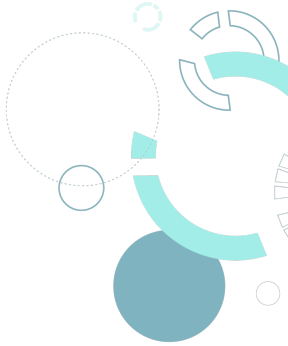
CRITICAL MINERALS

Emerging Global Policy Landscape and Its Relevance to India

August 2025

UNIVERSITY OF CAMBRIDGE
Department of Engineering

IfM Industrial Resilience Research Group



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Emerging Global Policy Landscape and Its Relevance to India

Report provided by the Industrial Resilience Research Group, at the Institute for Manufacturing, in collaboration with IIT Bombay, IISER Pune and Asterix Innovations.

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Foreword

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The critical minerals sector stands at the intersection of technological innovation, strategic sovereignty, and sustainable development. As nations worldwide navigate the complex landscape of resource availability, geopolitical shifts, and environmental imperatives, understanding the diverse policy frameworks that shape this sector becomes increasingly important.

India's unique position as a large, fast-growing economy with rising domestic demand of critical minerals and limited primary reserves underscores the importance of adaptive and forward-looking policies.

The report emphasises India's need to accelerate exploration, enhance its technological capabilities across multiple value chain areas, and develop international collaborations to establish a resilient and self-reliant critical minerals ecosystem. By examining global best practices and challenges, this report aims to inform policymakers as they craft strategies, supporting India's developmental and strategic objectives to achieve much-needed material and technology security in this sector.

This report offers a comprehensive analysis of policy initiatives across 19 countries and the European Union, highlighting contrasting strategies employed by mineral-rich and mineral-deficient nations to secure their future supply chains. It offers a comprehensive overview of global best practices, strategic benchmarks, and emerging trends. Notably, this analysis complements and significantly enriches the ongoing work of the UK-India Critical Minerals Supply Chain Observatory project, providing a comparative lens that highlights strategic divergences and convergences among global players on mineral policy fronts.

This report examines how mineral-rich countries, such as Australia, Chile, and Indonesia, are utilising their domestic reserves through resource nationalism, export controls, and targeted value-added strategies. Conversely, mineral-deficient nations, including India, the UK, South Korea, and the EU, are prioritising global partnerships, acquisition of overseas assets, and fostering innovative recycling and processing ecosystems. Such contrasting approaches are analysed through multiple lenses, including value chain positioning, geopolitical partnerships, stakeholder engagement, and mineral criticality assessment.

Drawing from successful initiatives worldwide, the report offers several actionable recommendations tailored to India's context. For example, the Canadian 30% Critical Mineral Exploration Tax Credit provides a model to de-risk early-stage exploration and catalyse the early development of a junior miner ecosystem, while Australia's refundable processing tax offsets address midstream processing viability. Similarly, the EU's regulation of black mass exports showcases how targeted regulation can bolster domestic recycling capacity, and the UK is aiming to set up multiple lithium refineries to have a strong presence in the midstream sector, supporting the EV batteries and other downstream projects.

We hope that this comprehensive analysis not only strengthens India's policy discourse but also provides key inputs for a deeper and stronger UK-India collaboration in the critical mineral sector.

Executive Summary: Key Policy Priorities in the Indian Critical Minerals Sector

Background

India holds a very distinctive and unique place in the global critical minerals sector. It is one of the largest and fastest-growing economies globally and is poised to emerge as a large consumer of key critical minerals, driven by demands from large decarbonisation and energy transition initiatives, the fast-expanding electronics and semiconductor sectors, and growing emphasis on self-reliance in defence and national security.

Among the critical minerals essential for the energy transition, energy storage applications predominantly drive the demand for lithium. In contrast, nickel and cobalt have applications that extend beyond the energy transition. Nickel is utilised in the production of stainless steel and superalloys for manufacturing aero engines, while cobalt is used to produce superalloys for defence and strategic applications. With no primary reserves for most of the 30 critical minerals identified by India in 2023, India relies entirely on imports for the majority of these minerals (including lithium, nickel, cobalt, vanadium, and germanium), with only a few exceptions like zirconium, natural graphite, and rare earth elements.[1]

Supported by policies such as ‘Make in India’ and increasing domestic and capital inflow, India is fast transitioning from a mere mineral processing and assembly producing base to a large components and devices manufacturing nation. To meet the growing demand for critical minerals, India needs to develop an effective policy framework to ensure both material and technology security in this sector through multiple policy measures.

Challenges

From the absence of adequate mineral reserves to a lack of access to some relevant mineral processing and recycling technologies, India faces multiple challenges to achieve a well-developed critical minerals industry and self-reliance. Some of the key issues faced by India in the critical minerals sector, which need to be addressed as a priority, include the following:

- India is underexplored and needs the participation of private exploration companies and junior mining companies to boost and fast-track the exploration programmes. However, there is a scarcity of reliable and high-quality geological data to attract private and foreign participation in exploration, including global junior mining leaders.
- There are unexploited critical mineral co-dependencies with primary minerals, and reinforced efforts are needed to extract critical minerals from lean resources such as low-grade ores of primary metals and mine tailings.
- There is a lack of refining competency in the midstream sector, and it is essential to introduce policy support and develop refining technologies through domestic research and innovation, and international collaborations.
- There is a lack of end-of-life management of post-consumer electronics waste and the absence of recycling ecosystems at scale.
- India lacks visibility and participation in the global supply chain. It is essential to map and monitor fast-evolving global critical minerals supply chains to identify points of intervention and achieve a strategic balance between depending on the global/regional supply chain and localising the supply chain.

Global Policy Trajectories: Benchmark and Examples

Diverse policies from critical mineral-rich countries, mineral-deficient nations, and large consuming economies shape the global critical minerals supply chain. Mineral-rich countries such as Indonesia, Australia, Chile, and the Democratic Republic of Congo (DRC) leverage their abundant reserves to gain economic benefits through resource nationalism, building domestic capabilities, and attracting foreign investments. Some of these mineral-rich countries effectively use export controls to maximise local value addition and generate employment. For example, Indonesia's ban on exports of nickel ores forced Chinese stainless-steel producers and electric vehicle battery manufacturing industries to invest in Indonesia, leading to the rapid growth of the nickel industry there and the large-scale use of the high-pressure acid leaching (HPAL) process, helping Indonesia become the largest producer of nickel globally. With the aim of securing investment in the midstream and downstream segments, Zimbabwe will ban lithium concentrate exports from 2027. This move to ban lithium concentrates builds on Zimbabwe's ban on lithium ore exports, implemented in December 2022. In 2024, Zimbabwe was the second-largest source of spodumene and petalite imports for China. According to Benchmark's Lithium Forecast, the supply of lithium concentrate in Zimbabwe is projected to reach 100 kt LCE (lithium-carbonate equivalent) in 2025 and 162 kt LCE in 2029.[2] The Philippines, the second-largest producer of nickel, is also planning a similar export ban to attract investment in midstream and downstream units. In another example of an export ban,

the DRC, the largest producer of cobalt, introduced a ban on cobalt exports for an initial period of four months in February 2025 in response to the falling price of cobalt.

Mineral-deficient nations such as India, the UK, the European Union (EU), Japan, and South Korea focus on diversifying supply sources, acquiring overseas exploration or mining assets, aiming for localisation of supply chains, fostering international partnerships, and advancing recycling technologies to reduce reliance on dominant suppliers. The USA has introduced several incentives to attract foreign investment as well as 'friendshoring' in midstream units. Additionally, the USA has invested in the Lobito corridor project in Africa to facilitate the import of critical minerals from Angola, the DRC, and Zambia. India has established KABIL (Khanij Bidesh Limited) to acquire foreign mining assets in mineral-rich countries like Argentina, Bolivia, and Chile (collectively known as the lithium triangle) for the exploration and extraction of lithium from brine. The Critical Raw Materials Act by the EU aims to increase the recycling of critical raw materials, with the goal of sourcing 15 per cent of its critical material needs from recycled sources. Furthermore, the EU plans to support domestic industries by setting targets for domestic capacities in the strategic raw material supply chain by 2030: at least 10 per cent of the EU's annual consumption for extraction; at least 40 per cent of the EU's annual consumption for processing; and sourcing no more than 65 per cent of the Union's annual consumption of each strategic raw material at any relevant stage of processing from a single third country.

The critical minerals sector is witnessing several multilateral (such as the Mineral Security Partnership,a USA-led, 14-country partnership) and bilateral agreements to create secure, diverse, and sustainable global critical mineral supply chains and reduce dependency on just a few mineral-producing geographies.

As the world's largest consumer of critical minerals, China drives global demand through its electric vehicle, solar, and battery industries. Besides being a large consumer of critical minerals, China has also emerged as a leading supplier of critical minerals globally, leveraging its domestic resources as well as overseas mining assets, secured over the last decades through state-backed acquisitions in Africa, Latin America, and Southeast Asia, and investing in large refining capacities of unparallel scale. It asserts global dominance by also using export controls. Export bans on gallium, germanium, and graphite disrupt Western supply chains, leveraging China's processing dominance. In January 2025, China proposed banning exports of lithium-ion battery technologies, including lithium salt production and battery-grade LFP, LMFP, and cathode materials, seeking public feedback.

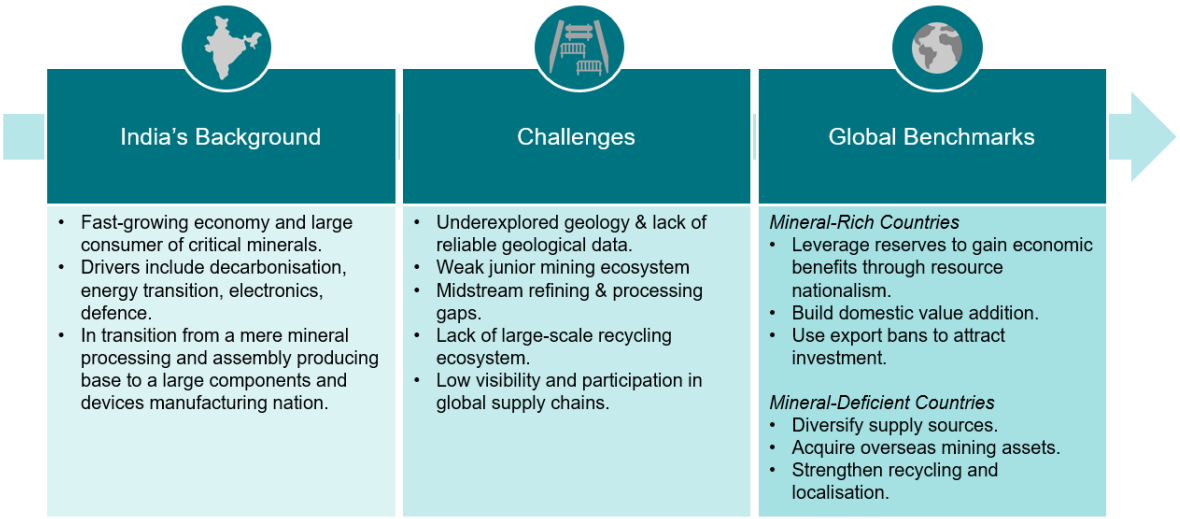

Figure 1. India's Critical Minerals Context in Global Perspective

Global Critical Minerals Outlooks

Table 1 below summarises the different critical mineral lists of the countries mentioned in the report. The comparative analysis reveals that while there is a growing global consensus on the importance of critical minerals, however, there is no universal definition of what is critical. The composition and length of each country's list function as a policy statement, reflecting its unique industrial ambitions, geological endowments, and perceived supply chain vulnerabilities.

A key trend emerging from the comparison is the adoption of a two-tier system by advanced economies like the European Union and Australia. The EU differentiates between a broad list of 34 "Critical Raw Materials" and a highly focused list of 16 "Strategic Raw Materials" to prioritise policy action and investment. Similarly, Australia separates its 31 "Critical Minerals" from 5 "Strategic Materials" like copper and aluminium, which are essential for its industrial base. This approach allows for targeted, high-impact interventions on the most vital resources while maintaining a broader watch list. South Korea employs a similar model, designating 10 of its 33 critical minerals as 'strategic'.

The table also highlights significant divergence in national priorities. The United States maintains the most extensive list with 50 minerals, adopting a comprehensive approach to securing its supply chains. In contrast, South Africa's list is much smaller at 14 minerals, focusing heavily on resources where it holds a global production advantage, such as PGMs, manganese, and chrome, but also including coal and uranium, underscoring a broader definition of economic security. Japan's inclusion of gold and silver alongside industrial minerals points to a similar strategic calculation.

For India, its list of 30 minerals is a balanced framework, but the global trend towards creating a shorter, "strategic" sub-list could be a valuable consideration for focusing future policy efforts and capital allocation.

Table 1: A comparative analysis of critical mineral lists of different countries

Country	Referenced Document / List Name	Year Published / Updated	Number of Minerals	Strategic Sub-list?	Common Minerals Included*	Notable/Unique Minerals or Features
India	Ministry of Mines Critical Minerals List	2023	30	No	Yes (Li, Co, Ni, Cu, Graphite, REE, Ti)	Includes Potash, Phosphorous, and Strontium.
United Kingdom	UK Criticality Assessment (by CMIC)	2024	34	No	Yes (Li, Co, Natural Graphite, Ni, REE, Ti)	Includes Iron, Aluminium, Helium, Sodium, and Zinc as new additions to the 2024 list.
United States	USGS 'Final List of Critical Minerals'	2022	50	No	Yes (Li, Co, Graphite, Ni, Ti) but excludes Copper.	Lists all 17 Rare Earth Elements and 6 Platinum Group Metals individually.
Canada	Canadian Critical Minerals List	2024	34	No	Yes (Li, Co, Ni, Cu, Graphite, REE, Ti)	Includes Uranium and Potash. High-Purity Iron and Phosphorus were added in 2024.
Australia	Australian Critical Minerals List	2024	31 (Critical)	Yes, a separate list of 5 Strategic Materials.	Yes (Li, Co, Ni, Graphite, REE, Ti) are on the Critical list. Copper is on the Strategic list.	The two-list system is a key feature. The Strategic list includes Copper, Aluminium, Tin, Phosphorous, and Zinc.
European Union	EU Critical Raw Materials Act	2023	34 (Critical)	Yes, a list of 16 Strategic Raw Materials.	Yes. Battery-grade versions of Li, Ni, Co, Mn, and Graphite are on the Strategic list.	The two-list system is a key feature. The Critical list includes Coking Coal, Feldspar, and Baryte.

Country	Referenced Document / List Name	Year Published / Updated	Number of Minerals	Strategic Sub-list?	Common Minerals Included*	Notable/Unique Minerals or Features
South Korea	MOTIE Critical Mineral Policy	2023	33 (Critical)	Yes, 10 minerals are designated as 'strategic'.	Yes. Li, Ni, Co, Mn, Graphite, and key REEs are designated as 'strategic'.	Features a single list with a specific 'strategic' designation for a high-priority subset.
South Africa	Exploration Strategy for the Mining Industry	2022	14	No	Yes (Li, Co, Ni, Cu, REE) but excludes Graphite.	The list is notably smaller and includes Coal and Uranium. It heavily features minerals of national strength like PGMs, Manganese, and Chrome.
Japan	METI Critical Minerals Report	2023 (updated)	32	No	Yes (Li, Co, Ni, Cu, REE, Ti) but excludes Graphite.	Notably includes Gold, Silver, and Lead on its list. Uranium was added in 2023.

Policy Interventions and Recommendations

To meet the growing demand for critical minerals from electric mobility and low-carbon intensity energy (solar, wind, hydrogen, and nuclear), ICT and electronics, and defence and national security applications, India needs to develop a policy framework driven by demand data projections. Demand for some of the critical minerals is projected to grow rapidly (for example, the demand for lithium will grow from 1,600 tonnes to over 40,000 tonnes by 2030), and the policy framework should be designed to meet such fast-growing demand. Additionally, it needs to align itself favourably with the changing geopolitical dynamics in the critical minerals sector through bilateral agreements and multilateral forums. This study has identified the following key policy priorities and recommendations.

Short Term Priorities

- Fast-track exploration projects by empowering Notified Private Exploration Agencies (NPEAs) with support from the National Mineral Exploration Trust (NMET).
- Attract global junior mining companies by releasing high-quality geological datasets and promoting supportive investment policies.
- Deepen UK-India collaboration through existing frameworks to fund joint R&D projects and launch targeted skill development programs.

Medium Term Priorities

- Build a domestic junior mining ecosystem to foster local expertise supported by the UK and Indian organisations.
- Establish a robust reverse-supply chain by developing a recycling ecosystem for "urban mining" and extracting minerals from low-grade sources and from mine tailings industrial waste like red mud and fly ash.
- Introduce and adopt new exploration and extraction technologies to intensify projects and improve the efficiency of mineral recovery.

Long Term Priorities

- Explore possible global collaborations in deep-sea and offshore mining, leveraging India's Deep Ocean Mission to develop future-facing resources.
- Create tailored infrastructure by constructing specialized Mineral Processing Parks to establish dedicated hubs for domestic refining.
- Execute a joint UK-India strategy to acquire strategic mining and exploration assets in third countries to secure a diverse international supply chain.

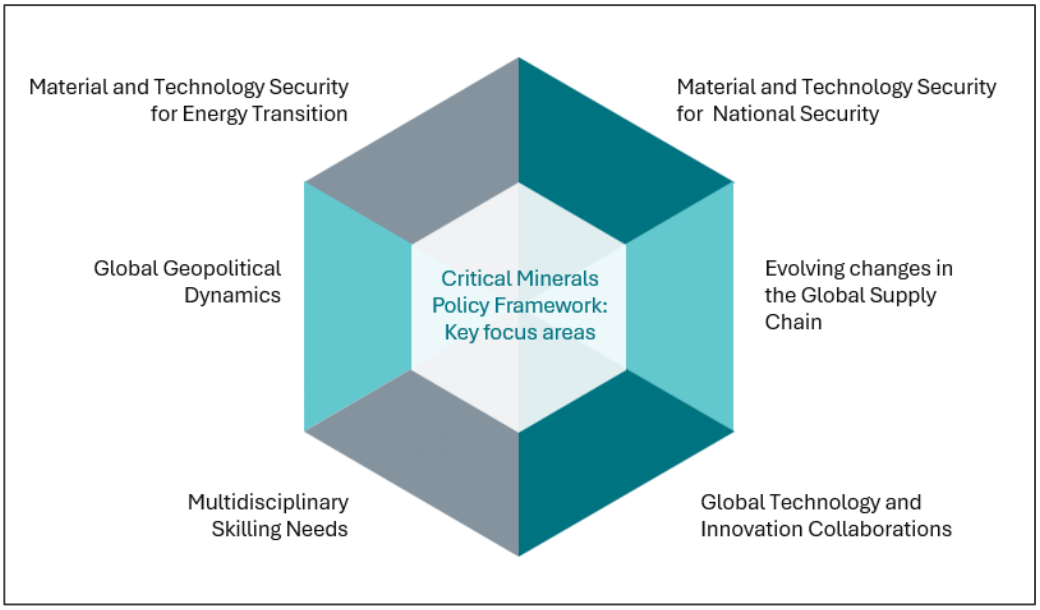

Figure 2: Critical minerals policy framework: Key focus areas

For some policy areas, there are interdependencies between various policy measures that aim to achieve measurable outcome indicators, and these can be planned for implementation in stages. Here are a few examples:

Figure 3: Interdependencies between different policy measures

While this section summarises key policy issues and recommendations, the following section includes more details and an analysis of policy priorities.

END NOTES

[1] Australian Trade and Investment Commission (2021). Unlocking Australia-India Criticial Minerals Partnership Potential.
[2] Benchmark Source (2025). Zimbabwe To Ban Lithium Concentrate Exports From 2027.

Introduction

With critical and strategic minerals concentrated in only a handful of countries, the global landscape of critical minerals is shaped by a complex interplay of demand driven by industrialisation, technological advancements, energy transition and decarbonisation, and economic growth, alongside geopolitical conflicts and supply chain vulnerabilities. Policymakers face the challenge of ensuring both material and technology security and achieving self-reliance by de-risking supply chain disruptions, mitigating price volatility, and building domestic capabilities. While countries without domestic resources or supply chains of critical minerals are developing policies to address the weakness and vulnerability of supply chain disruptions, countries with a dominant position as producers of minerals and metals in high demand are increasingly taking a strong stance to position themselves as strategic partners. The objectives and policies of mineral-rich nations differ from those of those that are vulnerable to supply shocks and, therefore, want to strengthen their positions and protect their interests.

China maintains a dominant position on the critical minerals supply chain through its unmatched refining and processing capacities, domestic mineral reserves and strategic acquisition of mineral assets globally over several decades. It has initiated several export control measures on both the supply of minerals (such as rare earth, antimony, gallium, and germanium) and technologies (such as technologies for producing lithium and other cathode materials for Lithium-ion batteries). Besides China, several mineral-rich nations are introducing policies to ban or restrict their exports of minerals to secure foreign investment in the processing and refining of minerals and help domestic companies move up the technology value chains. For example, Indonesia’s decision to ban nickel ore exports resulted in large Chinese investments, initially from stainless steel players and then from electric battery (EV) manufacturing companies. These investments and the development of the hydrometallurgical (high-pressure acid leaching) refining process have revolutionised Indonesia’s nickel industry and catapulted it to the top nickel producer globally. The Philippines, the world's second-largest nickel producer, is planning to follow a similar policy by introducing an export ban on nickel ore to strengthen its domestic industry. The Democratic Republic of the Congo has already taken measures to stabilise the cobalt market by imposing a four-month export ban in February 2025, effective from 22 February 2025, following a sharp decline in prices to a nine-year low. The ban, aimed at addressing oversupply, was further extended in June 2025 for an additional three months to allow time for developing a quota system for export allocation among mining companies.

Resource-deficient countries, on the other hand, are working on a diverse policy mix, ranging from strengthening exploration efforts, planning to own overseas mining and

exploration assets, investing in midstream and recycling, and developing R&D programmes to achieve mineral and technology security.

As concerns over China's dominance grow, international collaborations tackling shared concerns about mineral security are becoming important to counterbalance this influence. Critical minerals are finding a key place in bilateral commercial and technology cooperation measures such as the UK-India Technology Security Initiative and the recently announced India-US TRUST (Transforming the Relationship Utilising Strategic Technology) initiative. The UK and India have entered into several bilateral agreements with many mineral-rich nations and joined the US-led 14-country forum, the Mineral Security Partnership.

The mining sector often faces reputational challenges, including environmental degradation and human rights violations, necessitating the promotion of responsible and sustainable mining practices as a top priority for key stakeholders. So, besides technologies and business aspects, ESG issues are becoming increasingly important for policymakers and businesses.

This report provides an overview of the global policy landscape in the critical minerals sector, highlighting significant policies that major economies (comprising 19 countries and the European Union) are developing to enhance their mineral and technology security.

In light of India's recent introduction of the National Critical Minerals Mission at the end of January 2025 and the UK's plans to launch a new Critical Minerals Strategy in the coming months, it is very timely to examine the key policy initiatives of both countries against the backdrop of global policy dynamics in the critical minerals sector. The insights on policy trajectories identified in this report will support the UK-India Critical Minerals Virtual Observatory Project in several ways:

- Develop a more comprehensive understanding of how current and emerging policies may impact the global critical minerals industry and key supply chain dynamics.
- Draw a comparison of policy interventions in the critical minerals industry by key countries.
- Identify and benchmark successful initiatives to address any policy gaps in India and the UK, including bilateral cooperation initiatives such as the UK-India TSI.
- Enhance preparedness to respond to evolving policy challenges.
- Help create a 'global policy observatory' to support and complement the ongoing workstreams in the UK-India Critical Minerals Virtual Observatory Project.

Part A: India’s Strategic Initiatives in the Critical Minerals Sector

India: Key Strategic Initiatives in the Critical Minerals Sector

Background

India produces 95 minerals, including four fuel, ten metallics, 23 non-metallic, three atomic, and 55 minor minerals. Globally, India is among the top five producers of bulk minerals, including coal, bauxite, iron ore, chromite, and zinc. India has a geological potential similar to mineral-rich Southern and Eastern Africa and Western Australia. However, historically, India focused on mining conventional minerals and exploring critical minerals like lithium, cobalt, and rare earth elements was not prioritised. The emphasis of the mining sector has been on meeting the domestic demand for minerals for industries such as iron and steel and thermal power, reducing dependence on imports through the setting up of state-owned mining enterprises and the nationalisation of mineral resources. As a result, most investments in the mining sector were made in conventional minerals such as iron ore, coal, bauxite, and limestone, which were essential for industrialisation and infrastructure development. Without adequate proven reserves and exploration efforts, India could not capture the value addition through processing and refining critical minerals for high-tech applications.

India's key priorities are now to secure access to resilient global supply chains, invest in or co-own overseas critical minerals assets at various stages - from early prospecting and exploration blocks to shovel-ready mines, initiate focused exploration efforts to identify and assess new reserves of critical minerals and build a robust recycling ecosystem through urban or secondary mining. In addition, India must actively engage in bilateral and multilateral arrangements to develop and benefit from assured critical mineral supply chains in friendly countries and close allies and deepen collaboration on emerging technologies in various parts of the value chain.

India’s ongoing exploration programmes have recently identified a few lithium reserves, but the mine planning, development, and commencement of commercial-scale production will take several years. The Geological Survey of India discovered 5.9 million tonnes of inferred lithium resources in the Salal-Haimana area of Reasi district, Jammu & Kashmir, in February 2023. The term ‘inferred’ refers to the ‘preliminary exploration stage’, the second of a four-step process. So, a full assessment of the reserve size and commercial viability of mining has not yet been ascertained.

The Ministry of Mines has taken several steps aimed at developing a globally competitive critical minerals sector in India:

1. The Government of India (GoI) amended the Mines and Minerals Development and Regulation (MMDR) Act, 1957, through the MMDR Amendment Act, 2023, to include 24 minerals identified as critical and strategic for the country under the Act. The amended Act has also empowered the Central Government to auction blocks of these minerals. GoI has removed six critical minerals (lithium, beryllium, titanium, niobium, tantalum and zirconium) from the list of atomic minerals and placed them with other minerals to be auctioned by the GoI.

2. Like most countries, India has assessed the criticality of minerals based on two key factors: economic importance (need for minerals in various end-user industries and impact of the sectors when minerals become unavailable in supply chains) and supply risk[a]. The Centre for Social and Economic Progress (CSEP), a non-profit public policy think tank in India, and the GoI's Department of Mines have identified critical minerals for India using the EU methodology. The first stage of assessment was to study the critical minerals strategies of various countries to determine key criteria for assessing criticality and develop a set of minerals for identification as critical minerals. In the second stage of assessment, an inter-ministerial consultation was carried out to identify minerals critical to the sectors concerned. The third stage of assessment was to derive and use an empirical formula to determine the list of critical minerals. The empirical formula considered factors like disruption potential, substitutability, cross-cutting usages, import reliance, and recycling rates. Following the assessment, the Ministry of Mines identified a set of 30 critical minerals in its report, published on 28 June 2023.

The Final Set of 30 Minerals Critical to India		
Antimony	Lithium	Strontium
Beryllium	Molybdenum	Tantalum
Bismuth	Niobium	Tellurium
Cobalt	Nickel	Tin
Copper	PGE[b]	Titanium
Gallium	Phosphorous	Tungsten
Germanium	Potash	Vanadium
Graphite	REE[c]	Zirconium
Hafnium	Rhenium	Selenium
Indium	Silicon	Cadmium

[a] Supply Risk takes into account the country's reserves and production compared to the global reserves and production and issues that might affect supply, such as the governance of supplier countries, environmental aspects, the contribution of recycling (i.e., secondary raw materials), substitution, import reliance, and trade barriers such as export restriction by key producing countries.

[b] The platinum-group elements (PGEs),platinum, palladium, rhodium, ruthenium, iridium, and osmium.

[c] Rare earth elements (REE) are a group of 17 elements, including 15 elements of the lanthanide series in the periodic table of elements, together with scandium and yttrium.

3. In November 2023, India launched the first round of its critical minerals auction for 20 blocks, out of a planned 100 blocks, in eight Indian states for a range of minerals such as lithium, potash, vanadium, graphite, and rare earth elements (REE).[d] GoI planned to check monopolies in critical minerals by allowing one applicant to submit only a single bid in an auction of a mineral block. Five tranches of auctions have been held so far. The table below represents the key outcomes of these five rounds of the auction:

Table 2: Outcomes of the five rounds of critical minerals auction

Tranche	Launched	Number of Blocks	Critical minerals	Status
I	29.11.2023	20	Glauconite (3), Nickel (2), Nickel and PGE (1), Potash (1), Graphite (5), Molybdenum (5), Phosphorite (1), Lithium and Titanium (1), Lithium & REE (1)	The preferred bidder for six blocks has been announced.
II	29.2.2024	18	Tungsten (3), Graphite & Vanadium (4), REE (1), Graphite (2), Glauconite (1), Phosphorite (1), Cobalt (1), Nickel & PGE (2), Nickel & Cobalt (1), Potash (2)	Preferred bidder for four blocks has been announced.
III	14.3.2024	7 (2nd attempt of auction)	Glauconite (3), Graphite (1), Potash (1), Lithium & Titanium (1), Nickel & PGE (1)	Preferred bidder for four blocks has been announced.
IV	24.06.2024	21 (10 fresh)	Graphite (2), Graphite and Vanadium (3), Cobalt, Manganese and Iron (Polymetals) (1) Glauconite (2), Nickel, Chromium and associated minerals (1), Nickel, PGE (1), Phosphorite (1), Phosphorite and Limestone (2), Phosphate and REE (1), Potash and Halite (2), Tungsten (2), Tungsten and Associated Minerals (Mo,Au,Pb,Zn) (1), REE and Associated Minerals (Copper, Gold and associated minerals) (1), REE (1).	Preferred bidder for 10 blocks has been announced.
V	20.01.2025	15	Graphite and Vanadium (1), Glauconite (2), Graphite (2), Tungsten (1), Phosphorite (1), Potash and Halite (2), REE (2), Phosphorite and limestone (2), Phosphorite and REE (1), Nickel and PGE (1).	Preferred bidder for 10 blocks has been announced.

[d] Further details suggests that four out of 20 blocks are auctioned for a Mining Licence (ML), allowing the licensee to begin mining operations after obtaining necessary clearances. The remaining 16 blocks are auctioned for a Composite Licence (CL), allowing further geological exploration to determine mineral content. Once sufficient information is collected on mineral deposits, the licensee can apply to the state government to convert their CL to an ML for mining operations. The licensee has three to five years to complete the exploration level, failing which, the license will be withdrawn.

4. On 13 March 2025, India launched the first-ever auction of 13 Exploration Licence blocks, covering critical minerals such as Rare Earth Elements (REE), Zinc, Diamond, Copper, and Platinum Group Elements (PGE). This initiative will be facilitated through a transparent online bidding process to accelerate systematic mineral exploration, enhance private sector participation, and reduce import dependency.[3]

5. In March 2025, the Ministry of Mines held a hackathon to encourage AI-based mineral targeting and prospecting. The initiative aims to leverage AI-driven techniques and geoscience data to identify new mineral-rich zones, particularly concealed and deep-seated deposits. Participants will develop AI models utilising datasets such as geophysics, geochemistry, remote sensing, and borehole data, focusing on critical minerals like REE, Ni-PGE, and Copper. This hackathon is expected to drive innovation in India's exploration ecosystem and strengthen data-driven mineral discovery.[3]

6. GoI aims to expedite the critical minerals mine development process so that the mines can enter the production phase within four years.[4] Moreover, to boost private sector participation and support Notified Private Exploration Agencies for critical and strategic mineral exploration, incentives up to 25-30 per cent of the exploration cost would be funded by the National Mineral Exploration Trust (NMET).[5]

7. Aside from critical and deep-seated minerals within India's landmass, India is aiming to build expertise in deep-sea mining exploration and became a member of the UN's International Seabed Authority (ISA) in 2016. This led to the launch of India's Deep Ocean Mission (DOM) through the Ministry of Earth Sciences (MoES) in 2021, with a budget of INR 40.7 billion over five years. This initiative, a part of India's Blue Economy agenda, aims to develop deep-sea mining technologies and is expected to support the Critical Minerals strategy. [6] DOM is one of nine missions under the Prime Minister's Science, Technology, and Innovation Advisory Council (PMSTIAC).[7] Two key focus areas of this initiative are the Central Mid-Ocean Ridge (exploring hydrothermal sulphide deposits that contain multi-metals such as gold, platinum, and other minerals) and the Central Indian Ocean (exploring poly-metallic nodules). India is developing 'Matsya6000', a deep-ocean submersible (expected to be completed by FY24) designed to accommodate a three-member crew to reach a depth of 6,000 m to the ocean bed in the central Indian Ocean. India has also developed a deep-sea mining machine called VARAH-1, which successfully completed a field test at a depth of 5,270 meters in the Central Indian Ocean. [8, 9] In January 2024, India submitted applications to the International Seabed Authority for approval of plans of work for rights to explore polymetallic sulphides in the Indian Ocean Ridge (Carlsberg Ridge) located away from India's western shores and for exploration of a cobalt-rich ferromanganese crust in deep

seabed region, Afanasy-Nikitin Seamount (ANS), located away from the eastern shores, in the Central Indian Ocean.[10, 11, 12]

In 2024, the deep-sea mining group of the National Institute of Ocean Technology conducted exploratory mining trials at several locations in the Andaman Sea. Nodules of sizes 60-120 mm were collected using a specially built seabed mining mission, Varah-3, from depths up to 1,193 metres.

CSIR-IMMT is developing technology for polymetallic nodule extractive metallurgy. It developed a process for recovering copper, nickel, and cobalt and demonstrated it at a scale of 500 kg/day nodules at Hindustan Zinc Limited, Udaipur. The process is being modified to meet present-day requirements and to include manganese as the fourth metal to be recovered.

8. GoI promoted Khanij Bidesh India Ltd (KABIL),[e] which focuses on having overseas mining assets for two prime, critical, and strategic minerals, lithium and cobalt. KABIL has actively engaged with Australia on a G2G basis and initiated due diligence for two lithium and three cobalt mines in Australia.[13] In January 20204, KABIL entered into an agreement with the state-owned enterprise of the Catamarca province of Argentina, Catamarca Minera Y Energética Sociedad Del Estado (CAMYEN SE), to start exploration and development of five lithium brine blocks in the Catamarca province at a project cost of INR 2 billion. KABIL plans to open an office in Catamarca, Argentina, to support this project.[14] Key projects being pursued by KABIL are given below:

   - On 15 January 2024, India's KABIL signed an agreement with Argentina's state-owned Catamarca province of Argentina- Catamarca Minera Y Energética Sociedad Del Estado (CAMYEN SE) to explore and develop five adjacent lithium brine sites covering 15,703 hectares for 20 years, with an extension option, at a project cost of US$ 27 million (INR 200 Crores). Susana Peralta, Camyen's President, mentioned that a similar contract was granted to Hyderabad-based company Greenko Energy Holdings in 2023.[14 15]

   - Under the Critical Minerals Investment Partnership, KABIL signed an MoU with the Critical Mineral Office (CMO), Department of Industry, Science and Resources (DISER), Government of Australia, in March 2022. In March 2023, bilateral talks between the Australian Minister for Resources, Madeleine King and the Indian Minister of Coal and Mines, Pralhad Joshi, led to the announcement that five target projects (two lithium and three cobalt) were identified for detailed due diligence. [16]This partnership falls under the Australia-

[e] KABIL is a joint venture company of three Central Public Sector Enterprises under the Ministry of Mines, Government of India, namely, National Aluminium Company Ltd. (NALCO), Hindustan Copper Ltd. (HCL) and Mineral Exploration and Consultancy Ltd (MECL).

