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The race for critical minerals: Energy security, AI growth and geopolitics

Summary

- Critical minerals are emerging as strategic resources at the intersection of energy security, artificial intelligence (AI) and geopolitics. Accelerating electrification, power grid expansion, AI-related data centre (DC) growth and rising defence spending are creating multiple, overlapping sources of demand for critical minerals across the energy, technology and defence sectors.
- Critical mineral supply chains remain highly concentrated and vulnerable to geopolitical risks, including export controls and shipping disruptions. Governments are pursuing supply diversification, strategic stockpiling, international cooperation and greater circularity to strengthen long-term supply security and resilience.

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Global scramble for critical minerals

Critical minerals have become increasingly central to discussions on energy security and economic competitiveness in recent years. These finite resources play an essential role in clean energy technologies underpinning the global energy transition, as well as strategic industries such as advanced manufacturing, AI, aerospace and defence. The minerals classified as 'critical' differ across countries, reflecting varying industrial structures, import dependence and strategic priorities.

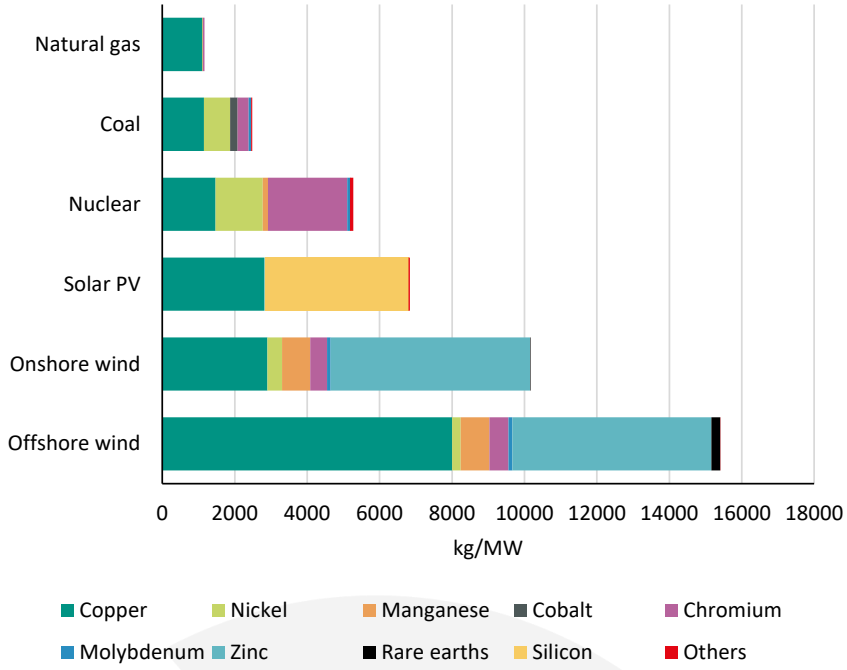
Growing geopolitical tensions, export restrictions and supply disruptions have brought renewed attention to the strategic importance of resilient critical mineral supply chains. After a period of weakness in several mineral markets in recent years, prices rebounded in 2025. Prices of base metals, including aluminium, copper and tin, rose by one-third between Jan 2025 and Apr 2026, with copper prices reaching record highs amid supply constraints and resilient demand, according to the International Energy Agency (IEA). Aluminium prices rose by over 10% in 2025 and increased by a further 20% from February 2026 following the onset of the Middle East conflict. The conflict also exposed vulnerabilities in mineral supply chains through disruptions to shipping and exports via the Strait of Hormuz. Disruptions in sulphur and sulphuric acid markets further highlighted the reliance of critical mineral processing on key industrial inputs, as sulphuric acid is important for copper, nickel and cobalt leaching operations.

Even with weakening climate policy momentum in some markets amid geopolitical uncertainty, demand for critical minerals used in the energy sector and strategic industries remains strong. However, global supply chains have become increasingly fragmented. Governments are increasingly seeking to improve national supply chain resilience through measures such as expanding domestic mining and refining, supporting recycling, building stockpiles and diversifying import sources. Meanwhile, some mineral-producing countries have introduced export restrictions and local-processing requirements to capture more domestic value. While these measures may support national industrial objectives, they can contribute to a more protectionist policy environment, restrict global trade and intensify competition for access to critical minerals.

