



National Defence & Aerospace Power



GLOBAL INITIATIVES TO SECURE CRITICAL MINERALS SUPPLY CHAIN

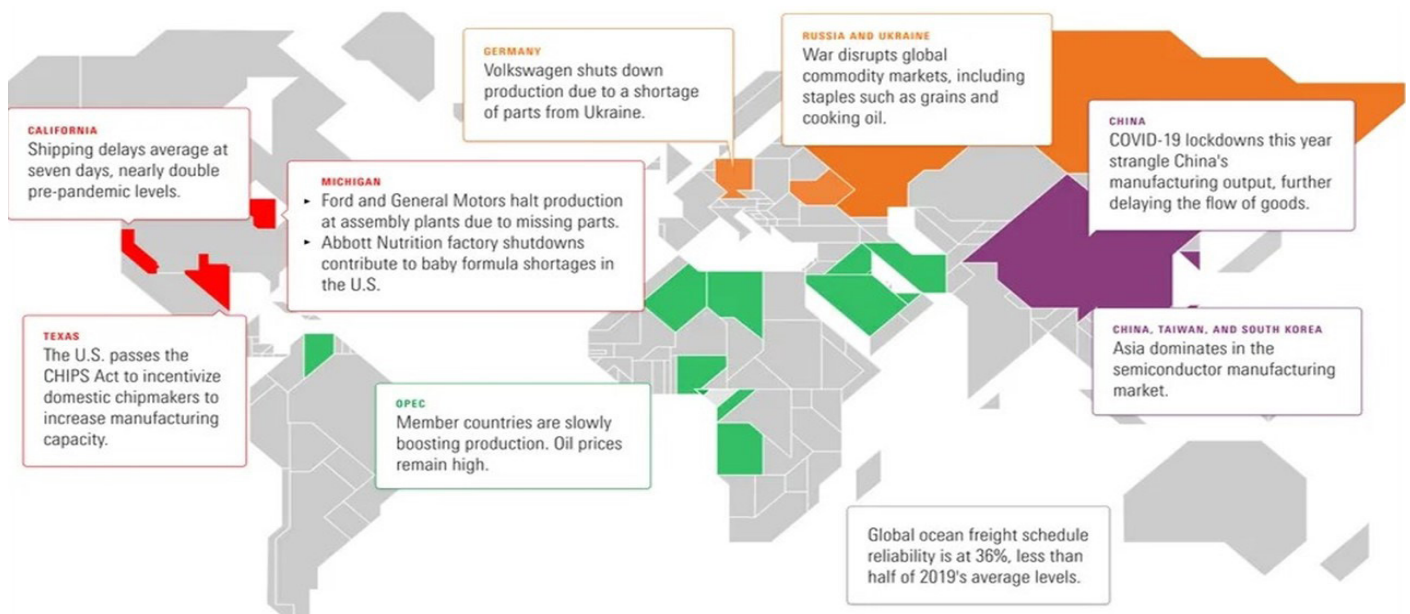
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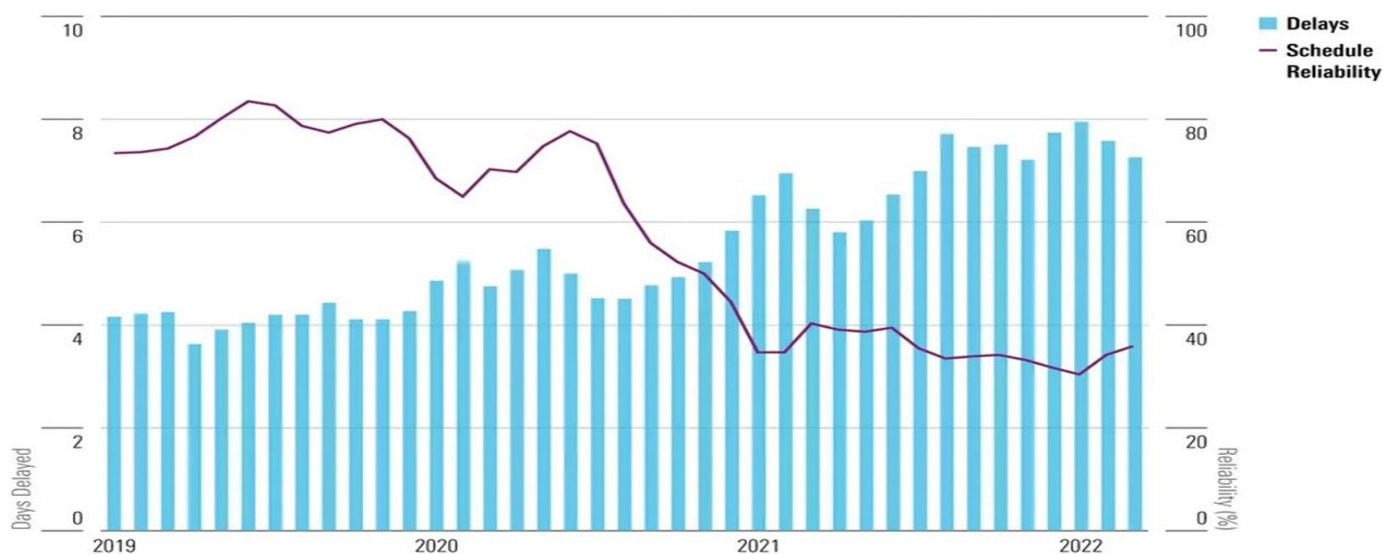