India Economic Cooperation and Trade Agreement (ECTA) of the countries' Comprehensive Economic Cooperation Agreement (CECA).[17]

- In July 2024, KABIL signed an NDA agreement in 2023 with a State-owned company of Chile, Empresa Nacional de Mineria and Codelco (ENAMI), to take up exploration of brine-type lithium block in Chile.

- KABIL, along with Oil India Limited (OIL) and ONGC Videsh Limited (OVL), signed an MoU with International Resource Holdings (IRH), United Arab Emirates, in September 2024 for global collaboration in the critical mineral supply chain.[18]

9. The Inter-ministerial Committee, set up by the GoI to identify key critical minerals for India, recommended creating a Centre of Excellence for Critical Minerals (CECM) in the Ministry of Mines. The centre will collaborate with international agencies/ KABIL to strategically acquire foreign assets of critical minerals. The Centre of Excellence will periodically update the list of critical minerals for India, notify the critical mineral strategy from time to time, and work on developing an effective value chain of critical minerals in the country.[19]

10. Several Indian companies are engaged in recycling critical minerals from electronic waste, including end-of-life consumer electronics products. These companies are developing technologies for treating black mass from battery waste (both process waste and end-of-life batteries). India's Black Mass Export Data (2022-2023) suggests that India exported 350 tonnes of cobalt, 71.7 tonnes of lithium, and 215 tonnes of nickel. Exports primarily go to China, South Korea, and Europe for processing and recovery of key minerals. While the exports reflect high global demand, India could have processed the black mass domestically if it had adequate domestic capacity and did not have a regulatory gap in the form of a ban on exports of black mass. So, India is losing valuable critical minerals to other nations and importing them at a higher price. To address the issue, India needs investment and rapid capacity building in recycling facilities, as well as strict export regulations and a closed-loop battery minerals industry, i.e., keeping minerals for reuse and recycling[20].

11. India is keen to build domestic capabilities in rare earth extraction and processing and the manufacture of permanent magnets. India’s import of permanent magnets has tripled since 2019. The Indian automotive industry is heavily dependent on China for the supply of permanent magnets. In 2024, China accounted for 82.9 per cent of metal-based permanent magnets imported by India. In value terms, India imported US$199 million worth of permanent magnets from China in 2024, a slight dip from US$202 million in 2023. China's recent restrictions on rare earth and permanent magnet exports, which took effect in April 2025, require special export

licenses for certain materials and assurances regarding end-use from buyers. In India, the Directorate General of Foreign Trade (DGFT) is issuing certificates to importers, ensuring these magnets are not used for defence purposes or re-exported to the U.S. Indian automotive industry bodies such as the Society of Indian Automobile Manufacturers (SIAM) and Automotive Components Manufacturing Association (ACMA) have sought the intervention from the Government of India to resume the supply of rare earth magnets from China. [21] [22] [23] [24]. According to reports, the GoI is likely to introduce an incentive scheme of INR 50 billion (£500 million) to boost the emerging rare earth ecosystem in India.[25]

12. On 8 June 2025, Midwest Advanced Materials, a Hyderabad-based company, announced plans to launch India's first domestically produced rare-earth magnets by December 2025. With an initial capacity of 500 tonnes per year for NdFeB (Neodymium-Iron-Boron) magnet production at its Hyderabad facility, the company plans to scale up to 5,000 tonnes annually within three years through an investment of INR 1,000 crore (US$ 120 million). Backed by secured monazite feedstock mines in Sri Lanka, the project supports India's goal of rare earth self-reliance, aligning with government efforts such as a proposed INR 1,345 crore (US$ 162 million) incentive and INR 3,500-5,000 crore (approximately US$ 422-602 million) PLI scheme to boost domestic magnet production amid China's tightening export controls.[26]

13. A similar announcement was made by Sona Comstar in June 2025, when the Gurgaon-based automobile component manufacturer, one of India's largest importers of rare earth magnets and a supplier of gears and motors to global carmakers such as Tesla and Stellantis announced plans to localise the production of rare earth magnets in India.[27]

14. Moreover, to support India's National Critical Mineral Mission (NCMM) and align with the country's goal of building self-reliant critical mineral capabilities, as of 19 June 2025, Attero, an e-waste recycling company based in Uttar Pradesh, India, announced a INR 100 crore (approximately US$ 12 million) investment to expand its rare-earth element (REE) recycling capacity from 300 tonnes to 30,000 tonnes annually over the next 12-24 months. Attero's proprietary technology will enable the recovery of neodymium (Nd), praseodymium (Pr), and dysprosium (Dy) from e-waste sources such as hard drives, laptops, and earphones, with 98 per cent recovery efficiency and 99.9 per cent purity. In FY 2024-2025, the company processed over 1.5 lakh tonnes (1,50,000 tonnes per annum) of e-waste and 15,000 tonnes of lithium-ion batteries, targeting 100 per cent year-on-year growth. The company also plans to expand operations in the US and Europe, aiming to process 4.15 lakh tonnes (4,15,000 tonnes per annum) of e-waste and 50,000 tonnes of batteries annually.[28]

15. BatX Energies, a critical material recovery and battery recycling company based in Gurgaon, India, has signed a Memorandum of Understanding (MoU) in July 2025 with Rocklink, a Germany based rare earth element (REE) and specialty metal recycling company, to establish India's first integrated rare earth magnet recycling and refining ecosystem. As part of the partnership, the two companies will also jointly develop and commercialise advanced solvent extraction (SX) technologies to efficiently separate and purify high-value REEs such as Neodymium, Praseodymium, Dysprosium, Terbium, Gadolinium, and Holmium.[29]

16. Major manufacturing economies worldwide are building international partnerships on critical minerals. These cooperations are happening bilaterally and multilaterally in groups such as the US-convened Minerals Security Partnership (MSP) of 14 developed countries. India joined this US-led alliance in June 2023 during Indian Prime Minister Narendra Modi's visit to the USA.[30] India's global collaborations through various bilateral and multilateral bodies are given below:

Mineral Security Partnership (MSP): In 2023, India joined the US-led Minerals Security Partnership (MSP), an elite critical minerals club launched in June 2022. MSP is a collaboration of 14 countries and the EU. The current chair is the Republic of Korea. MSP is considering 32 Critical Minerals projects in different countries. Consequently, Indian companies are showing interest in MSP projects.

Initiative on Critical and Emerging Technology (iCET): Announced in May 2022, this India-UK initiative currently has 12 projects involving US partners and Indian partners such as the Geological Survey of India (GSI), Indian Bureau of Mines (IBM) and IREL. During Indian Prime Minister Narendra Modi's visit to the USA in February 2025, India and the USA launched 'TRUST' - Transforming Relationship Utilising Strategic Technology. The initiative will focus on creating strong supply chains of critical minerals, advanced materials and pharmaceuticals. It has also been decided to launch a recovery and processing initiative for strategic minerals like lithium and rare earth under TRUST, which is likely to replace and subsume current projects under iCET.

India-Australia Critical Mineral Investment Partnership: India has been working with several countries to build close cooperation in the critical minerals sector. In March 2023, India and Australia entered into a Critical Mineral Investment Partnership, mainly focused on lithium and cobalt.[31] According to the Australia-India Economic Cooperation Trade Agreement, tariffs on the import of essential minerals like zirconium, titanium, cobalt, and nickel from Australia have been eliminated.

International Collaboration- Indo-Pacific Economic Framework (IPEF): Launched in May 2022 in Tokyo, Japan, it is a US-led initiative bringing together 14 partner countries, namely, Australia, Brunei, Darussalam, Fiji, India, Indonesia, Japan, the Republic of Korea, Malaysia, New Zealand, the Philippines, Singapore, Thailand, and Vietnam.[32] The framework is structured around four pillars relating to Trade (Pillar I), Supply Chain Resilience (Pillar II), Clean Economy (Pillar III), and Fair Economy (Pillar IV). India ratified the Agreement on Supply Chain Resilience (Pillar II) in February 2024 and has maintained an observer status in Pillar I.[33]

Quadrilateral Security Dialogue (Quad): The Quad, formed in 2007, is a strategic security platform between Australia, India, Japan, and the USA. At the QUAD 2023 leaders' summit, partners announced a QUAD statement of 'Principles on Clean Energy Supply Chains in the Indo-Pacific'. [34] Quad partners have set up the Quad Investors Network (QIN), with a working group focusing on clean energy and critical minerals.[35] [36] The United States will host the 2025 Quad Foreign Ministers Meeting, and India will host the 2025 QUAD Leaders Summit.[37]

India-UK Technology and Security Initiative (TSI): The UK-India Technology Security Initiative was launched on 24 July 2024. Coordinated by the national security advisors of both nations, the TSI focuses on seven key areas: telecommunications, critical minerals, semiconductors, artificial intelligence, quantum technology, biotechnology and health tech, and advanced materials. This initiative builds upon the India-UK Roadmap 2030, aiming to strengthen bilateral cooperation across these critical and emerging technologies and promote economic growth, innovation, and security.[38] The Indian Ministry of Mines will lead this bilateral UK-India engagement in the critical minerals area.[39]

G7 Critical Minerals Action Plan: At the recent G7 Summit held in Kananaskis, Canada, from 15-17 June 2025, the Group of 7 (G7) leaders from Canada, France, Germany, Italy, Japan, the UK, India, and the USA agreed to deepen collaboration in several areas, including critical minerals. The G7 Critical Minerals Action Plan, launched at the summit, will focus on building standards-based markets, mobilising capital and investing in partnerships, and promoting innovation. The G7 leaders look forward to the upcoming Conference on Critical Materials and Minerals, to be chaired by the US in Chicago in September 2025.

Other Bilateral Agreements: To develop bilateral cooperation with countries possessing rich mineral resources and advanced technologies, the Government of India's Ministry of Mines entered into Memoranda of Understanding (MoUs) with the Governments of various countries, including Australia, Argentina, Chile, Zambia, Zimbabwe, and the Republic of Côte d'Ivoire.

India is reportedly in discussions with the DRC on the supply of critical minerals, and a Memorandum of Understanding (MoU) is likely to be signed soon.[40] An Indian delegation led by Mr Vivek Kumar Bajpai, Joint Secretary, Ministry of Mines, attended the DRC Mining Week 2025, held in Lubumbashi from 11 to 13 June 2025. The delegation met several companies in the DRC, including Nationals Metals SARL , a copper cathode manufacturer based in Lubumbashi, DRC since 2008.[41] At the margins of the event, the Indian delegation had an interaction with the UK delegation on collaborative opportunities in exploration, technology exchange, and sustainable mining practices, with both sides expressing interest in working together in the critical minerals and clean energy value chains.[42]

At the meeting of the India-Italy Strategic Economic Partnership Forum, held in Brescia in June 2025, Indian Commerce and Industry Minister Piyush Goyal and the Italian Deputy Prime Minister and Foreign Minister, Antonio Tajani, announced that India and Italy could consider forming joint ventures in the critical minerals sector.[43]

India is in discussion with several Central Asian countries for collaboration in extraction of rare earth and several critical minerals. The 4th meeting of the India-Central Asia Dialogue was held in New Delhi on 6 June 2025. Ministers of Foreign Affairs of the Republic of Kazakhstan, the Kyrgyz Republic, the Republic of Tajikistan, Turkmenistan and the Republic of Uzbekistan took part in the meeting. Building on the outcomes of the India Central Asia Rare Earth Forum, held in September 2024, the second meeting of the Forum will be held soon to explore new areas of cooperation in the rare earth sector.[44]

India is also in discussion with Peru, as a part of a free trade agreement (FTA) being negotiated, for an assured supply of critical minerals such as copper, zinc, lithium, molybdenum and rare earth elements.[45]

Another notable bilateral partnership is ‘The Council for Critical Minerals Development in the Global South’, a joint initiative by SEforALL (Austria), UC Davis Institute of Transportation Studies (United States), and Swaniti Global (India), launched in April 2024 during the SEforALL Global Forum in New York. Supported by the ClimateWorks Foundation, this Council aims to promote equitable, locally integrated critical minerals value chains in the Global South. A member of this council is the Africa Minerals Strategy Group (AMSG), established by African governments to promote cooperation in sustainable mineral exploration, production, and commercialisation. It aims to support the energy transition and socio-economic development across the continent. The 16 founding member nations are: Botswana, Burundi, Chad, Democratic Republic of Congo,

Guinea-Bissau, Liberia, Malawi, Nigeria, Sierra Leone, Somalia, South Africa, South Sudan, Tanzania, Uganda, Zambia, and Zimbabwe. [46] [47]

India: National Critical Mineral Mission (NCMM) FY 2024-25 To FY 2030-31

Budget Announcement on National Critical Mineral Mission (NCMM)

- India's Finance Minister Nirmala Sitharaman announced the setting up of the 'Critical Mineral Mission' in the Union Budget speech 2024-25 on 23 July 2024. In her speech at the Parliament of India, she said, 'We will set up a Critical Mineral Mission for domestic production, recycling of critical minerals, and overseas acquisition of critical mineral assets. Its mandate will include technology development, a skilled workforce, an extended producer responsibility framework, and a suitable financing mechanism. As India embarks on the journey of Viksit Bharat 2047, minerals will continue to play an important role in the nation's progress. The National Critical Mineral Mission (NCMM) envisions securing a long-term sustainable supply of critical minerals and strengthening India's critical mineral value chains encompassing all stages from mineral exploration and mining to beneficiation, processing, and recovery from end-of-life products. The NCMM seeks to develop a holistic action plan through strategic interventions, policy reforms, financial support, infrastructure facilities, human resource development, technological advancements, and international collaboration. [48]

- In Budget 2024-2025, the GoI also announced the launch of the auction of offshore mining blocks identified through exploration. Consequently, on 28 November 2024, G. Kishan Reddy, Union Minister of Coal and Mines, launched the first-ever tranche of e-auction of mineral blocks in the offshore areas of India. This first tranche of the auction includes 13 mineral blocks spanning across the Arabian Sea and the Andaman Sea, featuring a mix of minerals, such as construction sand, lime-mud and polymetallic nodules and crusts.[49]

- On 30 January 2025, the Union Cabinet approved the launch of the National Critical Mineral Mission (NCMM), which will cost INR 16,300 crore (£1.63 billion) and expect PSUs to invest INR 18,000 crore (£180 billion) for a total outlay of INR 34,000 crores (INR 340 billion).[50] [51]

- In the 2025-26 Budget on 1 February 2025, India announced a Tailings Policy reform under the National Critical Mineral Mission to recover critical minerals from mining by-products. The July 2024 Budget had already exempted Basic Customs Duty (BCD) on 25 critical minerals and reduced it for two others to boost processing, especially for MSMEs. In 2025, the Finance Minister proposes full BCD exemptions on cobalt powder, lithium-ion battery scrap, lead, zinc, and 12 more critical minerals to enhance availability for manufacturing and create jobs.[52]

Mission Components[53]

Increasing Domestic Critical Minerals Production

- Expanding exploration and mining activities: Undertake 1200 exploration projects and more than 100 blocks of critical mineral resources to be auctioned.
- Mining in offshore areas: Polymetallic nodules contain minerals like Cobalt, REE, Nickel, Manganese, etc. Enhanced efforts to explore more critical minerals-bearing blocks in offshore areas and start mineral production.
- Critical Minerals Regulatory Support Programme: Create a fast-track regulatory approval process for domestic critical minerals exploration and mining projects
- Concession for Private Exploration: New concession viz., Exploration Licences (EL) for encouraging private participation in exploration activities
- Recovery of Critical Minerals from overburden/tailings/fly ash/red mud: Regulatory regime to be relaxed to encourage optimum recovery of critical minerals from various sources such as overburden, tailings, fly ash, red mud, and existing mines
- Assessment of Trace Elements/Critical Minerals during Exploration: Enable collaboration across ministries to integrate data with the National Geoscience Data Repository (NGDR) portal for optimum assessment of trace elements/ critical minerals. The Mission, along with agencies like GSI and IBM, may prepare SOPs/guidelines to facilitate the assessment of trace elements.
- Formation of Mineral Processing Parks: Allocate funds to support Critical Mineral Processing Parks.
- Role of State Governments: To promote exploration, mining, processing, and R&D in the Critical Mineral value chain and infrastructure support. State PSUs to actively participate in acquiring mineral assets abroad or make financial investments to support other Central PSUs

Acquisition of Critical Mineral Assets Abroad

- Mapping and Acquisition of Significant Critical Mineral Assets: The Mission will extend support for mapping and detailed exploration of Critical Mineral Assets in resource-rich countries. Additionally, the Government will earmark funds to support Critical Minerals Exploration Activities outside India.
- PSUs and private companies in Overseas Critical Mineral Asset Acquisition: The government aims to motivate central PSUs and private sector companies to allocate funds for acquiring critical mineral assets overseas. The Empowered Committee will provide broad directions and inter-ministerial support and issue necessary guidelines to empower central PSUs, their JVs, and subsidiaries to invest in these assets.
- Facilitation of PSU-led Asset Acquisitions with Private Sector Collaboration: The Government of India will facilitate central PSUs in leading asset

acquisitions in association with private companies contributing capital and sharing revenue.

- Encouraging Private Sector Companies: To encourage the participation of Indian public and private sector companies in the acquisition of assets abroad, the Government will provide targeted subsidies for mining and for setting up evacuation infrastructure with appropriate finances.
- Infrastructure Support: The Ministry of Mines will work very closely with the Ministry of External Affairs (MEA) to engage with the regulators from the resource country to support the development of mineral evacuation infrastructure.

Recycling of Critical Minerals

- Guidelines/SOPs for Recycling of Critical Minerals: Formulation of separate guidelines/Standard Operating Procedures (SOPs) for recycling of critical minerals to streamline the informal mineral recycling sector in the country.
- Incentive scheme for Recycling: The government will introduce an incentive scheme for setting up minerals recycling, and as per Budget 2025-2026, a policy for the recovery of critical minerals from tailings will be introduced.
- Formation of Recycling Advisory Group on Critical Minerals: This group would assess the presence of different critical minerals in domestic and imported products and suggest necessary measures for the optimum recovery of critical minerals from these products.

Trade and Markets

- Enhance Trade with Resource-Endowed Countries: India is to enter into Critical Minerals Partnership Agreements (CMPA) with resource-rich countries and will work to include Critical Minerals chapters in existing bilateral/Free Trade agreements with countries of interest.
- Harmonise Tariffs through Bilateral FTAS: To actively engage with stakeholders concerning revising Critical Minerals sector relevant Harmonised System (HS) codes.
- Eliminate Import Duty on Critical Minerals: In Budget 2024-25, India has removed import duty on critical minerals based on strategic requirements to facilitate easier flow of these essential resources into the country. A periodic review has also been done.
- Removal of Import Duty and other Barriers on Recyclable Materials: In the budget 2025-2026, import duties and other barriers on recyclable materials such as scrap, black mass, and e-waste were exempted. [46]
- Develop National Critical Mineral Stockpile/Reserves: A joint initiative between central PSUs shall be institutionalised to develop a National Critical Mineral

Stockpile/ Reserves Programme to guard against supply disruptions and aid mineral supply for domestic utilisation.

Scientific Research and Technological Advancement for Critical Minerals

- Promoting Research and Innovation in Critical Minerals: Supporting innovators, start-ups, and enablers in patent filing through improved institutional coordination.
- Establishing a Centre of Excellence (Coe) on Critical Minerals: Creating a dedicated Coe that operates on a Hub-and-Spoke model, fostering collaboration with research labs and institutions.
- Supportive Mechanisms and Regulatory Simplification: This would help to streamline regulations and enhance collaboration with technology labs and academia to bolster local capabilities.
- Global Collaboration on R&D: The government will allocate dedicated funds to strengthen international research and development partnerships across the critical minerals value chain.

Human Resource Development

- Promoting Expertise and Skilled Workforce in Critical Minerals: Establish Skill Development Centres in collaboration with MSDE and provide funding.
- Promoting Expertise and a Skilled Workforce in Critical Minerals, Setting up Skill Development Centres with the Ministry of Skill Development and Entrepreneurship (MSDE) collaboration and dedicated funding.
- Develop Targeted Degree Programs, Scholarships, and Internships: To develop and introduce specialised modules on critical minerals in existing mining, metallurgy and recycling technologies degree programmes by 2026.
- Capacity Building Programs for Resource-Endowed Countries: Conducted through the Geological Survey of India (GSI), MECL, Indian Bureau of Mines (IBM), and Indian institutes and universities.

Developing Effective Funding, Financing and Fiscal Incentives

- Developing Appropriate Fiscal Measures: The mission will design and implement fiscal policies to incentivise junior exploration and mining companies.
- Leveraging Funding from National/International Institutions**:** The government will facilitate the participation of institutions like the World Bank, ADB, and IMF in global development programs.

- Dovetailing with Existing Schemes: Government financing schemes will be aligned with existing programs to maximise efficiency and integration within the mission.

Governance Framework

According to the Ministry of Mines, a Mission Secretariat will be created that will comprise a dedicated team led by the Joint Secretary, who will serve as the Mission Head. The Mission will also have a director, geologists, mineral economists and professionals from the mining industry, mineral processing industry and finance.

Empowered Committee on Critical Minerals will be established where the Ministry of Mines will be the administrative Ministry. The mission's activities will be coordinated by an Empowered Committee, chaired by the Cabinet Secretary and including members from relevant stakeholder ministries. The empowered committee shall monitor and review the activities of the Mission and give broad directions for investment in foreign countries and minerals.

Role of State Government

NCMM has expanded the role of State Governments in supporting critical minerals projects:

1. Promote exploration, mining, processing, and R&D in the critical minerals value chain.
2. State Public Sector Undertakings (PSUs) to be encouraged to actively participate in acquiring mineral assets abroad and/or make financial investments to support other Central PSUs.
3. Simplify/fast-track land acquisition and clearances (Environment Clearance, Forest Clearance, etc.) for exploration and mining activities.
4. Infrastructure Development for transportation, power, and storage infrastructure near Critical Mineral Mining areas will be made if required.

Mission Targets

Table 3: National critical mineral mission targets

Mission objectives	Key Activities		Total (2024-25 to 2030-31)
Securing Domestic and Foreign Sourcing	Domestic Critical Minerals Exploration Projects		1,200
	Foreign Critical Minerals Mines	PSUs	26
		Private Entities	24
	Incentive scheme for recycling - total materials recycled (kt)		400
Strengthening Value Chains	Patents in critical mineral value chain		1,000
	Skill development		10,000
	Mineral Processing Parks		4
	Centre of Excellence		3
	Mineral Stockpile (cumulative)		5

Centres of Excellence

On 1 August 2025, the Ministry of Mines announced the recognition of seven Centres of Excellence (CoEs) under the National Critical Mineral Mission (NCMM). The announcement followed a meeting of the Project Approval and Advisory Committee (PAAC), held under the co-chairmanship of V.L. Kantha Rao, Secretary, Ministry of Mines, and Prof. Abhay Karandikar, Secretary, Department of Science & Technology. The approved CoEs are IIT Bombay; IIT Hyderabad; IIT-ISM Dhanbad; IIT Roorkee; CSIR-IMMT, Bhubaneswar; CSIR-NML, Jamshedpur; and NonFerrous Materials Technology Development Centre (NFTDC), Hyderabad.

These CoEs will operate under a hub-and-spoke consortium model, focusing on R&D for the entire critical minerals value chain, from exploration and processing to applications in advanced technologies. The seven CoEs have together brought in around 80 industry and academic/ R&D spokes, enabling broad-based collaboration. They will help scale innovations to higher Technology Readiness Levels (TRL 7/8) through pilot plants and pre-commercial demonstrations, while promoting public-private partnerships and multi-institutional cooperation to support India's strategic goals in critical mineral security and the energy transition.[54]

Policy Interventions and Recommendations

India is well-positioned to build on the industry's initial positive response to its policy initiatives and can plan to roll out a range of policies in various areas of the critical minerals value chain. Some priority areas of policy interventions are presented below:

Short-Medium Term Priorities

- One key gap in the Indian exploration sector is the absence of an early-stage (junior) exploration industry. This junior mining industry, which accounts for more than 80 per cent of new and world-class mineral discoveries internationally, is a crucial component that India needs to develop. This could be achieved through:

  - Engage with the UK-based junior mining ecosystem and secure the interests of key junior mining companies through high-quality geological datasets and supportive policies aimed at de-risking and accelerating the growth of the critical minerals exploration sector.

  - Build a junior mining ecosystem in India through TEXMiN/other organisations, which are already working with several start-ups. Some Indian junior mining/exploration start-ups might need technology/business partnerships with UK junior mining companies.

  - Introduce customised commercial packages/incentives such as critical mineral exploration tax credits and innovative financing tools for early-stage explorers of deep-seated and critical minerals in India to attract national/international junior exploration companies.

- While the recent tranches of auctions of the critical minerals have led to mixed responses, the availability of high-quality data about the blocks would secure a more encouraging response from prospective bidders.

- Introduce new and appropriate technologies to accelerate and intensify exploration projects in India:

  - Reprocessing, integrating, and analysing existing exploration data by applying technologies based on Artificial Intelligence (AI) and Machine Learning (ML) to generate exploration targets.

  - Application of new and disruptive exploration technologies (such as Airborne Full Tensor Magnetic Gradiometry (QMAG) that has successful case histories for critical minerals in Canada; Airborne/Ground Sub Audio Magnetics (SAM)

with a proven track record for Nickel exploration in Australia, and Mineral Prospectivity Analysis (MPA) using AI-based Self Organizing Map (SOM) technology; and also Full Tensor Gravity, which has been used (in very small projects) in India but only for Oil & Gas, however it has wide application in critical minerals.

- Fast-tracking exploration projects through Notified Private Exploration Agencies with the National Mineral Exploration Trust (NMET) support.

- Data sourcing, compilation and analysis to assess the potential of extracting critical minerals from low-grade sources (such as nickel from chromite ore overburden in Sukinda, Odisha) and recovering critical minerals from mine tailings and process waste/byproducts, such as red mud in the aluminium industry and fly ash from coal-fired power plants.

- In the absence of a primary source of critical minerals, recycling and recovering these metals from end-of-life equipment, process reverts, scrap, and other sources such as spent catalysts could play a key role in helping India progress towards material security. This 'secondary mining' or 'urban mining' can create a reverse supply chain for user industries from end-of-life or process waste, supporting the circular economy in the battery minerals sector. A robust recovery and recycling ecosystem is essential, supported by relevant policy initiatives, technologies, and investment. Key focus areas to include:

    - First Priority: Recover and recycle critical minerals from end-of-life and process waste of lithium-ion batteries (all formats and all chemistry) and electric motors.
    - Second priority: Recover and recycle critical minerals from end-of-life Solar PV cells, wind turbines and electrolysers (beyond 2040).
    - Prepare SOPs for recycling lithium-ion batteries and zinc-manganese dioxide batteries.
    - Introduce schemes similar to 'Extended Producers Responsibility' for the EV battery manufacturing sector, stipulating mandatory recycled content in battery manufacturing when a domestic recycling ecosystem is ready and well-established.
    - Develop innovative battery technologies and designs to enhance the recyclability of batteries.
    - Explore opportunities for introducing UK technologies from ongoing commercial and research projects such as ReLiB[f] (including best practices such as LCA and sustainability metrics).

[f] The UK Faraday Institution's ReLiB project is a £18m basic research initiative, led by University of Birmingham, that aims to provide technological solutions to the challenges of re-using and comprehensively recycling lithium-ion batteries of different chemistry systems.

- The recycling sector will benefit from a production-linked incentive scheme, which is reportedly under the Government of India's (GoI) consideration. There are also initiatives to restrict the export of black mass out of India to make enough feedstock available to recycling units and retain all critical minerals in black mass within the country.

- Deepen and strengthen collaboration and technology transfer programmes between academia, R&D and innovation bodies, start-up and corporate R&D centres of the two countries by leveraging various bilateral partnerships, such as the UK-India Technology Security Initiative and GoI funds and initiatives, such as the establishment of the Centre of Excellence on Critical Minerals, as proposed in the recently launched National Critical Minerals Mission of India. Besides focusing on key areas of the critical minerals value chain, the R&D, innovation, and technology transfer programmes could also examine substitution materials and alternative material platforms (such as rare-earth-free magnets and lithium/cobalt/nickel-free battery chemistries) to reduce dependence on critical minerals.

- The critical minerals sector requires very diverse skill sets ranging from geoscientists, mining engineers, material scientists, and chemical engineers to people skilled in AI and automation, battery chemistry, and process industries, and professionals for analysis of policies and regulatory framework. Academia, industry, policymakers, and R&D bodies need to work together to address possible skilling gaps through skilling and training initiatives and make necessary changes in the curricula. There are opportunities for relevant UK bodies to engage with the Skill Development Centres in India, which are being set up as a part of the National Critical Minerals Mission and organisations such as the Geological Survey of India, IIT/ISM Dhanbad, and other leading Indian academic institutions.

- Pursue ‘mineral diplomacy’ through bilateral and multilateral platforms (such as Mineral Security Partnerships and QUAD) and address trade barriers.

- Engage with key State Governments (such as Maharashtra and Odisha), which are playing an increasingly important role through State Government departments and State Public Sector Undertakings to promote exploration and mining and secure investment in various downstream (EV battery and EV production) areas and recycling.

Long Term Priorities

- Explore possible collaboration in deep-sea mining and mining in offshore areas, building on the ongoing initiatives in India as a part of its Deep Ocean Mission, being led by the Ministry of Earth Science.
- Streamline and fast-track the regulatory approval process for domestic critical minerals exploration and mining projects.
- Create tailored infrastructure for the critical minerals sector, such as establishing Mineral Processing Parks, as proposed in India's National Critical Minerals Mission.
- Explore a possible UK-India joined-up approach to acquiring critical minerals exploration and/or mining assets in third countries.

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Part B: Emerging Global Policy Landscape

The United Kingdom

Background

While the UK does not have notable critical mineral reserves, it has a long and deep expertise in the fields of geology, mineral prospecting, exploration, mining, and beneficiation technologies, and a robust ecosystem of research and innovation, and is a source of investment and Global mining majors such as Rio Tino, Anglo American and BHP Billiton are headquartered in London, the home to London Metal Exchange and a range of junior mining companies and investors. Several junior mining companies are listed on AIM. To locate fresh deposits of critical minerals, the UK is planning a national-scale assessment of the critical minerals by collating geoscientific data and identifying target areas of potential. This will lay the foundations for detailed field work, such as airborne geophysical surveying, target areas, and planning commercial exploration. Several UK companies, such as Green Lithium, are investing in the midstream sector to set up processing and refining facilities based on imported ore. A few UK companies are investing in overseas mining blocks. For example, Pensana Plc is developing a rare earth mine in Angola, and Blencowe Resources is working on a graphite project in Uganda. The UK is also assessing the risks and potential for environmentally responsible extraction of minerals from coastal waters and evaluating the potential of deep-sea mining.

Mineral Criticality Assessment: 2021 and 2024

The UK Department for Business, Energy and Industrial Strategy (BEIS) (now a part of the Department for Business and Trade) commissioned a criticality assessment of technology-critical minerals and metals in 2021. The assessment looked at 26 potential candidate materials, of which 18 were found to have a 'high' potential criticality rating and comprised the UK Critical Minerals List 2021. The assessment by the Critical Minerals Intelligence Centre (CMIC) also drew up a 'watchlist' of five minerals deemed to be increasing in criticality.

Critical Minerals for the UK: 2021	
Antimony	Palladium
Bismuth	Platinum
Cobalt	Rare Earth Elements
Gallium	Silicon
Graphite	Tantalum
Indium	Tellurium
Lithium	Tin
Magnesium	Tungsten
Niobium	Vanadium

Watchlist
Iridium
Manganese
Nickel
Phosphates
Ruthenium

The latest UK Criticality Assessment, published in November 2024 by CMIC, focuses on the vulnerability to supply disruption of minerals in an increasingly diversified UK economy. The analysis is intended to support policymakers in building economic resilience and securing minerals of importance to the UK economy and national security.[55] The 2024 UK Criticality Assessment finds that 34 minerals out of the 82 candidate materials identified are 'critical'. This is an increase relative to the 2021 assessment, where only 26 candidate materials were assessed, and 18 were assessed as critical. Of the 18 minerals classed as critical on the 2021 list, 17 remain critical in this new assessment , palladium is now below the criticality threshold , whilst notable new additions in 2024 include nickel, iron, germanium, aluminium and chromium (plus others).

The assessment builds on data used in various areas, including diplomatic efforts to secure stable trade relationships, supporting improved recycling capabilities as part of a more circular economy, and further investment in exploration, mining and processing, the pursuit of alternative materials. The exercise highlighted several areas affecting the criticality of minerals, such as technology-driven mineral demand, decarbonisation effects on mineral demand, trade regulations and global supply risks, recycling potential, and climate change's effect on supply risks.

Critical Minerals for the UK: 2024	
Antimony	Platinum
Bismuth	Rare Earth Elements
Cobalt	Silicon
Gallium	Tantalum
Natural Graphite	Tellurium
Indium	Tin
Lithium	Tungsten
Magnesium	Vanadium
Niobium	
New Addition to the List	
Aluminium	Nickel
Borates	Phosphorous
Germanium	Rhenium
Hafnium	Rhodium
Helium	Ruthenium
Iridium	Sodium
Iron	Titanium
Magnesite	Zinc
Manganese	

While the Critical Assessment exercise primarily examined the present-day scenario, in March 2025, the British Geological Survey (BGS) published a forward-looking component of this exercise, exploring future demand for raw materials related to the deployment of decarbonisation technologies in the UK up to 2050.[56]

Key Policy Initiatives

In July 2022, the UK Government published the first-ever Critical Minerals Strategy, setting out the approach to accelerating domestic capabilities, collaborating with international partners and enhancing global markets. The document sets an approach to delivering resilient critical mineral supply chains to secure the UK industry's long-term supply of critical minerals. As a part of the strategy, the UK Government launched an independent Task & Finish Group on critical minerals resilience for the UK Industry, which will find out which – and how much – critical minerals the UK industry needs now and in future, what risks they face and how businesses can promote resilience in their critical mineral supply chains. An updated policy paper on the Critical Minerals Strategy was published by the Department of Business, Energy and Industrial Strategy in March 2023. This sets out the UK's new A-C-E (Accelerate – Collaborate – Enhance) approach to the sector.

Accelerate the UK's Domestic Capabilities

- Maximise what the UK can produce domestically, where viable for businesses and where it works for communities and our natural environment.
- Rebuild our skills in mining and minerals.
- Carry out cutting-edge research and development to solve the challenges in critical minerals supply chains.
- Make better use of what we have by accelerating a circular economy of critical minerals in the UK – increasing recovery, reuse and recycling rates and resource efficiency, to alleviate pressure on primary supply.

Collaborate with International Partners

- Diversify supply across the world so it becomes more resilient as demand grows.
- Support UK companies to participate overseas in diversified responsible and transparent supply chains.
- Develop our diplomatic, trading and development relationships around the world to improve the resilience of supply to the UK.