Diverse sectoral demand drivers

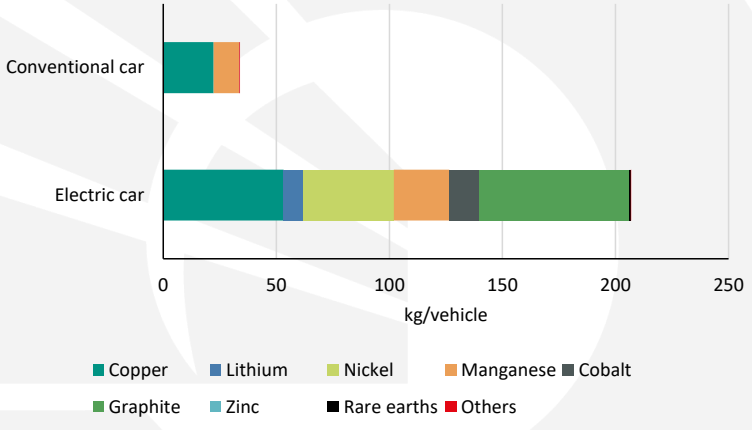
Demand for critical minerals is increasingly being shaped by developments across multiple sectors. Energy security considerations and efforts to diversify energy systems are supporting the deployment of clean energy technologies that enhance energy resilience, while reducing reliance on volatile fossil fuel markets. Clean energy technologies, including solar photovoltaic (PV) plants and wind farms, are significantly more mineral-intensive than their fossil fuel-based counterparts (Figure 1). For example, an offshore wind plant requires around six times more mineral inputs than a coal-fired power plant. A typical electric car also requires around six times more mineral inputs than a conventional car (Figure 2).

Figure 1: Clean energy technologies are more mineral-intensive than their fossil fuel-based counterparts



Source: IEA, OCBC Group Research.

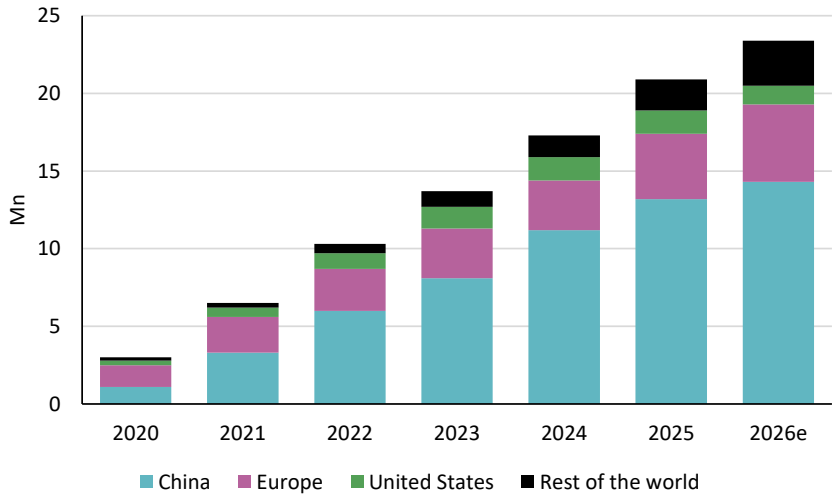
Figure 2: Electric cars need six times more minerals than conventional cars



Source: IEA, OCBC Group Research.

Accelerating electrification across industrial and transport sectors (Figure 3), power grid expansion and the rapid growth of AI-related DCs are expected to further boost demand for critical minerals and place additional pressure on supplies. Reflecting these trends, the demand for key energy minerals, including copper, lithium, nickel and cobalt, has grown at close to 10% per year on average in recent years. This has significantly outpaced demand growth for base metals, such as aluminium and zinc, which has averaged around 1% annually, according to the IEA.

Figure 3: Global electric car sales, 2020 – 2026e



Source: IEA, OCBC Group Research. Note: 2026 estimates are based on market trends through 1Q26.