The Russia-Ukraine conflict is causing a hike in the market prices and disruption in the value supply chain of multiple commodities. The energy and critical minerals is also one such affected sector making the high importing countries struggle with the manufacturing (see figure 1 and 2). The demand for rare earth metals is skyrocketing and is projected to reach 315,000 tonnes by 2030, and so is their supply risk due to factors like the dominance of China in the rare earth supply chain; the growing global shift towards clean technologies like electric vehicles, wind and solar power; the realizing economic importance of these metals, and so on.

Figure 1: Supply Chain Disruptions across the World



Source: Morningstar Sea Intelligence, <https://www.morningstar.com/articles/1096095/where-does-the-supply-chain-crisis-stand-now>. Accessed on 24 May 2022.

Figure 2: Average Delays and Schedule Reliability in Global Shipping

Source: Morning Star, Sea-Intelligence. <https://www.morningstar.com/articles/1096095/where-does-the-supply-chain-crisis-stand-now>. Accessed on 25 May 2022.

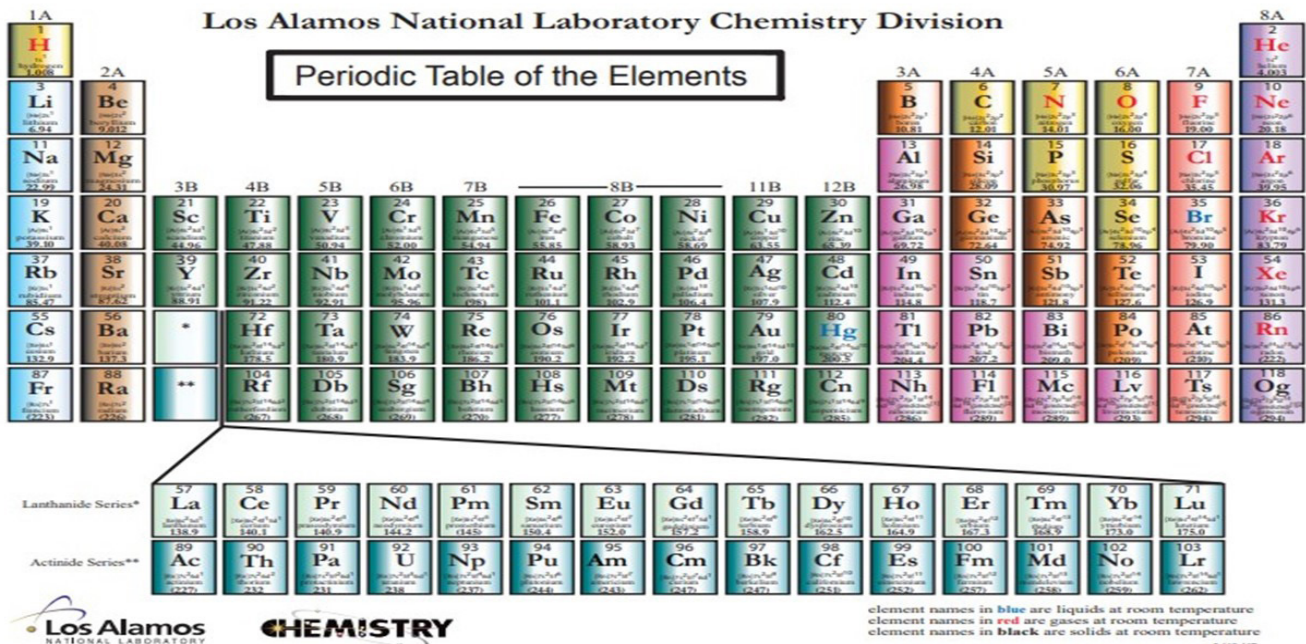
Why Critical Minerals Supply Needs to be Secured?