Enhance International Markets

- Boost global environmental, social and governance performance (ESG), reducing vulnerability to disruption and levelling the playing field for responsible businesses.
- Develop well-functioning and transparent markets, through improved data and traceability.
- Champion London as the world's capital of responsible finance for critical minerals

In March 2023, the UK Government launched the 2023 Integrated Review Refresh to respond to growing global volatility. The document reinforces the government's commitment to the Critical Minerals Strategy, highlights the UK's progress and sets out upcoming delivery milestones.

On 3 December 2024, Sarah Jones MP, the Minister of State for the Department of Business and Trade (DBT) and the Department of Energy Security and Net Zero (DESNZ), announced at a Westminster Hall debate on the domestic production of critical minerals led by Perran Moon that a new Critical Minerals Strategy will be launched in 2025.

On the skilling front, the Department for Business & Trade (DBT) awarded funding support in January 2025 to a collaboration to bring critical minerals learning resources into UK schools. With industry support from SLR Consulting, the joint project between Future Is Mine CIC and Minerals Matter will deliver teaching resources on critical minerals supply chains to UK schools starting in April 2025. This critical minerals outreach funding was awarded to address the geoscience skills gap in the UK. [57] DBT also supported the Critical Minerals Association, UK, in hosting an in-person workshop on skills development for the UK's midstream and recycling industries on 24 February 2025. The workshop aimed to build on the findings of the IOM3 report published in 2023, The Talent Gap: Critical Skills for Critical Minerals, by identifying common challenges and collaborative solutions for industry, government and education providers moving forward. The participants included representatives from UK-based midstream and recycling companies, start-ups, universities, and research centres such as the Rio Tinto Centre for Future Materials, Birmingham Centre for Strategic Elements and Critical Materials, and Met4Tech (Circular Economy Centre for Technology Metals).[58]

All-Party Parliamentary Group: The All-Party Parliamentary Group (APPG) for Critical Minerals in the UK was established in March 2020.[59] Following the UK election in 2024, the newly constituted APPG had its first meeting on 11 December 2024, chaired by Noah Law, MP. APPG's key priorities include domestic capacity, planning and permitting, finance, skills, midstream, infrastructure, circular economy, and international alignment. It will work closely with other relevant APPGs, such as the APPG for Automotives, which has lithium supply for electric vehicle (EV) batteries as a top priority for its downstream sector stakeholders. APPG's second meeting, held on 12 February 2025, focused on financing the critical mineral sector. Key takeaways included the necessity of streamlining planning and permitting processes, fostering innovative financing models, and maintaining high ESG standards.[60]

Financial Support for the UK Critical Minerals Businesses

- The UK Policy Paper on Critical Minerals proposed to develop financial support that can accelerate and catalyse the development of critical mineral extraction, refining, processing, and recycling capabilities. Examples of financial support opportunities for UK critical minerals businesses include the Automotive Transformation Fund (ATF) (£850 million), Industrial Energy Transformation Fund (£315 million), and National Security Strategic Investment Fund[g] and the Energy Intensive Industries scheme, and the UK Infrastructure Bank's relevant schemes for the development of supply chains across its five priority sectors (clean energy, transport, digital, water and waste)[h].

  Less Common Metals (a UK-based rare earth magnet alloy manufacturer), Pensana (developing an industrial-scale separation of rare earth elements at the Humber Freeport), Green Lithium (setting up Europe's first large-scale lithium refinery), Cornish Lithium (planning to construct geothermal lithium recovery pilot plant) and Weardale Lithium Limited (undertaking a feasibility study for extracting lithium from geothermal brines in County Durham) have received funding from ATF.

- UK Research and Innovation's Circular Critical Materials Supply Chains (CLIMATES) fund, launched with £15 million, will focus on making the UK's Rare Earth Element supply chains more resilient and boosting the circular economy.

- A £65.5 million Accelerate-to-Demonstrate (A2D) Facility, under the umbrella of the Clean Energy Innovation Facility (CEIF) platform through the UK Government's £1 billion Ayrton Fund commitment, includes a dedicated funding pillar on technology innovations for critical minerals in developing countries.

- To support a circular economy of critical minerals, the UK is supporting the Interdisciplinary Circular Economy Centre for Technology Metals (Met4Tech) through UK Research and Innovation's (UKRI) National Interdisciplinary Circular Economy Research (NICER) Programme, a £30 million programme to support R&D in the circular economy, including in technology metals. The key partners of

[g] This fund acts as the UK Government's corporate venturing arm for dual-use advanced technologies, which is a joint initiative between the government and the British Business Bank. Its objectives include accelerating the adoption of the government's future national security and defence capabilities and the development of the UK's dual-use technology ecosystem.
[h] The UK Infrastructure Bank has £22 billion of financing capacity to deploy and is aiming to invest across the capital structure, including senior debt, mezzanine, guarantees and equity.

Met4Tech are the British Geological Survey, the University of Birmingham, the University of Leicester, and the University of Manchester.[61] Met4Tech has recently produced a report on regulatory procedures and practices for the primary extraction of technology metals in Cornwall.[62]

- In May 2023, the UK Department for Science, Innovation and Technology (DSIT) published the £1 billion National Semiconductor Strategy, which will rely on international collaboration and strengthening domestic capabilities. This recognises the global nature of the end-to-end semiconductor supply chain. Due to the relatively small quantities of critical minerals required, critical mineral supply issues are not a significant driver of risk to the availability of most current-generation semiconductors. However, future compound semiconductors like gallium arsenide may be more vulnerable to critical minerals supply disruption. Ninety-four per cent of the world's gallium is produced in China and 4 per cent in Russia. Gallium is a by-product of aluminium and zinc mining, meaning that supply and demand dynamics are complex, and markets are vulnerable to supply shocks. In June 2023, China announced export control measures on gallium and germanium, metals used in chips, electric vehicles, and a range of telecom products. Industry experts expect China to introduce further retaliatory measures in response to the expansion of US-led controls on technology exports such as chip manufacturing machinery and chips used in AI and the decision of ASML, the Dutch manufacturer of advanced lithography machines to sell only low-yield machines to China.

- In October 2024, the UK approved using export finance by UK Export Finance to secure critical minerals. The Chancellor has announced that UK Export Finance (UKEF), the government's export credit agency, will offer financial support for overseas projects that supply critical minerals, fuelling UK industrial growth and the net zero transition. While this funding opportunity will be of interest to international supply chain partners of UK critical minerals players, it will also facilitate the overseas presence of key UK players.[63]

- On 28 January, the UK's National Wealth Fund announced a £28.6 million direct equity investment into Cornish Metals Inc to help finance the reopening of the South Crofty tin mine in Cornwall. Its investment is part of a £56m funding round to further de-risk South Crofty by commencing early project works, placing orders on long-lead items and completing key work programmes, including the shaft refurbishment and mine dewatering. Chancellor of the Exchequer Rachel Reeves said: "This is just the kind of investment that will help us do that, not only supporting the growth of the Cornish mining sector but creating high-quality jobs and opportunities for the region and beyond."[64]

- In January 2025, A £50m investment deal was secured between Nissan, the Japan Automatic Transmission Company (JATCO), and the UK Government to establish a new electric vehicle (EV) powertrain manufacturing facility in Sunderland. The UK Government has taken steps to address these issues, providing funding through programmes such as the Automotive Transformation Fund (ATF) and the Advanced Propulsion Centre (APC). These initiatives aim to support the design, development, and manufacturing of EV technologies in the UK, and they have already secured more than £6 billion in private-sector investment. The Government has also committed an additional £2bn in the Autumn Budget to fund zero-emission vehicle manufacturing and their associated supply chains over the next five years.[65]

Global Partnerships

- The UK is ramping up bilateral engagements with international partners, including Canada, Australia, the Republic of Korea, Saudi Arabia, South Africa and others, some of which are already formalised in government-to-government partnerships. For example, the UK and South Africa recently established a Partnership on Minerals for Future Clean Energy Technologies to promote increased responsible exploration, production and processing of minerals in South and Southern Africa. Further, the UK and Canada have signed a landmark agreement to cooperate on critical minerals and boost green technology supply chains. At COP27, the UK hosted a panel event on critical minerals for the energy transition – the first of its kind – leading the global conversation and recognising the supply of critical minerals as an essential factor in delivering climate goals. The UK Prime Minister also announced a new development-funded international climate finance programme through the £1 billion Ayrton Fund commitment. It includes a first-of-a-kind dedicated funding pillar on technology innovations for critical minerals in developing countries, establishing the UK as an Official Development Assistance (ODA) leader on critical minerals amongst developed country donors.

- At the Future Minerals Forum in Riyadh on 11 January 2023, the UK's Secretary of State for Business, Energy and Industrial Strategy (BEIS) (now a part of the UK Department for Business and Trade) Grant Shapps agreed to deepen the UK's collaboration with the Kingdom of Saudi Arabia on critical minerals. [66] In the run-up to the Future Minerals Forum, it was announced that the UK's Industry Minister, Sarah Jones, will sign a new critical minerals partnership at the event. While in Riyadh, the minister will hold a bilateral meeting with Saudi Arabia's Industry and Mineral Resources Minister, Bandar al-Khorayef, and participate in a ministerial roundtable with key players from across the sector before signing the Memorandum of Understanding.[67] The minister led a trade mission of 16 UK critical minerals companies to the Future Minerals Forum. The participating UK

companies included Beowulf, Cornish Lithium, Cornish Metals, Cornwall Mining Alliance, Dendra, Deswick, Edge, Gravity Mining, GSA Environmental, Headland Archaeology, Next Generation SCM, Project Blue, Sensoteq, SFA Oxford, UMS Group, and Westcountry Minerals.

- In the past, under the auspices of the GREAT Futures campaign and within the framework of the Kingdom of Saudi Arabia and the United Kingdom Strategic Partnership Council, Saudi Arabia's Minister of Commerce, H.E. Dr Majid Al-Kassabi, and the UK's former Deputy Prime Minister, the Rt Hon Mr Oliver Dowden MP held the fourth meeting of the Economic and Social Pillar in Riyadh in May 2024. Both sides reiterated the need for diversified and secure supplies of critical minerals, and the UK reaffirmed its support for and participation in leading UK institutions in Saudi Arabia's Future Minerals Forum. They welcomed the London Metals Exchange announcement regarding its intention to list Jeddah as a new global metals warehouse location.[68]

- In April 2023, Australia and the UK signed a statement of intent to strengthen cooperation on critical minerals. Under the statement of intent, Australia and the UK will work to:

  - Increase investment links for critical minerals projects;
  - Support sovereign downstream processing and manufacturing capabilities;
  - Seek new critical minerals value chains, including through recycling, and create skilled jobs;
  - Enhance collaboration on research and development;
  - Promote high environmental, social and governance (ESG) standards; and
  - Encourage the exchange of skills and expertise between Australian and UK firms and other international partners.

- There has been a lot of interest in engaging with the UK in the Central Asia region. A memorandum of understanding was signed between the UK and Kazakhstan in 2023, followed by a roadmap signed in 2024 to support objectives in technology partnerships, mining environment and capability building.[69] Kazakhstan has become a vital supplier for industries worldwide, with its titanium used in aircraft fuselages, rhenium in jet engines and beryllium from the Ulba Metallurgical Plant in satellites and nuclear energy applications. Recently, the nation has supplied 5 per cent of the global high-purity manganese sulphate market, essential for lithium-ion batteries. Future plans include doubling manganese sulphate production and manufacturing nickel and cobalt cathode components.

- The Minerals Security Partnership (MSP): The US has long been pushing to secure supply chains of critical minerals, including through a Minerals Security Partnership (MSP) that includes the EU, UK and Japan, and other countries such as Australia

and South Korea.[70] In June 2022, Australia, Canada, Finland, France, Germany, Japan, the Republic of Korea, Norway, Sweden, the UK, the US and the European Union entered the new MSP. India joined MSP in June 2023. The MSP aims to boost investment into critical mineral supply chains to incentivise diversification in the market and is focused on four pillars: information sharing and cooperation; investment networks; elevation of environmental, social and governance standards; and recycling and reuse

- The Atlantic Declaration: A framework for a twenty-first century US-UK Economic Partnership: In this initiative, launched in June 2023, the UK and USA committed to deepening cooperation to develop and strengthen clean energy supply chains, including building diverse, resilient, and secure critical mineral and battery supply chains that reduce unwanted strategic dependencies to meet defence, economic, energy security, and climate goals. Both countries agreed that with congressional consultation, the UK and the USA will intend to immediately begin negotiations on a targeted critical minerals agreement covering the five relevant critical minerals most important for electric vehicles – cobalt, graphite, lithium, manganese, and nickel – that are extracted or processed in the United Kingdom count toward sourcing requirements for clean vehicles eligible for the Section 30D clean vehicle tax credit of the Inflation Reduction Act. It remains to be seen how, under the new US administration and the new Presidency in the USA, the measures announced at the Atlantic Declaration, especially the proposed UK-USA critical minerals agreement, will progress.

- The Minerals Security Partnership Finance Network (MSPFN), a joint financing body, was announced by the United States, the European Commission, the United Kingdom, Canada, Japan, Australia, and nine other nations on 23 September 2024 at the United Nations General Assembly in New York.[71] The MSPFN was created to strengthen cooperation and promote information exchange and co-financing among participating institutions. It intends to provide greater access to debt financing for borrowers (primarily from participating nations) to fund critical minerals projects across the mine-to-market value chain to address these issues. It will also aim to bring together export credit agencies and development finance institutions (DFIs) to act as a lever for additional commercial bank financing and private capital for critical minerals projects to help alleviate funding constraints and propel more of these projects to a final investment decision.

China

Background

China has solidified its position as a leading force in the global critical minerals market, primarily controlling the production and refining of vital minerals such as rare earth elements, lithium, cobalt, and graphite. Although its share of global mineral resources is relatively modest, China has become the dominant player in refining processes, leveraging its role as the world's largest importer of critical minerals to process and supply these materials worldwide. It boasts unmatched scale, expertise, and efficiency in mineral processing.

While China accounts for only about 10 per cent of the world's reserves of lithium, cobalt, nickel, and copper, it imports substantial quantities to process between 65 per cent and 90 per cent of the global supply of these metals. For example, in 2024, China processed 92 per cent of spherical graphite and 99 per cent of synthetic graphite. It also produced 68 per cent of lithium chemicals and an astonishing 99 per cent of lithium iron phosphate (LFP) cathode materials.

This dominance is reinforced by its sizable domestic mineral reserves, access to key international mineral assets, government-backed initiatives to expand mining operations, and investments in advanced processing technologies. Additionally, China has strengthened its supply chains through strategic partnerships and the acquisition of mining rights in resource-rich regions, such as Africa.

Starting in 2000, China began providing extensive credit to companies mining critical minerals through state-sponsored entities, totaling approximately US$56.9 billion, according to a 2025 AidData report. The country has supplied 66 per cent of loans to 14 mining operations across eight nations, including the Toromocho, Las Bambas, and Marcona mines in Peru; the Tenke Fungurume, Kamoa-Kakula, Sicomines, Kolwezi, and Kinsenda mines in the Democratic Republic of the Congo; the Bor mine in Serbia; the Aktogay mine in Kazakhstan; the Phu Kham mine in Laos; the Mirador mine in Ecuador; the Bisha mine in Eritrea; and the Ramu mine in Papua New Guinea.

A strategic move occurred in 2016 when Chinese firms acquired assets from American mining company Freeport-McMoRan, which exited the DRC due to financial pressures, with the backing of Chinese credit facilities. In Asia, China has heavily invested in Indonesia's nickel industry, initially driven by Chinese stainless steel producers, then by electric vehicle (EV) battery and cathode precursor manufacturers. In March 2025, Chinese company Sunwoda Electric announced a US$1 billion investment in establishing a new EV battery manufacturing facility in Thailand,one of China's first ventures into the EV battery market within the ASEAN region.

Much of China's acquisition of mines and its control over extraction and processing operations are driven by the Belt and Road Initiative, a global infrastructure development project aimed at connecting Asia with Africa and Europe through land and maritime networks.

Chinese entities have targeted regions that enable their materials to qualify for US Inflation Reduction Act (IRA) tax credits, either by establishing operations in countries with free trade agreements (FTAs) with the US, such as Canada, Morocco, and South Korea, or by investing directly within the US, as seen with Gotion and Graphex. Additionally, China has engaged in strategic stockpiling of critical minerals; for example, in 2023, about 4 per cent of the global cobalt demand was purchased by the Chinese State Reserve Bureau for reserves.

Recent Developments

Recent announcements from China's Ministry of Commerce indicate the imposition of new export controls on tungsten, tellurium, bismuth, molybdenum, and indium,five critical minerals essential for high-tech and defence applications,citing national security interests. In 2024, China also announced export controls on graphite, specifically targeting the USA, aiming to disrupt its anode manufacturing plans. Though there is growing graphite production (especially synthetic graphite) outside of China, it will take time to establish new deals and undergo qualification periods. [72]

In the semiconductor, defence, and strategic applications sector, China has introduced a series of export controls for antimony, germanium, and gallium since 2023. It is the largest producer of all three metals. In December 2024, China announced an official ban on the export of germanium and gallium to the U.S., building on an earlier announcement in 2023 to ban exports of these two minerals, essential for the semiconductor industry, in response to U.S semiconductor sanctions banning exports of advanced semiconductors, quantum computing equipment, and lithography equipment to China. China’s export data, released in April 2025, reveal that exports of antimony and germanium products in the first quarter of 2025 were down 57 per cent and 39 per cent, respectively, compared to a year earlier. The export of gallium in March 2025 hit its lowest level since October 2023.[73]

In January 2025, China announced that it was inviting feedback on proposed restrictions on technology exports, including technologies relating to lithium salt production and the production of battery-grade lithium iron phosphate (LFP), lithium manganese iron phosphate (LMFP) and other cathode materials.

This potential technology export ban could significantly impact the global lithium-ion battery supply chain, as China dominates the space and many Western companies seek Chinese expertise to support project development. Chinese battery makers, including CATL, Gotion, and EVE Energy, have all announced plans to establish joint ventures with Western companies to produce EV batteries outside of China, and any potential export ban could adversely affect these projects.

As part of China's broader retaliatory measures to the US President Trump's 'Liberation Day' tariffs announced in April 2025, China announced fresh export controls on medium and heavy rare earth elements:

The restricted list includes samarium, gadolinium, terbium, dysprosium, lutetium, scandium, and yttrium,key inputs for various high-tech and defence applications. Notably, the controls exclude praseodymium and neodymium, elements used in rare earth permanent magnet production. According to the Benchmark Rare Earths Forecast, China is the dominant global supplier of medium and heavy rare earth elements, accounting for 41 per cent of mined dysprosium supply and 99 per cent of processed dysprosium supply.[74]

Considering China's dominance in the supply chain of essential critical minerals and its extensive access to mining and production assets worldwide, it is crucial for key critical minerals producers and users to monitor emerging Chinese policies closely and remain fully prepared with strategic responses to anticipated changes.

The United States of America

Background

The USA has very few primary resources and operational mines for most of the 50 minerals identified as critical minerals by the U.S. Geological Survey (USGS). It is 100 per cent import-reliant for 12 of these 50 minerals and over 50 per cent import-dependent for another 29 minerals. China, the top producer of 29 of these critical minerals, has implemented various export restrictions, including bans on exports of antimony, gallium, and germanium.[75] It is worth noting that even where domestic mining does exist in the USA, such as for copper and rare earths, the US lacks adequate domestic processing capacity to refine extracted minerals, remaining dependent on third countries, like China, to upgrade the material. According to the Benchmark Copper Service, nearly half (48 per cent) of the copper contained in US mined concentrate was exported in 2024, largely due to limited domestic smelting capacity. [76]

In April 2025, China placed export restrictions on rare earth elements as part of its response to the new U.S tariffs.[77] China already accounts for a very large share of midstream activities for various critical minerals and controls between 40 and 90 per cent of the world's supply of rare earth elements, graphite, lithium, cobalt, and copper. In January 2025, China proposed a ban on the export of technologies for the manufacture of several cathode precursors and cathode active materials:[78]

- Lithium Iron Phosphate (LFP) battery material preparation technology
- Lithium Manganese Iron Phosphate (LMFP) battery material preparation technology
- Phosphate-Based Cathode Precursor Preparation Technology
- Spodumene-Based Lithium Extraction for Lithium Carbonate Production
- Spodumene-Based Lithium Extraction for Lithium Hydroxide Production
- Metallic Lithium and Lithium Alloy Preparation Technology
- Direct Lithium Extraction (DLE) from Brines
- Preparation of Purified Lithium Solutions

Reducing reliance on China and creating resilient mineral supply chains is one of the most bipartisan priorities of the U.S. government. In 2017, President Donald Trump issued Executive Order 13817, which aimed to enhance the management of critical minerals essential for economic prosperity and energy security. Subsequently, in 2021, President Joe Biden issued Executive Order 14017 to review U.S. critical minerals and material supply chain vulnerabilities.

Mineral Criticality Assessment

In February 2022, the U.S. Geological Survey (USGS) published the '2022 Final List of Critical Minerals'. The 2022 list of critical minerals, which revised the U.S. list of critical minerals published in 2018, included 50 mineral commodities instead of 35 mineral commodities or mineral groups. The changes in the 2022 Final List of Critical Minerals from the 2018 list were the addition of nickel and zinc, listing out individual platinum- group metals (excluding osmium) and rare-earth elements, and the removal of helium, potash, rhenium, strontium, and uranium. The list of critical minerals is to be updated at least every three years and revised as necessary, consistent with available data.

Fragmented Approach towards Policy Making

The USA has as many as 15 government departments and agencies working on a range of programmes in the critical minerals sector. Some of the key departments include the Departments of the Interior, Commerce, Energy, Defense, State, Labor, Homeland Security, Treasury, Agriculture, and Education; the Export-Import Bank; the U.S. International Development Finance Corporation; the U.S. Agency for International Development; the Environmental Protection Agency; and the National Aeronautics and Space Administration (NASA). As these departments have their own set of programmes and priorities in the critical minerals sector, it might be challenging to achieve interagency coordination and collaboration.[68]

Key Policy Initiatives

Several congressional acts and other U.S. Government actions and programmes have focused on a range of support measures including investments in clean energy projects, critical mineral mapping, production, recycling, resource assessments; downstream activities such as battery production, research and development, and infrastructure projects such as port and rail links for strengthening the supply chain.

A series of actions by the Government in recent years addressed domestic supply chain vulnerabilities for critical minerals, beginning with Executive Order 13817, "A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals," which initiated a whole-of-Government call to action to identify critical minerals and develop a strategy to address U.S. supply-chain vulnerabilities.

Subsequently, there have been additional actions, including the following:

- The USGS published the 2018 List of Critical Minerals and an updated list of 50 critical minerals in 2022.

- The U.S. Department of Commerce, with interagency input, published the '2019 Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals'.
- The CHIPS and Science Act of 2022 provided US$ 280 billion in funding over the next 10 years for domestic research, commercialisation, and manufacturing of semiconductors.
- The Inflation Reduction Act of 2022 authorised US$ 391 billion in funding for domestic renewable energy production, including targeted tax incentives aimed at manufacturing U.S.-sourced materials such as batteries, electric vehicles (EVs), solar, and wind energy parts and technologies.
- In October 2022, the "American Battery Materials Initiative" was launched to support the ongoing efforts throughout the U.S. Government to meet resource requirements and strengthen energy security.
- In December 2022, the US$ 858 billion National Defense Authorization Act included a provision requiring that a Federal strategy be developed to recycle and recover critical minerals from batteries used in the Federal EV fleet.
- In July 2023, the Department of Energy (DOE) published its 2023 DOE Critical Materials list of energy-specific critical and near-critical materials for clean energy technology supply chains.
- The US leads the 14-member Mineral Security Partnership and has multiple bilateral initiatives in the critical minerals sector.

Key details of some of the above initiatives and programmes are discussed below.

Inflation Reduction Act (IRA)

The IRA, signed into law on 16 August 2022 by former U.S. President Joe Biden, proposed the largest single investment in climate and energy in American history. It focuses on clean energy technology, manufacturing, and innovation, with US$392 billion (comprising tax credits of US$271 billion and direct financing of US$121 billion) in investments aimed at incentivising private investments in clean energy, supply chains, job creation, and reducing energy costs. The IRA aimed to support multiple climate goals: 100 per cent carbon pollution-free electricity by 2035, a 50-52 per cent reduction in economy-wide net greenhouse gas (GHG) pollution from 2005 levels by 2030, and net-zero emissions economy-wide by 2050.[79]

Key Sections:

Section 30D New Clean Vehicle Credit

Section 30D of the IRA enhances affordability and the large-scale deployment of EVs by offering up to $7,500 in tax credits for eligible electric vehicle purchases. To qualify, manufacturers must meet certain criteria, including sourcing critical minerals and

components. Beginning in 2024, 50 per cent of the minerals in a qualifying vehicle must be extracted or processed in the U.S., a country with a U.S. free trade agreement, or Japan, the sole critical minerals agreement (CMA) partner. This requirement will rise to 80 per cent by 2027. Vehicles must also adhere to foreign entity of concern (FEOC) rules, meaning they cannot include minerals from entities defined as FEOCs (China, Russia, Iran, and North Korea). An FEOC is characterised by 25 per cent or more voting rights, board control, or equity interest held by a covered nation's government, or control via license or contract.

These sourcing requirements were intended to facilitate investments in critical mineral production in the United States and its free trade partners and to incentivise auto manufacturers to source critical minerals from domestic sources. However, a notable unintended consequence of the Section 30D tax credit is the disqualification of many North American-made EVs. The primary sourcing challenge is graphite, a critical mineral for batteries, with 60-80 kg required per EV. China dominates global graphite production, accounting for 77 per cent of natural graphite, over 95 per cent of synthetic graphite, and nearly all refining, leaving the U.S. almost entirely dependent on imports for battery-grade graphite. To support U.S. electric vehicle (EV) manufacturing, the Treasury exempted graphite from FEOC rules until 2027. However, this exemption has raised concerns that it may hinder the growth of a domestic graphite industry, which struggles to compete with Chinese prices.

Section 45X of the IRA

This section proposed to offer a 10 per cent credit for expenses related to producing critical minerals at specified purity levels, aiming to boost domestic production of critical mineral components for clean energy technology. The credit phases out by 2032 for most industries, but critical minerals projects are exempt, allowing ongoing financial support for capital-intensive projects if executed properly. In December 2023, the Treasury proposed a rule excluding material and extraction costs from production costs; however, this was amended in 2024 to include extraction costs, encouraging investment in upstream sectors and supporting vertical integration for companies.

Section 48C Qualifying Advanced Energy Project Credit

The Section 48C investment tax credit provides US$ 10 billion in credits for qualifying projects that fall into one of three categories:

- Clean Energy Manufacturing and Recycling: A qualifying advanced energy project in this category involves re-equipping, expanding, or establishing an industrial or manufacturing facility.
- Industrial Decarbonisation: An advanced energy project qualifies under this category if it involves retrofitting an industrial or manufacturing facility, particularly

in energy-intensive sectors such as cement, iron and steel, aluminum, and chemicals. The retrofit must include the installation of equipment specifically designed to reduce greenhouse gas emissions by at least 20 per cent.

- Critical Materials Projects: A qualifying advanced energy project in this category re-equips, expands, or establishes an industrial facility for the processing, refining, or recycling of critical materials

Manufacturers were eligible to apply for a credit of up to 30 per cent of their total investment in critical minerals production facilities. Unlike the non-competitive Section 45X credit, the Section 48C program is competitive, meaning not all applicants will receive benefits. In the first round, out of 250 applications requesting $13.5 billion in credits, 35 projects worth $4 billion were awarded.

Defence Production Act Title III

The US Defense Production Act (DPA) Title III authorises the federal government to incentivise the domestic manufacturing of critical materials and goods essential for national security. It provides funding, loans, and resource allocation to expand U.S. industrial capabilities, particularly in sectors such as defense, energy, and technology. By fostering public-private partnerships and supporting the development of supply chains for strategic materials, Title III aims to reduce reliance on imports and enhance the resilience of critical industries.

The IRA provided an additional US$ 500 million toward the DPA Title III grants to provide financial support to critical minerals projects, especially in the midstream segment of the value chain. The DPA Title II has supported several other critical minerals projects, such as cobalt refining in Canada, titanium processing in North Carolina, and rare earth element (REE) separation in Texas.[68]

Department of Energy: Loan Programmes

The Department of Energy received an extra US$11.7 billion in funding and US$100 billion in loan authority for its Loan Programs Office (LPO), established in 2005 to provide affordable private debt and help bring energy technologies to market. The LPO acts as a “bridge to bankability” for projects, especially critical minerals ventures struggling during low commodity prices. The IRA expanded the LPO’s scope, adding new programs and increasing loan authority by US$100 billion. Critical minerals projects can access funding through the Advanced Technology Vehicles Manufacturing Loan Program (ATVM), which offers loans or guarantees of up to 80 per cent of eligible costs.

The IRA's primary goals for critical minerals are to accelerate clean energy tech deployment, support domestic manufacturing, and secure supply chains free from foreign adversaries. However, progress has been mixed, with supply chains still insufficient to meet the needs of ongoing energy projects. A significant shortcoming is in "friendshoring" efforts under Section 30D, intended to incentivize sourcing critical minerals from the U.S. or FTA partners. This approach excludes key allies and major producers like Argentina, Brazil, India, Namibia, and the EU, while ignoring dominant mineral producers such as Chile, Mexico, and Peru, which mainly produce copper,not eligible for Section 30D benefits. As a result, most FTA partners are not benefiting substantially, and resource-rich countries outside the scope are excluded, limiting the effectiveness of IRA's sourcing strategies.

CHIPS Act

The CHIPS Act proposed a funding of US$ 52.7 billion for semiconductor-related activities through FY 2027 through four funding streams, targeted at different parts of the semiconducire supply chain: the CHIPS for America Fund, the CHIPS for America Defense Fund, the CHIPS for America International Technology Security and Innovation Fund, and the CHIPS for America Workforce and Education.

The CHIPS for America Fund, through which the majority of the funds were proposed to be spent, provided the Department of Commerce with US$ 50 billion to incentivise domestic manufacturing capabilities, R&D, and workforce development. Of this total, US$39 billion was allocated for a programme to promote investment in semiconductor fabrication, assembly, testing, advanced packaging, and R&D.

While the CHIPS Act has had a limited direct impact on the critical minerals industry, some of the fund beneficiaries may aim to use part of the funding for projects that support new domestic capacity for mining, mineral processing, or recycling critical minerals.

Recent Critical Minerals Investments in 2024

In 2024, the Department of Defense (DoD) actively advanced its efforts to build domestic manufacturing capacity for critical minerals through the Defense Production Act Investments program. The department awarded over US$ 400 million to U.S.-based projects aimed at developing or expanding the production of materials such as aluminium, magnesium, tin, titanium powder, zirconium powder, cobalt, graphite, lithium carbonate, manganese, and nickel, which are essential for industrial, defence, and energy applications. This included support for producing germanium substrates used in solar cells for both defence and commercial satellites, high-purity niobium

oxide for electronics, and rare-earth elements like terbium oxide for permanent magnets and other uses.

Since 1992, Canada has been recognised as a domestic source under the Defense Production Act, and in 2024, the Department of Defense announced awards exceeding US$ 40 million to Canadian companies. These awards are part of the broader effort to support the United States-Canada Joint Action Plan on Critical Minerals, with a focus on strengthening supply chains for cobalt and graphite. These initiatives align with the 2024 National Defense Industrial Strategy, which emphasises expanding domestic critical minerals production to enhance resilience.

Meanwhile, the Department of Energy (DOE) allocated significant funds through the Bipartisan Infrastructure Law, announcing US$ 4.82 billion in 2024 for 39 projects across the country. These projects aim to enhance domestic production of advanced batteries and battery materials, with funding distributed over two rounds. During fiscal year 2023, the DOE's Loan Programs Office completed transactions totalling over US$ 5 billion, including financing a lithium-ion battery recycling facility, and was evaluating seven additional projects requesting nearly US$ 14 billion. These projects span lithium carbonate extraction, battery recycling, and battery manufacturing facilities.

In addition, in January 2025, the National Renewable Energy Laboratory announced that it had awarded US$ 1.8 million in a second round of contracts supporting the development of more efficient and cost-effective cadmium-telluride (CdTe) solar cells. This initiative is part of the three-year Cadmium Telluride Photovoltaics Accelerator program, which aims to advance the deployment of solar technology.

Initiative in Africa: Lobito Corridor

The Lobito Corridor megaproject could reshape global critical mineral supply chains by connecting Africa's mineral-rich regions to European and North American markets. The Lobito Corridor project is an infrastructure initiative spanning Angola, the Democratic Republic of the Congo (DRC), and Zambia, connecting the Copper Belt of the latter two countries with the Angolan Atlantic Ocean port of Lobito.

Over the last several decades, China has established a significant presence in Africa's mining sector, particularly in the Copperbelt region of Central Africa, by the early 2000s. China owns or has a stake in fifteen of the DRC's nineteen cobalt mines and has also made substantial investments in lithium production in Zimbabwe. The Lobito corridor project is the USA's largest effort to counter China's presence in Africa. [80]

The U.S. Government announced the commitment of a loan of up to US$ 553 million to upgrade the Lobito Atlantic Railway.[81] The loan will support the rehabilitation and

operation of the brownfield mineral port in Lobito and an approximately 1,300-kilometre brownfield rail line in Angola running between the Lobito port and Luau on the Angolan border. The project is expected to expand and protect critical mineral supply chains, increase rail transport capacity, and reduce freight transit times and costs. Other project partners include the Singapore-based leading commodities company Trafigura, the Portuguese construction company Mota-Engil, and the Brussels-based private railway operator Vecturis, which together plan to invest US$555 million in Angolan and Congolese operations.

