Chapter 5

Resilient Critical Minerals Supply Chains: Opportunities for India, Japan, and Regional Partners

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Chapter 5

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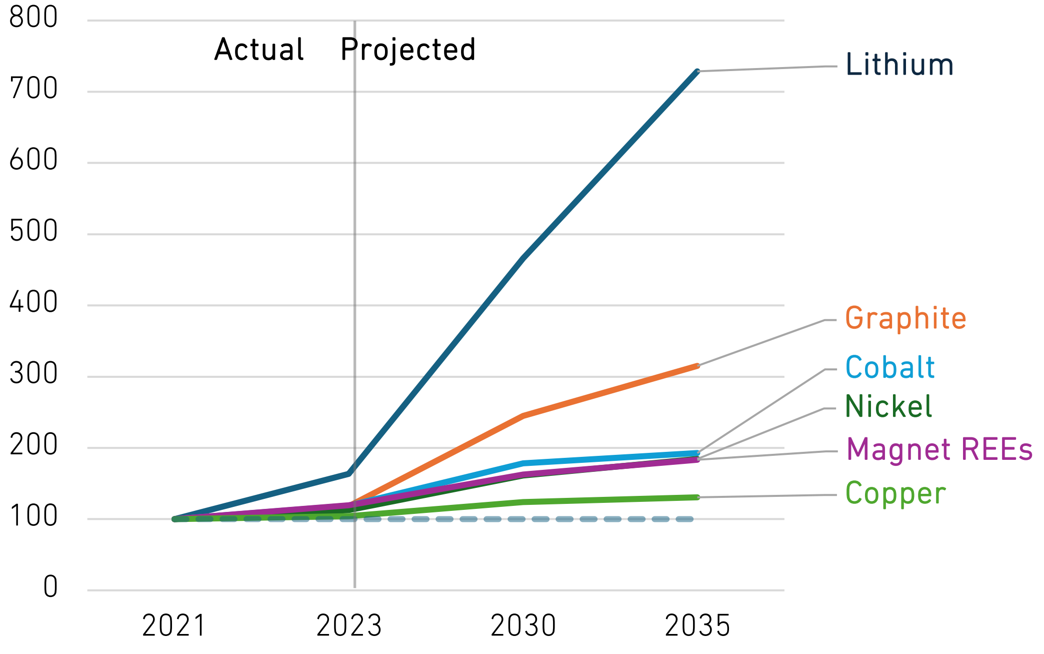
Introduction

Minerals like lithium, graphite, and nickel are widely expected to play an increasingly prominent role in global trade. Even under conservative projections, demand for these and other critical minerals will grow robustly, reflecting their importance for green technologies. Figure 5.1 shows projections of demand growth, in volume terms, to 2030 and 2035 under the Stated Policies Scenario of the International Energy Agency (IEA).

Figure 5.1: Volume of Demand, Energy Transition Minerals, Indexed to 2021 = 100



IEA = International Energy Agency, REE = rare earth element.
Note: 2030 and 2035 are projections based on the IEA Stated Policies Scenario. Magnet REEs are neodymium, praseodymium, dysprosium, and terbium.
Source: Based on IEA (2024a, 2024b) data.

A second category of critical minerals constitutes those with applications in semiconductor manufacturing. Since these minerals also tend to be used in solar photovoltaic (PV) technology, they overlap with the energy transition minerals. Silicon is a key example, with global trade in high-purity forms reaching US$6.0 billion in 2022 (IEA, 2024a, 2024b; and US Geological Survey, 2024). Tantalum, used in capacitors, is another, with trade around US$1.3 billion in 2022.[1] Others like gallium and germanium, which have more niche high-end and military applications, are traded in smaller volumes but feature on Indian, Japanese, and Australian government critical minerals lists (Geoscience Australia, 2024).

Many of these markets face uncertainty as to whether supply will reliably meet the levels required to reach even modest emissions-reduction goals. Against this backdrop, domestic and international initiatives to safeguard critical minerals supplies have proliferated. Governments have employed a wide range of instruments, from regulatory policies to taxes and transfers to trade policies. In some cases, trade has been liberalised to facilitate critical minerals supply, such as India's recent exemption of 25 minerals from customs duties (Mishra, 2024). In other cases, trade has been restricted, including through local content requirements and export curbs.

A critical role for India, Japan, and their regional partners is to resist imposing unilateral barriers and instead invest in institutions that keep markets for these minerals open. If markets become mired in trade restrictions, then security of supply – and the diffusion of emissions-reducing technologies – will become, on average, slower, costlier, and more volatile. It is difficult to predict the supply, demand, and relative importance of critical minerals over long time horizons because they depend on technological change. An approach that encourages flexibility, preserves multilateral trade rules and norms, and uses industrial strategies judiciously will be most effective for securing supply into the future.

