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SECURING CRITICAL MINERALS SUPPLY CHAINS FOR THE CLEAN ENERGY TRANSITION

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Abstract





The International Energy Agency estimates that to hit net-zero globally by 2050, six times more critical minerals will be required in 2040 than today.¹ The rapid increase in demand for critical minerals is likely to increase price volatility. This could aggravate energy security concerns, and thereby delay the necessary clean energy transition.

These vulnerabilities are amplified in emerging economies because they lack access to capital to secure critical minerals. It is essential for G20 countries to collaborate to lower the cost of capital across the critical minerals value chain—production, processing, and recycling—as well as to develop and adopt sustainability criteria to ensure that clean energy supply chains are both resilient and sustainable.

This policy brief provides an overview of frameworks for investment in critical minerals production and explores ways to deepen access to supply chains by lowering the cost of capital. Banks and investors are deterred by the risks

associated with upstream mining, so additional types of capital provision are needed. It will assess several modes of blended finance, in which development finance is used to unlock commercial finance, with the fundamental objective of derisking mining investment and improving access to critical minerals for emerging economies.

The brief builds on the Global Blended Finance Alliance launched at the previous G20 summit in Indonesia to assess different types of capital provision, with a focus on environmental, social, and governance frameworks. It examines how G20 cooperation, with the support of international financial institutions, might be able to maximise capital availability for critical mineral supply. The authors urge the G20 to consider creating a critical minerals supply chains working group, consider G20 enabled financing, coordinate the formation of standards and investment facilitation, and coordinate emerging economy participation in critical mineral alliances.



The Challenge



1



Critical mineral supply gaps

The International Energy Agency (IEA)² estimates that to hit net-zero globally by 2050, six times more critical minerals will be required in 2040 than today. The rapid increase in demand for critical minerals, coupled with inadequate investment is likely to cause a supply-demand deficit that will contribute to greater price volatility. The International Monetary Fund argues that the supply of critical minerals is inelastic in the short term and that lithium, cobalt, nickel, and copper prices could reach high peaks over a prolonged period of time under a net-zero scenario.³ According to Bloomberg New Energy Finance, the supply of metals used in the energy transition is constrained due to a lack of investment, increasing country risk towards mining, and the decreasing quantity of reserves.⁴ Even without net-zero scenarios, demand could outstrip supply, especially for copper⁵ and lithium.⁶

This could aggravate energy security concerns and make the clean energy transition unaffordable for developing and emerging economies, as well as unattainable globally. Diversified supply chains for critical minerals are needed to overcome bottlenecks, such as the high geographical concentration of

minerals' ownership and processing in certain areas, long project development times, underdeveloped international trade, and exposure to climate risks. For example, more than half of the world's lithium production is located in areas with high water stress.⁷ Upstream, the development of new mines takes 16 years on average, from discovery to production, with the discovery, exploration, and feasibility phase (which includes permitting) taking more than 12 years.⁸ Currently, energy transition models do not factor in critical mineral supply constraints in a bottom-up assessment of how a lack of supply could slow down technology adoption.⁹

Investment challenges to securing sustainable critical mineral supply chains

Critical mineral supply chains require significant up-front capital for the upstream production, processing, and eventual recycling of critical minerals. This up-front capital is also needed to ensure that critical minerals are processed according to sound environmental and social standards, which virtually all policymakers, supply chain participants, and investors recognise as a necessity.



These vulnerabilities are especially amplified in critical mineral-rich developing and emerging economies, and other countries that seek to capitalise on the need for midstream or recycling processes. This is because access to capital and technology is tougher here compared to many higher-income economies. Globally, it is estimated that the required investment in four key minerals (copper, lithium, nickel, and cobalt) to achieve net-zero by 2050 is between US\$360 billion and US\$450 billion.¹⁰ Currently, however, 55 percent of that needed investment remains absent, with only 45 percent announced.¹¹

A combination of factors lowers investment attractiveness in critical minerals. The higher cost of capital due to rising interest rates to combat inflation is presently posing a formidable hurdle for project developers. Many countries, especially developing and emerging economies, are dealing with high debt levels and have low fiscal space to support new sectors. In addition, certain countries might seek to nationalise industries or increase the role of the

state to capture more economic rents. Banks and investors are deterred by these various risks associated with upstream mining, making other energy transition projects with higher risk-adjusted returns more attractive. Additionally, mining companies do not yet see reliable market structures (for instance, uncertainty about offtake and price, about the market size of certain smaller metals, and about pricing instruments that are in the early stages of development) that can facilitate investment. Environmental, social, and governance (ESG) criteria also remain inconsistent, further discouraging investment.

