

GLOBAL Insight



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Special report

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Mission critical: Securing supply of critical minerals

Critical minerals are the building blocks of most modern technologies. We explore the drive for resilient supply chains and weigh the portfolio implications.

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For important disclosures, see [page 8](#).

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Special report

Mission critical: Securing supply of critical minerals



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Critical minerals are indispensable to the manufacture of many everyday items. They are also essential for national security as well as the greening of the economy and the jobs it will provide. But current supply is woefully insufficient to meet future needs and much of today’s mining and processing capacity is concentrated in countries with geopolitical risk. We look at the drive to build secure, resilient critical mineral supply chains for the decades to come and weigh the portfolio implications.

What are critical minerals?

Some 50 minerals are crucial for manufacturing a wide range of goods such as fighter jets, cars, mobile phones, computers, and semiconductors.

Some of the most common critical minerals include well-known elements such as aluminium, copper, nickel, and silver. Also included are cobalt, a blue metal by-product of the extraction of copper and nickel, and lithium, a light, lustrous, salt-like metal. Both are used in rechargeable batteries for mobile phones, laptops, digital cameras, and electric vehicles (EVs).

So-called rare earth minerals are essential components of many high-tech products due to their magnetic and fluorescent properties. Rare earths include 17 lesser-known substances such as neodymium (used in powerful magnets for computers and wind turbines) and yttrium (used in targeting systems and televisions). Contrary to what the name suggests, most rare earth elements can be easily found all over the world, though often not in large quantities. They are also hazardous to extract and require expensive processing to deliver the input for end users.

Critical minerals are indispensable for manufacturing clean technologies such as EVs, wind turbines, solar panels, and rechargeable batteries. Given that decarbonizing the global economy will certainly take decades, and that it is so

Critical mineral needs for clean energy technologies

Technology	Copper	Cobalt	Nickel	Lithium	REEs	Chromium	Zinc	PGMs	Aluminium
Solar photovoltaic	●●●	●	●	●	●	●	●	●	●●●
Wind	●●●	●	●●	●	●●●	●●	●●●	●	●●
Hydro	●●	●	●	●	●	●●	●●	●	●●
Concentrating solar power	●●	●	●●	●	●	●●●	●●	●	●●●
Bioenergy	●●●	●	●	●	●	●	●●	●	●●
Geothermal	●	●	●●●	●	●	●●●	●	●	●
Nuclear	●●	●	●●	●	●	●●	●	●	●
Electricity networks	●●●	●	●	●	●	●	●	●	●●●
EVs and battery storage	●●●	●●●	●●●	●●●	●●●	●	●	●	●●●
Hydrogen	●	●	●●●	●	●●	●	●	●●●	●●

● = Low ●● = Medium ●●● = High

REEs = rare earth elements; PGMs = platinum group metals. Aluminium demand is assessed for electricity networks only.

Source - International Energy Agency

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widely underpinned by government policies—some 200 national governments worldwide are trying to lower their country’s CO₂ emissions by discouraging the use of fossil fuels and nurturing greener alternatives—we believe the surge in critical mineral demand is likely the start of a commodity supercycle that could last decades.

In a 2020 paper, the International Energy Agency (IEA) estimated that by 2040 the greening of the economy alone would require 40 times more lithium, and 20 to 25 times more graphite, nickel, and cobalt than is currently being produced.

Supply chain insecurity

Keeping up with demand will prove challenging for two reasons, in our view. One is low supply, as current deposits of critical minerals are simply not enough to meet the expected surge in demand.