There are promising opportunities to improve the resilience of supply by encouraging deeper, more transparent international markets. Governments can also boost resilience by finding ways to create a more enabling environment for recycling. Since different countries have advantages in different parts of the value chain, there are international synergies. The good news is that India, Japan, and regional partners have a wealth of forums available that, if used wisely, allow them to coordinate policies and strengthen supply chain resilience.

The geographic distribution of production varies by mineral and is subject to change

A central question in assessing risk is whether production can expand quickly in the event of a shock. A market may appear relatively diversified geographically, but if barriers to entry are high, it may take some time to increase production in an emergency. Conversely,

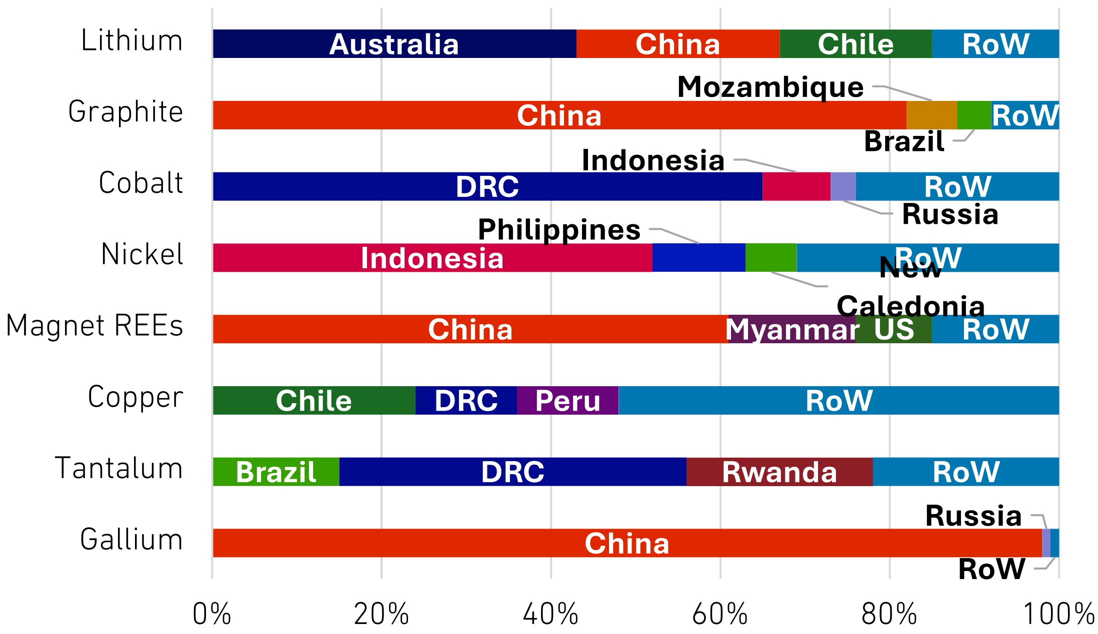
[1] Tantalum and silicon trade figures are from OEC (2024). 'High-purity' silicon refers here to at least 99.99% silicon (Harmonised System (HS) code 280461), but electronic and solar applications typically require an even higher percentage.

a market may appear highly concentrated, but if it is competitive and contestable, then the distribution of supply can more easily adapt to changing conditions.

In 2010, for example, China was reported to have restricted rare earth exports to Japan following a diplomatic dispute, thereby weaponising its dominance as a producer. Over the next few years, markets for raw rare earths became increasingly diverse and more reserves were found. Japan, like most Western countries, now sources a much smaller fraction of its supply from China compared with a decade ago. Reflecting on that episode, Evenett and Fritz (2023: 39) noted that the 'leverage of each supplier tends to decline as markets thicken'.