At the same time, developing and emerging economies are additionally vulnerable because of the developmental implications of the energy transition. When they are unable to source critical minerals, they are at risk of losing market share in emerging electric vehicle supply chains.



The G20's Role



2

G20's role in reducing risk in critical minerals investment

The G20 countries are major producers (see Tables 1 and 2) of critical minerals, which warrants coordination across the G20 to improve the security of supply and accelerate the global energy transition.

The G20 countries are also the main consumers of critical minerals, at the first stage of processing or further stages such as cathode and anode manufacturing. China processes 40 percent of the world's copper, 35

Table 1: G20 countries' share of global production of critical minerals (2023, in %)

	Lithium	Cobalt	Nickel	Copper	Manganese	Rare Earth	Graphite
Argentina	4.77						
Australia	46.92	3.11	4.85	1.46	16.50	6.00	
Brazil	1.69		2.52		2.00	0.03	6.69
Canada	0.38	2.05	3.94	1.19			1.15
China	14.62	1.16	3.33	42.31	4.95	70.00	65.38
France							
Germany				2.38			0.02
India					2.40	0.97	0.64
Indonesia		5.26	48.48	1.15			
Italy							
Japan				6.15			
South Korea				2.54			1.31
Mexico							0.00
Russia		4.68	6.67	4.23		0.87	1.15
Saudi Arabia							
South Africa							
Turkey		1.42					0.22
UK							
US		0.42	0.55	3.85		14.33	
European Union							
G20 Total	68.38	6.32	14.64	44.96	23.45	76.03	73.23

Source: Compiled by authors based on USGS 2023 Mineral Commodity Surveys¹²

percent of nickel, 65 percent of cobalt, 58 percent of lithium, and 87 percent of rare earths; Japan processes 6 percent of copper and 8 percent of nickel; Indonesia processes 15 percent of nickel; EU countries process more than

15 percent of cobalt; and Argentina processes 10 percent of lithium.¹³

Some risk factors in certain mineral-rich emerging economies remain, such as expropriation risk and political

Table 2: G20 countries' share of global reserves of critical minerals (2023, in %)

	Lithium	Cobalt	Nickel	Copper	Manganese	Rare Earth	Graphite
Argentina	10.38						
Australia	23.85	18.07	21.00	10.90	15.88	3.23	
Brazil	0.96		16.00		15.88	16.15	22.42
Canada	3.58	2.65	2.20	0.85		0.64	
China	7.69	1.69	2.10	3.03	16.47	33.85	15.76
France							
Germany							
India					2.00	5.31	2.42
Indonesia		7.23	21.00	2.70			
Italy							
Japan							
South Korea							0.55
Mexico							
Russia		3.01	7.50	6.97		16.15	4.24
Saudi Arabia							
South Africa							
Turkey		0.43					27.27
UK							
US	3.85	0.83	0.37	4.94		1.77	
European Union							
G20 Total	50.31	33.92	70.17	29.39	50.24	77.10	72.67

Source: Compiled by authors based on USGS 2023 Mineral Commodity Surveys¹⁴



instability. However, the G20 can play a positive role with respect to the high cost of capital and high perceived investment and credit risk in critical mineral supply chains. As with many other energy transition investments in emerging economies, developers and financiers believe there is insufficient risk capital and a lack of bankable projects within critical mineral supply chains, in part because many critical minerals are ‘by-products’ of minerals that are consumed in larger quantities, such as copper or nickel. Essentially, the G20 can leverage its resources to contribute to two main pillars that can improve critical mineral supply chains, namely investment and sustainability.