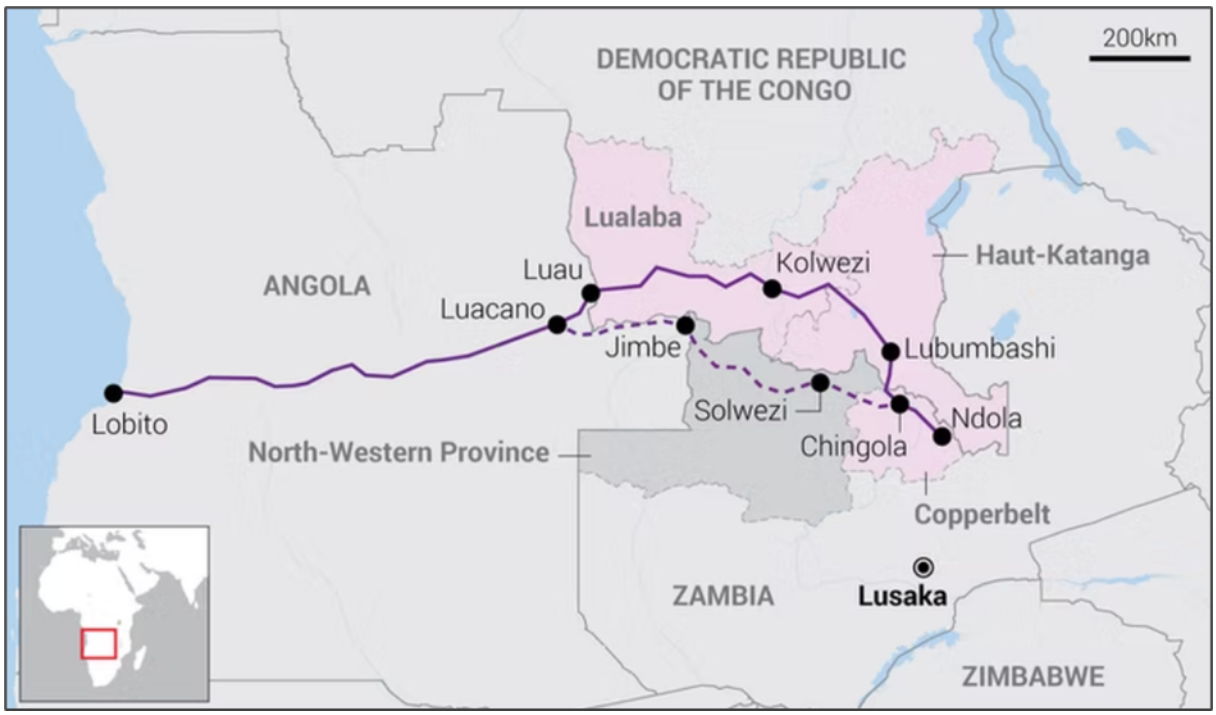

Figure 4: Lobito Atlantic Railway

Source: Lobito Corridor Investment Promotion Authority (www.lobitocorridor.org)

The U.S Development Finance Corporation (DFC) is exploring a range of investment opportunities along the Lobito Corridor, which extends across Angola, Zambia, and the DRC. DFC provided a US$ 3.4 million technical assistance grant to UK headquartered Pensana Plc to conduct feasibility studies to advance the development of a rare earth mine and refining facility in Longonjo, Angola, along the Lobito Corridor. Separately, DFC also committed a US$ 3.2 million DFC technical assistance grant to Chillerton in support of the development of a green copper mining project in Kakosa, Zambia, which is also along the Lobito Corridor. A retainer letter with Kabanga Nickel Limited, a subsidiary of Lifezone Metals Limited, to begin due diligence for political risk insurance on the Kabanga Nickel underground nickel-copper-cobalt mine site and the Kahama Hydromet Refinery site in Tanzania. DFC also signed a non-binding letter

with Kabanga Nickel Limited, expressing DFC's interest in considering the project for a loan.[82]

Recent Developments

The 47th US President, Donald Trump, issued a set of executive orders that have considerable implications for critical minerals, batteries, and electric vehicles. National security will play a central role in all of this. Trump's executive order 'Unleashing American Energy' puts forward a vision to establish the US as a global leader in critical minerals, including rare earths and mandates, among others, the following policy actions:[83]

- Federal government agencies are directed to review, revise or rescind existing regulations and policies to speed up the permitting process for critical mineral mining and processing projects. Linked to this, Trump declared a "national energy emergency", giving the federal administration more power to address and, if needed, remove various barriers related to the environment, property rights and federal and state policies to expedite project approvals.
- The US Geological Survey (USGS) is directed to consider updating the Survey's list of critical minerals, with Uranium highlighted.
- Federal support through the Department of Energy (DoE) must be made available for critical mineral projects, contingent on available funding.
- The Department of Defense (DoD) must ensure a robust supply of critical minerals within the National Defense Stockpile.

As expected, President Trump ordered an immediate pause on IRA and Bipartisan Infrastructure Law (BIL)- related funding, impacting unspent and conditional funding, and launched a thorough review of the IRA-led funding programmes.

Building on the initiatives of the 'National Energy Initiative', a new Executive Order specifically focused on the minerals sector was issued on 20 March 2025.[84]

Executive Order: Immediate Measures to Increase American Minerals Production

This Executive Order (EO) seeks to address national and economic security risks from high dependence on critical mineral imports, primarily from China, by directing federal agencies to fast-track permitting approvals, offering federal lands for mining and processing projects, and accelerating both private and public investment towards domestic mineral production.[85] [86]

The EO positions the new National Energy Dominance Council (NEDC), chaired by the Secretary of Interior to oversee the progress of domestic minerals security.

Notably, the EO defines 'minerals' as not only the minerals identified as critical on the Department of Interior's list but also includes copper, uranium, gold, and potash. The EO also leaves the critical minerals list open to the inclusion of other strategic materials as determined by the NEDC.

Some key recommendations of the EO include the following:

- Fast-track permitting approvals for priority mining projects. The Trump administration announced 20 mining projects that will benefit from streamlined permitting (known as FAST-41) and fast-tracking environmental reviews to a maximum of 28 days.[69]

- Invite industry feedback on regulatory bottlenecks and other recommended strategies for expediting domestic mineral production.

- Identify opportunities for critical mineral mining and processing on federal lands and provide leases to private entities on suitable sites.

- Explore minerals recovery from the treatment of waste rock, tailings, and mine waste.

- Use of the Defence Production Act (DPA) to fund and support domestic critical mineral projects. Its authority will be given to the Department of Defense (DoD) and the U.S. International Development Finance Corporation (DFC), creating a special mineral production fund that will provide loans, guarantees, and investments for U.S.-based projects.

- Create a government-backed offtake mechanism to coordinate bidding processes and secure global raw material offtake agreements to support domestic processing projects.

- Release of guidance by the US Export-Import Bank for the use of mineral and mineral production financing tools authorised under the Supply Chain Resiliency Initiative to secure the offtake of global raw mineral feedstock for domestic minerals processing, as well as under the 'Make More in America' Initiative to support domestic mineral production.[87]

USA – Ukraine Mineral Deal

According to the Kyiv School of Economics, Ukraine holds one-third of Europe's lithium reserves and 3 per cent of the world's total, along with 6 per cent of the world's explored graphite reserves. However, an estimated 20-40 per cent of Ukraine's mineral resources, including up to half of its rare earth deposits, are under Russian occupation.

Despite its mineral wealth, Ukraine's critical minerals sector remains largely undeveloped due to the ongoing war and long-standing political instability. Although the country has significant REE deposits, Benchmark data indicates that there are no active mines or deposits currently under development.

Ukraine is home to two early-stage hard-rock lithium projects. The Shevchenkivske project, the country's largest lithium deposit, is located in the Donetsk region, which is under Russian control. A second project, the Polokhivske and Dobra deposits, is situated in central Ukraine. Meanwhile, Ukraine's only operational flake graphite asset, the Zavalievsky Plant in the Kirovograd region, halted production in December 2024 due to a lack of investment and challenging market conditions. A second project in the same region is progressing through its early development stages, having completed a pre-feasibility study in early 2025. The country has also been home to a manganese ore mine since the Soviet era, but production has been stopped since 2023 due to electricity and labour shortages.

On 30 April 2025, the US and Ukraine signed an economic partnership deal to establish a jointly-owned "Reconstruction Investment Fund" to develop Ukraine's natural resources and associated infrastructure. The deal will not entitle the US to access critical minerals in Ukraine as compensation for its military support, as originally proposed by the US. However, there is a provision for the US to offtake Ukrainian mineral resources at a competitive rate, contributing to enhanced mineral security for the US. [88]

In the past, the European Union (EU) signed a strategic partnership on critical raw materials with Ukraine back in 2021, but there has been little progress on this since Russia's full-scale invasion in 2022.

In other news, to secure domestic supply of rare earth magnets, the U.S. Department of Defense entered into a strategic agreement with MP Materials. On 10 July 2025, MP Materials, an American rare earth materials company headquartered in Las Vegas, Nevada, announced a landmark partnership with the U.S. Department of Defense (DoD), which includes a US$ 400 million equity investment making the DoD its largest shareholder. The deal aims to establish a fully domestic supply chain for rare-earth magnets by supporting the construction of a new "10X Facility" that will

produce 10,000 metric tons of magnets annually by 2028. The DoD will guarantee a 10-year price floor of US$ 110/kg for neodymium-praseodymium (NdPr) and secure all magnet output via a long-term offtake agreement. Additionally, MP Materials will expand heavy rare-earth processing at its Mountain Pass facility with a US$ 150 million DoD loan. The move responds to China's export cuts and reinforces U.S. supply chain resilience, marking a rare instance of direct federal equity involvement in critical mineral infrastructure. Moreover, MP Materials' stock surged nearly 50 per cent following the announcement.[89]

Canada

Background

Canada has a well-developed mining industry. In 2021, the minerals sector directly and indirectly contributed CAD$ 125 billion or 5 per cent of Canada's total nominal GDP. It has a strong environmental, social, and governance (ESG) credentials.

Canada's updated Critical Minerals List was announced on 10 June 2024, including the original 31 minerals identified in 2021, plus three additional: high purity iron, phosphorous and silicon metal.

Over the last 15 years, several Canadian senior mining companies have been acquired by multinationals, resulting in fewer head offices in Canada. Canada's share of global production for critical minerals and metals has been decreasing, with other jurisdictions capturing a greater market share of the growing global demand. Capital investment continues to be substantially below its level a decade ago.

Important in a North American context, where the United States' Inflation Reduction Act offers incentives to promote its own domestic production of minerals. The attractiveness of these incentives could redirect capital towards the U.S., reducing opportunities for Canadian miners.

Canada must establish streamlined procedures and transparent eligibility criteria for businesses that want to access investment tax credits. The credits should also be flexible enough to move with innovation in the industry as the landscape of clean technology and mineral extraction continues to evolve.

The Canadian Climate Institute released a report called the "Critical Path: Securing Canada's Place in the Global Critical Minerals Race" in June 2025. It presents evidence-based policy recommendations to help Canada attract investment in six key minerals: copper, nickel, lithium, graphite, cobalt, and rare earth elements, while aligning development with environmental safeguards and Indigenous rights. The report estimates that Canada needs new investment of US$ 30 billion over the next 15 years to fully meet domestic critical minerals potential. To meet the growth in global demand, investment in Canadian critical minerals would have to increase to US$ 65 billion in that time frame. [90]

The Critical Minerals Centre of Excellence (CMCE), housed at Natural Resources Canada, leads the development and coordination of Canada's policies and programmes on critical minerals in collaboration with federal, provincial, territorial, Indigenous, industry, non-governmental, and international partners. The CMCE will

continue to act as the central coordination hub for critical mineral programs within the federal government, assisting partners and stakeholders in navigating Canada's regulatory processes to advance project development. Recognising the wealth of expertise that already exists across the Canadian critical mineral sector, the CMCE also strives to facilitate regional engagement and connections within the sector and communicate industry information and resources to further stimulate project development.

Critical Mineral Strategy

The Canadian Critical Minerals List contains 34 minerals or mineral groups. To support the sector, the Canadian government published a Critical Minerals Strategy in 2021.

The strategy talks about developing domestic and global value chains for the green and digital economy. Apart from this, the Canadian government has made headway by offering a range of incentives for this sector.

Federal initiatives and investments related to this Strategy will be advanced according to six focus areas: (1) Driving research, innovation, and exploration, (2) Accelerating responsible project development, (3) Building sustainable infrastructure, (4) Advancing reconciliation with Indigenous peoples, (5) Growing a diverse workforce and prosperous communities, and 6) Strengthening global leadership and security.

1. Driving Exploration, Research & Development, and Innovation

Canada is planning to expand geoscience and exploration activities to find the deposits of the future, as locating critical minerals in Canada's vast landmass is a complex endeavour. It requires advanced geoscience capabilities, including geological mapping, geophysical surveying, and scientific assessments and data. The next step is to be able to extract and process critical minerals sustainably. Canada will need to continue developing innovative technologies (e.g., new conversion processes) and industrial practices that optimise efficiency, cost competitiveness, and environmental stewardship. Budget commitments from 2021 and 2022 cover different aspects of the critical minerals value chain, from exploration to processing and refining to more advanced products. They include:

- CAD$ 144.4 million for critical mineral research and development and the deployment of technologies and materials to support critical mineral development for upstream and midstream segments of the value chain.
- 30 per cent Critical Mineral Exploration Tax Credit for targeted critical minerals;

- CAD$ 47.7 million for targeted upstream critical mineral R&D through Canada's research labs;
- CAD$ 79.2 million for public geoscience and exploration to better identify and assess mineral deposits;

The federal government will invest in geological modelling and resource potential mapping for both conventional and unconventional sources. Discoveries of future mineral wealth, particularly in rural, remote, and northern regions, will require advanced technologies at the exploration stage to identify areas of the highest potential while minimising exploration costs, reducing the carbon footprint of exploration programs, and minimising the environmental impact on the landscape.

Streamlined permitting processes: The government is working to expedite permitting processes for critical mineral projects while maintaining environmental standards. Canadian authorities plan to shorten the time required to obtain permits for extracting and processing six battery metals: lithium, nickel, cobalt, graphite, copper, and rare earth elements. The move aims to reduce reliance on Chinese mineral imports and offer the West a new, secure source of supply. The plan is to shorten the regulatory and permitting process from 12 to 15 years to five.

Moreover, Canada plans to conduct federal and provincial permitting simultaneously, aiming to reduce delays by conducting environmental assessments and permitting simultaneously while improving funding and staffing for the regulatory agency.
Information and data will be made publicly available to inform development considerations for potential critical mineral projects and to support investment decisions across the supply chain.

Canada is the leading global centre for mining finance. The Toronto Stock Exchange (TSX) and TSX Venture Exchange (TSX-V) list 43 per cent of the world's publicly traded mining companies. Combined, the two exchanges accounted for more mining equity capital raised (CAD$ 44 billion, or 37 per cent of the total raised worldwide) than any other exchange.

At the end of 2022, 1,157 of the firms listed on the TSX and TSX-V were mining companies. Together, they had a combined market value of CAD$ 520 billion and raised CAD$ 7.6 billion in equity. TSX-listed mining companies mainly deal in gold, copper, uranium, silver, diamonds, zinc, nickel, lithium, iron ore, zinc and molybdenum. Listings of mining companies on both exchanges have been relatively steady over the past five years, but have declined by almost 30 per cent over the past decade.

Canada's pre-eminence in the world of mining finance should not be taken for granted. The Canadian exchanges give mining companies access to capital while offering investors a regulated market for venture investments. The ecosystem of businesses

that support mining finance in Canada form a beneficial cluster that creates benefits for the sector and the whole economy.

Financing for the Junior Mining Sector: The mining sector has traditionally been divided into two types of companies: junior and senior. Junior companies are nimble, flexible, and raise money on the equity markets to support their exploration activities. Senior mining companies are more experienced, larger, and generate cashflow from their operations and production instead of raising it on the market. When a junior company finds a mineral resource that could become a mine, they typically partner with a senior mining company to bring the mine to production.

In December 2022, the Government of Canada, in the 2022 Budget, proposed the Critical Mineral Exploration Tax Credit (CMETC), which is a new incentive that provides investors in companies exploring for certain critical minerals a 30 per cent tax credit based on the amount invested. This is double the current 15 per cent credit available with the Mineral Exploration Tax Credit (METC) (available to investors in flow-through shares) and the legislation outlines how funds must go towards exploration for one of the following 15 minerals: copper, nickel, lithium, cobalt, graphite, a rare earth element, scandium, titanium, gallium, vanadium, tellurium, magnesium, zinc, a platinum group metal, or uranium. The METC is an additional incentive under the federal flow-through share rules contained in the Income Tax Act (Canada), which already provides for qualifying resource expenses to be renounced to a flow-through share investor. In 2018, the government extended the METC until 31 March 2024, which was further extended till 1 March 2025 on 28 March 2024 by the Department of Finance Canada. This extension is expected to provide CAD$ 65 million to support mineral exploration investment. The Critical Mineral Exploration Tax Credit applies to exploration expenditures targeted at minerals used in the production of batteries and permanent magnets (both of which are used in zero-emission vehicles or are necessary for the production and processing of advanced materials), clean technology, or semiconductors.

Canada as a Global Destination for Exploration Spending: For the past forty years, Canada has been a top destination for mineral exploration investment globally. In 2023, 19 per cent of global exploration spending was in Canada, the top national destination.

Building on the momentum of the Critical Minerals Research, Development and Demonstration Program launched in 2021, Canada will scale up support to de-risk innovations through research, piloting, and deployment to advance sustainable technologies and processes towards commercialisation in identified priority value chains. New innovation funding will focus on processing and refining technologies needed to effectively and efficiently transform minerals from primary and secondary

sources into intermediate materials, including post-consumer waste (e.g., used batteries) and mining waste (e.g., tailings).

2. Accelerating Responsible Project Development

To advance the transition to a net-zero economy, the federal government is providing financial and administrative support to accelerate the development of strategic projects in critical mineral mining, processing, manufacturing, and waste reduction (e.g., through recycling and mining value from waste). This support includes strategic investments to unlock potential in critical-mineral-rich regions, leveraging the resources and expertise of federal trade and business development organisations such as the Business Development Bank of Canada, Export Development Canada, and the Canadian Commercial Corporation. It also means capitalising on existing programs such as the Strategic Innovation Fund (SIF), which is already making significant investments in the electric vehicle battery industry.

Most critical mineral industrial projects require large upfront investments at higher risk and may generate a slower return. For example, it can take 5 to 25 years for a mining project to become operational, with no revenue until production starts. Domestic projects are also subject to rigorous federal and provincial/territorial regulatory assessments to meet Canada's high environmental and social standards. Budgets for 2021 and 2022 include multiple initiatives to help accelerate project development: CAD$ 21.5 million to support the Critical Minerals Centre of Excellence (CMCE) to develop federal policies and programs on critical minerals and to assist project developers in navigating regulatory processes and federal support measures.

The SIF will be one of the most significant direct funding mechanisms in Canada's toolkit presented under this Strategy. The SIF will support projects that decrease or remove reliance on foreign critical mineral inputs across a range of priority industrial sectors or technologies. It will help grow Canada's critical mineral value chains in areas of research, development, extraction, processing, manufacturing and/or recycling. Finally, SIF investments will favour critical mineral development opportunities that aim to reduce GHG emissions in Canada's critical mineral and manufacturing sectors. According to the SIF Impact Report, SIF projects are split into two overarching categories: Business Innovation and Growth projects and Collaborations and Networks projects. (SIF has been used to support projects across the country through 2 primary categories. Projects funded under the Business Innovation and Growth category, also known as direct-to-business contributions, foster the development of for-profit businesses so that they can invest in innovation, grow and create jobs for the prosperity of Canadians. Projects funded under the Collaborations and Networks category foster large, collaborative, business-led projects and innovation networks in areas where Canada has a demonstrated or an

emerging advantage. Through this, the program has enabled the Government of Canada to deliver significant benefits for the country.)

Building on Mines to Mobility: In 2019, the federal government launched the Mines to Mobility initiative to build a sustainable battery innovation and industrial ecosystem in Canada. To date, the initiative has attracted more than CAD$ 7 billion in announced investments to capture opportunities in the growing global battery market. It has led to an increased interest in Canada's value proposition in the battery sector, attracting notable global players in the midstream and upstream segments of our domestic value chain. The federal government will continue to support Canada's battery ecosystem through the Canadian Critical Minerals Strategy by building value chains that position Canada as a global leader in the innovative and sustainable production of ZEV batteries.

3. Building Sustainable Infrastructure

To address this, Budget 2022 includes a provision of up to CAD$ 1.5 billion for infrastructure development for critical mineral supply chains, with a focus on priority deposits. The federal government is supporting the development of Canada's critical minerals sector by investing in sustainable energy and transportation infrastructure to support industrial development, unlock priority mineral deposits, improve supply chain resiliency, and facilitate international trade. These investments will support Canadian economic development and trade by addressing gaps in enabling infrastructure to unlock priority mineral deposits. Additionally, investments would complement existing clean energy and transportation programming, including the Canada Infrastructure Bank (CIB), Transport Canada's National Trade Corridors Fund (NTCF) and NRCan's Smart Renewables and Electrification Pathways (SREPs) Programme.

Canada's geography and underdeveloped land-based infrastructure across northern regions create logistical challenges for industrial development and access to domestic and international markets. Transportation infrastructure is a major catalyst for critical mineral development, particularly in northern and remote areas. New infrastructure investments aimed at unlocking new mineral projects in resource-rich regions , including roads, rail, and ports , are needed to help Canada's mining industry provide the minerals and metals required to reach net zero by 2050, in consultation with Indigenous peoples and local communities. Enhancing Canada's transportation infrastructure in northern and remote regions represents a strategic opportunity to support broader economic growth objectives, Canada's Arctic sovereignty and national security, and reconciliation with Indigenous peoples.

Strengthening Global Leadership and Security

The concentration of critical mineral production in a few countries overseas that use non-market-based practices raises the risk of supply chain disruptions and inflated prices of key minerals and materials for Canada and its allies. The risk inherent to this concentration of production is being accentuated by geopolitical events, which further fuels supply uncertainties. In addition, some jurisdictions have not prioritised high environmental, social, and governance (ESG) standards, including in the resource development activities they undertake in other countries. As the global economy moves towards net zero, advanced manufacturers are seeking to ensure their supply chains are carbon-competitive, environmentally sustainable, and respectful of human rights. As a trusted and reliable supplier of responsibly sourced mineral and metal products, Canada is well-positioned to be a leader in the responsible, inclusive, and sustainable production of critical minerals and resilient value chains. It has a role in powering the green and digital economy, both at home and around the world, in a manner that avoids a race to the bottom for the lowest cost output.

Interest in pursuing collective action on critical minerals to support the global green energy transition is growing within several key multilateral organisations, including the Organisation for Economic Cooperation and Development (OECD), the G7/G20, the International Energy Agency (IEA), the World Bank, the International Renewable Energy Agency (IRENA), the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF), the Extractive Industries Transparency Initiative (EITI), and the Energy Resource Governance Initiative (ERGI). Enhancing Canada's participation in these forums will help strengthen the linkage between critical minerals and the energy transition, advance Canada's commitment to responsible supply chains, and further its role as the global leader in responsible and sustainable mining.

Strengthening Research and Development in Critical Minerals

Canada introduced Canada's Critical Minerals Research, Development and Demonstration Program (CMRDD) to advance the commercial readiness of emerging mineral processing operations or technologies.[91] CMRDD is administered through two funding streams:

a) Federal Research and Development: Between 2022 and 2024, CAD$ 35.7 million was allocated to 30 R&D projects undertaken by federal research laboratories. These projects focused on battery minerals, mining value from waste, clean tech, and other value chains. Learn more about Canada's R&D projects. The most recent budget will allocate up to CAD$ 44.4 million to federal

R&D laboratories for the development of new or improved technologies that support the advancement of critical mineral value chains. In order to better align federal R&D with industry needs, industry and academia were invited to submit an expression of interest to collaborate with federal research laboratories on upstream and midstream projects at low to mid technology readiness levels (TRL) 2–5 with the capacity to make significant positive impacts on the critical minerals industry in Canada and help propel projects into the pilot and demonstration (pre-commercialization) phase of development.

b) Contribution funding: Between 2022 and 2025, CAD$ 22.2 million in contribution funding was allocated to pilot plant and demonstration projects. In total, eight projects were funded to validate the feasibility and viability of processing technologies. The most recent call for proposals will allocate up to CAD$ 40 million to support midstream projects at technology readiness levels 6–8. This will help to advance the commercial readiness of emerging processing technologies and provide raw material inputs for use in batteries and permanent magnets, advanced manufacturing supply chains, semiconductors, information and communication technologies, and critical infrastructure value chains for commercialisation.

Bilateral Cooperation on Critical Minerals

Since January 2020, Canada has formalised bilateral cooperation agreements on critical minerals with the United States, the European Union, and Japan and is actively engaging with additional allies such as the United Kingdom and the Republic of Korea.

Canada-US critical minerals value chains are deeply integrated. Bilateral mineral trade between Canada and the U.S. was valued at CAD$ 104.5 billion in 2023, with imports from the U.S. valued at CAD$ 41 billion in 2023. The U.S. is the top country in terms of value for Canadian-owned mining assets abroad, accounting for 20.8 per cent of the total CAD$ 44.7 billion in 2022. Over 300 Canadian companies are developing projects in the US. Moreover, there are examples of bilateral co-funding through the U.S. DPA Title II and Canada's Critical Mineral Strategy. Examples include Fortune Minerals' Nico Cobalt-Bismuth project, which received US$ 6.4 million DPA funding and US$ 5.6 million under Canada's Critical Minerals Strategy and Electra Battery Materials' Cobalt Sulphate facility, which secured US$ 20 million DPA funding and US$ 3.6 million funding from Canada's Critical Minerals Research, Development and Demonstration Program (CMRDD).

Australia

Background

Australia has rich geological reserves, expertise in extracting minerals and a long track record of exporting mineral resources. Over the years, Australia has grown the geostrategic and economic benefits of its critical minerals sector (with 14 per cent of GDP coming from the mineral sector[92] and 62.5 per cent of exports coming from mineral exports[93]).

Strategic Move towards Midstream

Despite its rich mineral reserves and large mining sector, Australia has very little mineral processing capacity. The country is forecast to produce 27 per cent of the world's mined lithium in 2028, according to Benchmark's Lithium Forecast. However, the country is set to produce just 3 per cent of the world's lithium chemicals in the same year, whilst China is set to produce 59 per cent. The conversion of spodumene concentrate into lithium chemicals is a complex process that involves multiple chemical steps," said Federico Gay, principal lithium analyst at Benchmark. "Yet, the highest challenge remains on the cost side, as the conversion is an energy-intensive process that also requires considerable amounts of reagents, which makes it harder to compete with China." For other key battery minerals, as with lithium, Australia's processing capabilities are relatively small compared to those of China and the rest of the world.

The production of critical minerals is concentrated in a small number of countries outside Australia, making their supply vulnerable to trade disruption. While Australia supports sustainable supply chains of a diverse range of minerals globally through its exports, the country is keen to build more domestic capabilities for processing and refining facilities and downstream operations. There will be an increasing focus on extracting more value onshore from resources through midstream activities – creating jobs and helping Australian firms move further up the value chain and capture economic opportunities, including for regional, Aboriginal, and Torres Strait Islander communities.

Critical Mineral Strategy

Australia currently has 31 minerals on its Critical Minerals List.

The government will support Australian critical minerals processing as a priority under the Future Made in Australia Investment Framework.[i] It introduced The Critical Minerals Strategy 2023–2030 as a framework to grow Australia's critical minerals sector. The Strategy was shaped by extensive public consultation to understand the barriers and opportunities facing the Australian industry and community. As Australia is focusing on investing in refining and processing of critical minerals to capture more value and economic benefits onshore and aiming to become a leading global producer and exporter of processed critical minerals, many strands of the strategy focused on supporting the midstream processing and refining sectors. Australia's National Battery Strategy also highlights critical mineral processing as a key objective and integral to national battery manufacturing and global supply chain diversification.

To develop a robust mid-stream processing industry and compete alongside global processing powerhouses, Australia will require a multifaceted approach, ranging from technological innovation and strategic collaboration to policy frameworks and investment. Key focus areas of this strategy are:

Developing strategically important projects:

- Provide targeted and proportionate support to de-risk projects, crowd in commercial finance and help overcome market distortions.
- Enable a pipeline of new critical mineral discoveries and projects by supporting exploration.
- Review R&D support, including licensing and commercialisation settings.
- Attract international IP to grow domestic capability in refining and processing critical minerals.
- Analyse domestic industries and develop options to ensure Australian industries can access the minerals they need.

Attracting investment and building international partnerships:

- Optimise trade and investment settings for priority technologies.
- Facilitate business-to-business engagement, including business missions, to secure offtake, equity and debt.
- Attract international investment to support project development and downstream processing opportunities aligned with its national interest
- Step up the international engagement with bilateral partners and in multilateral forums to align policy frameworks.

[i] Priority industries under the Future Made in Australia agenda fall into one of two streams:
A. The Net Zero Transformation Stream, which includes industries where Australia will have a comparative advantage as the global economy transitions to net zero
B. The Economic Resilience and Security Stream, which includes industries where some level of domestic capability is necessary to deliver economic resilience and security.

The strategy also focuses on strengthening engagement and partnerships in the mineral sector with First Nations people and communities, respecting their land and water rights and interests and improving equity and investment opportunities for First Nations interests. On the ESG front, Australis will aim to reinforce Australia's high ESG credentials to improve market access and shape global ESG standards to ensure the clean energy transition is socially and environmentally responsible.

To speed up the growth of the sector, Australia will work with all levels of government to streamline environmental approvals and ensure public and private infrastructure investment decisions appropriately consider critical minerals projects and related heavy industry precincts.

To grow a skilled workforce, Australia will build on the existing investment in skills and education to increase the number of highly skilled specialists available for critical minerals projects. It will also consider how Australia can better target and apply its skilled migration settings to support industry needs.

The 2024-25 May Budget, announced in May 2024, introduced several measures to capitalise on making progress on the Critical Minerals Strategy.[94]

In the election held in May 2025, Australian Prime Minister Anthony Albanese was re-elected. Albanese's victory offers a policy certainty to prospective investors. In the run-up to the election, Prime Minister Albanese announced support for domestic projects, outlining an initial investment of AU$1.2 billion ($763 million) to establish a strategic reserve for 31 critical minerals. Aimed at providing price support to domestic projects, this support will involve the government purchasing critical minerals or having the option to buy minerals at a certain price threshold. [95]

Resourcing Australia's Prosperity Initiative

The government is providing AUD$ 566.1 million over 10 years from 2024-25 for a new Resourcing Australia's Prosperity initiative. This will enable Geoscience Australia to comprehensively map Australia's natural resources and accelerate the discovery of critical minerals.

Critical Minerals Production Tax Incentive

The government will provide AUD$ 7 billion through the new Critical Minerals Production Tax Incentive (CMiPTI). It will provide a refundable tax offset of 10 per cent of eligible processing costs for all 31 critical minerals currently on Australia's critical minerals list. The CMiPTI will start on 1 July 2027. The government will consult

on final eligibility criteria, administrative arrangements and legislation ahead of time. While these incentives could be worth up to AUD$ 17 billion according to estimates by the Association of Mining and Exploration Companies, a trade organisation, they could help encourage the flow of capital into projects with strong underlying cost fundamentals and stimulate billions in new investment in critical minerals processing, which will be far more valuable than the incentives on offer.[96]

Some of the US-based processors are at risk of President Trump withholding Inflation Reduction Act payments. As such, this move by Australia could be a catalyst for the diversion of private investment into the country.

Given the tax incentives are not set to commence until 2027 and will continue through 2040, such a measure will require long-term political support. However, with the next federal election in Australia due to take place on or before the 17th of May 2025, such support is not guaranteed with a potential change in government before the tax credits would begin. There are speculations that Prime Minister Albanese's Labor Party is falling behind in the polls and the Conservative-Liberal Party has a different vision for the country's future, focusing less on driving green industrial manufacturing through subsidies and tax breaks.

Investing in Common User Processing Facilities

The government is investing AUD$ 10.2 million to establish the Critical Minerals National Productivity Initiative (CMNPI). Through this initiative, Australia's states and territories will identify potential common user facilities for critical minerals processing. When developed, these facilities will support small and medium-sized mining companies in undertaking downstream processing of critical minerals. The facilities will also support companies in engaging in the circular economy through recycling and reprocessing waste and mining byproducts.

The focus will be on small-scale projects that create an environment that will enable facilities to be quickly established to support multiple minerals and mining companies.

Financing Projects

Australia is leading upstream financing commitments towards developing an ex-China critical minerals supply chain, especially a rare earth supply chain, which is critical for the national and economic security of Western nations. The Critical Minerals Facility and the Northern Australia Infrastructure Facility support the critical minerals industry to build sovereign capabilities. Finance from these facilities has contributed to the following:

- Providing approximately AUD$ 840 million to Arafura Rare Earths' Nolans Rare Earths Project in the Northern Territory. Australia's National Reconstruction Fund (NRFC) agreed to invest a further AUD$ 450 million (US$ 283 million) in Arafura Rare Earths to support the development of its mine and processing facility in the Northern Territory.97
- In November, Lynas Rare Earths opened the Kalgoorlie Rare Earths Processing Facility in Western Australia, marking a significant milestone as the country's first rare earth processing facility and the largest facility outside China. The project was the recipient of an AUD$ 20 million (US$ 14 million) Australian government grant back in 2023.
- Providing AUD$ 400 million for the Alpha High Purity Alumina (HPA) – HPA First Project in Queensland,
- revising previously approved finance of AUD$185 million to Renascor Resources for its Siviour Graphite project in South Australia.

Austrade's Critical Mineral Prospectus demonstrates the investment opportunities in over 52 advanced critical mineral projects.

Supporting trade partnerships

The government is providing AUD$ 5.8 million over 3 years from 2024-25 for a critical minerals trade enhancement initiative. This will support growing trade partnerships and enhance Australia's competitiveness in international markets for sustainably produced critical minerals and downstream products.

International engagement with downstream off-takers will be required to de-risk domestic projects and to ensure off-taker product specifications are met. Alternatively, international engagement can enable the demonstration and deployment of Australian technologies in offshore jurisdictions.

Safeguarding Against Foreign Interference

Australia is spending AUD$ 1 million over 3 years from 2024 for a pilot program to strengthen the capabilities of Australia's critical minerals sector to detect, prevent and mitigate foreign interference. The programme will provide education and training through a virtual outreach service to individual critical mineral companies.

Australian Critical Minerals Research and Development (R&D) Hub

Established in line with Australia's Critical Minerals Strategy 2023–2030 and led by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), the Australian Nuclear Science and Technology Organisation (ANSTO) and Geoscience Australia (GA), the Hub's role is to foster greater collaboration within the Australian

critical minerals ecosystem, to guide and prioritise critical minerals R&D, develop expertise, and to support international engagement.

Global Partnerships in Critical Minerals

- In March 2023, Australia and India entered into the India- Australia Critical Minerals Investment Partnership.[98] The partnership will aim to develop two lithium and three cobalt projects in Australia by Indian companies led by Khanij Videsh Limited (KABIL). Supporting innovation in India Australia's relationship with India continues to grow strategically, economically and scientifically. The AUD$ 32.5 million CSIRO and India Partnerships consist of 3 packages: (1) the Australia Rapid Innovation and Startup Expansion (RISE) Accelerator, (2) The India-Australia Critical Minerals Research Partnership, and (3) The India-Australia Green Steel Partnership.
- Australia is also working closely with Japan, the USA, and Canada, and continues to build relationships with Chilean government agencies and industry leaders in the critical minerals and mining field, data science, and Earth observation, alongside other areas such as plastic waste and green hydrogen initiatives.
- The US has committed financing to projects in Australia: the US Export-Import Bank (EXIM) signed a AUD$ 600 million non-binding Letter of Interest with Australian Strategic Materials in 2024 to help progress the Dubbo project in New South Wales.
- Meanwhile, Australia has also signed a Critical Raw Materials (CRM) partnership with the European Union, facilitating the shipment of upstream mined material to support Europe's incoming capacity for rare earth processing.

The European Union

Background

The European Union (EU) is far behind China and has been falling behind the US due to its lack of abundance of critical minerals, sluggish development, and its NIMBY attitude to greenfield projects. The EU relies heavily on imports from quasi-monopolistic third-country suppliers, particularly China. The US has become an attractive investment destination due to the Inflation Reduction Act (IRA) and free-trade agreements with resource-rich countries.

Between 2024 and 2030, battery cell production capacity in Europe could reach 1.7 TWh, led by Germany, Hungary, Spain, France and the UK through over 38 EV battery gigafactories. However, just 815 GWh of this total (enough to power 13.6 million electric cars) is currently secure. More than half of planned battery plants are at risk of being delayed, scaled down or cancelled, as the race to capitalise on global EV demand means producers are being offered incentives in various geographies, including the US and China, and many would face supply chain vulnerabilities unless the EU addresses the issue through building a resilient supply chain, some degree of localisation of the supply chain and developing technologies for critical minerals processing and refining to produce battery material precursors and anode/cathode active materials.