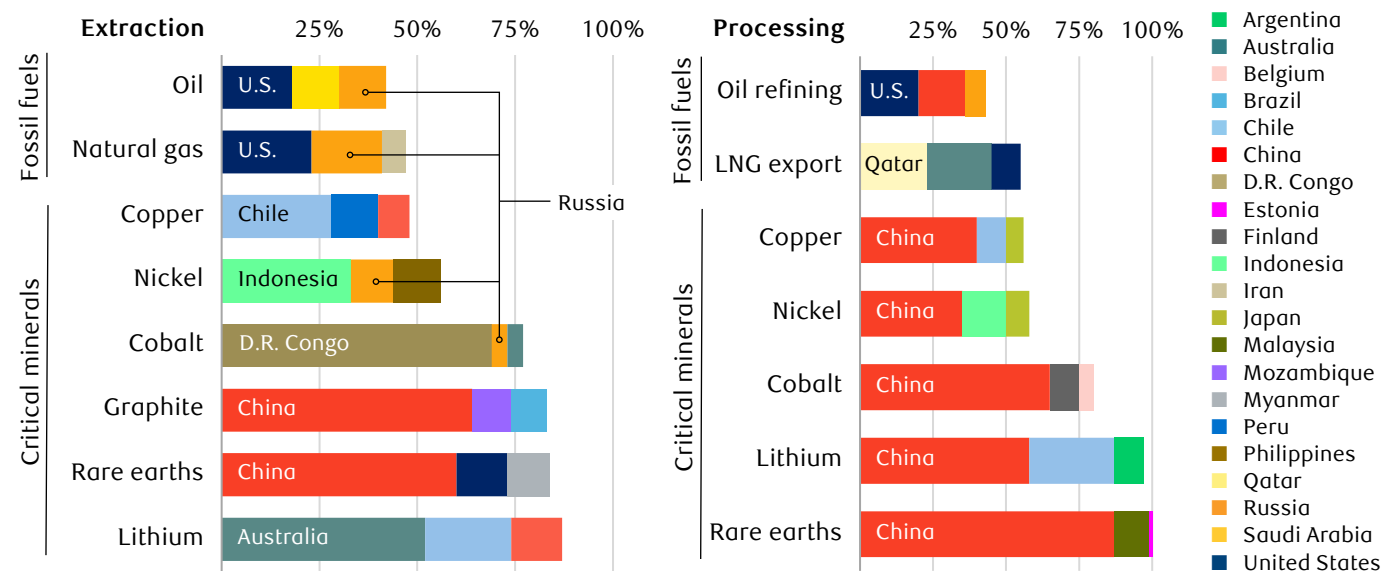
The other issue is that deposits tend to be concentrated in the hands of a few countries that can have outsized influence on supply chains. In fact, the production of many critical minerals is more geographically concentrated than that of oil or natural gas. Critical mineral processing is even more concentrated, with China the dominant player, as depicted below.

Such high concentrations make any supply chain susceptible to disruption. Critical minerals in particular are vulnerable to resource nationalism. Countries where they are either extracted or processed will naturally aim to protect their own economic security and safeguard access to these key resources.

For instance, some countries have placed conditions on the use of some of their critical minerals in an attempt to boost their economies. Back in 2016, Chile mandated that mining companies allocate part of their earnings to community development and to sell a quarter of their production below market prices to bolster local economies. Such regulations can have a beneficial impact on local markets and communities. But for mining companies that invest in a country and for international buyers, they represent an added cost and pose a risk of confiscation or delivery disruption.

Some countries have become more assertive in maintaining control of their natural resources. In April 2023, Chilean President Gabriel Boric announced

Share of top three producers of selected minerals and fossil fuels, 2019



LNG = liquefied natural gas; values for copper processing are for refining operations.

Source - International Energy Agency (2020), U.S. Geological Survey (2021), World Bureau of Metal Statistics (2020), Adamas Intelligence (2020)

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a plan to nationalise the country's lithium industry, with the state taking a majority stake in all new contracts. Though the government does not aim to terminate current private mining contracts, it hopes the two lithium miners currently operating in Chile, Sociedad Química y Minera de Chile and Albemarle, would be open to state participation before their contracts expire in 2030 and 2043, respectively. Details of the privatisation plan remain sketchy, and the proposal still needs to go through the National Congress of Chile, which has watered down Boric's plans before. Other miners operating in Chile fear that Boric may also try to make them junior partners in future copper projects.

Chile is not alone in becoming more assertive. In late 2022, Indonesia announced that an export ban on bauxite, the ore used to make aluminium, would commence in June 2023. It hopes to replicate the success of its 2020 measure that halted exports of nickel in its raw form. That ban encouraged the build-up of local smelters and spurred global EV manufacturers such as Tesla and BYD to establish manufacturing bases in the country, close to the source of the raw material used in batteries.

In extreme cases, resource nationalism can lead to the weaponisation of critical minerals. This risk can be most acute where autocratic regimes are emboldened by a rapid influx of money and leverage from critical minerals. Such nations can become unfriendly or unstable, and at the very least can make life difficult for international buyers.

In 2010, China banned exports of critical minerals to Japan for a few months due to a dispute in the East China Sea. More recently, Russia weaponised its natural gas supply to Europe as a strategy in its war with Ukraine. Both instances show how critical mineral supply can be imperiled by the whims of authoritarian regimes or those prone to shifting alliances.

Strategies for improving supply chain resiliency

Many countries are increasing investment in the search for and processing of critical minerals to diversify their supply chains and reduce vulnerabilities to regimes that may become unfriendly. To do so, three main strategies are being deployed.

China's tight grip

China not only is a key provider of the world's copper, lithium, and rare earth minerals but also refines as much as two-thirds of all cobalt, over 55 percent of lithium, 40 percent of copper, and close to one-third of the world's nickel.

China has built this strong presence over the last 15 years thanks to foresight and an active strategy. While Western mining companies prioritised share buybacks and dividend payouts to please equity investors, China extracted deposits from countries many labeled as too risky such as Argentina, where economic mismanagement put off many, and the conflict-ridden Democratic Republic of the Congo.