On the one hand, there is a need for better thinking about credit enhancements and political risk insurance products. In addition, technical assistance with respect to mining project preparation and regulatory frameworks is also necessary. On the other hand, the G20 countries and their capital markets can also contribute to mechanisms that improve the availability of catalytic capital. Catalytic capital refers to investments that can take on more significant risks and can fill financing

gaps and derisk projects. Specifically, the G20 should cooperate to develop and experiment with blended finance instruments that can lower the cost of capital across the critical minerals value chain.

Energy transition finance instruments less suited for mining and processing

The need for the G20 to explore new financial instruments and risk mitigation tools, such as credit guarantees and first-loss tranches, is especially needed given that other innovative financing tools appear less suitable for critical mineral supply chains. Instruments like green bonds are less applicable since they are more often used to finance the installation of infrastructure that directly contributes to the reduction of carbon emissions. It would be much more difficult to use such bonds for upstream mining or processing because of several factors:

1. The issuance of green or other thematic bonds for mining projects may face scepticism from investors who might question the credibility and impact of these instruments in a sector known for its potential negative externalities. Investors interested

in green bonds are often focused on supporting projects with a direct positive environmental impact.

2. Green bonds usually adhere to specific standards or guidelines, such as the Green Bond Principles or the Climate Bonds Standard. These standards require the financed projects to demonstrate positive environmental or social impacts. It might be difficult for mining projects to prove that the mined minerals are actually used for low-carbon environmental and socially sound purposes.
3. Some jurisdictions may have legal or regulatory constraints that limit the issuance of green bonds for specific industries, including mining. These constraints may arise from concerns related to environmental protection, social impacts, or sustainability objectives.

Blended finance as catalytic capital in critical mineral supply chains

Blended finance combines financial capital from impact investors, development finance institutions, philanthropic organisations, governments,

and the private sector. In the context of big, capital-intensive mining projects in emerging and developing economies, catalytic capital is crucial for several reasons besides helping counter the political, environmental, and social risks:

1. High upfront costs: Mining projects require significant investments in infrastructure, equipment, and exploration before generating revenues.
2. Long-term nature of investments: Mining projects incur long lead times between an investment decision and production. This extended timeline can deter investors looking for shorter-term gains.
3. Limited access to capital markets: Companies operating in emerging and developing economies often face challenges in accessing capital due to the lack of developed financial markets and institutional support.
4. Higher risk profile: Given the high upfront costs and long tenure, mining projects present uncertainty in the form of completion risk, market risk, and supply risk, among



others. Catalytic capital can help with derisking such projects.

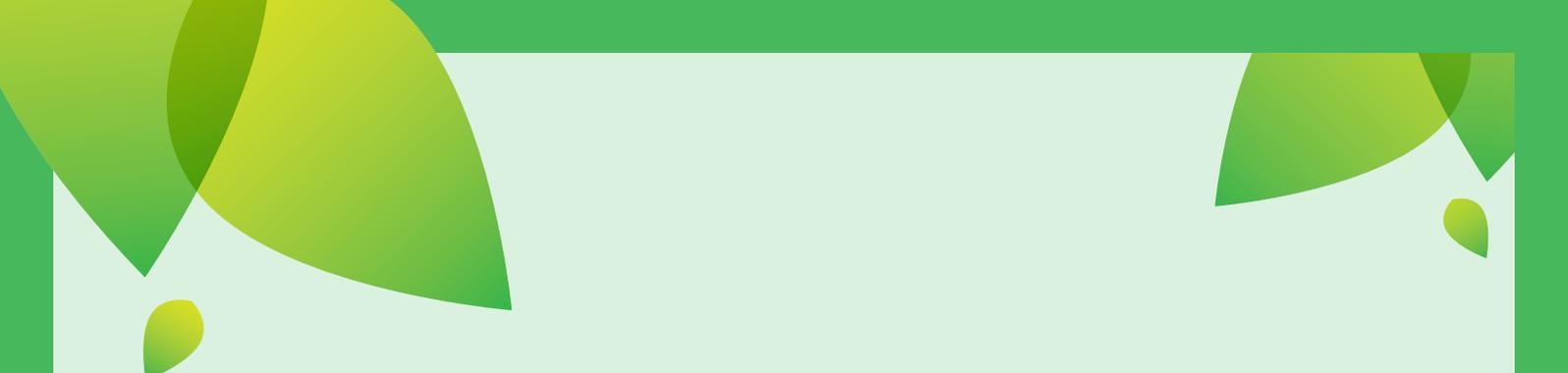
Over the last decade, blended finance has provided over US\$181 billion for the financing of projects, a majority of which were climate-oriented transactions.¹⁵ In recent years, there has also been a shift away from large, utility-scale renewable energy assets since they are now able to garner financing from institutional lenders and mainstream lenders. Given the changing nature of climate-oriented projects with more energy technologies yielding higher returns and becoming investment friendly, there is a need to evaluate new emerging sectors where more risk-bearing capital is relevant.