EU Critical Raw Materials Act

The Critical Raw Materials Act was first announced by EU President von der Leyen during her 2022 State of the Union speech, in which she called for addressing the EU's dependency on imported critical raw materials by diversifying and securing a domestic and sustainable supply of these materials. The EU Critical Raw Materials Act (CRMA) came into force on 23 May 2024.[99] The CRMA was adopted by the European Parliament and the Council of the EU on 11 April 2024.

The Critical Raw Materials Act is viewed as a comprehensive response to the risks of disruptions to critical raw materials supply and the structural vulnerabilities of EU critical raw materials supply chains. This is aimed at ensuring EU access to a secure and sustainable supply of critical raw materials, enabling Europe to meet its climate and digital objectives, maintaining EU industrial competitiveness, and ensuring the functioning of the single market.

The Act takes a balanced approach by proposing a mix of internal actions within the EU to strengthen competitiveness through greenfield facilities and recycling, and external engagement globally to diversify the import sources:

Internal Actions

- Setting clear priorities for action: In addition to an updated list of critical raw materials, the Act identifies a list of strategic raw materials which are crucial to technologies important to Europe's green and digital ambitions and for defence and space applications while being subject to potential supply risks in the future. The Regulation sets clear targets for domestic capacities for the strategic raw material supply chain by 2030:

    - At least 10 per cent of the EU's annual consumption for extraction
    - At least 40 per cent of the EU's annual consumption for processing
    - At least 15 per cent of the EU's annual consumption for recycling
    - Not more than 65 per cent of the Union's annual consumption of each strategic raw material at any relevant stage of processing from a single third country.

- To create a secure and resilient supply chain within the EU, the Act will reduce the administrative burden and simplify permitting procedures for critical raw materials projects in the EU. In addition, selected Strategic Projects will benefit from support for access to finance and shorter permitting timeframes (24 months for extraction permits and 12 months for processing and recycling permits). Member States will also have to develop national programmes to explore geological resources.

- The Act provides for the monitoring of critical raw materials supply chains, and the coordination of strategic raw materials stocks among Member States. Certain large companies will be required to audit their strategic raw materials supply chains, comprising a company-level stress test.

- Investing in research, innovation and skills: The Commission will strengthen the uptake and deployment of breakthrough technologies in critical raw materials. Moreover, establishing a large-scale skills partnership on critical raw materials and a Raw Materials Academy was announced to promote skills relevant to the workforce in critical raw materials supply chains. Externally, the Global Gateway Programme[j] will be used as a vehicle to assist partner countries in developing their own extraction and processing capacities, including skills development.

[j] The Global Gateway Initiative is a strategy by the European Union to invest in infrastructure projects worldwide.[1][2] The project was initiated by the EU Commission under the leadership of Ursula von der Leyen. Over the period 2021–2027, the EU will invest €300 billion. Investment into Africa is the regional priority of the initiative, as half the funds are allocated to projects on the continent. They aim to

- Focus on circularity and recycling: Member States will need to adopt and implement national measures to improve the collection of critical raw materials rich waste and ensure its recycling into secondary critical raw materials. Member States and private operators will have to investigate the potential for recovery of critical raw materials from extractive waste in current mining activities but also from historical mining waste sites. Products containing permanent magnets will need to meet circularity requirements and provide information on recyclability and recycled content.

International Engagement

- Diversifying the Union's imports of critical raw materials: The EU will never be self-sufficient in supplying such raw materials and will continue to rely on imports for a majority of its consumption. International trade is, therefore, essential to supporting global production and ensuring diversification of supply. The EU will need to strengthen its global engagement with reliable partners to develop and diversify investment and promote stability in international trade and strengthen legal certainty for investors. In particular, the EU will seek mutually beneficial partnerships with emerging markets and developing economies, notably in the framework of its Global Gateway strategy.

- The EU will step up trade actions, including by establishing a Critical Raw Materials Club for all like-minded countries willing to strengthen global supply chains, strengthening the World Trade Organisation (WTO), expanding its network of Sustainable Investment Facilitation Agreements and Free Trade Agreements and pushing harder on enforcement to combat unfair trade practices.

- The EU signed agreements with Kazakhstan under the EU's investment strategy, Global Gateway. Kazakhstan produces 18 of the 34 raw materials classified as critical by the EU and plans to ramp up the extraction of additional resources such as rare earth elements. At the eighth EU-South Africa summit that took place in Cape Town in March 2025, the EU and South Africa agreed to strengthen their strategic partnership. In addition to Global Gateway investments aimed at supporting clean energy, closer cooperation on critical raw materials is planned. South Africa holds the world's largest reserves of platinum group metals and is the leading global supplier.[100]

The Critical Raw Material Act is being implemented in parallel to the EU's Net Zero Industry Act, which aims to scale up the EU manufacture of key carbon neutral or "net-

improve the green transition, digital transition, sustainable economic growth, health care and education in Africa.

zero” technologies to ensure secure, sustainable and competitive supply chains for clean energy in view of reaching the EU's climate and energy ambitions. The political, economic, scientific, operational and logistical hurdles to achieving the objectives set out in the CRMA mean that the pace and ultimate success of its implementation are still to be determined. Nonetheless, the act represents a significant step forward in the EU’s efforts to enhance its economic resilience and a greener future.

In March 2025, the European Commission announced 47 strategic projects to secure the EU's critical raw materials supply, backed by a €22.5 billion investment (US$ 24.3 billion). Spanning Belgium, France, Italy, Germany, Spain, Estonia, Czechia, Greece, Sweden, Finland, Portugal, Poland, and Romania, these projects aim to meet 10 per cent of the EU’s extraction needs, 40 per cent of its processing, and 25 per cent of its recycling capacity by 2030, reducing dependence on external suppliers. They will fully meet the EU’s 2030 benchmarks for lithium and cobalt while advancing graphite, nickel, and manganese supply. [101] [102] [103] [104]

In June 2025, the EU announced additional 13 new strategic raw materials projects outside the EU. Located in Canada, Greenland, Kazakhstan, Norway, Serbia, Ukraine, Zambia, New Caledonia, Brazil, Madagascar, Malawi, South Africa, and the UK, the projects are expected to collectively mobilise about EUR 5.5 billion (£4.71 billion) of investment. These projects include the Hemerdon tungsten mine of Tungsten West Plc, located in South Devon, UK. While ten of these new strategic projects would aim to produce energy transition minerals, two projects would focus on rara earth. With the addition of these 13 projects, the EU now have 60 strategic raw materials projects in the critical minerals sector. [105] [106]

EU Industrial Plan for the Automotive Industry

In February 2025, the EU launched the ‘Industrial Plan for the Automotive Industry’ following the conclusion of a strategic dialogue with automakers. This policy framework aims to bolster the short-term competitiveness of Europe’s automotive sector. The plan includes several measures, such as a comprehensive "Battery Booster" package, which aims to support the production of battery cells and components through direct funding and non-price criteria for components. As a part of this plan, The EU plans stricter foreign investment rules in its battery and auto sectors to boost local industry and counter China’s dominance. Proposed measures include joint ventures, IP licensing, and supply commitments. With 61 per cent of Europe’s 2030 battery capacity under Chinese or South Korean control, localisation efforts face major challenges. The Commission will support the development of next-generation batteries through the BATT4EU partnership as part of the Horizon Europe program, with a focus on the whole value chain for the years 2025-2027. The BATT4EU has

already invested EUR 925 million in building and boosting a competitive, sustainable, and circular European battery value chain.[107] In December 2024, the BATT4EU Innovation Fund launched a call for proposals worth EUR1 billion for EV batteries made in Europe. The project may also include the additional production of upstream components such as precursor cathode material (PCM), cathode active material (CAM), anode active material (AAM), electrolyte, separator, battery or battery material recycling. Projects must be located in EU Member States or EEA countries.[108]

Next to the aim to accelerate the permitting process for battery materials refining (where the EU has arguably more growth potential than mining) and to increase support for recycling, including funding for recycling facilities, the EU proposes the establishment of a Battery Raw Materials Access Entity, which is supposed to support car manufacturers get the raw materials they need by pooling their commitments and investments.[109]

Mineral and Technology Criticality Assessment

The EU published a list of 14 critical minerals in 2011, which underwent several updates and revisions in the form of an updated list of 20 critical minerals in 2014 and 27 critical minerals in 2017. In 2020, a fourth list of 30 CRMs was published in the communication on critical raw materials.[110] The updates were based on developing economic importance and supply challenges. The EU has added bauxite, titanium, and strontium to the latest version of the list alongside lithium, and helium has been dropped from the list, which now contains 30 critical raw materials.

The 2020 criticality assessment was carried out for 66 candidate materials (63 individual materials and three material groups: heavy rare earth elements, light rare earth elements, and platinum group metals, amounting to 83 materials in total). In 2011, 41 materials were assessed, 54 materials were assessed in 2014, and 78 in 2017. In September 2020, the Commission presented a foresight report, 'Report on raw materials for strategic technologies and sectors'. Specifically, it estimates material needs for growing technologies such as clean energy technologies (photovoltaic, wind, storage), electric mobility and digital technologies (ICT, robotics, 3D printing) based on the EU's 2050 climate-neutrality scenarios and other forecasts. It provides an outlook for the period 2030-2050 of material demand for these sectors and identifies supply risks and bottlenecks at different levels of the supply chains.

The main parameters used to determine the criticality of the material for the EU are
-Economic importance - aims at providing insight into the importance of material for the EU economy in terms of end-use applications and the value added (VA) of corresponding EU manufacturing sectors

-Supply risk - reflects the risk of a disruption in the EU supply of the material. It is based on the concentration of primary supply from raw materials producing countries, considering their governance performance and trade aspects.

An EU foresight report complements the criticality assessment with a forward-looking perspective focused on selected strategic technologies and sectors. In 2023, a second foresight study assesses 15 technologies mapped to 5 strategic sectors. The update of the study gives a current picture of the technologies' materials demand in 2030 and 2050. It provides a more complete picture of the technologies needed to reach the EU's strategic goals. The study also served as supporting evidence in the development of the Critical Raw Materials Act and the list of strategic raw materials. The EU Foresight Report assessed EU dependencies in the supply chains of 15 key technologies. The report found that supply risks are highest at the raw materials stage, where the EU share in global production is never more than 7 per cent. The EU's vulnerability tends to decrease along the value chain. However, for several technologies, such as Li-ion batteries, the EU remains highly dependent throughout the entire supply chain. With an average 28 per cent share of global production, the EU is relatively stronger at the stage of manufacturing final technologies.

Other Policy Initiatives

The European Raw Materials Alliance (ERMA) was announced on 3 September 2020 as part of an Action Plan on Critical Raw Materials and the publication of the 2020 List of Critical Raw Materials.[111] A primary objective of the newly created body was to increase the EU‘s resilience in the rare earth and magnet value chains, which are vital for key industrial applications. By bringing together all relevant stakeholders along strategic value chains and industrial ecosystems, the alliance will initially focus on the most pressing needs, namely, to increase EU resilience in the rare earth elements and permanent magnet value chains. This is vital to key EU industrial ecosystems, such as automotive, renewable energy, defence and aerospace. Later, the alliance will expand to address other critical raw material and base metal needs, including projects supporting the circular economy and addressing the EU Green Deal. There will be an industry-driven process led by EIT RawMaterials, whose task will be to identify opportunities and barriers and create relevant investment cases with stakeholders and industry partners.

Export Control on Black Mass

The European Commission updated the List of Waste on 5 March 2025 to keep batteries and their critical raw materials in the economy for longer.

Recognising that access to shredded battery waste, known as "black mass", is essential to ensure electric vehicle battery recycling the decision clarifies that black mass shall be classified as hazardous waste. This will lead to better control of shipments of black mass and will ensure that black mass remains in the European economy.

New specific waste codes have been introduced to identify and support the proper management of waste from different stages of the batteries' life cycle, including waste from battery manufacturing, waste from post-consumer batteries, and Intermediate fractions from battery recycling.[112]

Finance for the Critical Minerals Sector in the EU

The CRMA anticipates mobilising finance from various sources, including the EU's Global Gateway initiative and the European Investment Bank. Some member states have also established their national funds. Germany launched a €1 billion (US$ 1.04 billion) raw-materials fund, while Italy introduced a €1 billion "Made in Italy" fund for critical minerals, and France dedicated €500 million under its 2030 investment plan to enhance domestic industry's resilience to disruptions of the metal supply chain.[113] [114]

Both the European Bank for Reconstruction and Development (EBRD) and the European Investment Bank have funding programmes for the critical minerals sector, mainly targeted at the junior exploration programmes and EV battery manufacturing sector.

European Bank for Reconstruction and Development (EBRD)

- In July 2024, EBRD and EU launched a joint facility to provide equity investments for the exploration of critical and strategic raw materials, aiming to mobilise up to €100 million in investments. The EBRD is providing €25 million, which will be matched by the EU's contribution from the Horizon Europe Programme under the InvestEU umbrella. The facility aims to mobilise a further €50 million.[115]

- The programme builds on the EBRD's extensive experience in financing mining projects, facilitating early-stage equity investments in operations in EU Member States where the Bank operates (Bulgaria, Croatia, Czechia, Estonia, Greece, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic and Slovenia), as well as EBRD economies outside the EU that are covered by the Horizon Europe programme (Albania, Armenia, Bosnia and Herzegovina, Georgia, Kosovo, Moldova, Montenegro, North Macedonia, Serbia, Tunisia, Türkiye and Ukraine).

- The EBRD expects to invest in 5-10 junior mining companies (small and medium-sized enterprises, medium-sized enterprises or small mid-caps) that undertake critical raw material exploration in eligible countries. The facility will be used to fund responsible exploration activities that are delivered to high climate, governance, environmental, and social impact standards. The facility is part of the EBRD's recently approved Junior Mining Framework worth €150 million for equity and quasi-equity investments in early-stage mining companies. The Junior Mining Programme (JUMP) is a € 150 million dedicated EBRD framework facility for equity and quasi-equity investments in early-stage mining companies in the EBRD's countries of operations. It focuses on small and medium-sized mining companies under-serviced by the limited depth of equity capital markets and private equity in the EBRD region. Investments under JUMP will primarily target the development of deposits where critical or strategic raw materials for green and digital transition are present as part of the product mix. Other raw materials, such as base metals, precious metals, etc., will be financed on a selective basis to support wider economic development. [116]

European Investment Bank

The European Commission and the European Investment Bank (EIB) have announced a new partnership to support investments in the EU's battery manufacturing sector. This partnership will see a €200 million top-up (loan guarantee) to the InvestEU programme from the EU Innovation Fund. In addition, it comes with €1 billion in grants to support electric vehicle battery cell manufacturing projects via the Innovation Fund. As part of the new partnership, the EIB envisages investing a further €1.8 billion in the wider battery value chain. These joint efforts will result in €3 billion of public support in total for the development of a competitive and sustainable European battery industry.

Support will be directed to a wide range of battery technologies, such as developing advanced materials, component manufacturing, or innovative recycling techniques.[117]

Indonesia

Background

Indonesia is the world's largest nickel-producing nation, accounting for 60 per cent of the global refined nickel supply this year,a figure that Benchmark forecasts will rise to 70 per cent by 2030.

Globally, the supply of refined nickel has traditionally been constrained by the availability of sulphide ores. However, Indonesia's vast reserves of laterite ores have shifted this dynamic. The combination of accessible nickel ores and robust demand from the rapidly expanding Chinese stainless steel industry, now including the battery sector, has driven significant investments in High-Pressure Acid Leaching (HPAL) facilities. This, along with a supportive Indonesian government aiming to develop a domestic refining industry, has positioned Indonesia as a leader in the global nickel market.

Western involvement in Indonesia's nickel industry remains minimal. In contrast, China's influence is prominent, particularly evident in the Morowali Industrial Park in Central Sulawesi, a key project of Beijing’s Belt and Road Initiative. Of the 21 planned HPAL projects in Indonesia, most are being developed with Chinese investment. Notable Chinese-owned or joint venture companies include PT Halmahera Persada Legend, PT QMB New Energy Materials, Huayue, Huafei, and Pomalaa HPAL. Exceptions to this trend include the operations of Vale, which produces matte in Sorowako; Nickel Industries, which is acquiring stakes in Tsingshan assets; and Eramet, which holds a stake in a Tsingshan-operated NPI smelter.

Indonesia is poised to diversify its investment sources, facilitating deeper integration into the international market and the global nickel value chain. This shift aims to leverage opportunities under the U.S. Inflation Reduction Act, which excludes producers with over 25 per cent Chinese equity. Both Indonesia and the United States view reducing reliance on China in the critical minerals sector as strategically essential. Indonesia seeks to maintain an "independent and active" foreign policy that steers clear of excessive dependence on any single nation.

While Chinese investment has significantly advanced Indonesia's nickel industry, Jakarta is increasingly cognizant of the risks of concentrated foreign influence. By diversifying its investment sources, particularly by forging closer ties with the United States, Indonesia pursues its broader objectives of safeguarding economic sovereignty and enhancing its geopolitical position. Nevertheless, Indonesia aims for this diversification strategy to deliver comprehensive benefits, including capital inflow,

technology transfer, environmental sustainability, downstream investment, and long-term economic advantages.[118]

Introduction of High-Pressure Acid Leaching Process for Low-grade Ores

Mining nickel laterite ore, such as those found in Indonesia, accounts for about 60% of globally identified nickel resources and represents an increasing share of global nickel production. However, developing laterite resources presents distinct challenges. Historically, much of the raw nickel ore extracted in Indonesia was exported unprocessed to China or other countries.

Indonesian nickel ores are primarily lateritic, consisting of two types: saprolite, with nickel content ranging from 1.5% to 2.0%, and limonite, with less than 1.5% nickel content. Limonite ore is located near the surface, while saprolite lies beneath it. Thus, mining saprolite requires the removal of limonite ore.

Prior to 2021, Indonesia lacked facilities to process limonite ore, and saprolite was typically processed through traditional pyrometallurgical smelters. As a result, limonite was often treated as overburden or waste. However, since 2021, the advent of High Pressure Acid Leaching (HPAL) technology has enabled the processing of limonite ore into mixed hydrate precipitate (MHP), containing nickel and cobalt. The success of the HPAL route revolutionised the nickel industry in Indonesia and largely contributed to a significant growth in nickel production, making Indonesia the global top producer of nickel.

Traditionally, most nickel mined in Indonesia was either exported raw or processed into lower-grade ferronickel or NPI for stainless steel production. However, the battery industry demands higher-grade nickel, spurring an increase in projects utilizing acid-leaching processes to convert limonite ore into intermediate products suitable for lithium-ion batteries.

Nickel ore extraction from lateritic deposits is usually conducted through opencast mining techniques, which have considerable environmental impacts, such as deforestation and water pollution. Moreover, the acid-leaching process raises environmental concerns, primarily due to the generation of harmful acidic effluents requiring extensive treatment.

Export Control of Nickel Ores

Indonesia views the country's critical mineral prospects as a key part of its aim to become one of the world's top five economies by 2045. Under the former President Jako Widodo, Indonesia adopted a policy known as "downstreaming." This approach focuses on encouraging foreign companies to invest in smelters and downstream units instead of importing nickel ore from Indonesia.[119]

Indonesia's 2009 Mining Law required companies to process ore locally before shipping it abroad. Indonesia has implemented this law through a series of regulations that ban the export of over 200 types of mineral ores. In 2014, as part of implementing the 2009 Mining Law, Indonesia prohibited the export of nickel ore. From 2014–2017, companies were only able to export concentrates associated with certain mineral ores (including nickel, copper, lead, and iron) if they paid an export tax and met other requirements, such as building smelters in Indonesia. Indonesia temporarily relaxed the nickel export ban in 2017 but reinstated the full export ban as of January 1, 2020 (earlier than the January 2022 date previously announced), which essentially halted all exports of nickel ores and concentrates.

Official government estimates indicate that the added value of nickel production, as a result of the export ban of ores, has increased from US$ 1.4 billion to US$ 34.8 billion from 2020 to 2023, and mining now accounts for just under a tenth of overall gross domestic product (GDP). More broadly, it has stimulated growth in the downstream industrial sector. In the two years following the ban, the value of Indonesia's nickel exports surged from US$ 3 billion to US$ 30 billion, and President Widodo remarked: "We want to benefit from added-value exports so that there's income for the state in the form of taxes and new job opportunities," in an August 2023 interview in Jakarta. He went on to state, "We don't just want to build batteries. This is just half of it. We want to build electric cars in Indonesia."[120] To achieve the expansion of the downstream nickel industry, the government has targeted foreign investment of US$ 21.3 billion in mining and processing projects in Indonesia.

In May 2024, the London Metal Exchange (LME) approved the listing of the first-ever Indonesian brand of refined nickel. For Indonesia, it's a vindication of its policy of forcing miners to move downstream by banning ore exports from 2020. For the LME it's a welcome liquidity booster as it looks to rebuild its nickel contract after the crisis of 2022.[121]

In November 2024, the first delivery of Indonesian cobalt metal from producer Ningbo Lygend reached the US. Chinese cobalt metal has struggled to be price-competitive in the US due to a 25 per cent tariff on Chinese goods, which was recently increased to 35 per cent. Although Lygend is a China-based company, customers in the US can take advantage of its Indonesian operations to obtain cheaper cobalt metal while

avoiding tariffs. The introduction of Indonesian-origin metal into the US market has led to a notable widening of the price range as cheaper cobalt metal becomes available.
Indonesia's trade policy related to export control of nickel ore has been challenged by stakeholders in the international community.

The World Trade Organization has ruled that Indonesia's export ban violates international regulations, siding with the European Union.

The European Union (EU) took exception to Indonesia's export ban and related domestic processing requirements. According to the EU, the ban on the export of ores unduly and illegally restricts EU access to raw materials needed for stainless steel production and distorts world market prices of ores. The USA also expressed concerns about the impact of Indonesia's export ban on global nickel supply and prices and Indonesia's increased volume of downstream stainless steel products. In December 2019, the United States joined the EU-initiated consultations concerning the consistency of Indonesia's export ban with Indonesia's WTO obligations. In November 2022, the WTO panel issued a report outlining its findings in the case and determined that Indonesia's export ban on nickel ore was inconsistent with its WTO obligations. In a December 2022 response to this determination, Indonesia filed a notice of appeal to the appellate body, arguing certain issues of law and legal interpretations in the panel. The EU may propose countermeasures (including import duties or quantitative restrictions on trade) on Indonesian exports to the EU.

Quotas for Mining Production

Introduced in 2023, Indonesia's nickel ore production quotas are provided on a company-specific basis after assessing resource-reserve estimates, sustainability and logistics issues. The system aims to curb illegal mining, improve environmental standards, and ensure responsible resource management amid concerns over premature resource depletion. Around mid-2024, the Indonesian government approved annual ore quotas worth 240 million tonnes, valid until 2026. However, by the end of 2024, the final quota was understood to have been reduced to approximately 200 million tonnes. But if based on their performance evaluation, especially post-mining reclamation and environmental management (not meeting government requirements), this could be cut further. This would leave domestic smelters reliant on imports from the neighbouring Philippines to fill this supply gap. Last year, Indonesia imported record levels of nickel ore from the Philippines to sustain domestic refined output, registering a 24-fold increase between January and October compared to the imports in 2023. Indonesia, being the largest producer of nickel globally, the short-term outlook for the nickel market and price movement depends heavily on Indonesia's decision on shifting nickel ore mining quotas in 2025.

Lock-Up of Export Earnings

Indonesia has announced an extension of the lock-up period for export earnings from resource sectors, increasing it from a minimum of three months to 12 months, effective 1 March 2025.[122] Previously, the regulation, introduced in 2023, required export earnings of at least US$ 250,000 to be held in domestic banks for a minimum of three months. With the aim of boosting foreign exchange inflow and reserves and stabilising the exchange rate, this new regulation will apply to export earnings from sectors such as mining, plantations, forestry, and fisheries.

While some feel this move will negatively affect investment sentiment in Indonesia, the Central Bank of Indonesia (BI) welcomed the new regulation and said it would support domestic financing and foster economic growth.

Global Partnerships

The USA has approached Indonesia to join the Mineral Security Partnership (MSP), a coalition of 14 countries and the European Union aimed at securing critical mineral supply chains. This initiative emerged from a broader discussion about establishing a limited or critical minerals-specific free trade agreement (FTA) between the United States and Indonesia. In November 2023, former US President Joe Biden and the then Indonesian President Joko Widodo advanced bilateral ties to a Comprehensive Strategic Partnership. Indonesia has expressed interest in a critical minerals agreement to access tax incentives from the US Inflation Reduction Act (IRA). However, mines with over 25 per cent Chinese ownership would not be eligible for IRA benefits as this will breach the US government's foreign entity of concern (FEOC) limits. In light of this, Indonesia is expected to aim to diversify its source of investment, Indonesia has been keen on a limited free trade agreement (FTA) between Indonesia and the United States, a move aimed at qualifying Indonesian exports for electric vehicle (EV) tax credits under the US Inflation Reduction Act (IRA). However, the pathway to realising this deal is fraught with significant challenges and complexities. One of the primary obstacles to this proposed agreement is Indonesia's policy on nickel exports. For a critical minerals deal to be considered, Indonesia would likely need to ease or entirely lift these export restrictions, a move that could prove politically contentious and economically infeasible for the country.[123] [124]

Indonesia's current President, Prabowo Subianto, was the Chief Guest at India's Republic Day celebrations in 2025. During his visit, India and Indonesia discussed ways to deepen their relations in areas such as security, defence manufacturing, trade, FinTech, AI, and more. Both countries decided to work closely in the areas of food security, energy, and disaster management.[125]

South Africa

Background

South Africa holds 88 per cent of global platinum group metals (PGMs), 80 per cent of manganese, and significant reserves of chromium, vermiculite, gold, vanadium, palladium, rhodium, and rare earth elements, valued at over US$ 2.5 trillion.[126]

Key bodies that manage the sector are Department of Mineral and Petroleum Resources (DMPR) (DMPR is the primary government body responsible for regulating the mining), Council for Geoscience (CGS) (conducts geological surveys to identify mineral deposits), Mine Health and Safety Council (MHSC) (advises on safety standards and regulations for mining operations), Mining Qualifications Authority (MQA) (manages skills development), Minerals Council South Africa (Represents mining companies) and Mintek (research body that helped developing the Critical Minerals Strategy methodology).

There is a handful of private institutions in SA research on critical minerals, such as the Council for Scientific and Industrial Research (CSIR), the WITS Mining Institute, and the Minerals to Metals initiative by the University of Cape Town.

Projects like the Giga-Africa 1 battery gigafactory and Sishen Iron Ore Mine Ultrahigh Dense-Media Separation focus on downstream industries. Other Major mining projects are Tshipi Borwa Mining Project (Manganese), Steenkampskraal Mining Project (Rare Earth Minerals) and others.[126] However, a Mintek report mentioned that exploration investment fell from ZAR 6.2 billion in 2008 to ZAR 1.2 billion in 2023, with challenges from unreliable energy and transport infrastructure.[127] [128]

Government Policies for promoting Critical Minerals

- The Critical Minerals and Metals Strategy, approved in May 2025, and the Mineral Resources Development Bill (MRDB), gazetted on 20 May 2025, strengthen the sector.[129] [130] The MRDB amends the Mineral and Petroleum Resources Development Act of 2002, streamlining processes and aligning with environmental regulations. [131] [132] The strategy, developed by the Department of Mineral and Petroleum Resources (DMPR) with Mintek, prioritises PGMs, manganese, iron ore, chrome ore, coal, and moderately critical minerals like copper and lithium based on export potential and supply risk (the 2018 Mining Charter promoted

transformation but faced regulatory uncertainty). The 2025 strategy emphasises geoscience mapping, research, and infrastructure to drive economic growth. [133]

- Moreover, the Exploration Strategy for the Mining Industry Of South Africa Published In 2022 identified 14 critical minerals and metals that are essential for responding to shift towards the green economy.[134]

The Final Set of 14 Minerals Critical to South Africa		
Cobalt	Rare Earth Minerals	PGMs
Nickel	Manganese	Chrome
Copper	Iron Ore	Vanadium
Zinc	Coal	Lithium
Lead	Uranium	

Bilateral Investment Agreements

South Africa's critical minerals sector is supported by bilateral agreements fostering trade and technology:

- The 8th South Africa-EU Summit held on 13 March 2025 launched a Clean Trade and Investment Partnership with a €4.7 billion Global Gateway Investment Package (€303 million grants, €4.4 billion loans) for clean energy and raw materials, aligning with South Africa's G20 presidency.[135]
- Nigeria and South Africa signed MoU on April 2025 for the Nigeria-South Africa Minerals Pact to develop lithium and iron ore through geological mapping (2025–2026), exploration (2027–2028), and processing (2030 onward), supporting the African Mining Vision.[136]
- The 2025 Mining Indaba highlighted USA's support via the Minerals Security Partnership for technical exchanges to diversify supply chains.[137]

Brazil

Background

Brazil holds the world's third-largest, rare-earth element (REE) reserves, estimated at 21 million tonnes, behind China (44 million tonnes), Russia (28.5 million tonnes) and Vietnam (22 million tonnes). Brazil's current production is a fraction of its potential. The USGS estimates (2023) that Brazil produced 80 tonnes of rare earth raw materials last year out of the total global supply of 300,000 tonnes.[138] [139]

The main rare earth elements (REEs) deposits are located in the states of Minas Gerais, Goiás, Tocantins, Amazonas, Bahia, São Paulo and on the coasts of the Northern and North-Eastern regions. The sector faces challenges like insufficient geological mapping, environmental concerns, complex regulations, and limited financing, with only 7 per cent of global REE exploration budgets allocated to Latin America.[140] However, Brazil's low labour costs, established mining regulations, huge natural resource endowment and proximity to markets like North America position it as a potential global player.[141] (Over the last decade, smelting facilities in Brazil closed due to competition from Chinese and Middle Eastern aluminium firms. However, after the country's Alumar smelter, jointly owned by South32 and Alcoa, was reactivated in 2023 after being idle for seven years, the country's aluminium production has reached levels not seen since 2014).

The key body for Brazil's mining sector is the National Mining Agency (ANM), a Brazilian federal agency linked to the Ministry of Mines and Energy, created in 2017 and responsible for regulating, licensing, and supervising all mining activities in Brazil. The ANM manages mineral resources, including prospecting, industrial and artisanal mining, extraction of raw materials, fossils, and mineral water.[142] Other key organisations include the Geological Survey of Brazil under Ministry of Mines and Energy, which conducts geoscientific research, The Brazilian Mining Association (IBRAM), a private association of companies in mining sector.[143]

Government Policies for REE Mining

According to a forecast by the Brazil's national geological service, the country has the potential to become the world's largest producer of REE.[144] Brazilian mining company Serra Verde Group is spearheading the country's push into this market from its base in Goiás state, aiming to deliver 5,000 tonnes of rare earth oxide annually by 2026. It projects demand for its products to increase by 8.5 per cent annually through 2035. In

2024, Serra Verde became the only IAC-type REE producer (Ion-Adsorption Clay Rare Earth Elements) outside China[145]

Now, Brazil's government is actively promoting REE development to diversify supply chains and challenge China's dominance (70 per cent of global production). Key policies include:

- In February 2024, Brazil's National Bank for Economic and Social Development (BNDES) and the Ministry of Mines and Energy (MME) announced a BRL 1 billion (USD 200 million) fund to support both exploration and improvements in ESG practices. It is also aimed to help finance important mineral projects including mining rare earths. The programme is called the Fundo de Investimento em Participações (FIP) Strategic Minerals or public strategic minerals investment funds.[146] [147] [148]
- Brazil's National Bank for Economic and Social Development (BNDES) and government funding agency Finep have jointly committed BRL 5 billion (approximately US$ 815 million) to accelerate the development of strategic mineral projects across the nation. This substantial financial backing encompasses both credit lines and equity investments, targeting crucial elements in the clean energy transition.[149]
- In March 2021, Decree No. 10657 was established that defined the state's strategy for REM and rare elements which established the National Strategic Pro-Minerals Policy to support the environmental licensing of investment projects for the production of strategic minerals. Additionally, Decision Number 2 of the National Secretariat of Geology, Mining and Mineral Processing in June 2021 further classified the 17 rare earth elements (REEs) and rare metals such as niobium, tantalum, thallium, lithium, tungsten, and vanadium as minerals of importance for high-tech production. This decision aligns with the broader policy framework set by Decree No. 10,657 to promote the development of Brazil's mining sector for these critical materials. [150] Moreover, in 2021, Brazilian Government established a Pro-Strategic Minerals Policy to promote production of strategic mineral production projects for the country's development. [151] [152]

International Companies and investment in Brazil's REE Mining

Several international companies, particularly from Australia, Canada, and the U.S., are active in Brazil's REE sector, often in partnership with local firms:

- Meteoric Resources NL based in Australia is developing the Caldeira project in Minas Gerais, targeting light and heavy REEs.[153] They also secured a US$ 250

million MOU with the U.S. Export-Import Bank and an offtake agreement with Neo Performance Materials (Canada) for REE oxides.[154]

- Alvo Minerals, an exploration company advancing the polymetallic copper-zinc-lead-silver-gold VMS Palma project in Central Brazil, recently acquired the Bluebush REE project. In April 2024, Alvo Minerals managing director Rob Smakman said Brazil was fast emerging as the most important REE jurisdiction globally. [155] [156]
- Brazilian Rare Earths Limited, Australia operates the Rocha da Rocha Critical Minerals Province, with high-grade deposits in Bahia, Northern Brazil. Listed on the ASX in 2023, BRE focuses on neodymium, praseodymium, dysprosium, terbium, scandium, and niobium. [157]
- Viridis Mining and Minerals, Australia is developing the Colossus REE project in Minas Gerais.[158] [159] On 27 May 2025, the company successfully delivered the first locally sourced magnetic rare earth oxides to Latin America's only magnet manufacturing facility called the CIT SENAI ITR, facility in Lagoa Santa, Brazil to facilitate metal, alloy and magnet production at demonstration scale. SENAI ITR is a public research and development center under the Brazilian National Institute of Industrial Technology (INMETRO) and the Brazilian National Institute of Technological Innovation (SENAI), with strong support from the Brazilian government and various stakeholders like Invest Minas, FIEMG, and CODEMG. [160] [161] [162]
- Rainbow Rare Earths Ltd (UK) announced in 2023 that they are developing a project near Uberaba, Minas Gerais, targeting REEs from phosphogypsum stacks in collaboration with USA based Mosaic. [163] [164]
- Moreover, in January 2025, Saudi mining company Ma'aden announced plans to invest approximately BRL 8 billion (US$ 1.41 billion) in Brazilian mineral exploration, according to Alexandre Silveira, Minister of Mines and Energy.[145]
- Other companies actively managing in REE projects in Brazil are Appia Rare Earths & Uranium Corp, Canada (active in Goiás, operating the PCH Ionic Adsorption Clay Project) and Aclara Resources Inc, Canada) (technology company, operating semi-industrial heavy rare earths pilot plant facility in Goiás, recognized for its Circular Mineral Harvesting process, emphasising sustainable extraction)[165]. These projects aim to tap into ionic clay deposits, which showcase geological similarities to Chinese deposits, a rarity outside of China. [166]

The Philippines

Background

The Philippines is the world's second-largest nickel ore producer after Indonesia, accounting for 10.5 per cent of the global total in 2024. Currently, a significant portion of the Philippines' output is exported in its unprocessed form, primarily to China's nickel pig iron (NPI) industry, with the remainder consumed at two domestic high-pressure acid leach (HPAL) plants. In a notable development last year, increasing volumes of ore were exported to Indonesian smelters that were facing a shortage of domestic feedstock.