Over time, China has grown its presence and become a popular ally across Africa thanks to its ability to complete development projects quickly. According to global research provider BCA Research, former U.S. Treasury Secretary Lawrence Summers recently recounted a conversation

with one of his contacts in the developing world, who quipped that when his country was engaged with the Chinese, "it got an airport ... when it was engaged with the U.S., it got a lecture." This explains why many developing countries are reluctant to sever links with China.

China's grip on critical mineral processing activity is not surprising, according to Tyler Broda, RBC Europe Limited's Head of European Mining and Energy Transition Materials Research. After all, for the last 40 years the developed world has been "handing things over to China."

Loosening China's hold on the extraction and processing of critical minerals is a priority for many governments in today's fractious geopolitical environment. Yet supply chains would also benefit from the easing of other pressure points, including the dependence on Congo for cobalt, and Indonesia's dominance in nickel.

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Ongoing exploration and embracing reshoring and friend-shoring

New deposits are being discovered. In January 2023, Sweden's state-owned mining company announced the largest discovery of rare earth minerals in Europe. In time, we believe this should reduce the region's reliance on imported resources. Canada released "The Canadian Critical Minerals Strategy" in 2022, which seeks to power a green and digital economy. The country possesses significant amounts of many of the world's most critical minerals as well as the expertise to scale up exploration of these minerals. Australia, already the top lithium extractor globally, has redoubled its exploration efforts, with government officials suggesting peak discovery could still be 5–10 years away.

As for processing, in the U.S., the Biden administration's Inflation Reduction Act (IRA) encourages reshoring and friend-shoring (i.e., relocating processing back to the U.S. or to geopolitical allies). The IRA will invest billions of dollars to bolster critical mineral supply chains for the U.S. and its allies. For example:

- In order to receive tax credits, the IRA requires car manufacturers to process a significant portion of battery materials locally or in a country partnered with the U.S. on a free trade agreement, such as Canada, Mexico, Australia, or Chile.
- In 2022, the U.S. Defense Department awarded Australia's Lynas Rare Earths, the only major producer of rare earth materials outside of China, a \$120 million contract to establish a processing facility in the U.S.

Australia, which previously sent raw minerals to China for processing, is now looking to reshore this activity to secure its own supply chain and that of its allies. The latter are looking for clear alignment of their long-term national interests with those of their critical mineral suppliers.

When such interest is not clearly aligned, investment ownership is being redesigned. Late in 2022, Canada toughened its foreign ownership rules, requiring three Chinese firms to dispose of their stakes in domestic lithium miners.

Coordinate efforts via international partnerships

For instance, the U.S. and key partner countries established the Minerals Security Partnership, which includes G7 countries and the EU. Together, the U.S. and its allies are lobbying countries where mines will be built, providing financing for projects or helping to attract private investment.

Active diplomacy is also being used, particularly across Africa given it is home to just under one-third of the world's mineral resource deposits. U.S. Treasury Secretary Janet Yellen, U.S. Vice President Kamala Harris, and U.S. Secretary of State Antony Blinken have all visited Africa recently to promote better relations. U.S. President Joe Biden has promised to visit the continent and has called for the African Union to be admitted as a permanent member of the G20.

Technological improvements can reduce critical mineral needs

The search is on for alternatives to expensive critical minerals, or new technology solutions that reduce the use of these materials in the production of key components. In 2020, Tesla announced plans to develop a cobalt-free EV battery. By Q1 2022, almost half of its EVs had no cobalt in their batteries.

Another promising innovation is battery recycling. EV batteries typically last between 10 and 20 years, so by the time EV demand eventually peaks, many batteries will be available for recycling, reducing the need for additional supplies of newly extracted ores. In fact, by 2040, the IEA expects that extracting copper, lithium, nickel, and cobalt from old batteries could reduce the supply requirements of these minerals by some 10 percent.

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Secular growth trends can benefit many, but tread with caution

Improving critical mineral supply chains is a key objective of many governments, as these inputs play a crucial role not only for everyday life but also for national security and the fight against climate change.

Efforts are underway to reshore and friend-shore both extraction and processing where possible. We believe well-diversified miners and their suppliers, such as mining equipment firms, stand to be key beneficiaries of these secular growth trends. Companies that transport these commodities, such as railways, can also benefit from the reshoring and friend-shoring trends.

Timing and stock selection is key, however, in our view. The stock prices of companies in these sectors are very cyclical and not immune to volatility that may be kicked up by any U.S. recessionary concerns. Moreover, given vulnerabilities to resource nationalism, we would focus on well-diversified businesses. New industries, such as battery recycling, also appear well placed to benefit from these secular trends.

Research resources

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