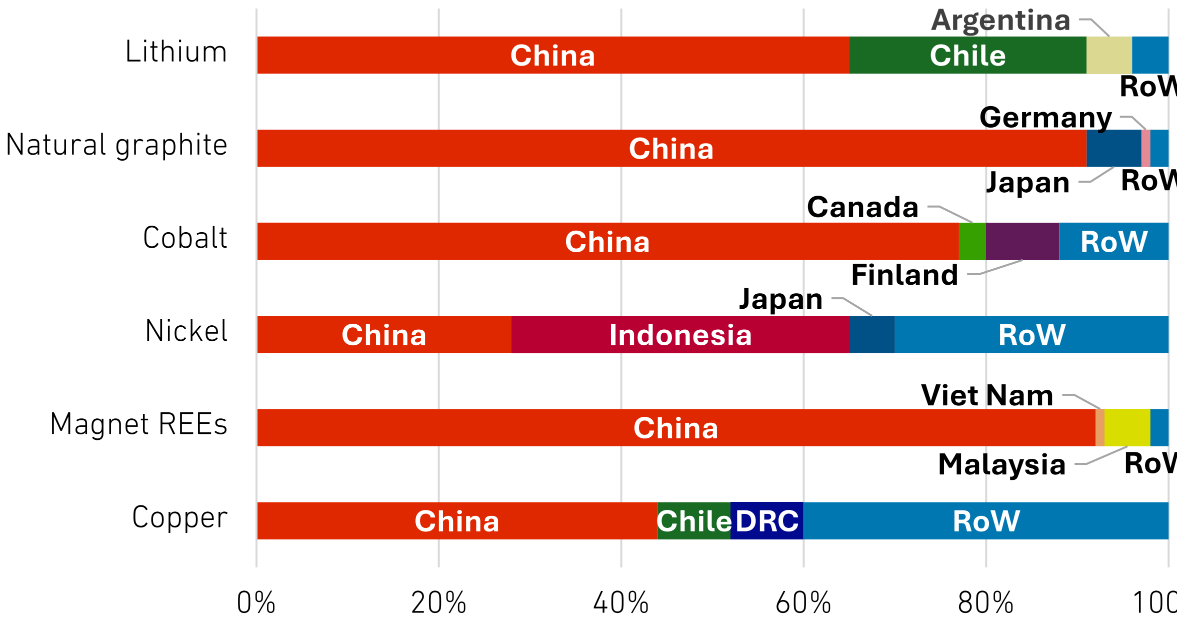
For copper, the most ubiquitous critical mineral, the issue that warrants greatest concern is not market concentration, but the risk that global supply will fall short of what is needed for the energy transition. Copper refining is more concentrated than mining – with China accounting for about 45% of refined output (Bloomberg, 2023) – but is diverse compared with other minerals (Figures 5.2 and 5.3). India and Japan have footholds in the supply chain. Japan is the third largest refiner by country of ownership and the fifth largest by location (IEA, 2024b: 115). India has substantial new refining capacity coming online, and the IEA expects its global refined copper market share to grow from 2.1% in 2023 to 3.5% in 2035 (IEA, 2024a).

Figure 5.2: Raw Minerals, Geographic Distribution of Output, 2023



DRC = Democratic Republic of the Congo, REE = rare earth elements, RoW = rest of the world, US = United States.
Source: Based on data from IEA (2024a, 2024b) and US Geological Survey (2024).

Figure 5.3: Refined Minerals, Geographic Distribution of Output, 2023



DRC = Democratic Republic of the Congo, REE = rare earth elements, RoW = rest of the world.
Source: Based on data from IEA (2024a, 2024b).

Products with highly concentrated production include refined magnet rare earth elements (REEs), gallium, and graphite. In addition to 80% of mined output, China produces 99% of spherical graphite, a precursor to graphite anodes used in batteries, and most synthetic graphite, which is the other (more emissions-intensive) option for graphite electric vehicle (EV) components. In the magnet REE sector, China produces about 92% of global refined output, with just four mines outside China and Myanmar operating at scale (IEA, 2024b: 172–173, 182).

The geographic concentration of refining output should be understood in relation to downstream production and consumption. For example, in 2023, China accounted for nearly 60% of new electric car registrations globally; the United States (US) represented about 10% (IEA, 2024c). China produced about 90% of the world's rare earth magnets in 2020 (US Department of Energy, 2022). Four of the world's top five wind power equipment manufacturers are in China, and in 2023, 97% of the turbines they installed were in their home market (Global Wind Energy Council, 2024).

While spherical graphite is the most concentrated part of the EV supply chain today, it is nonetheless diversifying. Assuming planned projects in North America and Europe come online, China's share in spherical graphite production is expected to fall to 85% by 2030 (IEA, 2024b: 173). India also has potential across the graphite value chain. It is a top five natural graphite producer, with 3.1% of global reserves, and Indian companies have produced spherical graphite in trials.[2]

India has an estimated 6.3% of global REE reserves, including neodymium and praseodymium, and Japan has rare expertise in producing rare earth magnets. There are two types of these magnets, bonded and sintered, with the latter used in EV motors and wind turbines. As of 2023, outside China, only two plants in Japan manufacture sintered magnets at scale. There is great rare earth potential in Southeast Asia; Lynas established the world's first refining plant outside China in 2012 in Malaysia. The US Geological Survey estimated that Viet Nam has the world's second largest rare earth reserves.[3] Yet project lead times are around 8 years and, with Chinese supply having met global demand to date, there have been few recent announcements of new mining projects (IEA, 2024b).