Because of drawbacks in instruments such as thematic bonds, there is a need for more blended finance instruments. While there are five broad vehicles for blended finance,¹⁶ some are more relevant for mining than others:

1. Blended funds: These could be limited liability debt facilities or provide private equity funding. Such a structure will allow investors to mitigate risks associated with the

high upfront capital costs of mining projects. Follow-on funding can also be available depending on the performance of the project.

2. Concessional capital: To derisk high capex projects and ensure a greater return for equity investors, providing upfront capital at a concessional rate is a potential solution. A study conducted by IFC noted that blended finance instruments had leveraged US\$ 1 to US\$4 of commercial capital for every dollar of concessional capital.¹⁷
3. Project financing: Blended capital that aims to utilise the creditworthiness of certain entities to finance high-risk, low-return projects has been used with great success in the past.



Recommendations to the G20



3



The G20 under the Indonesian presidency launched the Global Blended Finance Alliance (GBFA) in 2022. The initiative is new, with the G20 Development Working Group also agreeing on the G20 Principles to Scale up Blended Finance in 2022. This has put blended finance on the map, and it was discussed again at the first meeting of the Sustainable Finance Working Group held in Guwahati in February 2023.¹⁸ The G20 can align the need for critical minerals financing with the GBFA.

A G20 critical minerals supply chains working group

Similar to the G20 Energy Transitions Working Group, the Critical Minerals Supply Chains Working Group should focus on promoting sustainable supply chains, facilitating investment, and improving ESG performance in these supply chains. This group should then be aligned with, and feed into the work of existing groups such as the Trade and Investment Group, the Infrastructure Working Group in the finance track, and the Energy Transition Working Group. The G20 should help investigate what policies and blended

finance instruments and setups have worked in the past and how they can be adapted to critical mineral value chains, where projects are often of a multi-decade duration. This should then feed into the G20 Global Infrastructure Hub (GI Hub), specifically its action area 3.1 on how to best leverage private sector participation to scale up sustainable infrastructure investment.¹⁹

To deploy blended finance, there is a need to establish forecasts of expected infrastructure investments in mineral-rich countries as well as forecasts of anticipated demand for low-volume critical minerals, which remain important sources of uncertainty for investors. The G20 should immediately mobilise resources for this. The G20 group should also set up an institutional body like the GI Hub or the Green Finance Study Group to evaluate existing models of blended finance and see what type of models can be useful for investment in critical minerals. Similar to the G20 Compendium on Promoting Investment for Sustainable Development, the G20 group should request members countries to share their policy practices on promoting investment in critical mineral supply chains.

G20-enabled financing

The G20 should work with agencies such as the Multilateral Investment Guarantee Agency to provide additional downside risk coverage in the form of political risk insurance for borrowers or developers. There is also scope for providing support to emerging economies through bilateral trade agreements for raw critical minerals as mining and refining supply chains are being set up. For example, the EU is planning on using the Global Gateway^a to assist partner countries in setting up their own extraction and processing industries²⁰. The G20 should also approach the New Development Bank in addition to the World Bank to raise finance for critical minerals projects.