Mirroring Indonesia's strategy of banning exports of nickel-bearing ore, the Philippines is set to ban raw mineral exports to incentivise investment in domestic processing, enhance higher-value exports, and create jobs.[167] The Philippines' export ban was approved by the Senate on 3 February 2025. If signed into law, it will take effect following a five-year transition period to allow mining operators sufficient time to establish processing facilities and develop downstream industries.

Within the context of heightened geopolitical tensions between China and the USA, as well as ongoing international trade tensions, the ore export ban could serve as a strategic opportunity for the Philippines to attract Western investors to develop domestic processing capacity. The Philippines could be well-positioned to benefit, particularly as it already supplies nickel intermediates in the form of mixed sulphide precipitate (MSP) to Sumitomo Metal Mining's (SMM) IRA-compliant nickel sulphate operations in Japan. The USA has also demonstrated interest in the Philippines, which is positioning itself as a "non-China/Indonesia" supply chain partner for nickel.

Global Partnerships

However, efforts by US interests to secure the upstream sectors of the nickel supply chain would necessitate collaboration with partners possessing the technical expertise required to hydro-metallurgically process low-grade laterite ores into battery-grade nickel intermediates. This technical know-how, which has been expertly developed by Chinese entities, including ENFI and Huayou in Indonesia, is also demonstrated by Japan's SMM, which operates the Coral Bay and Taganito HPALs in the Philippines.

However, replicating Indonesia's success presents a massive challenge for the Philippines. On the supply side, the country lacks well-developed infrastructure, as well as sufficient low-cost coal resources to generate the electricity required for nickel refining. On top of this, its nickel ore grades are typically lower than those in Indonesia.

On the demand side, the global nickel market, particularly the Chinese stainless steel sector, is currently oversupplied. Moreover, the current low nickel prices present a significant obstacle to securing investment interest in this area. Consequently, there may not be adequate market incentives to support the development of new refining capacity within the Philippines.

In addition to the uncertainty surrounding the development of the downstream nickel supply chain, the Philippines government is expected to face significant pressure from the local ore mining industry. This sector is likely to experience substantial short-term economic losses and reductions in employment if the proposed ore export ban were to be implemented.

Second, differences in investment approaches between Western and Chinese entities play a significant role. China's investment in Indonesia's nickel sector did not rely on short-term gains or high profits related directly to nickel production. Instead, it focused on long-term advantages and domination of the downstream supply chain, such as EV batteries, as well as broader strategic national benefits. For instance, companies such as Tsingshan and CATL have invested heavily in Indonesia's nickel mining and refining sectors as part of their vertical integration strategies to secure raw materials for stainless steel and batteries. Conversely, many Western counterparts lack downstream business operations to capitalise on long-term benefits related to investing in the upstream nickel supply chain.

The USA has been working with critical minerals companies in the Philippines. In November 2023, the University of the Philippines Public Administration Foundation (UPPAF), in collaboration with the U.S. Agency for International Development (USAID) and the U.S. Commercial Service, and five Philippine government agencies formalised a partnership to operationalise a US-funded Php280 million (US$ 5 million) technical assistance program to develop the Philippines' critical minerals sector. The program was aimed to support the Philippine government's goal to become a major global value chain player in the clean energy sector by maximising the country's mineral potential and increasing value addition through mineral processing. It includes technical support for streamlining permitting processes, advancing policy reforms, improving minimum governance standards, and helping facilitate investments in minerals processing and other downstream industries. The Chamber of Mines of the Philippines and the Philippine Nickel Industry Association also signed the MoU to symbolise the importance of collaboration between the government and the private sector. [168]

It remains to be seen whether the Philippines can be as successful as Indonesia after taking a bold decision to ban the export of nickel ore. While US investment in nickel ore could play the same role for the Philippines that Chinese investment did for Indonesia, there are concerns that the new US administration under President Trump

might prefer shifting focus back to domestic oil and gas over energy transition, this remains uncertain.

India and the Philippines have been aiming to deepen collaboration in the defence and strategic sectors. extended an invitation to the Philippines for collaboration in developing and producing weapons systems, alongside supplying BrahMos missiles. Amid ongoing tensions with China, both nations discussed enhancing defence cooperation and self-reliance. They appreciated bilateral initiatives such as white shipping information exchange and establishing a new defence wing at the Indian embassy in Manila. It remains to be seen whether this collaboration is extended to the critical minerals sector.

Kingdom of Saudi Arabia

Background

Saudi Arabia aims to become an important hub for critical mineral mining and refining as part of its "Vision 2030" economic diversification strategy. With untapped phosphate, gold, lithium, rare earth, and copper resources, Saudi Arabia has strong potential to become a global mining hub as demand for critical and strategic minerals rises. Saudi Arabia's location between Europe, Asia, and Africa strengthens its position as a mining hub. The Kingdom has positioned itself as a geopolitically 'neutral' player in the critical minerals sector to attract investments from China, India and Western players alike. With a strong energy sector, the Kingdom also offers reliable, low-cost energy for processing both local and imported minerals.

The Saudi government aims to lift the domestic mining sector's GDP contribution from US$ 17 billion to US$ 75 billion by 2030, offering to derisk mining investments through public financial incentives.

Saudi Arabia is leveraging its Public Investment Fund (PIF)[k] and Ma'aden, the country's state miner, to target strategic investments both at home and abroad. Ma'aden has committed US$ 12 billion to mining projects by 2030.

India's Vedanta Group recently announced a US$ 2 billion commitment for a copper-processing facility in the Kingdom, while in January, oil giant Saudi Aramco (Aramco) and Ma'aden announced a joint venture targeting lithium extraction, targeting commercial-scale production by 2027. Currently, Saudi Arabia is home to the Jabal Sayid copper project, a collaboration between Ma'aden and Barrick Gold, and is the world's sixth-largest producer of phosphate rock, commissioning projects to increase production – although it lacks the purified phosphoric acid (PPA) capacity needed for lithium iron phosphate (LFP) cell production.

At the Future Minerals Forum in Riyadh in January 2025, Saudi Arabia presented $100 billion worth of domestic investment opportunities and outlined plans to expand geological exploration targeting lithium, rare earths, copper, and nickel deposits.[169] The Saudi government estimates the country's untapped mineral resources to be worth US$ 2.5 trillion.

[k] With about US$ 925 billion asset under management, Saudi Arabia's PIF, one of the world's largest sovereign wealth funds, is developing a portfolio of high-quality domestic, regional and international investments diversified across sectors, geographies, and asset classes.

Key Measures to Accelerate the Growth of the Mining Sector

Saudi Arabia's 'Vision 2030' has created a growing economy, making the Kingdom an attractive investment hub. The strategy's focus on 12 industrial sectors, many dependent on mining, reinforces this commitment.

Saudi Arabia's 2021 mining law simplified licensing, attracting over 70 firms in the initial rounds and improving the sector's investment climate. The 2023 Global Risk Report ranked Saudi Arabia as the world's most improved mining investment destination.

Aside from offering capital to de-risk project development, the Kingdom has reformed its mining laws to align closer with investor-friendly jurisdictions like Australia and Canada, resulting in a surge in active mine licenses since 2023.

The Ministry of Industry and Mineral Resources aims to reduce the license issuance period to less than 180 days this year. The ministry plans to issue at least 60 mineral exploitation licenses in classes A (precious metals) and B (industrial minerals like cement and bricks), plus over 200 licenses in the construction materials sector, which is seeing annual changes.

In March 2025, Saudi Arabia launched the 9th Exploration Licensing Round, opening pre-qualification applications for three mineral-rich belts spanning 24,946 km². This initiative is a key step in its broader plan to offer exploration licenses across 50,000 km² in 2025.[170] [171]

Saudi Arabia launched the Saudi Geological Survey Academy in March 2025 as a key skill development body to nurture talents and expertise in geology and earth science.[172]

In particular, the Kingdom is leveraging expertise in oil extraction to position itself as a global leader in adopting direct lithium extraction (DLE) technology, focusing on oilfield brines. In late 2024, Aramco and Saudi Lithium Infinity (Lihytech) announced the first successful lithium extraction from oilfield brine at a pilot scale.[173] Three announced lithium projects are projected to supply over 20,000 tonnes of lithium carbonate equivalent (LCE) by the end of the decade.

Additionally, Saudi Arabia is forecast to produce 60,000 tonnes of pet needle coke from oil feedstocks by 2030, supporting a 20,000-tonne synthetic anode facility, alongside a planned 20,000-tonne natural graphite anode facility.

Downstream

Aside from attracting investment in the upstream sector, Saudi Arabia is keen to develop the downstream sector and has set an ambitious target to produce 500,000 EVs domestically by 2030.

Saudi Arabia is also involved in developing mid- and downstream capabilities domestically. In 2021, Saudi Arabia became the first Middle Eastern country to establish pipeline capacity in lithium processing by signing an agreement with EV Metals Group to build a battery chemicals complex in Yanbu Industrial City. In 2023, TAQAT Development, a Saudi energy company, began a joint venture with Novonix to build a 30,000-tonne capacity graphite anode materials facility to supply EV and energy storage systems (ESS) to markets in the Middle East and North Africa.

The kingdom's ambition of producing EVs began to materialise in 2022 when Lucid Motors announced that it would build its first ex-US factory in Saudi Arabia and when the Saudi EV brand 'Ceer' was launched. The Saudi PIF backs both investments. The Saudi government has announced its goal of producing 500,000 EVs by 2030 and making 30 per cent of all vehicles on the road in Riyadh electric. [174]

Overseas Investments

To secure resources to support domestic mineral processing before the domestic natural resources sector is fully developed, Saudi Arabia has pursued a number of International partnerships – reaching preliminary agreements with several African countries, including the Democratic Republic of the Congo (DRC) and Zambia, to strengthen access to resources. Notably, the US views Saudi Arabia as a strategic partner for investments in Africa, often in jurisdictions that Western firms have long viewed to be too risky.

In early 2023, Saudi Arabia launched Manara Minerals, a joint venture between Ma'aden and the Public Investment Fund (PIF), with a mandate to begin acquiring overseas mining assets. Saudi Arabia's overseas acquisitions so far have been limited to a 10 per cent stake in Vale Base Metals in early 2024 when it was interested in a US$ 3.5 billion deal with Brazilian miner Vale for 10 per cent of its copper and nickel base metals division, marking its first entry into battery metals mining.[175] In January 2025, it agreed to acquire a minority stake in Barrick Gold's Reko Diq copper project in Pakistan, a project positioned to become the next major greenfield copper development.

Saudi Arabia is also reported to be in early-stage discussions with Chile's Codelco regarding potential copper investments in South America while also exploring lithium opportunities in the region.[176]

At the Future Minerals Forum in January 2025, the Brazilian Federal Government announced a BRL 8 billion investment by Ma'aden in geological mapping, research, and mineral exploitation in Brazil.[177] [178]

Global Partnerships

India

India's Union Minister of Coal & Mines, Shri G. Kishan Reddy, held a high-level meeting with Saudi Arabia's Minister of Industry and Mineral Resources, Mr Bandar Ibrahim Alkhorayef, in New Delhi on 4 February 2025. The dialogue builds on India's engagement at the Future Minerals Forum (FMF) 2025 in Riyadh, where Shri Reddy highlighted India's commitment to securing critical minerals essential for the energy transition and clean energy systems. The meeting aimed to strengthen cooperation in the critical minerals sector and explore new avenues for investment and technological collaboration.[179]

Key points of the meeting included:

- Resilient Mineral Supply Chains: Both leaders emphasised the need to establish reliable and secure mineral supply chains to reduce import dependency.
- Investment in Value-Added Processing: The focus was on promoting joint ventures to process critical minerals to support clean energy technologies.
- Technological Collaboration: Discussions also explored cooperation in adopting advanced mining technologies and innovation for sustainable mineral exploration and extraction.

It was agreed that the Geological Survey of India Training Institute (GSITI) will offer specialised training programs for geologists from Saudi Arabia as well as from several countries in, Africa, and Central Asia, contributing to capacity building in the global mining sector.

The UK

In the run-up to the Future Minerals Forum, it was announced that the UK's Industry Minister Sarah Jones will sign a new critical minerals partnership at the event. While in Riyadh, the minister will hold a bilateral meeting with Saudi Arabia's Industry and Mineral Resources Minister, Bandar al-Khorayef, and participate in a ministerial

roundtable with key players from across the sector before signing the Memorandum of Understanding.[180]

The minister led a trade mission of 16 UK critical minerals companies to the Future Minerals Forum. The participating UK companies included Beowulf, Cornish Lithium, Cornish Metals, Cornwall Mining Alliance, Dendra, Deswick, Edge, Gravity Mining, GSA Environmental, Headland Archaeology, Next Generation SCM, Project Blue, Sensoteq, SFA Oxford, UMS Group, and Westcountry Minerals.

In the past, Under the auspices of the GREAT Futures campaign and within the framework of the Kingdom of Saudi Arabia and the United Kingdom Strategic Partnership Council, Saudi Arabia's Minister of Commerce, H.E. Dr Majid Al-Kassabi, and the UK's former Deputy Prime Minister, the Rt Hon Mr Oliver Dowden MP held the fourth meeting of the Economic and Social Pillar in Riyadh in May 2024. Both sides reiterated the need for diversified and secure supplies of critical minerals, and the UK reaffirmed its support for and participation in leading UK institutions in Saudi's Future Minerals Forum. They welcomed the London Metals Exchange announcement regarding its intention to list Jeddah as a new global metals warehouse location.[181]

Democratic Republic of Congo

Background

The Democratic Republic of the Congo (DRC) is the largest country in sub-Saharan Africa and is endowed with many natural resources. The DRC recently overtook Peru to become the second-largest producer of copper and is by far the world's largest source of cobalt. Both commodities are key to the global energy transition.

The DRC has some of the highest-quality copper reserves globally, with some of the mines estimated to contain grades above 3 per cent, significantly higher than the global average of 0.6 - 0.8 per cent. The province of Lualaba (formerly Katanga), located in the south of the country, also known as the Copper Belt, has a long history of industrial copper mining, often combined with cobalt. These resources are concentrated in and around the cities of Lubumbashi, Kolwezi and Likasi. Cobalt is the key by-product of copper mining. DRC has about 53 per cent of global cobalt reserves and currently accounts for nearly 73 per cent of global production.[182] DRC's gold mining sector is also witnessing renewed interest from mining companies.[183]

The Lobito Atlantic Railway, which stretches over 800 miles, drastically reduces transportation times from Congo's copper and cobalt mining region. The port of Lobito on the Atlantic coast is closer to the U.S. and Europe than Africa's more widely used Indian Ocean ports.

Key Policy Initiatives

DRC's current policies in the critical minerals areas mainly focus on addressing the oversupply situation in the cobalt market through a short-term export ban, formalising the artisanal mining sector to address social and human rights issues, resolving regional political conflicts that might affect the investment climate in DRC, and attracting investment from diverse sources rather than relying heavily on China.

In a significant move to address the oversupply in the cobalt market, the DRC's Authority for the Regulation and Control of Strategic Mineral Substances Markets (ARECOMS) announced a four-month suspension of cobalt exports in February 2025. This decision aims to stabilise prices and manage the surplus that has been impacting the market. Initially, a four-month stoppage suggests a maximum supply reduction of one-third of the current projected cobalt production. This assumes that all miners cease cobalt production for the duration of the ban and resume normal production afterwards. The DRC halting exports of cobalt for four months could shrink the forecast oversupply for this year, though the extent of this will depend on whether producers

curtail production or increase stocks. However, mine closures are unlikely, as copper production must still be maintained. Instead, cobalt will likely be stockpiled in the DRC and sold subsequently. The low-price environment poses significant challenges to producers as well as the government, which relies on the income from royalties on cobalt exports.[184]

Large-scale mining (LSM) represents 70-80 per cent of DRC cobalt production, while the rest (20-30 per cent) comes from artisanal and small-scale mining (ASM). This means that artisanal cobalt production in DRC comprises 13-20 per cent of world production. The 2018 DRC Mining Code limits ASM activity to Artisanal Mining Zones (Zone d'exploitation artisanal (ZEAs)). However, due to few viable ZEAs and the concentration of deposits on private Exploitation Permits (PEs) intended for industrial mining, most ASM cobalt production currently takes place on PEs. ASM activities often overlap with active LSM operations or occur in inactive or residential and peripheral areas of the concession.

Challenges

Aside from occupational health and safety concerns, artisanal and small-scale mining sites face several other labour-related issues. Artisanal mines often operate illegally or at least informally, lacking the appropriate licenses and land rights to conduct their operations. Miners often feel exploited by traders, and the use of child labour in ASM operations has been described as a systemic issue by research published by Amnesty International and Berkeley University in the past.[185]

The DRC's mining code recognises artisanal mining alongside industrial mining as having developmental potential as a livelihood source. However, regulation of the artisanal mining sector has yet to be fully enforced. Several organisations, including the Fair Cobalt Alliance (FCA) and the Cobalt Institute, are working with the DRC authorities and mining communities to enable dignified working conditions, remediate child labour, and raise community incomes. Global organisations such as Save the Children and the Centre for Child Rights and Business have joined some of the FCA's initiatives. Formalising and professionalising the artisanal mining sector to create fairly sourced cobalt relies on all stakeholders taking shared responsibility.[186] The Cobalt Institute estimates that about 100,000 – 200,000 people work in the ASM sector. Responsible mining practices are essential to formalise the mining practices while allowing people a source of living.[187] In a major development, the DRC has recently granted state-owned EGC exclusive rights to export artisanal cobalt. This move aims to capitalise on the country's pivotal role in the global supply of battery metal and is part of broader efforts to strengthen its influence over cobalt prices following a period of market instability.[188]

While Chinese investors have dominated the DRC's mining sector, the country is aiming to diversify its investment sources. Congo's government has grown increasingly frustrated by its lack of influence over its mining industry, particularly in cobalt, a key ingredient in many electric-vehicle batteries. The country accounted for about three-quarters of global metal output last year, but a spike in production by miners in the nation , particularly China's CMOC Ltd. , has pushed prices to eight-year lows. The government is now looking to make "strategic choices" about who runs Congo's mines, citing this year's example of the state's decision to oppose a proposed sale of Trafigura Group-backed copper and cobalt miner Chemaf Resources Ltd. to China's Norin Mining Ltd.[189] DRC is trying to secure investments from the US, Europe and India in the mineral sector. However, DRC needs to address the concerns of potential investors regarding corruption, environmental pollution, and labour issues.

DRC is aiming to resolve the political tensions that escalated between January and February 2025 when the M23 rebel group, backed by Rwanda, captured several cities in North and South Kivu – two resource-rich provinces in Eastern Congo. The conflict forced schools and businesses to close, caused civilians to flee, and has had adverse economic consequences for Congo. At least 8,500 people have been killed since fighting escalated in January, according to the Congolese authorities. Allegedly, the rebels smuggled coltan[I] and various mineral resources to Rwanda, which faced accusations of exploiting Congo's mineral wealth through its support of M23 - allegations that Rwanda has denied.[190] Despite growing international pressure, the DRC has yet to open direct talks with the M23 rebels. The UK Government has encouraged the DRC to initiate an inclusive dialogue to help find a political solution to the conflict.[191] In March 2025, DRC extended an offer to the US, proposing exclusive access to its critical minerals and infrastructure projects. In return, the DRC is seeking US security assistance to resist the M23 rebel group. In a direct appeal, Congo has requested an urgent meeting between President Felix Tshisekedi and US President Donald Trump.[192] While the USA and the DRC are expected to have exploratory discussions on a possible mineral deal[193], India, too, has initiated discussions with the DRC to source key critical minerals such as cobalt and copper from the country.[194]

[I] Coltan, short for columbite-tantalite, is a dull black metallic ore from which the elements niobium and tantalum are extracted.

Morocco

Background

Morocco has nearly 70 per cent of the world's phosphate reserves and ranks 19th worldwide and 1st in Africa for silver exploitation, 7th worldwide and 2nd in Africa for fluorite, 3rd worldwide and 1st in Africa for barite, and 11th worldwide and 3rd in Africa for cobalt. The mining sector currently contributes between 7 per cent and 10 per cent to Morocco's GDP and nearly 22 per cent of the country's exports.

Located on the western flank of the MENA region, Morocco is looking to establish itself as an EV battery-making hub serving Western markets. The country also geographically well-situated, linking Europe to Africa. Its state-owned phosphate giant, OPC, has subsidiaries in 16 African countries. Due to its privileged status as an EU and US free trade agreement (FTA) partner, the latter partnership allowed materials produced there to be eligible for IRA EV tax credits. Morocco has attracted several mid- and downstream investments. The cheap availability of clean energy is further boosting the sector - Morocco plans to generate 50 per cent of its electricity from renewable energy sources by 2030. The country has abundant solar and wind energy resources.[195]

Morocco's rich phosphate reserves can cater to the rising demand for phosphate globally, which is used to make phosphoric acid for lithium iron phosphate (LFP) cathodes. As demand for next-generation LFP and lithium manganese iron phosphate (LMFP) cathode chemistries increases, more phosphoric acid will be needed. According to the USGS Latest Report on Morocco and Western Sahara Minerals (USGS, 2022), Morocco was the 11th-ranked and 17th-ranked producer of cobalt and silver, respectively, and accounted for 1.8 per cent and 1.4 per cent of world output, respectively. Morocco's leading mining company, Managem, is focusing on increasing its output of cobalt cathode, copper concentrate, and Silver, also leveraging African-wide regional value chains and shares in mining sites across the continent, such as the Pumpi Mine in Congo (Kinshasa).[196]

Over $700 million has been pledged for battery materials plants, which could increase Morocco's cathode production capacity to around 150,000 tonnes a year,around a quarter of Europe's planned cathode production capacity by 2030. Morocco has set a goal to produce 100,000 electric vehicles per year by 2025 and has been leveraging its existing automotive capabilities to attract more foreign investments. Renault-Nissan and Stellantis, Morocco's major automakers, have announced plans to expand EV production there.

Besides the investments from the West, several Chinese firms have committed investments in Morocco. So far, Morocco has seen commitments from Chinese firms such as BTR, CNGR, Huayou Cobalt, Gotion, and Guangzhou Tinci. Gotion's lithium-ion investment in Morocco would become Africa's first battery cell project. Moroccan investment agency CDG Group plans to invest 300 million euros ($280 million) in the first phase of Gotion's Moroccan project.[195] The unit will start production in the third quarter of 2026. The growing Chinese involvement in Morocco's critical minerals sector could create barriers to selling into the US market based on the latest proposed FEOC guidelines issued under the Biden Administration. Chinese firms may also have an incentive to set up shop in Morocco to bypass potential export restrictions on phosphates, which are also used for fertiliser.

Key Policy Initiatives

In June 2021, Morocco announced the new Morocco Mining Plan 2021-2030. The plan was developed along four strategic pillars: developing a network of competitive stakeholders, reforming how the sector's institutions are organised, ensuring the mining sector's positive social impact and sustainable development, and altering Morocco's legislative framework to make it better suited to the county's new ambitions" in the sector.[197]

The policy has been key to attracting investments in the EV value chain. Macroeconomic stability, infrastructure improvement, and incentives for international investors are supporting the country's development. Among its initiatives to attract investment are Morocco's 119 industrial zones and 7 Special Economic Zones, which have no taxes during a company's first 5 years in business and a reduced rate beyond that.

Angola

Background

Angola is emerging as a significant player in the global critical minerals landscape, leveraging its vast and largely untapped mineral wealth to attract investment and diversify its economy beyond oil and diamonds. The country's critical minerals assets comprise lithium, cobalt, copper, rare earth elements (like neodymium and praseodymium), and nickel,essential for clean energy technologies like electric vehicle batteries, wind turbines, and solar panels. [198]

Angola is witnessing large foreign interests in the mining sector. The Longonjo Rare Earth Project, led by UK-based Pensana Plc, is a flagship initiative near Huambo, targeting production of 20,000 tonnes per year of mixed rare earth carbonate,about 5 per cent of the global supply of magnet rare earths. In March 2025, Pensana secured US$ 268 million for Phase 1, backed by the Africa Finance Corporation and Absa Bank.[199] [200] [201] Once in the second phase of production, the mine will produce around 5 per cent of the world's production in the form of a high-value mixed rare earth carbonate, capable of being converted into permanent magnets for electric vehicles and offshore wind turbines. Pensana is setting up the rare earth separation and processing facility at Saltend in the Humber Freeport in the UK.

In 2023, Japan signed several trade cooperation deals with Angola during the visit of Japan's Minister of Economy, Trade and Industry, Nishimura Yasutoshi Angola.[202] In April 2024, the UK's Gemcorp plans a US$ 1 billion investment in southern African critical minerals, including Angola, and British firms like Anglo American and Rio Tinto are exploring copper, cobalt, and rare earths.[203] In September 2024, the EU inked a Sustainable Investment Facilitation Agreement (SIFA) with Angola, targeting not only its critical minerals potential but also green energy, agri-food value chains, digital innovation, fisheries, and logistics, aiming to diversify Angola's economy beyond oil under the EU's Global Gateway strategy.[204]

As mentioned earlier in this report, the U.S. and EU-supported Lobito corridor project will help mining and mineral industries in Angola, Zambia, and the DRC access the U.S. and the European market through the Lobito port on the Atlantic coast.[205]

Key Policy Initiatives

Angola's government is capitalising on its large mineral potential. The National Development Plan (2023-2027) prioritises mineral development (non-oil sectors like mining and agriculture) as part of plans for economic diversification and attracting FDI,

supported by the National Geology Plan (PLANAGEO), a seven-year survey completed in 2022 that maps resources to attract investors.[206] The National Agency for Mineral Resources (ANRM), established in 2020, regulates and encourages investment. Angola's current policies encourage the local processing of minerals rather than the export of ores. Gold and manganese production has begun, with rare earths, titanium, and lithium in the advanced prospecting stages.[207] Angola joined the Extractive Industries Transparency Initiative (EITI) in 2022, signalling a commitment to openness, which boosts investor confidence. The country also provides several tax and other incentives to attract investment in the mining sector.[208]

Challenges such as infrastructure gaps, a history of corruption, and post-civil war landmines deter some investors. Yet, with its strategic minerals, improving governance under President João Lourenço, and growing global demand, Angola is positioning itself as a key supplier in the critical minerals race.

Zambia

Background

Zambia has introduced laws and policies aimed at attracting foreign direct investment (FDI) in its mining sector, particularly in critical minerals such as copper and cobalt, as well as emerging resources like lithium. These measures align with its economic diversification goals and the global demand for minerals essential to the green energy transition. [209]

Key Policies

Zambia's legal framework for attracting Foreign Direct Investment (FDI) in the mining sector is anchored in the Mines and Minerals Development Act No. 11 of 2015, which has been amended over time to enhance investment appeal. Key measures include a stable tax regime and streamlined licensing process.[210] The 2023 National Mineral Resources Development Policy designates critical minerals as strategic, encouraging investment in exploration and value chains, supported by a planned 2024 geophysical survey to map resources like lithium.[211] The plan supports the Zambia Development Agency (ZDA) Act, which provides investment protection and guidelines for investing in Zambia.[212] [213]

These align with Zambia's Eighth National Development Plan (2022-2026), launched by Ministry of Finance and National Planning, Republic of Zambia in June 2022, which prioritises mining growth to achieve the production of three million metric tonnes of copper by 2032, leveraging its status as Africa's second-largest copper producer and in turn aligning with Zambia's Vision 2030.[214] [215] [216]

Recent Significant Investment and Bilateral Agreements

Zambia has entered into several bilateral agreements to strengthen its mining sector, especially for critical minerals:

- In January 2023, the USA signed a MoU with DRC and Zambia at the Africa Leaders' Summit. This MOU supports an electric vehicle battery value chain using DRC's cobalt and Zambia's copper and cobalt, backed by the U.S. through the Minerals Security Partnership.[217]

- A similar MOU was signed between EU, DRC and Zambia in October 2023 in Brussels, under the EU Global Gateway programme to boost critical raw materials value chains, linking Zambia's copper and cobalt to European green tech via the Lobito Corridor. Once fully operational, the Corridor will enhance export possibilities for Zambia, Angola and the DRC, boost the circulation of goods, and promote the mobility of citizens. [218] [219]

- The United Nations Conference on Trade and Development (UNCTAD) Investment Policy Hub provides more details of Zambia's Bilateral treaties and foreign investments.[220]

Zambia's critical minerals sector has seen major FDI from several nations.

- In 2023, Silicon Valley-based startup KoBold Metals, backed by Bill Gates and Jeff Bezos, has reportedly committed over US$ 200 million for copper and cobalt exploration in the Copperbelt, using AI and machine learning. The total estimated investment amount stands at US$ 2.3 billion to boost copper production in Zambia.[221] [222]

- In 2022, Canada-based First Quantum Minerals Expansion announced a commitment of US$ 1.25 billion investment to expand the Kansanshi copper mine in Zambia's Northwestern Province.[223] [224]

- UAE also has long term interests in Zambian mining. As of early 2024, UAE's International Resources Holding (IRH) secured a US$ 1.1 billion investment with 51 per cent stake in Mopani Copper Mines. This deal outbid Chinese and South African firms.[225]

- China holds a dominant position in Zambia's copper mining sector. Chinese firms such as China Nonferrous Metal Mining Group hold stakes in copper mines like CNMC Luanshya Copper Mines, with investments exceeding US$ 2 billion historically.[226] Recently, in March 2025, operations of one of the Chinese mines in Zambia, operated by Sino-Metals Leach Zambia, a company largely owned by China Nonferrous Metals Industry Group, reportedly caused an environmental hazard due to an acid leak that contaminated the Kafue River. The Ministry of Water Development and Sanitation reported "severe damage," including the destruction of crops along the river.[227]

Argentina

Background

Argentina is a key player in the extraction of critical minerals, with a focus on lithium, copper, gold, and silver. It sits within the 'Lithium Triangle' (alongside Chile and Bolivia) in South America, which holds some of the world's largest lithium reserves. Argentina ranks third in terms of global lithium reserves at 20 million metric tonnes (mostly brine-based) and has the fourth-largest copper reserves at approximately 44 million tonnes. According to the International Trade Administration, Argentina earned mining exports of about US$ 3.8 billion with a 4 per cent annual growth and has the potential to achieve mining exports well worth over US$ 18 billion per annum by 2030.[228] Currently, Argentina has more than 150 mining projects in various stages of development. [229]

Mining in Argentina is regulated at both federal and provincial levels. The Federal Secretariat of Mining (under the Ministry of Economy) and the Federal Mining Council (COFEMIN) (a collaborative organisation comprising representatives from all 23 provinces and the national government) oversee national policy, while each province manages its own regulations through local authorities.

Provinces have their own mining procedural laws and governing bodies, such as the Ministry of Mining in Catamarca (along with its state-owned company CAMYEN) and the Government of Jujuy (through JEMSE), among others.

The Argentinian Geological Survey (SEGEMAR), a government agency under the National Secretariat of Mining, provides geological, topographic, and metallogenic maps of the country, along with exploration services and mineral resource data.[230]

The Argentine Chamber of Mining Companies (CAEM) advocates for investment, sustainability, and policy improvements. Representing 160+ members, including mining companies, suppliers, and provincial chambers, CAEM facilitates dialogue between investors, authorities, and industry leaders. It also supports provincial participation in national initiatives like RIGI (Régimen de Incentivo para Grandes Inversiones - Promotional Regime for Large Investment) to accelerate major projects, strengthening Argentina's mining framework alongside working on legal regulations and supporting international investment agreements. [231]

Key Policy Initiatives

Argentina's mining policies are designed to attract domestic and foreign investment through a robust mix of legal frameworks, fiscal incentives, and regulatory stability. Environmental oversight is a cornerstone, governed by Act No. 25,675 and Law No. 24,585 under the Mining Code. These laws mandate an Environmental Impact Assessment (EIA) before operations begin, followed by a biennially updated Environmental Impact Statement (EIS) to ensure ongoing compliance and transparency to reduce environmental risks and foster sustainable investment.
The National Mining Code sets the foundation for mining rights,covering mine acquisition, maintenance, transfer, and revocation,while provincial procedural laws align with these guidelines to streamline implementation. Complementing this, the Mining Investment Law, established in 1993, offers a 30-year guarantee of fiscal and foreign exchange stability, alongside stage-specific benefits, making Argentina a reliable destination for long-term projects.

Sustainability and transparency are further prioritised through Argentina's 2019 entry into the Extractive Industries Transparency Initiative (EITI). Since 2022, the SIACAM online system provides accessible data on economic, environmental, social, and cadastral aspects of mining, reinforcing accountability. In 2024, RIGI strengthened this framework, targeting projects between US$ 200 million and US$ 900 million with VAT and income tax benefits, duty exemptions, fiscal stability, and unrestricted foreign currency access. Together, these policies create a compelling, stable environment for responsible mining investment.[232] [233] [234]

Significant Recent Bilateral Investments

Argentina has entered various Bilateral Investment Treaties with several countries, including the United States, Australia, Canada, China and South Africa, for the promotion and protection of investment. In 2023, Argentina's top five mining export destinations saw distinct product concentrations: Switzerland (92.1 per cent gold, 7.9 per cent silver), the United States (87.3 per cent gold, 11.5 per cent silver), China (91.2 per cent lithium, 4.0 per cent silver, 3.1 per cent lead), Canada (54.5 per cent silver, 45.4 per cent gold), and India (98.1 per cent gold, 1.5 per cent lithium). [232]

In August 2024, the U.S. and Argentina signed a Memorandum of Understanding (MOU) in Buenos Aires to enhance cooperation on critical minerals. This agreement, part of the U.S.-Argentina Energy Security Dialogue, aims to strengthen supply chains, promote trade, and encourage investment in exploration, extraction, and processing. It aligns with the USA-led Minerals Security Partnership (MSP), which includes 14

countries and seeks to counter China's dominance in critical minerals. The MoU positions Argentina to potentially benefit from the U.S. Inflation Reduction Act (IRA) tax credits (which are currently under review under the US Presidency of Donald Trump), though Chinese ownership in some projects complicates eligibility.[235]

In February 2024, India and Argentina's Catamarca Province signed an MOU between India's Mineral Exploration and Consultancy Limited (MECL) and provincial authorities. This agreement focuses on lithium exploration and mining, utilising Argentina's resources to meet India's growing demand for EV batteries and renewable energy storage. It includes frameworks for joint ventures and long-term supply contracts. India's KABIL plans to explore and develop five adjacent lithium brine sites in Argentina, covering 15,703 hectares for 20 years, with an option for extension, at a projected cost of US$ 27 million (INR 2.16 billion).

In March 2025, Rio Tinto, a global mining giant, confirmed a US$2.5 billion investment to expand the Rincon lithium project in Argentina, marking the company's first commercial-scale lithium operation in Salta Province. This investment, tied to Rio Tinto's acquisition of Arcadium Lithium[m], underscores Argentina's appeal as a lithium hub and reflects confidence in its policy direction as a part of its market-friendly reforms.[236]

[m] Arcadium Lithium plc, a lithium chemicals production company, is headquartered in Shannon, Ireland. It operates globally, with assets in Argentina, Canada, and Western Australia, and downstream conversion assets in the U.S., China, Japan, and the UK. Rio Tinto completed the acquisition of the company in March 2025.