Other minerals are somewhat less concentrated but face challenges with market responsiveness, with lithium as an example. Today, supply of lithium chemicals is relatively concentrated and, in the context of US–China strategic competition, exposed to geopolitical risk. There are plans for additional refining capacity in Australia, China, and the Republic of Korea (henceforth, Korea) (IEA, 2024a: 131). The diversity of the future geographic distribution depends significantly on which battery technologies are adopted most widely. Lithium reserves were discovered in India in 2023, which could present a significant new supply, though exploration is in its very early stages (Takkar, 2024).

Geopolitical and trade policy risks are disrupting all critical mineral markets

Geopolitical risks in the critical minerals sector will affect different markets in Asia and the Pacific in different ways, determined in large part by trade policies in the US, China, and other large economies. Markets for all EV inputs are likely to be significantly shaped by US policy, currently exemplified by the Inflation Reduction Act (IRA) of 2022. To qualify for US EV tax credits, a vehicle must have a minimum amount of its components sourced domestically or from free trade agreement partners (Table 5.1). These partners include Japan, which signed a critical minerals trade agreement with the US in 2023, but exclude India and most Association of Southeast Asian Nations (ASEAN) Member States.

[2] See Ramji, Shivani, and Das (2024); US Geological Survey (2024); and Wischer (2024).

[3] See US Geological Survey (2024) on estimated rare earths reserves globally; the Indian Department of Atomic Energy (2023) on the composition of India's reserves; and IEA (2024b: 185, 189) on Lynas and Japan's refining capacity.

Table 5.1: Content Requirements to Qualify for US Clean Vehicle Tax Credits

	Minimum percentage of value required to be sourced domestically or from FTA partners	
Year	Critical minerals	Battery components
2024	50%	60%
2025	60%	60%
2026	70%	70%
2027	80%	80%
2028	80%	90%
2029 and later	80%	100%

FTA = free trade agreement, US = United States.
Note: Qualifying vehicles must be assembled in the US.
Source: US Department of Energy (2024).

Requirements are looser for leased EVs, creating a loophole that has blunted much of the IRA's trade impact, but which has an uncertain future. EVs cannot qualify for US subsidies if they contain any battery components manufactured or assembled by a 'foreign entity of concern', including China.

Some analysts expect that a two-tier lithium price will arise, with a premium for IRA-compliant sources (Simionato, 2024). Similar dynamics may be emerging in graphite markets. In February 2024, Benchmark Mineral Intelligence, a leading source of price data, introduced a CIF North America graphite index.[4] It cites incentives like the IRA, which encourage sourcing from outside China, as a reason for the index, with traders seeking to 'ensure the price is reflective of dynamics in North America' (Benchmark, 2024). That said, regional price disparities also reflect non-policy factors like distance, and assigning causality to geopolitics to two-tier pricing is not straightforward.

In July 2023, China imposed export controls on gallium and germanium in retaliation to US CHIPS Act measures. These were followed by controls on natural graphite exports and, later in the year, separate export bans on technology to refine REEs and to produce rare earth magnets. The graphite measures are licencing requirements, rather than bans, but exports nonetheless plunged.[5] Given the increasingly zero-sum nature of technological competition, the expansion of export controls is a risk to the short-term supply of any mineral concentrated in few countries. India, Japan, and regional partners' best defence against trade policy risks is to support institutions that aim to keep this trade open.

[4] The index tracks graphite prices in North America inclusive of cost, insurance, and freight. It was initiated partly to provide information on graphite supply and demand outside China (Benchmark, 2024).

[5] See Home (2023) and Tabeta and Kawate (2023) on the context around the graphite measures, Liu and Patton (2023) on other rare earth controls, and Bloomberg (2024) for the subsequent drop in exports.

Indonesia's ban on exports of nickel ores and concentrates (starting in 2009 but with uneven implementation until around 2020) has precipitated major changes in global markets. Nickel laterite mining and refining has overtaken the traditionally mined sulphide, driven by newer, more emissions-intensive laterite refining technology pioneered by Chinese firms in Indonesia (Mandala, 2024). Indonesia now accounts for over half of global supply (IEA, 2024b: 142). A World Trade Organization (WTO) dispute regarding the bans was appealed into the void in December 2022, the panel having ruled against Indonesia (WTO, 2023).

There are several reasons why further export restrictions in critical minerals would create unfavourable conditions for India, Japan, and others in the region. Most immediately, they are costly for buyers and suppliers. Quantitative restrictions tend to attract costly rent-seeking behaviour from firms seeking allocations. Over longer periods, export restrictions generate policy uncertainty that discourages investment in new capacity. Most significantly, trade barriers spark retaliation. While curbs on the export of intermediates may assist local downstream producers, these benefits are likely to be eroded if other countries follow suit.