The importance of critical minerals is attached to its application in almost every modern technology, be it civilian daily life equipment, military equipment or green technology. In 2021, the US Department of the Interior published a list of 50 critical minerals in the Federal Register that involved 17 rare earth elements, along with aluminium, antimony, arsenic, barite, beryllium, bismuth, cerium, caesium, chromium, cobalt, fluorspar, gallium, germanium, graphite, hafnium, indium, iridium, lithium, magnesium, manganese, nickel, niobium, palladium, platinum, rhodium, rubidium, ruthenium, tantalum, tellurium, tin, titanium, tungsten, vanadium, zinc, and zirconium (see figure 3). They are important in the manufacturing of energy technology, defence, agriculture, consumer electronics and health-care related technologies.¹

With the world becoming aware of the interconnection between emerging technologies and critical minerals in the need for global economic recovery, the value chain of critical minerals involves new levels of risks and conflicts. For instance, the pandemic crisis and the Russia-Ukraine conflict reflected how much the world economy is dependent on supply chain for resources and getting crippled by such events. In fact, any country with high resource exporting capacity dominates the parameters of the supply chain more than those who are import dependent, that is Russia being a high production source of critical minerals (as shown in figure 4) made the supply chain more vulnerable than Ukraine. The supply value chain of critical minerals needs to be secured to facilitate the global clean energy transition and adoption of emerging technologies.²

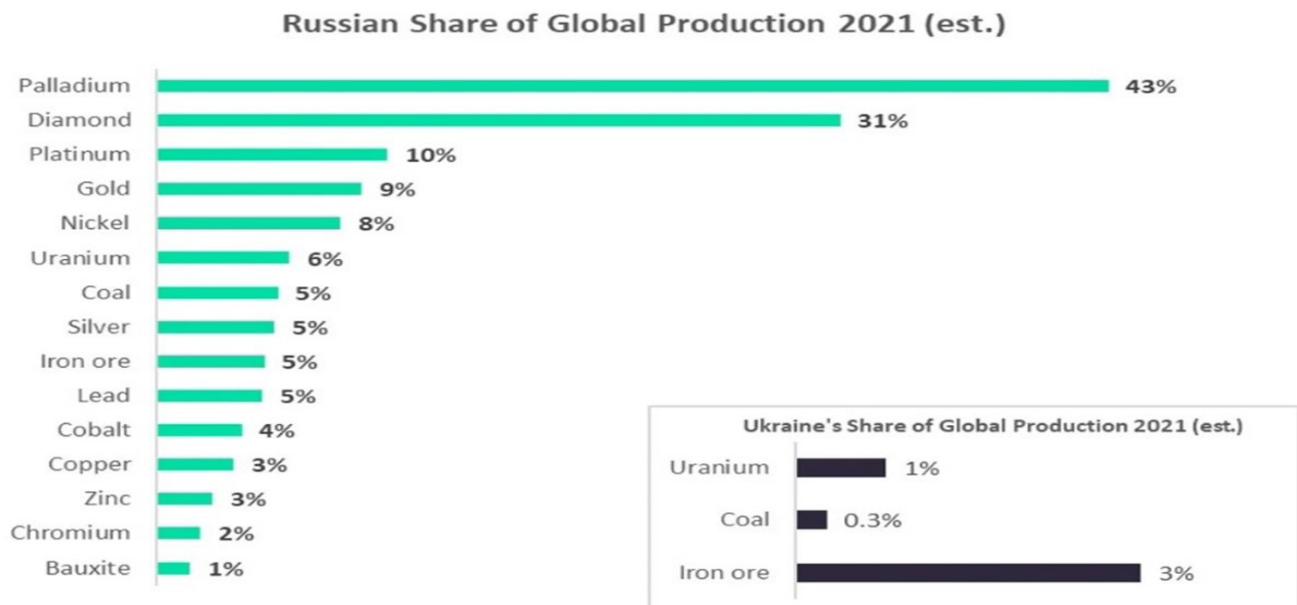
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Figure 3: Chemistry of Critical Minerals in the Periodic Table



Source: USGS Mineral Resource Program. <https://pubs.usgs.gov/of/2020/1127/ofr20201127.pdf>. Accessed on 26 May 2022.

Figure 4: Russia-Ukraine Share of Global Critical Mineral Production



Source: Mining Technology, “Russian invasion of Ukraine: Potential impact on supply chains of mineral commodities”, <https://www.mining-technology.com/comment/supply-mineral-commodities/>. Accessed on 26 May 2022.