Bolivia

Background

Bolivia's economy relies heavily on natural resources,minerals, natural gas, and agriculture,with mining as a key pillar. Mining accounts 28 per cent of exports (US$ 2.2 billion in 2017), spanning silver, tin, zinc, gold, and critical minerals like lithium. [237] Historically, tin has been one of the country's most significant mineral exports, with Bolivia being a leading global producer. The country is also rich in silver, particularly from the famous Cerro Rico mine in Potosí. Additionally, Bolivia is a major producer of zinc, largely extracted from large mining operations such as the San Cristóbal mine. In recent years, lithium has emerged as a highly valuable resource, with Bolivia holding some of the largest lithium reserves (mostly brine-based) in the world, located in the Salar de Uyuni salt flats. The sector is diverse, involving state-owned enterprises and private domestic companies, and attracts the interest of foreign miners. Environmental challenges, including water contamination from gold mining and deforestation in the Amazon, add complexity to its development.

In 2023, Bolivian President Bolivia Luis Arce stated that Bolivia's lithium reserves were estimated at 23 million metric tonnes (MT) (in locations such as Salar de Uyuni, Coipasa and Pastos Grandes salt flats). This reserve size is the largest in the world and larger than the reserves of its 'Lithium Triangle' counterparts, Argentina (20 million MT) and Chile (11 million MT). [238]

Key Bolivian mining companies in critical minerals include state-owned Corporación Minera de Bolivia (COMIBOL) and Yacimientos de Litio Bolivianos (YLB). While COMIBOL has been focusing on base minerals (it has a subsidiary mine called Empresa Minera Huanuni, the largest tin producer in Bolivia) and REE, YLB leads in lithium extraction and processing, managing Uyuni's plant and foreign partnerships.

Key Policy Initiatives

Government policies have historically leaned toward resource nationalism, with the Bolivian Constitution declaring natural resources state property (Law No. 535). Since 2014, it shifted from a concession-based system to one requiring contract with the state-owned Corporación Minera de Bolivia (COMIBOL), ensuring government oversight while allowing private and cooperative participation. Mining rights are no longer outright ownership but temporary authorisations, subject to state approval and legislative review.[239] Secondly, the law prioritises strategic minerals like lithium, reserving their exploitation for state entities such as Yacimientos de Litio Bolivianos (YLB), created under Law No. 928 in 2017. Private firms can only participate via joint

ventures where the state holds a majority stake,typically 51 per cent (as seen in recent lithium deals). Environmental issues are guided by the Law of Mother Earth (Law No. 300, 2012), which grants nature equal rights to humans and mandates sustainable practices, though enforcement remains inconsistent.[240] Additionally, the most peculiar and socially relevant feature of Bolivia's mining sector is the preeminence of mining cooperatives. These are small-scale miners organised under a collective structure, making up the major part of Bolivian mineral production, particularly in tin and silver. The 2014 law initially barred direct cooperative-private partnerships, but amendments allow ‘mixed companies’ via COMIBOL, balancing their influence with state control.

Significant Recent Investments

Foreign investment is encouraged but tightly regulated. The Constitution forbids foreign entities from owning property within 50 kilometres of borders unless approved by a legislative supermajority, and foreign investors cannot appeal to international arbitration, submitting instead to Bolivian jurisdiction. The Supreme Decree No. 4721 (2022) created the Vice-Ministry of Technological Minerals to promote rare earths and lithium development, signalling openness to private capital, though legal restrictions still limit non-state actors in these sectors.[239]

Bolivia received two significant deals in late 2024 for its lithium reserves. Its state-owned YLB partnered with China’s CBC consortium (including battery giant CATL) on a US$ 1 billion project to build two Direct Lithium Extraction (DLE) plants in the Uyuni salt flat, with Bolivia holding a 51 per cent stake. Meanwhile, Russia’s Uranium One Group committed US$ 970 million for a plant to produce 14,000 tonnes of lithium carbonate annually, ramping up foreign investment in this key resource. Another example of foreign participation in this sector is the zinc-silver and lead-silver producer, San Cristóbal Mining, owned by Japan's Sumitomo Corporation. [241] [242] [243] [244] [245]

The Republic of Chile

Background

Chile has a long mining tradition, and it is well known for its world-class mining deposits. It is the biggest producer and has the largest reserves of copper in the world. As per estimated in 2023, Chile possesses copper reserves of around 190 million tonnes, making up 19 per cent of the world's total. In 2023, Chile's copper production reached 5 million tonnes, representing 25 per cent of global output.[246] Chile also has a significant production and reserves of molybdenum, lithium, silver, gold, iron and other minerals. While several mines are owned by private companies, state-owned companies, such as CODELCO (The National Copper Corporation of Chile),[3] holds significant mines and large quantities of mining properties. [247] [248]

Chile is the world's second-greatest producer of lithium, responsible for 44,000 tonnes in 2023. President Gabriel Boric announced Chile's National Lithium Strategy (NLS) in 2023 to enhance private sector involvement across the lithium value chain while maintaining selective state control in public-private partnerships. The Atacama Salt Flat is an epicentre of this growth. The region contains an estimated 8.3 million tons of lithium and now supplies 30 percent of global demand annually.[248] The signing of the Memorandum of Understanding between SQM and Codelco in December 2023 was a landmark event for Chile's lithium industry, enabling SQM to increase production by 30,000 tonnes per annum of lithium carbonate equivalent and extend operations for 30 years.[249]

For the period 2023 to 2032, the Chilean mining investment portfolio comprises 49 projects, totalling an investment of US$65.71 billion, according to Cochilco (Chilean Copper Commission). Some companies operating in Chile include Canada-based Tribeca Resources, Teck Resources, China-based CBC, Australia-based BHP, and the UK-based Rio Tinto[250]. In November 2024, BHP announced an investment of US$ 14.7 billion over a decade in the Escondida mine and other operations in Chile.[251]

Key Policy Initiatives

Chile's mining laws stem from the 1980 Constitution, which keeps all minerals under state ownership. Private companies, though, can secure concessions to explore or mine through the Mining Code (Law No. 18,248). According to Law No. 21,649, effective from 2024, exploration permits run for four years (renewable once), and mining rights last as long as fees are paid. [252]The state-owned Codelco dominates copper mining, but private firms, including foreign ones, play a major role, with no significant restrictions on foreign ownership except near borders. Moreover, key

regulations include environmental compliance under the Environmental Framework Law (Law No. 19,300), requiring impact assessments for projects over 5,000 tons monthly, and safety standards enforced by the National Geology and Mining Service (SERNAGEOMIN). According to the 2023 mining royalty reform in Chile, beginning in 2024, mining royalties will rise to a range of 8 to 26 per cent of the operating margin from the previous range of 5 per cent to 14 per cent. There will also be a 1 per cent ad valorem tax based on sales for miners that post a profit. [253] [254] [255] There have been demands for faster permits and cheaper energy to stay competitive, but as of March 2025, no new measures are set.[256]

Chile's National Lithium Strategy aims to reinforce its leadership in global lithium production while inviting private investment. The strategy mandates the use of sustainable technologies, such as direct lithium extraction, to conserve water and lessen environmental impact by avoiding large evaporation ponds. In 2024, Chile supplied 19 per cent of the world's lithium, trailing behind Australia and China. In April 2025, Chile's Mining Ministry started accepting applications for three new lithium projects, operated as public-private partnerships with the government holding a majority stake. These projects will be licensed through Special Lithium Operating Contracts, favoring companies with solid financials, technology, and experience. The state's approach is drawing global interest, with over 50 companies showing interest in the new projects, with more tenders expected in 2025.[257]

Japan

Background

Reportedly, Japan's susceptibility to disruptions in rare earth mineral supplies became international news following a diplomatic dispute with China in 2010. This dispute highlighted the risks to Japan's high-tech sectors, including electronics, automotive, and renewable energy. This incident prompted Japan to prioritise the securing of essential minerals to safeguard key Japanese industries. Japan has since intensified its investment efforts and pursued strategic agreements with resource-rich nations and international partners to ensure a consistent and reliable supply chain.[258]

Key Policy Initiatives

In 2018, the Japanese Ministry of Economy, Trade and Industry released the Critical Minerals Report, which identified 31 minerals, including key energy transition minerals such as lithium, nickel, cobalt, and the platinum group of elements, as critical minerals (the full list is included in Annexe I). Uranium was added to the list in 2023. [259] [260]

Japan's Ministry of Economy, Trade and Industry (METI) pledged nearly US$ 1 billion in 2023 for storage battery production, followed by another ¥347.9 billion (US$ 2.4 billion) from METI in September 2024 to enhance the lithium-ion battery supply chain, targeting 150 GWh capacity by 2030. These funds will support 12 projects: four battery gigafactories, four battery material projects, and four for cell production equipment. Companies like Toyota, Nissan, Panasonic, and Subaru are involved, with Toyota, Nissan, and others investing ¥1 trillion (US$ 7 billion) to boost domestic battery production capacity for electric stationary storage batteries by around 50 per cent to 120 GWh. [261] [262]

Japan has entered into several bilateral and multilateral agreements to secure critical minerals, focusing on diversifying supply chains and ensuring resilience in key industries, such as electric vehicle (EV) battery production:

- Firstly, Japan is a member of the Minerals Security Partnership (MSP), a U.S.-led initiative involving 14 countries and the EU to promote secure and sustainable critical minerals supply chains. This complements Japan's bilateral efforts by fostering global cooperation.[263]

- In March 2023, the U.S. and Japan signed a Critical Minerals Agreement (CMA) that establishes several new commitments and areas for cooperation regarding electric vehicle battery critical minerals supply chains. The deal bans export

restrictions between the two nations, promotes fair competition, and lets Japanese-processed minerals qualify for U.S. Inflation Reduction Act (IRA) tax credits. [264] [265]

- New tariffs under the U.S. President Trump, rolled out in early 2025 and targeting imports from Japan and beyond, exempt critical minerals (critical minerals like lithium and cobalt are exempt from the 24 per cent reciprocal tariff on Japanese goods), keeping the CMA framework intact, preserving supply chain cooperation. Yet, duties on automobiles (25 per cent) and other goods raise costs for Japanese EV manufacturers, putting indirect pressure on the agreement's advantages. Japan is pushing for negotiations rather than retaliation, though prolonged tensions could divert attention from the CMA's goals. [266]

- In October 2023, Japan and the UK approved this Memorandum of Cooperation (MoC) during the G7 Trade Ministers' Meeting in Osaka, where the UK's Department for Business and Trade (DBT) and Japan's Ministry of Economy, Trade and Industry (METI) agreed to establish a framework for deepening cooperation and promoting dialogue between the two nations in the field of critical minerals. The MoC aligns with the Hiroshima Accord (May 2023), focusing on joint sourcing, processing, research, innovation, and sustainable supply chains for minerals, while enhancing market transparency through information sharing and improved data and traceability.[267]

- In August 2023, Japan signed agreements with five African countries, namely Namibia, the Democratic Republic of Congo (DRC), Zambia, Angola, and Madagascar, to diversify its critical mineral supply chains, as reported by Africa's investment platform Energy Capital & Power. Led by METI and the Japan Organisation for Metals and Energy Security (JOGMEC), this initiative aimed to secure stable supplies and reduce reliance on China. In Namibia, Japan plans to collaborate on rare earth exploration and produce a 'Namibia Rare Earth Industry Master Plan'.[268] In the DRC, the focus is on joint implementation of geological surveys and exploration for cobalt, lithium, and copper. In Zambia, JOGMEC and the Ministry of Mines and Mineral Development of Zambia will conduct joint geological surveys for copper and nickel deposits, aiming to achieve an annual copper production of three million tonnes; additionally, JOGMEC co-hosted the Japan-Zambia Mining Investment Roundtable with METI and the Zambian Ministry, involving 11 Japanese companies, one local Japanese company, and Japan International Cooperation Agency (JICA), where the Zambian Ministry presented details about investment opportunities, mining policy, taxation, incentives, debt restructuring, and cobalt mineralisation in the Copperbelt. In Angola and Madagascar, Japan seeks to foster trade and investment in mineral resources, focusing on cooperative agreements in Angola and nickel-related collaboration in Madagascar, leveraging existing industry ties. These efforts, announced in August 2023, during Nishimura's visit, include JOGMEC's geological support and private-sector partnerships.[269] [270]

- In 2023, Japan, Canada, Italy, the Republic of Korea, and the UK pledged an initial total contribution of more than US$40 million to The Resilient and Inclusive Supply-chain Enhancement (RISE), an initiative that will help emerging markets and developing countries (EMDCs) increase their manufacturing of clean-energy products and boost their participation in the minerals industry.[271]

Japan is also advancing recycling technologies to reduce virgin mineral demand and promote sustainability. Companies like Panasonic and Toyota are driving battery recycling to foster a circular economy. Both companies made significant deals with US-based, Redwood Materials to promote a circular supply chain. [272] [273]According to 2025 reports, Panasonic Energy Co. Ltd., a Panasonic Group unit, has partnered with Sumitomo Metal Mining Co. Ltd. for a lithium-ion battery recycling initiative in Japan. Sumitomo recycles nickel from battery scrap at Panasonic's Osaka factory, converting it into nickel sulphate for cathode materials in Panasonic's lithium-ion batteries. Initially focused on nickel, the programme plans to include lithium and cobalt by 2026, aiming for 20 per cent recycled cathode content by 2027. Panasonic's first closed-loop recycling initiative in Japan aims to support Panasonic's target to minimise its carbon footprint up to 50 per cent of the 2022 level by 2031, reinforcing Japan's sustainable EV battery ecosystem.[274]

In addition to domestic investments, Japan has made numerous significant international investments. Some key examples are outlined below:

- In March 2023, Japan's Sojitz Corporation and JOGMEC, via Japan Australia Rare Earths (JARE), invested AUS$ 200 million in equity in Lynas Rare Earths, operator of Australia's Mount Weld rare earths mine. The funds, along with investments since 2009, enhance production of light (neodymium, praseodymium) and heavy (dysprosium, terbium) rare earths, essential for EV motors and wind turbines, at Lynas' Western Australia and Malaysia facilities. Through this, JARE secures priority access to 65 per cent of heavy rare earths, reducing Japan's reliance on China.[275]
- In 2025, Japan Bank for International Cooperation (JBIC) agreed to provide a loan of US$ 666 million to Chile's Copper giant CODELCO to help supply Japanese manufacturers with a stable supply of copper concentrates. [276]
- During Japan's 2023 ministerial visit to five African countries, Japan pledged to invest US$1 billion in DRC to explore rare minerals in this country rich in cobalt, lithium, and copper.[277] [278]
- Japan's Sumitomo Metal Mining (SMM) has operations in Indonesia and the Philippines, where the company has nickel smelters, although in April 2022, the company cancelled one nickel smelter project in Indonesia's Southeast Sulawesi province due to Chinese intervention.[279] [280] In the Philippines, SMM holds shares in Coral Bay Nickel and Taganito HPAL Nickel. [281] In 2023, the company also entered into a collaboration agreement with Canada's Nano One Materials, a clean

technology company having Australian assets like Oaky Creek and Northparkes mines through partnering with firms like Glencore.[282] [283]

Japan is set to host the ‘Critical Minerals Japan Conference & Exhibition’ in Tokyo in September 2025, drawing over 20 countries and 400 senior-level executives to foster investment and collaboration in critical minerals.[284]

The Republic of Korea

Background

South Korea, a global leader in high-tech industries like semiconductors, batteries, and electric vehicles, relies heavily on critical minerals to fuel its economy and support the global clean energy transition. With limited domestic mineral resources, the country has adopted a strategic approach to secure stable supplies, reduce import dependency, and strengthen its position in global supply chains. This involves robust domestic policies, active international partnerships, and private-sector investments to address the challenges of concentrated mineral reserves and potential supply disruptions.

Key Policy Initiatives

South Korea has prioritised critical minerals as a matter of economic security, focusing on reducing reliance on imports, enhancing stockpiles, and promoting recycling. In 2023, South Korea launched its Critical Mineral Policy, and their Ministry of Trade, Industry and Energy (MOTIE) identified 33 critical minerals essential for its industries, with 10 designated as 'strategic minerals' (lithium, nickel, cobalt, manganese, graphite, and rare earth elements such as neodymium, dysprosium, terbium, cerium, lanthanum) for high-tech sectors like electric vehicles and batteries.[285]

Key goals of the critical mineral policy include cutting import dependency from 80 per cent to 50 per cent by 2030 and increasing recycling rates from 2 per cent to 20 per cent. To achieve this, South Korea is expanding its stockpile capacity from 54 to 100 days and developing an eight-day rapid-response distribution system to mitigate supply shocks. The Ministry of Trade, Industry, and Energy leads efforts to create a global minerals supply map and an early-warning system to detect risks. Financial support, including public loans, insurance, and tax incentives, encourages private-sector exploration and overseas mining ventures. Furthermore, South Korea is advancing investments and initiatives to bolster recycling technologies, including setting up demonstration centres and clusters to aid small and medium enterprises and mid-sized firms in recycling electric vehicles and secondary batteries, and fostering inter-ministry collaboration to establish a circular system for managing waste resources from these technologies. [286] [287]

South Korea actively pursues international cooperation to secure critical mineral supplies, leveraging both bilateral and multilateral frameworks.

- Firstly, South Korea is part of the Mineral Security Partnership (MSP), a key global platform with 14 countries and the EU to support the critical mineral supply chain. As the MSP Chair since July 2024, South Korea drives collaboration on responsible mining, recycling projects, and partnerships with resource-rich regions like Africa and Southeast Asia.[286] [288]

- In March 2025, the Ministry of Trade, Industry and Energy of South Korea agreed to reinforce cooperation with Mongolia in supply chains for rare metals, building on the agreement made in 2023. The initiative will support the Korea-Mongolia Rare Metals Cooperation Centre (funded by official development assistance) for use as a base for Korean businesses to advance mineral development activities in Mongolia by November 2025. In addition, both sides will also conduct joint exploration for key minerals through cooperation between the Korea Institute of Geoscience and Mineral Resources (KIGAM) and Mongolia's Geological Centre for Research and Analysis (GCRA) to obtain data on rare metal deposits in Mongolia. The Korea Institute of Energy Technology Evaluation and Planning is expected to stimulate tin mine development and secure Korean supply chains in Mongolia by implementing a research and development project to verify technology for developing tin ore, applying smart mining suitable for Mongolian sites, and securing technologies for pilot plants. [289]

- South Korea also engages with ASEAN, and in July 2024, both parties launched the Association of Southeast Asian Nations (ASEAN) and the Republic of Korea (ROK) or ASEAN-ROK Project on Critical Minerals Management and Strategy for Sustainable Environment in ASEAN. The initiative aims to enhance ASEAN officials' expertise in mineral exploration through capacity-building programs, emphasising smart exploration technologies and real-time data platforms. It also involves updating geological and mineral occurrence maps across ASEAN Member States to provide datasets, encourage investment, and advance regional critical mineral development.

- In 2023, South Korea and Canada signed four Memoranda of Understanding to strengthen critical minerals cooperation and address global supply chain challenges. The Korea Mine Rehabilitation and Mineral Resources Corporation and Canada's Department of Natural Resources agreed to collaborate on data exchange and technology development. Additionally, LG Energy Solution signed MOUs with three Canadian firms,Avalon, Electra, and Snow Lake,for the supply and processing of critical minerals, enabling Korean companies to build North American supply chains for secondary batteries and electric vehicle materials, parts, and finished products. [290]

South Korea's private sector plays a pivotal role in securing critical minerals, with companies investing heavily in overseas projects to meet domestic demand. In recent years, firms like LG and POSCO have formed partnerships and offtake agreements, particularly in Australia and African countries, for minerals like lithium, nickel, and cobalt.

- In 2024, POSCO and Australia's Hancock Prospecting partnered to develop a lithium business with a 30,000-tonne annual production capacity, jointly assessing optimal plant locations, including South Korea. The collaboration seeks to secure a stable lithium supply chain for POSCO. This bolsters POSCO's lithium value chain, covering mining, processing, cathode production, and recycling. As of 2024, Posco's lithium production capacity stands at 68,000 tonnes annually, with 25,000 tonnes from brine lithium facilities in Argentina and 43,000 tonnes from ore lithium operations.[291]

- South Korea is intensifying its engagement with Africa to secure critical minerals such as graphite, nickel, cobalt, manganese, and lithium, driven by an annual import demand exceeding US$ 36 billion. At the Korea-Africa Critical Minerals Dialogue during the African Mining Indaba in Cape Town, South Korea outlined plans to strengthen ties with African nations. At the inaugural Korea-Africa Summit in June 2024, South Korea committed US$2.5 billion in concessional loans to Tanzania and signed a memorandum of understanding to enhance cooperation in mining investment and beneficiation of energy transition metals. An agreement on critical minerals was also concluded with Madagascar. Zimbabwe, rich in platinum, gold, nickel, and chrome, has expressed interest in attracting Korean mining firms for mineral extraction and processing, with President Emmerson Mnangagwa considering opening an embassy in Seoul. [292]

- A few examples of South Korean investment in Africa: In 2024, POSCO International, acquired a 19.9 per cent stake in Black Rock Mining, which owns the Mahenge graphite mine in Tanzania. This investment provides POSCO with early access to graphite from the mine, strengthens its supply chain, and grants it global sales rights for industrial graphite. Additionally, in 2023, in Madagascar, POSCO has also signed an agreement with Canada's NextSource Materials to secure 30,000 tonnes of flake graphite or 15,000 tonnes of spherical graphite annually for 10 years from the Molo mine.[293] STX Corporation, a Korean trading firm, has acquired the rights to trade graphite from the Caula mine in Mozambique. Beyond graphite, LG Energy Solution signed a 2023 preliminary agreement with Yahua, a Chinese lithium producer, to produce battery-grade lithium hydroxide in Morocco.[292]

- As stated before, in 2023, Korean companies expanded their footprint in Mongolia, with investments in rare metals mining following government-led agreements. [289]

- In May 2024, Indonesia's Geological Agency of the Ministry of Energy and Mineral Resources (ESDM) announced a strategic partnership with the Korea Institute of Geoscience and Mineral Resources (KIGAM) to explore the untapped potential of the REE Mamuju region of West Sulawesi in Indonesia.[294]

- South Korea is reviving its tungsten industry through the Sangdong mine, one of the world's largest single-mine tungsten reserves, holding 7.9 million tonnes of

high-grade ore. Acquired by Canada's Almonty Industries in 2015, the mine, now operated by Almonty Korea Tungsten Corporation, is expected to run for over 100 years, mirroring Almonty's long-operating Portuguese mine. Sangdong is poised to emerge as a key supplier of tungsten, despite China's 80 per cent dominance in the global tungsten production (63,000 metric tonnes in 2023). Tungsten's importance spans semiconductors, EV batteries, automobiles, weapons, and industrial tools due to its hardness and energy density. To enhance output, Almonty signed an MoU with the Yeongwol County in Korea in 2024 to build a downstream tungsten oxide plant, investing 100 billion won (US$ 72 million), and 40 billion won (US$ 29 million) for processing upgrades at Sangdong. These developments aim to bolster South Korea's role in the global supply chain for tungsten, reducing reliance on Chinese supplies.[295] [296] [297]

Comparative Analysis and Discussion

Critical Minerals Lists Comparison

Table 4 below summarises the different critical mineral lists of the countries mentioned in the report. The comparative analysis reveals that while there is a growing global consensus on the importance of critical minerals, however, there is no universal definition of what is critical. The composition and length of each country's list function as a policy statement, reflecting its unique industrial ambitions, geological endowments, and perceived supply chain vulnerabilities.

A key trend emerging from the comparison is the adoption of a two-tier system by advanced economies like the European Union and Australia. The EU differentiates between a broad list of 34 "Critical Raw Materials" and a highly focused list of 16 "Strategic Raw Materials" to prioritise policy action and investment. Similarly, Australia separates its 31 "Critical Minerals" from 5 "Strategic Materials" like copper and aluminium, which are essential for its industrial base. This approach allows for targeted, high-impact interventions on the most vital resources while maintaining a broader watch list. South Korea employs a similar model, designating 10 of its 33 critical minerals as 'strategic'.

The table also highlights significant divergence in national priorities. The United States maintains the most extensive list with 50 minerals, adopting a comprehensive approach to securing its supply chains. In contrast, South Africa's list is much smaller at 14 minerals, focusing heavily on resources where it holds a global production advantage, such as PGMs, manganese, and chrome, but also including coal and uranium, underscoring a broader definition of economic security. Japan's inclusion of gold and silver alongside industrial minerals points to a similar strategic calculation. For India, its list of 30 minerals is a balanced framework, but the global trend towards creating a shorter, "strategic" sub-list could be a valuable consideration for focusing future policy efforts and capital allocation.

Table 4: A comparison of critical mineral lists of different countries.

Country	Referenced Document / List Name	Year Published / Updated	Number of Minerals	Strategic Sub-list?	Common Minerals Included*	Notable/Unique Minerals or Features
India	Ministry of Mines Critical Minerals List	2023	30	No	Yes (Li, Co, Ni, Cu, Graphite, REE, Ti)	Includes Potash, Phosphorous, and Strontium.
United Kingdom	UK Criticality	2024	34	No	Yes (Li, Co, Natural	Includes Iron, Aluminium,

Country	Referenced Document / List Name	Year Published / Updated	Number of Minerals	Strategic Sub-list?	Common Minerals Included*	Notable/Unique Minerals or Features
	Assessment (by CMIC)				Graphite, Ni, REE, Ti)	Helium, Sodium, and Zinc as new additions to the 2024 list.
United States	USGS 'Final List of Critical Minerals'	2022	50	No	Yes (Li, Co, Graphite, Ni, Ti) but excludes Copper.	Lists all 17 Rare Earth Elements and 6 Platinum Group Metals individually.
Canada	Canadian Critical Minerals List	2024	34	No	Yes (Li, Co, Ni, Cu, Graphite, REE, Ti)	Includes Uranium and Potash. High-Purity Iron and Phosphorus were added in 2024.
Australia	Australian Critical Minerals List	2024	31 (Critical)	Yes, a separate list of 5 Strategic Materials.	Yes (Li, Co, Ni, Graphite, REE, Ti) are on the Critical list. Copper is on the Strategic list.	The two-list system is a key feature. The Strategic list includes Copper, Aluminium, Tin, Phosphorous, and Zinc.
European Union	EU Critical Raw Materials Act	2023	34 (Critical)	Yes, a list of 16 Strategic Raw Materials.	Yes. Battery-grade versions of Li, Ni, Co, Mn, and Graphite are on the Strategic list.	The two-list system is a key feature. The Critical list includes Coking Coal, Feldspar, and Baryte.
South Korea	MOTIE Critical Mineral Policy	2023	33 (Critical)	Yes, 10 minerals are designated as 'strategic'.	Yes. Li, Ni, Co, Mn, Graphite, and key REEs are designated as 'strategic'.	Features a single list with a specific 'strategic' designation for a high-priority subset.
South Africa	Exploration Strategy for the Mining Industry	2022	14	No	Yes (Li, Co, Ni, Cu, REE) but excludes Graphite.	The list is notably smaller and includes Coal and Uranium. It heavily features minerals of

Country	Referenced Document / List Name	Year Published / Updated	Number of Minerals	Strategic Sub-list?	Common Minerals Included*	Notable/Unique Minerals or Features
						national strength like PGMs, Manganese, and Chrome.
Japan	METI Critical Minerals Report	2023 (updated)	32	No	Yes (Li, Co, Ni, Cu, REE, Ti) but excludes Graphite.	Notably includes Gold, Silver, and Lead on its list. Uranium was added in 2023.

Value Chain Lens

Table 5 illustrates the central strategic tension in the global critical minerals sector: the race to control the midstream (processing and refining). While upstream extraction is geographically constrained, the ability to process raw ores into high-purity materials is where significant value is added and geopolitical leverage is created. The data clearly shows two distinct strategic postures:

- Established Dominance: China stands out not just for its upstream acquisitions but for its near-monopoly in the midstream, processing the majority of the world's lithium, cobalt, nickel, and REEs. Its use of export controls on processed materials like gallium and even on processing technologies is a clear exercise of this power.

- Building Midstream Capacity: Western allies are now squarely focused on building their processing capabilities to counter this dominance. The US is using the Inflation Reduction Act (IRA) to provide tax credits for domestic processing. Australia has made a "Strategic Move towards Midstream" the core of its policy, backed by a production tax incentive. Canada is deploying its Strategic Innovation Fund to a similar end. This concerted push signifies that the midstream is the primary arena for geopolitical competition.

Furthermore, the table contrasts different policy approaches to achieving this goal. Indonesia provides a powerful example of resource nationalism, using a forceful export ban on nickel ore in the past to compel foreign companies to invest in domestic smelters and refineries. In contrast, countries like the US, Canada, and Australia are using an incentive-based model, offering tax credits and funding to attract private investment.

For India, the proposed establishment of Mineral Processing Parks and the focus on R&D for refining technologies show a policy direction that is well-aligned with this global trend. The key challenge highlighted by this table is the need for speed and scale in implementation to secure a foothold in the highly competitive midstream sector.

Table 5: A comparative analysis of policy initiatives mapped against critical minerals value chain

Country	Upstream (Exploration & Mining)	Midstream (Processing & Refining)	Downstream (Manufacturing, Recycling & Circular Economy)
India	• Acquiring overseas assets via Khanij Bidesh India Limited (KABIL).	• Proposing the establishment of Mineral Processing Parks.	• Establishing a robust recycling ecosystem for "urban mining".

Country	Upstream (Exploration & Mining)	Midstream (Processing & Refining)	Downstream (Manufacturing, Recycling & Circular Economy)
	• Through several bilateral agreements, India is aiming to access critical minerals assets. Indian private sector companies are encouraged to look at overseas mining and exploration blocks. • Auctioning mineral blocks for exploration and mining. India's 5th tranche critical mineral auction, the latest concluded on 28 January 2025, successfully auctioned 10 of 15 blocks in Chhattisgarh, Rajasthan, Uttar Pradesh, containing graphite, REE, potash; In totalm 34 of 55 total blocks have been successfully auctioned across five tranches. • Incentivising private exploration agencies with funding from the National Mineral Exploration Trust (NMET). • Developing deep-sea mining capabilities through the Deep Ocean Mission. •	• Developing refining technologies through domestic R&D and international collaborations • Exempting Basic Customs Duty (BCD) on 25 critical minerals to boost processing. • Aims to extract critical minerals from low-grade sources like overburden, tailings, red mud, and fly ash. • In June 2025, India plans to approve a scheme of INR 3,500–5,000 crore (US$ 400–580 million) to boost local rare earth mineral and magnet production, with five major domestic firms ready to participate.	• Considering a Production-Linked Incentive (PLI) scheme for the recycling sector. • Planning to restrict the export of black mass to keep minerals in the country for recycling. • Supporting a circular economy in the battery minerals sector. • In June 2025, the Ministry of Mines delegation held a high-level meeting with Nationals Metals SARL , a copper cathode manufacturer based in Lubumbashi, DRC.
UK	• Planning a national-scale assessment to identify target areas for exploration. • A few UK companies are investing in overseas mining blocks (e.g., Pensana in Angola, Blencowe in Uganda). • Assessing the potential for mineral extraction from coastal waters and deep-sea mining • £28.6M investment into Cornish Metals Inc. to help finance the reopening of the South Crofty tin mine.	• Supporting the setup of processing and refining facilities based on imported ore (e.g., Green Lithium) • Supporting an industrial-scale separation of rare earth elements at the Humber Freeport (Pensana).	• Accelerating a circular economy by increasing recovery, reuse, and recycling rates. • Supporting the Interdisciplinary Circular Economy Centre for Technology Metals (Met4Tech). • £50M investment deal with Nissan for a new EV powertrain manufacturing facility in Sunderland.

Country	Upstream (Exploration & Mining)	Midstream (Processing & Refining)	Downstream (Manufacturing, Recycling & Circular Economy)
China	• Leverages domestic mineral reserves and strategic acquisition of overseas mining assets in Africa, Latin America, and Southeast Asia. • State-sponsored entities provided US$ 56.9 billion in credit to companies mining critical minerals since 2000.	• Dominates the global refining process, holding significant shares of capacities for rare earth elements, lithium, cobalt, and graphite. • Processes 65 per cent to 90 per cent of the global supply of lithium, cobalt, nickel, and copper.	• Uses export controls on processed materials (gallium, germanium, graphite) and technologies (lithium salt production, LFP/LMFP cathode materials) to assert dominance. • Drives global demand through its massive electric vehicle, solar, and battery industries.
USA	• Directing federal agencies to fast-track permitting for mining projects. • Identifying opportunities for mining on federal lands. • Investing in the Lobito corridor project in Africa to facilitate mineral imports. • Pursuing access to Ukraine's critical mineral reserves.	• The Inflation Reduction Act (IRA) provides tax credits (Sec 45X) for the domestic production of critical minerals. • Defense Production Act (DPA) funds have been used to support midstream capabilities like REE separation and cobalt refining. • The Department of Energy (DOE) Loan Programs Office (LPO) provides a "bridge to bankability" for capital-intensive processing projects. • While some of the IRA schemes are being paused or amended under the current administration, the broad policy trajectory is expected to remain unchanged in the short-medium term.	• IRA (Sec 30D) provides tax credits for EVs that meet sourcing requirements for critical minerals and recycled content. • The CHIPS Act provides funding for domestic semiconductor manufacturing, which uses critical minerals. • Developing a federal strategy to recycle and recover critical minerals from government EV fleet batteries. • Funding battery recycling facilities through the DOE's LPO.
Canada	• Critical Mineral Exploration Tax Credit (CMETC) offers a	• Strategic Innovation Fund (SIF) supports	• The Mines to Mobility initiative aims to build a sustainable battery

Country	Upstream (Exploration & Mining)	Midstream (Processing & Refining)	Downstream (Manufacturing, Recycling & Circular Economy)
	30 per cent tax credit to investors for exploration. • CAD$ 79.2 million was allocated for public geoscience and exploration to identify deposits. • Aim to expand geoscience and geological modelling activities.	projects in processing and refining. • Plans to shorten the permitting process for processing six key battery metals to five years. • The CMRDD Program supports piloting and deployment of mineral processing innovations.	innovation and industrial ecosystem. • SIF supports projects in manufacturing and waste reduction. • New innovation funding focuses on transforming minerals from secondary sources like post-consumer waste.
Australia	• Resourcing Australia's Prosperity initiative (AUD$ 566.1M) to map resources and accelerate discoveries. • Supporting a pipeline of new mineral discoveries through exploration support. • Finance from the Critical Minerals Facility and NAIF supports projects like the Arafura Rare Earths' Nolans Project.	• Critical Minerals Production Tax Incentive offers a 10 per cent refundable tax offset for eligible processing costs. • Strategic Move towards Midstream is a core policy to capture more value from resources onshore. • Investing in "common user" processing facilities to support small and medium-sized miners.	• Encouraging new value chains through recycling. • National Battery Strategy links mineral processing to national battery manufacturing goals.
EU	• CRMA Target: At least 10 per cent of the EU's annual consumption for extraction must be domestic by 2030. • EBRD Junior Mining Programme (JUMP) provides equity for early-stage mining companies. • Member states must develop national programs for geological exploration.	• CRMA Target: At least 40 per cent of the EU's annual consumption for processing must be domestic by 2030. • Streamlined permitting for Strategic Projects (12 months for processing permits). • France, Germany, and Italy have established national funds (€500M to €1B) to support domestic industry and resilience.	• CRMA Target: At least 15 per cent of the EU's annual consumption must come from recycled sources by 2030. • Export control on Black Mass to ensure battery waste remains in the EU for recycling. • A "Battery Booster" package and BATT4EU partnership support battery cell manufacturing and the full value chain.