No country, even China, would benefit from critical minerals autarky. If markets become segmented along geopolitical lines, prices will be higher and, on average, supply will be less responsive to shocks. International cooperation is critical to ensure governments can balance national security concerns with the broadly open markets that underpin that security.

Greater market depth and recycling capacity would improve responsiveness to shocks

An important factor in the ability for critical minerals supply to expand in response to shocks is accurate and timely pricing. The impact is not just on mining but on investment and production decisions in midstream processing, refining, and recycling. Factors influencing price transparency include:

- the presence of markets at both spot and futures prices;
- whether trading is offered on major regulated exchanges; and
- the availability of data on costs, prices, capacities, and stockpiles (IEA, 2024b: 244–245).

Lithium prices have been highly volatile relative to other transition minerals, raising concerns about delayed or discouraged investments (IEA, 2024b). There have been calls for lithium futures contracts to increase price predictability, with some exchanges beginning to offer them (Jamasmie, 2021). In October 2023, the US Department of Defense announced plans for an artificial intelligence (AI)-based programme to estimate critical mineral prices and supplies, aimed at improving transparency (Scheyder, 2024).

Governments or industry bodies in producing countries could jointly explore regulatory means to improve global price transparency. Key regional partners in this area are China, Australia, and Korea, as current and prospective lithium hydroxide producers, and Indonesia as a major nickel and cobalt supplier. Avenues for dialogue would include improving reporting on costs and quantities, and exploring the use of physically settled contracts (Epper, Handler, and M. Bazilian, 2024). Physically settled as opposed to cash-settled contracts provide more information about stocks because they are physically tied to the underlying commodity. Dialogue amongst industry, finance, and regulatory organisations could shed light on opportunities in this area.

Prices for rare earths and graphite are even less transparent than lithium, as they are not typically traded on traditional commodity exchanges. Information on supply is scarce – governments generally do not publish data on germanium production or reserves, for example (US Geological Survey, 2024). Researchers at the Federation of American Scientists have proposed government-backed auctions and even support for new commodity exchanges as ways to improve transparency (Wu, 2024).

Recycling capacity, like price transparency, increases the responsiveness of critical minerals supply to shocks. Recycling has outsize benefits for supply chain resilience, growing an extra branch in a supply network that can be leant on when primary supplies run short. The IEA estimated that further development of copper, lithium, nickel, and cobalt recycling could reduce the level of primary supply required by between 10–30% by 2040 (IEA, 2024b: 236).

Critical minerals recycling has been highlighted as an area for greater India–Japan cooperation. The India–Japan Clean Energy Partnership, signed in 2022, names recycling as a candidate for future collaboration (Indian Ministry of External Affairs, 2022). In August 2023, Japanese and ASEAN environmental ministers agreed to enhance cooperation on recycling, including on the development of e-waste disposal and collection regulations (Tanaka, 2023). Japan recycles more e-waste than any other Organisation for Economic Co-operation and Development (OECD) country, of which 40% is imported, having long considered recycling as a pillar of its critical minerals strategy.[6] Like copper refining, India also has potential to expand its role in global copper recycling (Raizada and Moerenhout, 2024).

India, Japan, and regional partners can gain from deeper critical minerals cooperation

India, Japan, and their regional partners have several avenues for cooperation to enhance the resilience of critical mineral supply chains. Multiple forums and mechanisms have been established for collaboration on critical minerals and related issues (Table 5.2). In addition to these forums, there are non-governmental initiatives. The Quad Investors Network, for example, is a non-governmental project to foster private investment in strategic sectors, launched alongside the May 2023 Quad Leaders' Summit. Mobilising private capital is a central objective of critical minerals cooperation – e.g., the IEA

[6] See Dewit et al. (2022) on India–Japan cooperation, Otaka (2024) on Japan's e-waste recycling, and Nakano (2021) on Japan's critical minerals strategy.

estimates that 70% of clean energy financing to meet announced pledges must come from the private sector (IEA, 2021).

Table 5.2: Relevant International Forums and Initiatives for India and Japan

Mode	Forum
Bilateral (including either country)	Australia–India Critical Minerals Partnership Australia–Japan Critical Minerals Partnership and Working Group India–Japan Clean Energy Partnership US–India Initiative on Critical and Emerging Technology US–Japan Agreement on Strengthening Critical Minerals Supply Chains
Plurilateral	Indo-Pacific Economic Framework for Prosperity Quadrilateral Security Dialogue Supply Chain Resilience Initiative (Australia, India, and Japan) OECD (Japan as member, India as key partner)
Multilateral	International Energy Agency (Japan as member, India as association country) Minerals Security Partnership World Trade Organization

OECD = Organisation for Economic Co-operation and Development, US = Untied States.
Sources: Indian Ministry of External Affairs (2022); Australian Department of Industry, Science and Resources (2023); Office of the United States Trade Representative (2023); and White House (2023).

