterprise below 15%. Countries with in-scope multinationals will need to think carefully about the extent to which they continue to use tax incentives to promote investment in the mining sector.

Finally, whereas in the past, incentives have largely been used to encourage investment in mineral extraction (the upstream part of the business), this could be a moment for countries to think more about incentivizing processing or value addition more broadly. Chile is already using performance-based incentives to increase processing capacity in lithium, for example (Government of Chile, 2023). Like all decisions regarding the use of incentives, they should be based on robust financial modelling to inform decision making on whether incentives are required, in recognition of existing investment agreements, and in what form. Inter-agency coordination is also important, particularly considering that critical minerals have significant implications across several government departments.

4.4 Develop New Revenue Streams From Production of Co-Products and By-Products and Processing Mine Tailings

Most critical minerals are often by-products or co-products of other base metals.¹⁷ Cobalt, for example, is often a by-product of nickel and copper mining. The production of the base metals often generates more revenue and will influence the production of critical minerals. To illustrate this point, new investments in cobalt have been more closely linked to the market performance and dynamics of copper than those of cobalt. Supply responses for metals such as cobalt, indium, and tellurium are thus indirectly influenced by price increases of copper due to the peculiar nature of by-product production (Nassar et al., 2015).

However, the relationship between by-products and their main metal product is not always straightforward. Tellurium, which is used in the production of solar panels, is a by-product of copper, with more than 90% of tellurium production coming from the refinery process of

¹⁶ See IGF website for other IGF publications on mining tax incentives, via <https://www.igfmining.org/beps/current-topics/tax-incentives/>

¹⁷ See Bellois & Ramdoo (2023) for further discussion on examples of, and the difference between, co-products and by-products.



copper (Rietveld et al., 2019). In this situation, market demand for tellurium does not affect copper production and processing capacities, but the copper market has a direct influence on the amount of tellurium being made available (Bellois & Ramdoo, 2023).

There is scope for countries to address the treatment of co-products and by-products, more specifically within the fiscal policy framework. In some countries, their royalty or tax law may not clearly specify by-products and co-products altogether, raising questions about whether they are subject to tax, as well as what opportunities are available to adjust the incidence of tax burden further along the value chain. It is also necessary to consider whether the mineral is sufficiently concentrated to be economical to recover, as this will determine whether the miner is actually paid for it. Finally, some countries apply different tax rates to minerals produced as by-products.¹⁸ The *Future of Resource Taxation* handbook suggests there may be scope to apply higher variable rate royalties to by-products because they generally do not follow the cost cycle of the mining industry (Readhead et al., 2023).

Advancements in mining technologies and declining ore grades in primary deposits have led to an increased interest in reprocessing mine tailings as a potential secondary source of some critical minerals. Reprocessing the contents of mine tailings can extend the life of existing mining operations, or—in cases where the mining operations have ceased—become small mining operations on their own. This can enhance the resilience and competitiveness of the mining sector, especially in the face of increasing demand, scarcity, and volatility of raw materials prices.

¹⁸ The DRC has, for example, established a list of “strategic minerals” that includes cobalt and coltan. These will be taxed at a higher rate of 10% in comparison to other minerals that are taxed 3.5%. Western Australia, in comparison, has historically levied a lower rate on copper, cobalt, and silver that are sold as by-products, and the rise in demand for critical minerals may create an opportunity for these fixed rates to be reviewed.



5.0 Conclusion

Governments seeking to benefit financially from the rise in demand for critical minerals must first ascertain how much revenue is at stake and identify and categorize the minerals deemed critical for their context and policy ambitions, albeit within the context of the wider global definition of criticality. These countries will also need to identify their opportunities and risks across global supply chains and define the fiscal policies that best meet their production and industrial goals while still adhering to the principles of sound fiscal governance.

The challenges and opportunities outlined in this note can each be developed further, either alone or within the context of the framework set out in Section 2 of this note. They will vary depending on the country context. What unites them, however, is a common underlying thread of optimization—the need to maximize the financial benefits from the new opportunities created, subject to constraints that are unique in scale and scope to each country.

We have embarked on a series of discussions with mineral-rich developing countries to ensure that the matters flagged are representative of their concerns. These discussions will give further insight into their priorities and strategic direction regarding a wide range of critical minerals issues. We intend to develop more detailed research and guidance on specific issues identified in the note, and we welcome further input and collaboration in this process. For example, we will review the financial benefit-sharing rules and practices for in-country mineral value addition, focusing on critical minerals, and examine the risks and mitigating actions from a policy implementation standpoint.



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