Demand for critical minerals associated with electrification and energy diversification is increasingly shaped by policy support and technology deployment, although conventional industrial cyclicality remains important. Among these, copper has emerged as one of the most strategically important minerals due to its role in various energy applications such as power grid expansion, renewables and electric vehicle (EV) infrastructure. Silver has also gained strategic importance through its industrial applications including solar PV, EVs and advanced manufacturing.

The construction of DCs requires significant quantities of minerals including copper, aluminium, silicon, gallium, rare earth elements and battery minerals. There is considerable overlap between the minerals needed for DC expansion and those required for energy technologies, potentially intensifying supply constraints and creating bottlenecks for future capacity expansion as these sectors continue to experience robust growth.

Rising defence spending globally could also add to demand for minerals such as aluminium, titanium and copper, highlighting the growing importance of selected minerals across a broad range of strategic industries. As demand rises across these sectors, the medium-term outlook for key energy mineral prices, particularly copper, is likely to remain supported by structural demand from clean energy deployment, AI-related DC growth and grid expansion, as well as broader electrification trends. However, critical mineral markets remain sensitive to supply disruptions, export controls and technological shifts. These demand trends are unfolding against a highly concentrated supply base, exposure to geopolitical shocks and trade restrictions.

Supply concentration and geopolitical complexities

Critical mineral mining, processing and refining remain highly geographically concentrated, driven by capacity expansions led by a few dominant producers. Combined with resource-nationalistic policies, this concentration has heightened the vulnerability of global mineral supply chains to disruptions, price volatility and geopolitical risk.

China not only dominates the production and refining of many critical minerals, but also holds significant influence through ownership, with Chinese firms holding major positions in upstream mining in countries such as Indonesia and maintaining a dominant position in global midstream processing. For refined materials, Indonesia for nickel and China for most other key energy minerals together accounted for over 75% of global growth in refined supply between 2023 and 2025.

Nonetheless, recent developments point to gradual diversification in mineral supply, although progress is uneven across different minerals. For example, the IEA estimates that lithium supply is expected to become more diversified, with growing production in Africa and continued investments in Argentina expected to reduce the combined market share of Australia, Chile and China from around 75% to below 70%. The Democratic Republic of the Congo (DRC) remains the world's largest supplier of mined cobalt, although Indonesia has emerged as a key alternative supplier where cobalt is produced as a by-product of nickel operations. Indonesia's share of global cobalt production has increased tenfold from around 1.5% in 2020 to approximately 15% in 2025. New rare earth refining projects in Malaysia and the US have also led to a modest decline in supply concentration between 2023 – 2025, as countries work to build secure supply chains outside of China. In contrast, the global nickel market has become increasingly concentrated in Indonesia, which remains the world's largest producer of both mined and refined nickel, with its share of global nickel supply rising to above 70% through continued growth in nickel production hubs.

The implementation of export controls by dominant critical mineral suppliers adds an additional layer of volatility to critical mineral markets. For example, Indonesia has implemented a ban on any export of nickel ore since Jan 2020, requiring nickel to be processed domestically for export, with the aim of strengthening domestic processing facilities. Table 1 illustrates examples of recent developments in mineral export controls.

Table 1: Examples of developments in mineral export controls (2025 – 2026)

Mineral	Country	Market share (2025)	Export control developments
Gallium	China	99%	Suspended its ban on export to the US until Nov 2026, but broader export licensing requirements remain in place
Germanium	China	94%	
Rare earths	China	91%	Export licensing requirements for seven rare earths in Apr 2025. Further export controls for five additional rare earth elements, announced in Oct 2025, remain suspended until Nov 2026
Cobalt	DRC	66%	Export ban and quota system
Lithium	Zimbabwe	10%	Suspended exports of lithium concentrate in Feb 2026, followed by potential export ban in 2027

Source: IEA, Reuters, OCBC Group Research.

Safeguarding supply security

Diversifying sources of critical mineral supply has become a key priority for enhancing the long-term resilience of mineral supply chains. However, bringing new mining, processing and refining capacity online takes time. There are also challenges in financing new projects due to unclear demand signals, higher ESG risks in new jurisdictions and the lack of established downstream supply chains.