To strengthen supply chain resilience, policymakers should use international agreements to favour measures that allow greater trade in critical minerals over those that impede it, such as export bans. Openness to foreign capital, with prudent regulations around areas of legitimate national security concern, is vital to ensuring competitive, diverse supply networks. For example, Australia's first facility for refining lithium hydroxide from hard rock – one of few such facilities outside China – was enabled by Chinese investment and know-how (Laurenceson, 2024).

In crafting national approaches, policymakers need to reckon with inherent uncertainties in critical minerals markets, both geopolitical and technological. Enhancing market functionality and adaptability, informed by ongoing public–private dialogue – rather than concentrating efforts in any single sector – is a useful guiding principle.

A productive agenda for India and Japan to boost critical minerals supply chain resilience could include the following.

Engage with industry to identify favourable regulatory settings for market transparency. This would include encouraging reporting on prices, costs, and stocks; facilitating the development of deeper financial markets for certain minerals; and creating an enabling environment for recycling. One avenue for this engagement is the India–Japan Clean Energy Partnership, where policymakers could consider incorporating critical minerals into the partnership's four existing working groups (Indian Ministry of External Affairs, 2022). Another suitable forum is the US-led Minerals Security Partnership (MSP) which has previously convened meetings with private sector participants (US Department of State, 2024a).

Governments could also consider cooperating on geological mapping, which researchers have proposed as a potential Quad project (Dewit et al., 2022), building on an ongoing Australia–Canada–US initiative (IEA, 2022). By providing information on potential reserves and relevant geological phenomena, the mapping could contribute to international price transparency. There is also value in engaging with Chinese market participants and regulators, given their prominence and experience in key sectors. Initial engagement amongst academic and private sector experts could pave the way for governmental collaboration.

Continue to mobilise private investment and coordinate national policies through forums like the Quad. Governments can use these forums to signal joint interest and mobilise investment to address legitimate vulnerabilities. Coordination amongst countries can yield synergies, such as Japanese rare earth refiners benefiting from Indian mining operations. MINVEST, a US project to advance public–private dialogue and increase critical minerals investment, was launched in November 2023 and is open to other MSP parties joining (US Department of State, 2024b).

Encourage the free flow of skilled labour in midstream refining and processing. Some parts of critical minerals supply chains that are essential for everyday green technologies are dominated by a small number of firms – even a small number of facilities. While this concentration is broadly expected to ease over time, allowing mobility of skilled workers in these sectors would speed up this process. Highly specialised areas like the production of sintered rare earth magnets and lithium hydroxide would be ideal targets. Subsidising training programmes could further help disseminate expertise.

Support open trade in critical minerals and multilateral solutions to disputes. India, Japan, and regional partners can build on successes like the Australia–India Economic Cooperation and Trade Agreement to reduce critical minerals trade barriers. Commercial diplomacy can play a productive role, especially where informational barriers and regulatory complexity are high (Fry-McKibbin and Nguyen, 2019). Above all, a functioning multilateral trade system is the ultimate defence against fragmented, uncertain trade in these critical products. Japan's decision in March 2023 to join the Multi-Party Interim Appeal Arbitration Arrangement was an important step forward in this regard.

References

Australian Department of Industry, Science and Resources (2023), *Critical Minerals Strategy 2023–2030,* Appendix A: International Partnerships. https://www.industry.gov.au/publications/critical-minerals-strategy-2023-2030/appendix-international-partnerships

Benchmark (2024), 'Benchmark Launches CIF North America Graphite Price Driven by Growing Demand for Ex-China Graphite', *Benchmark Source*, 9 February. https://source.benchmarkminerals.com/article/growing-demand-for-ex-china-graphite-drives-need-for-new-pricing-data

Bloomberg (2023), 'China Tightens Grip on Copper, Key to World's Energy Transition', *Bloomberg News,* 13 November. https://www.bloomberg.com/news/articles/2023-11-12/china-tightens-its-grip-on-the-greenest-metal-of-them-all

——— (2024), 'Chinese Exports of Battery Material Graphite Plunge on Controls', *Bloomberg News*, 22 January. https://www.bloomberg.com/news/articles/2024-01-22/chinese-exports-of-battery-material-graphite-plunge-on-controls