In order to secure their supply chain, the major importing countries are introducing policies and strategies at bilateral as well as multilateral levels. Such major actors are:

1. European Union

The European Union is heavily import-dependent on China and Russia for manufacturing its emerging and clean technologies, like semiconductors, wind turbines,

Electric Vehicles (EVs), solar cells, and others. In order to reduce their reliance, the EU members have been seeking alternative sources of import, for instance Germany has started importing raw materials from Brazil to diversify its sources. In 2020, the European Raw Materials Alliance was founded to increase the domestic mining and processing facilities of critical minerals. The alliance marked the beginning of lithium mining in Spain and Germany but involved high public opposition and environmental concerns. The limitations of European mines thus suggested recycling and circular economy as the viable options for the EU.³

The global Rare Earth Industry Association (REIA) announced a three-year innovation project to develop a blockchain-based Circular System for Assessing Rare Earth Sustainability (CSyARES), which is being funded by Germany-based EIT Raw Materials. The partners for this initiative would be BEC GmbH (Germany), Circularise (Netherlands), Grundfos (Denmark) and Minviro (United Kingdom), to improve the transparency and sustainability of REE supply chains. The central element of blockchain technology is the decentralized ledger that records and protects transaction data shared among multiple parties, thus allowing them to conduct transactions directly.⁴ Blockchain would help in lowering the cost and improving the performance, along with driving greater for the industries or companies. Blockchain also ensures increased security and visibility to track complex variables related to sustainability and ethical sourcing.

2. United States

The US majorly relies on the non-fuel critical mineral commodities for sectors from infrastructure and transportation to communication and healthcare. The US Energy Act 2020 defined critical minerals as essential for the economic and national security of the United States, whose supply chain is increasingly vulnerable to disruptions due to foreign political risks, military conflict, and violent unrest.⁵ The US administration's initiatives to secure the critical minerals supply chain involve:

a) Diversification of sources through investment, most particularly domestic reserves of rare earth, lithium and other critical minerals. It also implies promoting the recycling and refining of critical minerals.

b) Enhance the role and funding of the Department of Energy and Defense, and the US Agency for International Development to deal with the environmental, social and governance challenges.⁶

Within one month of assuming office, President Joe Biden conducted the 100-day 'Supply Chain Review' that included the rare earth industry as well. While sharing his vision for the US's future, President Biden said, "We need to level the playing field with China and other competitors, which requires the passing of certain bipartisan bills to increase the investment in emerging technologies and manufacturing sector". The President of the Information Technology and Innovation Foundation, Rob Atkinson,

informed, “how the US Compete Act is the first major Competitiveness Act after 1988”.⁷

In the past five years, the US has introduced the following strategies to secure its critical minerals supplies:

i. *Strategy to Ensure Secure and Reliable Supplies of Critical Minerals*: Announced by former US President Donald Trump in 2017 through Executive Order 13817, by calling critical minerals vital to the nation’s security and economic prosperity. The order implied that the Secretary of Commerce and selective branches submit a report to the President that should include the following in relation to critical minerals: a) Strategy to reduce dependence on critical minerals; b) Recycling and processing technologies of critical minerals; c) Trade and investment to ensure the access to the critical minerals; d) Improve the geological and geophysical mapping of US to support the private sector in the mineral exploration; e) Streamline the permitting and review stages to give the leases for domestic discovery and refining of critical elements.⁸

ii. *Onshoring Rare Earth (ORE) Act*: As the COVID-19 pandemic furthered the realization of the growing supply chain vulnerabilities for the US, Senator Ted Cruz introduced the ORE Act in 2020. It aims to support domestic manufacturing and rare earth capacity.⁹ It offers up to a 200% tax reduction to US taxpayers for the acquisition of critical minerals and elements extracted from US mining land. The act implies giving tax incentives for the purchase of mined rare earth, battery minerals or metals, and funding the pilot programs to develop the critical minerals in the US.¹⁰

iii. *US Compete Act 2022*: This act aims to invest more than US\$ 300 billion in developing its domestic semiconductor manufacturing in order to reduce or eliminate the dependence on China.¹¹ It aims to fund domestic semiconductor manufacturing and ensure supply chain security and innovation. The bill proposes to allocate US\$ 52 billion to enhance the semiconductor products that will develop the manufacturing self-sufficiency of the US; allocate US\$ 1.5 billion for the communication sector by funding the public wireless supply chain innovation fund for deploying the Open Radio Access Network (O-RAN), which will lead the development of open architecture software-based wireless technologies for 5G and 6G; allocate US\$ 9 billion to establish a new technology directorate in the National Science Foundation (NSF) that will focus on technologies like Quantum Computing, where China leads.¹²

iv. *Quad Critical Minerals Partnership Act*: Passed with the objective to enhance the trade partnership among Quad members and reduce the dependence on China, the US Senate lawmakers introduced the act. The act implies that the administration should promote investment in critical resources, finance new projects, produce technologies, and enhance coordination among the Quad countries.¹³