Within this context, export controls and other resource-nationalistic policies are prompting governments to expand strategic stockpiles to safeguard against short-term disruptions. Countries including Japan, Australia and the US hold strategic stockpiles of critical minerals that have protected industries from supply disruptions. The US has been mobilising unprecedented resources to boost critical mineral stockpiles and secure critical mineral supply chains. The launch of Project Vault was also announced in Feb 2026, which is a public-private US critical mineral reserve intended to provide a buffer of critical minerals for commercial manufacturers to bolster industrial and economic resilience.

Similarly, the EU is moving to stockpile critical raw materials through its RESourceEU Action Plan to strengthen resilience against supply disruptions. The Action Plan also seeks to accelerate projects that could reduce dependencies by up to 50% by 2029 for the battery, rare earths and defence raw materials value chains (Table 2).

Table 2: RESourceEU Action Plan's estimated benefits for strategic value chains

Value chain segment/ Raw material	Dependency on single 3rd country in 2025	Projected dependency on single 3rd country in 2030 with implemented projects
Rare earth elements (REE) value chain		
REE extraction	95%	42%
Rare earth processing/recycling	100%	60%
Permanent magnets	90%	80%
Space and defence raw materials		
Tungsten	31%	26%
Gallium	71%	17%
Germanium	45%	0%
Battery raw materials		
Cobalt	63%	44%
Graphite	41%	25%
Lithium	89%	64%
Manganese	41%	30%
Nickel	29%	26%

Source: European Commission, OCBC Group Research.
Note: 3rd country – A country that is not a member of the European Union as well as a country or territory whose citizens do not enjoy the European Union right to free movement, as defined in Art. 2(5) of the Regulation (EU) 2016/399 (Schengen Borders Code).

Strategic critical mineral stockpiling coupled with greater international collaboration can also support long-term diversification efforts. Building up critical mineral stockpiles encourages the development of alternative supply routes and increases sourcing from alternative producers, potentially reducing dependence on major suppliers. Coordinating stockpile purchases with international partners can further enhance supply security through aggregated demand, while enabling knowledge-sharing on effective stockpile management.

For example, the US and Japan agreed in Oct 2025 to support the supply of raw and processed critical minerals and rare earths crucial to both countries' domestic industries. Under the agreed framework, efforts include (i) considering a mutually complementary stockpiling arrangement, (ii) cooperating in the geological mapping of mineral resources to support diversified supply chains, and (iii) establishing a US-Japan Critical Minerals Supply Security Rapid Response Group to identify supply chain vulnerabilities and develop a plan to accelerate the delivery of minerals in response to potential supply disruptions.

Greater circularity, supported by higher recycling rates for critical minerals, can play an important role in alleviating supply constraints. The IEA estimates that average recycling rates across key minerals could increase from approximately 10% today to nearly 20% by 2040 under current policy settings. However, the maturity of recycling streams varies across minerals. For example, copper benefits from relatively well-established recycling streams compared with nickel. Efforts to enhance recycling capacity are also increasingly being supported through multilateral cooperation. Australia, India, Japan and the US launched the Quad Critical Minerals Initiative Framework in May 2026, with plans to mobilise up to US$20bn in government and private sector support to strengthen critical mineral supply chains, including in mining, processing and recycling. Investments in recycling technologies and collection networks within the Quad partner countries together with the private sector can enhance circularity, strengthen supply security and reduce reliance on concentrated sources of mineral supply.

Drawing parallels between oil security and mineral security

Growing concerns over safeguarding critical mineral supply today bear similarities to oil security concerns in previous decades. Just as disruptions to oil supply have far-reaching consequences across economies and energy systems, constraints in critical mineral supply chains can affect the deployment of energy technologies, AI-related infrastructure and the development of strategic industries. Strategic stockpiles have played an important role in enhancing oil security, and governments are increasingly adopting similar approaches for critical minerals. However, stockpiling critical minerals presents a more complex challenge, as storage requirements, shelf lives and associated costs vary significantly across different minerals and compounds. Therefore, securing reliable and diversified access to critical minerals is becoming an increasingly important component of long-term energy, economic and national security strategies.

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