Dewit, A., R. Shaw, S. Isetani, and S. Shimizu (2022), 'Indo-Japanese Collaboration on Energy Security and Critical Raw Materials', *Asia–Pacific Journal*, 15 November. https://apjjf.org/2022/18/isetani-shimizu-dewit-shaw

Epper, R., B. Handler, and M. Bazilian (2024), 'Revitalizing the Future Economy: Critical Mineral Derivatives Could Bring Stability', World Economic Forum, 29 April. https://www.weforum.org/stories/2024/04/revitalizing-the-future-economy-a-critical-mineral-derivative-market-could-bring-stability/

Evenett, S.J. and J. Fritz (2023), *The Scramble for Critical Raw Materials: Time to Take Stock?* Global Trade Alert report, London: Centre for Economic Policy Research. https://www.globaltradealert.org/reports/gta-31-report

Fry-McKibbin, R. and T.T. Nguyen (2019), 'Does Commercial Diplomacy Overcome Impediments to International Economic Flows? The Case of Australia', *The Hague Journal of Diplomacy* 14(4), pp.379–401.

Geoscience Australia (2024), Critical Minerals at Geoscience Australia, 23 August. https://www.ga.gov.au/scientific-topics/minerals/critical-minerals

Global Wind Energy Council (2024), 'Wind Turbine Manufacturers See Record Year Driven by Growth in Home Markets', 9 May. https://gwec.net/wind-turbine-manufacturers-see-record-year-driven-by-growth-in-home-markets/

Home, A. (2023), 'China Ups Critical Minerals Heat with Graphite Controls', *Reuters*, 24 October. https://www.reuters.com/markets/commodities/china-ups-critical-minerals-heat-with-graphite-controls-2023-10-24/

IEA (2021), 'The Cost of Capital in Clean Energy Transitions', 17 December. https://www.iea.org/articles/the-cost-of-capital-in-clean-energy-transitions

——— (2022), *Solar PV Global Supply Chains*. Paris: International Energy Agency.

——— (2024a), *Critical Minerals Dataset*, May. https://www.iea.org/data-and-statistics/data-product/critical-minerals-dataset

——— (2024b), *Global Critical Minerals Outlook 2024*. Paris: International Energy Agency.

——— (2024c), *Global EV Outlook 2024*. Paris: International Energy Agency.

Indian Department of Atomic Energy (2023), 'Mining of Rare Earth Elements', Press release, 6 April. https://pib.gov.in/PressReleasePage.aspx?PRID=1914305

Indian Ministry of External Affairs (2022), 'India–Japan Clean Energy Partnership', Visit detail, 19 March. https://www.mea.gov.in/incoming-visit-detail.htm?34992/IndiaJapan+Clean+Energy+Partnership

Jamasmie, C. (2021), 'CME Starts Trading Lithium Futures to Tap DV Demand', *Mining.com*, The Northern Miner Group, 3 May. https://www.mining.com/cme-starts-trading-lithium-futures-to-tap-ev-demand/

Laurenceson, J. (2024), 'It's Economically Naïve to Cut China Out of Direct Investment', *Australian Financial Review*, 6 May. https://www.afr.com/policy/economy/it-s-economically-naive-to-cut-china-out-of-direct-investment-20240505-p5foyj

Liu, S. and D. Patton (2023), 'China Bans Export of Rare Earths Processing Tech over National Security' *Reuters*, 22 December. https://www.reuters.com/markets/commodities/china-bans-export-rare-earths-processing-technologies-2023-12-21/

Mandala (2024), 'A Critical Juncture: Australia's Opportunities and Challenges in Nickel', February. https://mandalapartners.com/uploads/A-Critical-Juncture.pdf

Mishra, T. (2024), 'Budget 2024–25 Waives Import Duties on Lithium and other Critical Minerals', *The Economic Times*, 23 July. https://economictimes.indiatimes.com/industry/indl-goods/svs/metals-mining/budget-2024-25-waives-import-duties-on-lithium-and-other-critical-minerals/articleshow/111951813.cms

Nakano, J. (2021), 'Japan', in *The Geopolitics of Critical Minerals Supply Chains*, Washington, DC: Center for Strategic and International Studies, pp.19–22.

OEC (2024), Observatory of Economic Complexity. https://oec.world/en (accessed 6 December 2024).