One core strength of the G20 is in coordinating the work of national development banks for equity investments in projects that will enable critical mineral mining, processing, or recycling. China by far has the most experience in financing mining-related activities. An analysis of

China's development finance projects²¹ shows that between 2000 and 2017, it financed 690 mining-related projects, of which 69 went directly in the mining sector. Asia (253) and Africa (186) were the top beneficiaries, having received finance for project development and construction, geological surveys, mineral exploration, and joint mineral research and testing labs. China's Exim Bank issued the most loans, a total of 203, followed by China Development Bank. Besides China, other G20 countries have also used development finance for mining-related activities. For example, in 2020, the US Development Finance Corporation approved a US\$25 million investment in TechMet Limited to boost the production of nickel and cobalt in Piauí, Brazil.²²

Finally, the G20 group of countries has a history of extending technical assistance funding to emerging economies. Technical assistance is particularly relevant for critical mineral mining. The Global Green Finance Leadership Program^b recommended

a The Global Gateway is a European strategy to, among others, boost secure links in energy and transport sectors by also facilitating major investments in infrastructure development across the world.

b These suggestions were made at the G20 Workshop for scaling-up sustainable finance. For more, see: G20 Sustainable Finance Working Group, 2022 Sustainable Finance Report (G20, 2022), <https://g20sfwg.org/wp-content/uploads/2022/10/2022-G20-Sustainable-Finance-Report-2.pdf>.



that the G20 Sustainable Finance Working Group^c facilitate the creation of a network to coordinate various capacity-building programs in emerging markets and developing economies, with the help of multilateral development banks (MDB), non-governmental organisations, research bodies, and think tanks. The network should address the issues relevant to the G20 sustainable finance roadmap, including approaches for identifying sustainable investments and activities, taxonomies or labels, sustainability disclosures and reporting, risk/impact assessment and management, and managing the transition to clean energy.

Coordination of efforts with respect to standards and investment facilitation

The G20 should consider playing an active role in the coordination of efforts to develop ESG standards for critical mineral supply chains and assist mineral-rich countries in meeting those standards. This combination can help attract investment and

accelerate production. The sanctity of contracts is easier to uphold when local communities and indigenous peoples are involved since they will be able to hold both incumbents and new policymakers to account. It also reduces risk since social involvement helps accelerate permitting processes because political risk is reduced. Similarly, improving environmental standards will facilitate permitting.

The G20 should also consider adopting guiding principles on investment facilitation for sustainable critical mineral supply chains. The G20 ought to consider a supply chain development standard where investment in upstream mining is followed by assistance to develop local processing capacity, which increases the value share captured by resource-rich countries. A similar process was adopted for sustainable infrastructure in emerging economies through the Finance to Accelerate the Sustainable Transition-Infrastructure.²³ This initiative was conceived in 2020 by the Climate Policy

c The Sustainable Finance Study Group launched in 2018 is co-chaired by China and the UK, and has the objective of examining more initiatives of green finance. For more, see: Ray, S., Jain, S., Thakur, V., and S. Miglani, *Global Cooperation and G20: Role of Finance Track* (Springer, 2023), <https://link.springer.com/book/10.1007/978-981-19-7134-1>.



Initiative, the Hongkong and Shanghai Banking Corporation, the International Finance Corporation, and others to close the financing gap for sustainable infrastructure through a labelling process for sustainable infrastructure assets. This kind of assistance can help create a new sustainable infrastructure asset class that can further facilitate the expansion of bankable projects in emerging economies.

Finally, the G20 should consider the development of a minimum standard for Ease of Doing Business that developing economies should meet to receive blended capital from MDBs or developed economies. Preference should be given to countries with a minimum sovereign credit rating of Ba3, which is the minimum requirement for many mainstream private sector investors. This will help target blended finance instruments to regions where shorter-term project realisation is feasible.

Coordination of efforts with respect to emerging economy participation in critical mineral alliances

The G20 should also seek to coordinate the several alliances that are currently being developed, including the Minerals Security Partnership, the Sustainable Critical Minerals Alliance, and the Critical Minerals Club. Some of these alliances overlap while others compete. Even if these alliances follow geopolitical preferences and develop organically from other types of cooperation among member countries, the exclusion of emerging economies affects the feasibility of a just energy transition that many of the founding members of these alliances publicly support. Within a G20 context, there can be sound deliberation on how to integrate emerging economies in critical mineral partnerships set up by several other members. This can also prevent the creation of critical mineral cartels like the Organisation of the Petroleum Exporting Countries, which could delay the clean energy transition.

Attribution: Tom Moerenhout et al., “Securing Critical Minerals Supply Chains for the Clean Energy Transition,” *T20 Policy Brief*, May 2023.



Endnotes

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