3. Australia's High Potential in Critical Minerals

Australia, with its high reserves and manufacturing capacity of critical minerals, produces half of the world's lithium. It also has the second-largest cobalt reserve, and the fourth-largest REE reserves. It was the resource and energy exports that powered the Australian economy throughout the COVID-19 pandemic.¹⁴ Although the Russia-Ukraine conflict caused no direct trouble for Australia, its impact on market trends is a serious concern for the export market of Australia. In the words of Leon Trotsky, a Ukrainian-Russian Marxist revolutionary of the early 20th century, "You may not be interested in war, but war is interested in you," which implies the Australian economy and exporting capacity won't stay immune to the consequences of the ongoing crisis.¹⁵

The Australian government seems smart enough to deal with the future crisis by introducing the first Critical Minerals Strategy in 2019 and its second version recently in March 2022. The strategy aims to expand the critical mineral sector by increasing the downstream processing of Australian rare earth industries.¹⁶ The strategy will be complementing other already ongoing initiatives for critical minerals in the country like:

a) *Global Resources Strategy (2021)* aims to diversify markets and trade emerging commodities by investing US\$ 20.1 million. It intends to promote Australia as a reliable investment destination for resource exploration and supply.¹⁷

b) *Modern Manufacturing Strategy* that prioritizes the critical mineral processing as significant for the manufacturing of emerging technologies. The strategy is the action plan of the government to develop four pillars: right economic conditions for business; priorities science and technology for the manufacturing sector; focused projects on national manufacturing; building national supply chain resilience to support global market diversification and economy.¹⁸

c) *Technology Investment Roadmap* intends to accelerate the development and commercialization of low emission technologies, which also require critical minerals.¹⁹

India's Initiatives

India is also prioritizing critical minerals as part of its National Mines and Minerals Development and Regulation (MMDR) bill, 2021, aimed at reforming the production capacity of India. In comparison to resource rich regions like Australia and Africa, whose mining sector contributes 7-7.5% to the GDP, it is only 1.75% in India despite having over 95 types of minerals. It is an observation, by the Ministry of Mines, that only 10% geological potential of India has been explored. The objectives of MMDR are to ensure transparency in the auction process of mines and to enhance domestic and foreign investment in the mining sector, which will certainly increase their contribution to the GDP and secure the supply of resources at domestic level.²⁰ India and Australia recently announced their joined grant to research new critical minerals exploration technology and, fund rare earth processing facilities in Kalgoorlie, Western Australia. In the same

way, the India-US bilateral critical energy and green economy partnerships have already been shaped under agreements like the Partnership to Clean Energy Research (PACE) 2009, Strategic Energy Partnership (SEP) 2018, Partnership for a Green Future 2018, US-India Climate and Clean Energy Agenda 2030 Partnership 2021, and so on.²¹ The recent initiatives of the EU, US and Australia in terms of securing critical minerals supply carry opportunities for partnership for India as well, as the future will unfold.

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Notes:

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⁵ US Federal Register National Archives, “2021 Draft List of Critical Minerals”, Geological Survey, September 11 2021. <https://www.federalregister.gov/d/2021-24488>. Accessed on 15 May 2021.

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⁸ US Department of Commerce, “A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals”, June 4 2019. <https://www.commerce.gov/data-and-reports/reports/2019/06/federal-strategy-ensure-secure-and-reliable-supplies-critical-minerals>. Accessed on 3 April 2022.

⁹ Congress.gov, “S. 3694- Onshoring Rare Earth Act of 2020- 116th Congress”. <https://www.congress.gov/bill/116thcongress/senatebill/3694/text?q=%7B%22search%22%3A%5B%22Onshoring+Rare+Earths+Act+of+2020%22%5D%7D&r=1&s=3>. Accessed on 20 May 2022.

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¹¹ Ibid.

¹² Makenzie Holland, “U.S. awaits bill boosting technology competition with China”, *Tech Target*, March 7 2022. <https://www.techtarget.com/searchcio/news/252514215/US-awaits-bill-boosting-technology-competition-with-China>. Accessed on 22 April 2022.

¹³ Ibid.

¹⁴ Department of Industry, Science, Energy and Resources, “2022 Critical Minerals Strategy”, Australian Government, March 16 2022. <https://www.industry.gov.au/data-and-publications/2022-critical-minerals-strategy>. Accessed on 25 April 2022.

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¹⁶ Ibid.

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