Office of the United States Trade Representative (2023), 'United States and Japan Sign Critical Minerals Agreement', Press release, 28 March. https://ustr.gov/about-us/policy-offices/press-office/press-releases/2023/march/united-states-and-japan-sign-critical-minerals-agreement

Otaka, A. (2024), 'Japan Plans 10 E-Waste Hubs to Mine Copper and Metal Resources', *Nikkei Asia*, 2 June. https://asia.nikkei.com/Spotlight/Environment/Japan-plans-10-e-waste-hubs-to-mine-copper-and-metal-resources

Pan, S. (2024), 'US Delays Ban on Chinese Graphite in Batteries While Ex-China Suppliers Scrabble to Source Critical Minerals', *Fastmarkets*, 8 May. https://www.fastmarkets.com/insights/us-delays-ban-on-chinese-graphite-in-batteries/

Raizada, S. and T. Moerenhout (2024), 'Security India's Copper Supply: Challenges and the Way Forward', Winnipeg, Canada: International Institute for Sustainable Development. https://www.iisd.org/system/files/2024-07/securing-india-copper-supply.pdf

Ramji, A., Shivani, and A. Das (2024), 'Releasing the Pressure: Cultivating Graphite Value Chains in an Expanding Market', Blog post, 9 April. UC Davis Institute of Transportation Studies. https://its.ucdavis.edu/blog-post/releasing-the-pressure-cultivating-graphite-value-chains-in-an-expanding-market/

Rothrock, S. and P. Cambou (2023), 'Global Semiconductor Players Prepare to Cash in the CHIPS and Invest to Secure Supply', *Strategy Insights*, Yole Group, 6 July. https://www.yolegroup.com/strategy-insights/global-semiconductor-players-prepare-to-cash-in-the-chips-and-invest-to-secure-supply-atreg-yole-group/

Scheyder, E. (2024), 'Pentagon Plans AI-Based Program to Estimate Prices for Critical Minerals', *Reuters*, 29 January. https://www.reuters.com/markets/commodities/pentagon-plans-ai-based-program-estimate-prices-critical-minerals-2024-01-29/

Simionato, L. (2024), 'US Lithium Prices Need More Transparency to Help Secure Domestic Supply: Surge Battery Metals Chairman', *Fastmarkets*, 21 August. https://www.fastmarkets.com/insights/us-lithium-price-transparency-domestic-supply/

Tabata, S. and I. Kawate (2023), 'China's Graphite Export Curbs Take Effect with Uncertainty for EVs', *Nikkei Asia,* 2 December. https://asia.nikkei.com/Spotlight/Supply-Chain/China-s-graphite-export-curbs-take-effect-with-uncertainty-for-EVs

Takkar, R. (2024), 'India Faces Uphill Battle in Lithium Mining and Exploration', *The Economic Times*, 20 January. https://energy.economictimes.indiatimes.com/news/power/india-faces-uphill-battle-in-lithium-mining-and-exploration/107003624

Tanaka, M. (2023), 'Japan, ASEAN Partner to Recover Critical Metals from E-Waste', *Nikkei Asia*, 25 August. https://asia.nikkei.com/Spotlight/Environment/Japan-ASEAN-partner-to-recover-critical-metals-from-e-waste

US Department of Energy (2022), *Rare Earth Permanent Magnets: Supply Chain Deep Dive Assessment*, 24 February. https://www.energy.gov/sites/default/files/2022-02/Neodymium%20Magnets%20Supply%20Chain%20Report%20-%20Final.pdf

——— (2024), Electric Vehicle (EV) and Fuel Cell Electric Vehicle (FCEV) Tax Credit. https://afdc.energy.gov/laws/409

US Department of State (2024a), Minerals Security Partnership. https://www.state.gov/minerals-security-partnership/

——— (2024b), MINVEST Partnership. https://www.state.gov/minvest

US Geological Survey (2024), *Mineral Commodity Summaries 2024*, National Minerals Information Center. https://www.usgs.gov/centers/national-minerals-information-center/mineral-commodity-summaries

White House (2023), 'Fact Sheet: United States and India Elevate Strategic Partnership with the Initiative on Critical and Emerging Technology (iCET)', Press release, 31 January. https://www.whitehouse.gov/briefing-room/statements-releases/2023/01/31/fact-sheet-united-states-and-india-elevate-strategic-partnership-with-the-initiative-on-critical-and-emerging-technology-icet/

Wischer, G. (2024), 'Charging Up: India's Potential Role in Global Battery Supply Chains', Background Paper No. 21, Observer Research Foundation. https://orfamerica.org/newresearch/batteries-ev-india

WTO (2023), DS592: Indonesia – Measures Relating to Raw Materials (7 February). https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds592_e.htm

Wu, A. (2024), 'Critical Thinking on Critical Minerals', Federation of American Scientists, 9 July. https://fas.org/publication/critical-thinking-on-critical-minerals/

Wu, A. (2024), 'Critical Thinking on Critical Minerals', Federation of American Scientists, 9 July. https://fas.org/publication/critical-thinking-on-critical-minerals/