Country	Upstream (Exploration & Mining)	Midstream (Processing & Refining)	Downstream (Manufacturing, Recycling & Circular Economy)
Indonesia	• Manages mineral production through a system of company-specific quotas (RKABs). • Open-cast mining techniques used for its vast laterite nickel deposits.	• "Downstreaming" Policy: Banned the export of unprocessed nickel ore to force investment in domestic smelters and refineries. • Development of High-Pressure Acid Leaching (HPAL) technology to process low-grade limonite ore into battery-grade materials.	• Aims to move beyond processing to build electric cars in Indonesia. • Attracted large investments from Chinese EV battery manufacturing companies.
South Africa	• Exploration Strategy (2022) aims to increase exploration investment. • The Council for Geoscience (CGS) conducts geological surveys to identify deposits. • The Mineral Resources Development Bill (2025) aims to streamline processes.	• Strategy emphasises infrastructure development to support processing. • Mintek is a key research body supporting the development of processing technology.	• Projects like the Giga-Africa 1 battery gigafactory focus on developing downstream industries.
Brazil	• BRL 1 billion fund from BNDES and MME to support exploration. • The Geological Survey of Brazil conducts geoscientific research. • Serra Verde Group aims to deliver 5,000 tonnes of rare earth oxide annually by 2026.	• National Strategic Pro-Minerals Policy (Decree No. 10657) supports environmental licensing for strategic mineral production projects. • Aclara Resources is operating a semi-industrial heavy rare earths pilot plant facility.	• Developing a local magnet manufacturing facility (CIT SENAI ITR) with a demonstration-scale production line for metals, alloys, and magnets.
The Philippines	• World's second-largest nickel ore producer.	• Has two domestic high-pressure acid leach (HPAL) plants. • Set to introduce a ban on raw mineral exports (to take effect after a 5-year transition) to incentivise investment in domestic processing.	• US-funded program supports creating value addition through mineral processing and downstream industries.
Saudi Arabia	• Aims to become an important hub for critical mineral mining.	• Leveraging low-cost energy for processing	• Ambitious target to produce 500,000 EVs domestically by 2030.

Country	Upstream (Exploration & Mining)	Midstream (Processing & Refining)	Downstream (Manufacturing, Recycling & Circular Economy)
	• Launched the 9th Exploration Licensing Round in 2025 to offer licenses across 50,000 km². • Manara Minerals, a JV between Ma'aden and PIF, was launched to acquire overseas mining assets.	both local and imported minerals. • Agreement with EV Metals Group to build a battery chemicals complex in Yanbu Industrial City. • Targeting lithium extraction from oilfield brines using DLE technology.	• Lucid Motors building its first ex-US factory in Saudi Arabia; launch of the Saudi EV brand Ceer. • Building a graphite anode materials facility.
DRC	• World's largest source of cobalt and the second-largest producer of copper. • Regulating Artisanal and Small-scale Mining (ASM) sectors through designated zones (ZEAs) and granting state-owned EGC exclusive rights to export artisanal cobalt.	• Historically, refining capacity has been limited, with much of the value captured by foreign entities. A key policy goal is to gain more control and value from processing.	• Suspended cobalt exports for four months in 2025 to address market oversupply and support prices.
Morocco	• Home to around 70 per cent of global phosphate reserves. • Managem (leading mining company) focuses on cobalt, copper, and silver output.	• Attracted over US$ 700 million for battery materials plants to process minerals locally.	• Aim to produce 100,000 EVs per year by 2025. • Attracted investment from Gotion for Africa's first battery cell project. • Attracted Chinese firms (BTR, CNGR, Huayou) for downstream investments.
South Korea	• Financial support (public loans, insurance, tax incentives) encourages private-sector exploration and overseas mining ventures. • Korea Mine Rehabilitation and Mineral Resources Corporation collaborates with partners like Canada on data exchange and technology development.	• Securing supplies through offtake agreements with partners in Australia and Africa (e.g., POSCO's deals for lithium and graphite).	• Aims to increase recycling rates from 2 per cent to 20 per cent by 2030. • Establishing demonstration centres and clusters to aid SMEs in recycling EVs and secondary batteries.

Geopolitical Partnership Lens

Table 6 explains the strategic drivers behind the key international collaborations mentioned in the report, categorising them by their primary geopolitical or economic motivation. This comparative analysis demonstrates that international cooperation in critical minerals is not happening in a vacuum; it is being driven by distinct and overlapping strategic objectives. The landscape is rapidly evolving from simple trade relationships to the formation of strategic blocs designed to secure supply chains and project influence.

The primary driver for many of these alliances is the goal of creating resilient supply chains independent of China. The US-led Mineral Security Partnership (MSP), which India joined in 2023, is the clearest example of a multilateral effort to diversify investment away from a single dominant supplier. This same objective underpins the US-UK Atlantic Declaration's commitment to "reduce unwanted strategic dependencies" and the supply chain resilience pillar of the Indo-Pacific Economic Framework (IPEF).

At the recently held G7 Summit in Kananaskis, Canada, from 15-17 June 2025, the Group of 7 (G7) leaders from Canada, France, Germany, Italy, Japan, India, the UK, and the USA agreed to deepen collaboration in several areas, including critical minerals. The G7 Critical Minerals Action Plan, launched at the summit, will focus on building standards-based markets, mobilising capital and investing in partnerships, and promoting innovation.

A second, more targeted driver is economic alignment to access specific incentives, most notably the US Inflation Reduction Act (IRA). The US-Japan Critical Minerals Agreement (CMA) and the proposed US-UK deal are explicitly designed to allow allied nations' minerals to qualify for the IRA's clean vehicle tax credits, effectively creating a "friend-shoring" trade bloc.

Finally, a third layer of cooperation is focused on bilateral technology and knowledge transfer. Partnerships like the India-UK Technology and Security Initiative (TSI) and the Australia-India Critical Minerals Research Partnership are less about immediate supply and more about building long-term domestic capabilities through shared innovation. For India, its active participation across these different types of partnerships represents a robust strategy of multi-alignment, allowing it to simultaneously pursue supply security through the MSP, market access through potential trade deals, and technology development through bilateral initiatives.

Table 6: A comparative analysis of key strategic drivers behind the key international collaborations

Strategic Driver	Relevant Partnership(s)	Key Objective & Features
Countering China's Dominance & Building Resilient Supply Chains	• Mineral Security Partnership (MSP) • The Atlantic Declaration (US-UK) • Indo-Pacific Economic Framework (IPEF) • G7 Critical Minerals Action Plan (Canada, France, Germany, Italy, Japan, India, the UK, and the US, together with the EU).	• The MSP is a US-led, 14-country (+EU) alliance aiming to boost investment in and incentivise diversification of critical mineral supply chains away from single dominant suppliers. • The Atlantic Declaration commits the US and UK to build diverse and secure critical mineral supply chains to "reduce unwanted strategic dependencies" • IPEF's Pillar II, ratified by India, focuses on building supply chain resilience among 14 partner countries. •G7 Leaders' Summit held in Canada, 15-17 June 2025, launched a Critical Minerals Action Plan, focusing on diversifying responsible production, supply, investment, local value creation, and innovation. Moreover, it anticipates a US-chaired Conference on Critical Materials and Minerals in Chicago, in September 2025, to advance these goals.
Securing Supply for EV & Clean Energy (IRA Compliance)	• US-Japan Critical Minerals Agreement (CMA) • US-UK proposed minerals agreement (under the Atlantic Declaration) • US-Indonesia discussions	• These agreements are driven by the need for allies' minerals to qualify for US Inflation Reduction Act (IRA) tax credits. • The US-Japan CMA explicitly allows Japanese-processed minerals to qualify for the Section 30D tax credit. • Indonesia is seeking a similar deal to get access to IRA tax incentives for its nickel industry.
Bilateral Technology Transfer & R&D Collaboration	• India-UK Technology and Security Initiative (TSI) • Initiative on Critical and Emerging Technology (iCET) (India-US) and the recently launched,	• The TSI is a bilateral initiative focused on collaboration across seven technology areas, including critical minerals, semiconductors, and advanced materials. • iCET and its successor, TRUST, focus on creating strong supply

Strategic Driver	Relevant Partnership(s)	Key Objective & Features
	‘TRUST’ - Transforming Relationship Utilising Strategic Technology. • Australia-India Critical Minerals Research Partnership	chains through strategic technology collaboration. • Australia and India have established a specific partnership to foster collaboration on critical minerals research.
Strategic & Regional Security	Quadrilateral Security Dialogue (Quad) (US, India, Japan, Australia)	• The Quad is a strategic security platform that has expanded its focus to include a working group on clean energy supply chains and critical minerals.

Stakeholder Mapping

Table 7 categorises the key government and state-affiliated organisations involved in the critical minerals sector for countries, as identified in the report. This stakeholder mapping provides the institutional architecture that nations are building to execute their critical minerals strategies. It reveals that success is not just about having the right policies, but also about creating or empowering the right organisations to implement them. The comparison highlights a global trend towards establishing specialised bodies and leveraging a mix of public and private entities to achieve national goals.

A key pattern is the creation of new, purpose-built organisations to address specific parts of the value chain. India's establishment of Khanij Bidesh India Limited (KABIL) is a prime example, creating a dedicated state-owned vehicle with the sole mandate of acquiring overseas mineral assets. Similarly, Saudi Arabia launched Manara Minerals, a joint venture between its state miner and its Public Investment Fund (PIF), for the same purpose. This contrasts with a more diffuse approach where existing government departments handle these tasks.

The table also illustrates the different models of state versus private sector involvement. In the United States, the ecosystem is a complex network of multiple government departments, including the Department of Defense (DoD), Department of Energy (DOE), and Department of the Interior, each with its own funding and programs. Western allies like Canada and the UK have created structures to heavily support private industry, such as Canada's Critical Mineral Exploration Tax Credit (CMETC) for investors and the UK's All-Party Parliamentary Group (APPG) that engages with industry. This incentive-based model contrasts with the more state-dominated approach seen in China, where state-backed acquisitions are a primary tool, or Bolivia, where state-owned entities like COMIBOL and YLB lead mineral development.

Finally, the central role of national geological surveys is a consistent theme across nearly all countries. Bodies like the Geological Survey of India (GSI), the U.S. Geological Survey (USGS), the British Geological Survey (BGS), and Geoscience Australia (GA) form the foundational pillar of national strategies by providing the essential data needed to de-risk exploration and attract investment.

For India, this mapping validates its approach. The creation of the National Critical Mineral Mission (NCMM) as a central coordinating body, supported by specialised entities like KABIL for overseas acquisition and GSI for exploration, mirrors the successful institutional structures being adopted by other major players globally.

Table 7: Key government and state-affiliated stakeholders involved in the critical minerals sector

Country	Policy & Strategy	Exploration & Geoscience	Overseas Asset Acquisition & Diplomacy	R&D Innovation
India	• Ministry of Mines • National Critical Mineral Mission (NCMM) • Empowered Committee on Critical Minerals	• Geological Survey of India (GSI) • Mineral Exploration and Consultancy Limited (MECL)	• Khanij Bidesh India Limited (KABIL) • Ministry of External Affairs (MEA)	• Centre of Excellence for Critical Minerals (CECM) • CSIR-IMMT • Ministry of Earth Sciences (MoES) (for Deep Ocean Mission)
UK	• Dept. for Business and Trade (DBT) • Economic Development and Partnerships Directorate (EDPD) | Foreign, Commonwealth and Development Office (FCDO) • All-Party Parliamentary Group (APPG) for Critical Minerals	• British Geological Survey (BGS) • Critical Minerals Intelligence Centre (CMIC)	• UK Export Finance (UKEF)	• UK Research and Innovation (UKRI) • Interdisciplinary Circular Economy Centre for Technology Metals (Met4Tech)
China	• Ministry of Commerce • Ministry of Natural Resources	• China Geological Survey (CGS) under Chinese Ministry of Natural Resources. • Chinese Academy of Geological Sciences under China Geological Survey (CGS).	• State-backed acquisitions (by Ministry of Commerce) and Belt and Road Initiative projects	• China Geological Survey (CGS) • Chinese Academy of Geological Sciences under China Geological Survey (CGS). • State Key Laboratory of Rare Earth Materials Chemistry and Applications at Peking University, • Xinjiang Research Center for Mineral Resources of Chinese Academy of Sciences
USA	• White House (via Executive Orders)	• U.S. Geological Survey (USGS)	• Dept. of State • U.S. International	• National Aeronautics and Space Administration (NASA)

Country	Policy & Strategy	Exploration & Geoscience	Overseas Asset Acquisition & Diplomacy	R&D Innovation
	• Dept. of the Interior • Dept. of Commerce • Dept. of Energy (DOE) • Dept. of Defense (DoD)		Development Finance Corporation (DFC)	• National Renewable Energy Laboratory
Canada	• Critical Minerals Centre of Excellence (CMCE) • Natural Resources Canada	• Geological mapping and surveying initiatives • Geological Survey of Canada (GSC)	• Global Affairs Canada (GAC)	• Critical Minerals Research, Development and Demonstration Program (CMRDD) (a Natural Resources Canada initiative) • CanmetMINING (a Natural Resources Canada initiative) • Geological Survey of Canada (GSC)
Australia	• Department of Industry, Science and Resources (DISER) • Critical Mineral Office (CMO)	• Geoscience Australia (GA)	• Australian Trade and Investment Commission (Austrade) • Department of Foreign Affairs and Trade (DFAT)	• Commonwealth Scientific and Industrial Research Organisation (CSIRO) • Australian Nuclear Science and Technology Organisation (ANSTO)
EU	• European Commission • European Raw Materials Alliance (ERMA)	• Member State geological surveys	• Global Gateway Programme	• Horizon Europe Programme • BATT4EU partnership
Indonesia	• Ministry of Energy and Mineral Resources (ESDM)	• Geological Agency of the Ministry of Energy and Mineral Resources	• Ministry of Energy and Mineral Resources (ESDM) • Ministry of Foreign Affairs	• National Research and Innovation Agency (BRIN)

Country	Policy & Strategy	Exploration & Geoscience	Overseas Asset Acquisition & Diplomacy	R&D Innovation
South Africa	• Dept. of Mineral and Petroleum Resources (DMPR) • Mine Health and Safety Council (MHSC) • Minerals Council South Africa	• Council for Geoscience (CGS)	• Council for Geoscience (CGS) • Department of Trade, Industry and Competition (DTIC)	• Mintek • Council for Scientific and Industrial Research (CSIR)
Brazil	• Ministry of Mines and Energy (MME) • National Mining Agency (ANM) (under MME) • National Mineral Policy Council (CNPM)	• Geological Survey of Brazil	• National Mineral Policy Council (It is chaired by the Minister of Mines and Energy and includes 16 ministers, including the Ministers of Finance, Foreign Affairs, and Environment and Climate Change)	• SENAI ITR (public R&D centre) • SIGMINE – Mining Geographic Information System (developed and maintained by the National Mining Agency) • Center for Mineral Technology (CETEM) (under Ministry of Science, Technology and Innovations or MCTI) • National Nuclear Energy Commission (CNEN) (under MCTI)
The Philippines	• The Senate of the Phillipines (approved export ban) • Chamber of Mines of the Philippines • Philippine Nickel Industry Association	• Mines and Geosciences Bureau (under Department of Environment and Natural Resources)	• Department of Foreign Affairs (DFA)	•Department of Science and Technology – Philippine Council for Industry, Energy, and Emerging Technology Research and Development (DOST-PCIEERD)
Saudi Arabia	• Ministry of Industry and Mineral Resources	• Saudi Geological Survey Academy	• Manara Minerals (JV of Ma'aden and PIF)	• Aramco (involved in DLE tech)
DRC	• Ministry of Mines	DRC Geological Survey (Service	• State-owned Entreprise	N/A

Country	Policy & Strategy	Exploration & Geoscience	Overseas Asset Acquisition & Diplomacy	R&D Innovation
	• Authority for the Regulation and Control of Strategic Mineral Substances Markets (ARECOMS)	Géologique National du Congo, SGN-C)	Générale du Cobalt (EGC) (exclusive rights to export artisanal cobalt)	
Morocco	• Ministry of Energy, Mines and Environment of Morocco (announced Morocco Mining Plan 2021-2030 in 2021) •National Office of Hydrocarbons and Mines (ONHYM)	•National Office of Hydrocarbons and Mines (ONHYM)	N/A	N/A
Angola	• National Agency for Mineral Resources (ANRM)	• National Geology Plan (PLANAGEO)	N/A	N/A
Zambia	• Ministry of Finance and National Planning • Ministry of Mines and Mineral Development	• Planned 2024 geophysical survey	N/A	N/A
Argentina	• Federal Secretariat of Mining • Federal Mining Council (COFEMIN) • Argentine Chamber of Mining Companies (CAEM)	• Argentinian Geological Survey (SEGEMAR)	• Ministry of Foreign Affairs, International Trade and Worship	• Argentinian Geological Survey (SEGEMAR) • Centro de Investigación y Desarrollo en Recursos Minerales (CIDeReM, under CONICET or the National Scientific and Technical Research Council)

Country	Policy & Strategy	Exploration & Geoscience	Overseas Asset Acquisition & Diplomacy	R&D Innovation
Bolivia	• Corporación Minera de Bolivia (COMIBOL) • Yacimientos de Litio Bolivianos (YLB) (under Ministry of Hydrocarbons and Energies)	N/A (Not mentioned in the report) • Mining Geological Service of Bolivia	N/A	N/A
Chile	• Ministry of Mines • Corporación Nacional del Cobre de Chile (CODELCO)	• National Geology and Mining Service (SERNAGEOMIN)	N/A	• Centro de Investigación Científica y Tecnológica para la Minería (CICITEM) (under Ministry of Science, Technology, Knowledge and Innovation)
Japan	• Ministry of Economy, Trade and Industry (METI)	• Japan Organisation for Metals and Energy Security (JOGMEC)	• JOGMEC	•National Institute of Advanced Industrial Science and Technology (AIST) • New Energy and Industrial Technology Development Organization (NEDO)
South Korea	• Ministry of Trade, Industry and Energy (MOTIE)	• Korea Institute of Geoscience and Mineral Resources (KIGAM)	• Ministry of Trade, Industry and Energy (leads global mineral mapping)	• Korea Institute of Energy Technology Evaluation and Planning

India’s Challenges, Policy Recommendations & Learnings from Other Countries

Below is a comparative analysis (Table 8) outlining India's challenges, its proposed solutions, and relevant learnings from other countries' policies. This presents a highly actionable framework for Indian policymakers by directly linking its domestic challenges to proven international solutions. It underscores that India's hurdles,such as a lack of geological data, a nascent junior mining sector, and midstream processing gaps,are not unique. This presents an opportunity to learn from and adapt policy models that have been successfully implemented elsewhere.

The key takeaway is that the most effective global policies are often highly targeted and directly address a specific market failure.

- To solve the exploration challenge, Canada did not just offer general support; it created a specific 30 per cent Critical Mineral Exploration Tax Credit (CMETC) to de-risk private investment in high-risk early-stage exploration.
- To solve the processing challenge, Australia is implementing a direct 10 per cent refundable tax offset on operational processing costs, tackling the economic viability of the midstream head-on.
- To solve the recycling challenge, the EU is using direct regulation,controlling the export of black mass,to create a captive supply of feedstock for its domestic recycling industry, ensuring valuable materials are not lost.

The table validates India's proposed policy directions. The recommendation to introduce financial incentives for junior miners is supported by the Canadian experience. The proposal to establish Mineral Processing Parks and support refining aligns with the strategic focus of Australia and the US. Similarly, the focus on creating a robust recycling ecosystem mirrors the EU's and Japan's top priorities.

The "Learnings" column effectively serves as a menu of international best practices, allowing India to select and tailor proven policy levers to its own economic and political context, potentially accelerating its journey toward critical mineral self-reliance.

Table 8: Policy recommendations to address existing challenges through learnings from other countries

Challenge for India	Proposed Policy Solution/Recommendation for India	Learnings from Other Countries
Lack of high-quality geological data and	Short-Medium Term: • Attract global junior mining	Australia: Is investing AUD$ 566.1 million in its 'Resourcing Australia’s

Challenge for India	Proposed Policy Solution/Recommendation for India	Learnings from Other Countries
an underexplored territory.	companies by providing high-quality geological datasets. • Introduce new exploration technologies like AI and Machine Learning to reprocess existing data and generate new targets. • Fast-track exploration projects via Notified Private Exploration Agencies with NMET support.	Prosperity' initiative, which enables Geoscience Australia to comprehensively map the country's natural resources to accelerate discovery. UK: Is planning a national-scale assessment of its critical minerals by collating geoscientific data to identify target areas for commercial exploration.
Absence of a domestic junior mining ecosystem to lead early-stage exploration.	Short-Medium Term: • Introduce customised financial incentives such as critical mineral exploration tax credits to attract national and international junior exploration companies. • Aim to build a junior mining ecosystem in India through organisations like TEXMiN.	Canada: Offers a 30 per cent Critical Mineral Exploration Tax Credit (CMETC) to investors in companies exploring for targeted minerals, which has helped make it a top global destination for exploration spending. The government also provides direct support to the junior mining sector through its flow-through share rules.
Lack of refining and processing competency in the midstream sector.	Short-Medium Term: • Introduce policy support to develop refining technologies through domestic R&D and international collaborations. • Create tailored infrastructure by establishing Mineral Processing Parks as proposed in the National Critical Minerals Mission (NCMM).	Australia: Has made a "Strategic Move towards Midstream" a core part of its policy, supported by a 10 per cent refundable Critical Minerals Production Tax Incentive on eligible processing costs. USA: The Inflation Reduction Act (IRA) provides a 10 per cent tax credit for the production costs of critical minerals processed to specific purity levels. Saudi Arabia: Is leveraging its low-cost energy to become an attractive hub for mineral processing.
Absence of a scaled recycling ecosystem and lack of end-of-life management for post-consumer waste.	Short-Medium Term: • Establish a robust recycling ecosystem for 'urban mining' supported by policy, technology, and investment. • Introduce schemes similar to 'Extended Producers Responsibility' for the EV battery sector. • Consider restricting the export of black mass to make feedstock	European Union: Aims to source 15 per cent of its critical material needs from recycled sources by 2030. The EU has also moved to control the export of "black mass" by classifying it as hazardous waste to ensure it remains within the European economy for processing. Japan: Companies like Panasonic and Toyota are actively driving

Challenge for India	Proposed Policy Solution/Recommendation for India	Learnings from Other Countries
	available to domestic recycling units.	battery recycling initiatives to foster a circular economy, with Panasonic partnering to create a closed-loop recycling system in Japan.
Lack of overseas mining assets and reliance on imports for most critical minerals.	NCMM Goal: • Actively pursue the acquisition of foreign mining assets through the state-promoted entity KABIL (Khanij Bidesh India Ltd). • Earmark funds and provides targeted subsidies to support PSUs and private companies in acquiring overseas assets.	China: Has secured access to overseas mining assets over decades through state-backed acquisitions and easy credit in regions like Africa, Latin America, and Southeast Asia. Saudi Arabia: Launched Manara Minerals, a joint venture between the state miner and the Public Investment Fund (PIF), with a specific mandate to acquire overseas mining assets.
Significant skill gaps in diverse fields are required for the critical minerals sector.	Short-Medium Term: • Address skill gaps through training initiatives and necessary curriculum changes in collaboration with academia, industry, and R&D bodies. • Establish Skill Development Centres as part of the NCMM.	UK: The Department for Business & Trade (DBT) is funding collaborations to bring critical minerals learning resources into UK schools and hosting workshops on skills development for the midstream and recycling industries. Saudi Arabia: Launched the Saudi Geological Survey Academy in March 2025 to nurture talent and expertise in geology and earth science.
Inability to extract value from low-grade ores and mine tailings.	Short-Medium Term: • Exploit the potential of extracting critical minerals from low-grade sources like chromite ore overburden and waste like red mud and fly ash. • Introduce a "Tailings Policy reform" under the NCMM to recover critical minerals from mining by-products.	Indonesia: Revolutionised its nickel industry by adopting the High-Pressure Acid Leaching (HPAL) process, which allows for the economic processing of low-grade limonite ore that was previously treated as waste. EU: Requires member states and private operators to investigate the potential for recovering critical raw materials from extractive waste in current and historical mining sites. USA: The recent 'Executive Order' (Immediate Measures to Increase American Minerals Production) proposes to explore minerals

Challenge for India	Proposed Policy Solution/Recommendation for India	Learnings from Other Countries
		recovery from the treatment of waste rock, tailings, and mine waste.

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Annexure I – List of Critical Minerals of Key Countries

Annexure 1: List of Critical Minerals of Key Countries

India

India released its Critical Minerals List in 2023 as part of its strategy to secure key resources for economic and technological growth. The list is provided below.[298]

The Final Set of 30 Minerals Critical to India		
Antimony	Lithium	Strontium
Beryllium	Molybdenum	Tantalum
Bismuth	Niobium	Tellurium
Cobalt	Nickel	Tin
Copper	PGE[n]	Titanium
Gallium	Phosphorous	Tungsten
Germanium	Potash	Vanadium
Graphite	REE[o]	Zirconium
Hafnium	Rhenium	Selenium
Indium	Silicon	Cadmium

[n] The platinum-group elements (PGEs),platinum, palladium, rhodium, ruthenium, iridium, and osmium.
[o] Rare earth elements (REE) are a group of 17 elements, including 15 elements of the lanthanide series in the periodic table of elements, together with scandium and yttrium.

The United Kingdom

The United Kingdom published its first Critical Minerals Strategy in 2021, identifying 18 minerals as critical. In 2024, this list was updated to include 34 critical minerals, as given below.[299]

Critical Minerals for the UK: 2024	
Antimony	Platinum
Bismuth	Rare Earth Elements
Cobalt	Silicon
Gallium	Tantalum
Natural Graphite	Tellurium
Indium	Tin
Lithium	Tungsten
Magnesium	Vanadium
Niobium	
New Addition to the List	
Aluminium	Nickel
Borates	Phosphorous
Germanium	Rhenium
Hafnium	Rhodium
Helium	Ruthenium
Iridium	Sodium
Iron	Titanium
Magnesite	Zinc
Manganese	

United States of America

Given below is the list of critical minerals by USA published in the year 2022.[300]

The Final Set of 50 Minerals Critical to USA		
Aluminium	Graphite	Rubidium
Antimony	Hafnium	Ruthenium
Arsenic	Holmium	Samarium
Barite	Indium	Scandium
Beryllium	Iridium	Tantalum
Bismuth	Lanthanum	Tellurium
Cerium[p]	Lithium	Terbium
Caesium	Lutetium	Thulium
Chromium	Magnesium	Tin
Cobalt	Manganese	Titanium
Dysprosium	Neodymium	Tungsten
Erbium	Nickel	Vanadium
Europium	Niobium	Ytterbium
Fluorspar	Palladium	Yttrium
Gadolinium	Platinum	Zinc
Gallium	Praseodymium	Zirconium
Germanium	Rhodium	Rubidium

[p] The USA list of critical minerals has 16 REES (Cerium, Dysprosium, Erbium, Europium, Gadolinium, Holmium, Lanthanum, Lutetium, Neodymium, Praseodymium, Samarium, Scandium, Terbium, Thulium, Ytterbium, and Yttrium) and five PGEs (Iridium, Palladium, Platinum, Rhodium, and Ruthenium).

Canada

According to the Canadian Critical Minerals Strategy of 2021, Canada has 34 critical minerals, which are listed below. This list was later updated in 2024, adding High-Purity Iron, Phosphorus, and Silicon Metal to reflect evolving economic and industrial priorities.[301]

The Final Set of 34 Minerals Critical to Canada		
Aluminium	High-purity iron ore	Scandium
Antimony	Indium	Silicon metal
Bismuth	Lithium	Tantalum
Caesium	Magnesium	Tellurium
Chromium	Manganese	Tin
Cobalt	Molybdenum	Titanium
Copper	Nickel	Tungsten
Fluorspar	Niobium	Uranium
Gallium	Phosphorus	Vanadium
Germanium	Platinum group metals	Zinc
Graphite	Potash	
Helium	Rare earth elements	

Australia

The Australian Government maintains two lists: the Critical Minerals List and the Strategic Materials List.[302] The lists were first published in June 2023 which was updated in February 2024.[303]

The Set of 31 Critical Minerals to Australia		
High-purity Alumina	Hafnium	Scandium
Antimony	Indium	Selenium
Arsenic	Lithium	Silicon
Beryllium	Magnesium	Tantalum
Bismuth	Manganese	Tellurium
Chromium	Molybdenum	Titanium
Cobalt	Nickel	Tungsten
Fluorine	Niobium	Vanadium
Gallium	Platinum-group elements	Zirconium
Germanium	Rare-earth elements	
Graphite	Rhenium	

The Set of 5 Strategic Materials to Australia		
Copper	Phosphorous	Zinc
Aluminium	Tin	

The European Union

The European Union (EU) maintains two lists: the Critical Raw Materials List (CRML) and the Strategic Raw Materials List (SRML). The CRML, first published in 2011, was last updated in 2023 and now includes 34 materials. The SRML was introduced in 2023 alongside the latest CRML update and consists of 16 materials. These lists are periodically reviewed to reflect evolving supply chain risks and strategic priorities. [304]

The Set of 34 Critical Raw Materials to The EU		
Antimony	Gallium	Phosphate rock
Arsenic	Germanium	Phosphorus
Aluminium/Bauxite	Hafnium	Platinum Group Metals
Baryte	Helium	Scandium
Beryllium	Heavy Rare Earth Elements	Silicon metal
Bismuth	Light Rare Earth Elements	Strontium
Boron/borates	Lithium	Tantalum
Cobalt	Magnesium	Titanium metal
Coking Coal	Manganese	Tungsten
Copper	Natural Graphite	Vanadium
Feldspar	Nickel – battery grade	
Fluorspar	Niobium	

The Set of 16 Strategic Raw Materials to The EU		
Bismuth	Lithium - battery grade	Rare Earth Elements for magnets [q]
Boron - metallurgy grade	Magnesium metal	Silicon metal
Cobalt	Manganese - battery grade	Titanium metal
Copper	Natural Graphite - battery grade	Tungsten
Gallium	Nickel - battery grade	
Germanium	Platinum Group Metals	

[q] REE for magnets include Neodymium (Nd), Praseodymium (Pr), Terbium (Tb), Dysprosium (Dy), Gadolinium (Gd), Samarium (Sm), Cerium (Ce)

Indonesia

To support the development of domestic strategic industries, in 2023, Indonesia listed 47 mining commodities classified as critical minerals.[305]

The Set of 47 Minerals Critical to Indonesia		
Aluminium	Graphite	Ruthenium
Antimony	Hafnium	Scandium
Barium	Indium	Selenium
Beryllium	Iron	Silica
Bismuth	Lithium	Strontium
Boron	Magnesium	Sulphur
Calcium	Manganese	Tantalum
Cadmium	Mercury	Tellurium
Chromium	Molybdenum	Thorium
Cobalt	Nickel	Tin
Copper	Niobium	Titanium
Feldspar	Palladium	Tungsten
Fluorspar	Phosphorus	Vanadium
Galena	Platinum	Zinc
Gallium	Potassium	Zirconium
Germanium	Rare Earth Metals	

South Africa

South Africa identified 14 critical minerals and metals that are essential for responding to shift towards the green economy.[306]

The Final Set of 14 Minerals Critical to South Africa		
Cobalt	Rare Earth Minerals	PGMs
Nickel	Manganese	Chrome
Copper	Iron Ore	Vanadium
Zinc	Coal	Lithium
Lead	Uranium	

Japan

In 2018, the Japanese Ministry of Economy, Trade and Industry released the Critical Minerals Report, which identified the following 31 minerals as critical minerals. Uranium was added to the list in 2023.[259] [260]

The Final Set of 32 Minerals Critical to Japan		
Antimony	Indium	REE
Beryllium	Lithium	Rhenium
Chromium	Lead	Silver
Cobalt	Magnesium	Strontium
Copper	Manganese	Tantalum
Diamond	Molybdenum	Tin
Fluorite	Nickel	Titanium
Gallium	Niobium	Tungsten
Germanium	Phosphorous	Uranium
Gold	PGE	Vanadium
Zinc	Zirconium	

South Korea

In 2023, South Korea launched its Critical Mineral Policy, and their Ministry of Trade, Industry and Energy (MOTIE) identified 33 critical minerals essential for its industries, with 10 designated as 'strategic minerals' (lithium, nickel, cobalt, manganese, graphite, and rare earth elements such as neodymium, dysprosium, terbium, cerium, lanthanum) for high-tech sectors like electric vehicles and batteries.[285]

The Final Set of 33 Minerals Critical to Republic of Korea		
Lithium	Magnesium	Lead
Nickel	Molybdenum	Zinc
Cobalt	Vanadium	Gallium
Manganese	Platinum Group Metals (Platinum, Palladium)	Indium
Graphite	Tin	Tantalum
Rare Earth Elements (Neodymium, Dysprosium, Terbium, Cerium, Lanthanum)	Titanium	Zirconium
Niobium	Tungsten	Strontium
Copper	Antimony	Selenium
Aluminium	Bismuth	
Silicon	Chromium	
Lithium	Magnesium	

The Philippines

The Philippines does not have an official, publicly available list of critical minerals specific to the country.

Kingdom of Saudi Arabia

The Kingdom of Saudi Arabia does not have an official, publicly available list of critical minerals specific to the country.

Democratic Republic of Congo

In the DRC, while there isn't a comprehensive public list, certain minerals have been officially designated as strategic due to their global importance. In 2018, the DRC's Ministry of Mines issued Ministerial Decree #18/042, identifying cobalt, germanium, and columbite-tantalite (coltan) as strategic minerals vital for applications in information and communication technologies, military equipment, and renewable energy technologies.[307]

Morocco

Morocco does not have an official, publicly available list of critical minerals specific to the country.[308]

Annexe II: Abbreviations and Acronyms

Annexure 2: Abbreviations and Acronyms

1	A-C-E	Accelerate – Collaborate – Enhance
2	ADB	Asian Development Bank
3	AIM	Alternative Investment Market
4	ANRM	National Mineral Resources AgencY
5	ANS	Afanasy-Nikitin Seamount
6	ANSTO	Australian Nuclear Science and Technology Organisation
7	APPG	All-Party Parliamentary Group
8	ARECOMS	Authority for the Regulation and Control of Strategic Mineral Substances Markets
9	ASEAN	Association of Southeast Asian Nations
10	ASM	Artisanal and Small-scale Mining
11	ATF	Automotive Transformation Fund
12	ATVM	Advanced Technology Vehicles Manufacturing Loan Programme
13	BEIS	Business, Energy and Industrial Strategy
14	BEIS	Business, Energy and Industrial Strategy
15	BI	Central Bank of Indonesia
16	BIL	Bipartisan Infrastructure Law
17	CAEM	Argentine Chamber of Mining Companies
18	CAM	Cathode Active Material
19	CAMYEN	Catamarca Minera Y Energética Sociedad Del Estado
20	CAMYEN	Catamarca Minera Y Energética Sociedad Del Estado
21	CATL	Contemporary Amperex Technology Co., Limited
22	CdTe	Cadmium-Telluride
23	CECA	Comprehensive Economic Cooperation Agreement
24	CECM	Centre of Excellence for Critical Minerals
25	CEIF	Clean Energy Innovation Facility
26	CHIPS Act	Creating Helpful Incentives to Produce Semiconductors and Science Act of 2022
27	CL	Composite License
28	CMA	Critical Minerals Agreement
29	CMCE	Critical Minerals Centre of Excellence
30	CMETC	Critical Mineral Exploration Tax Credit
31	CMIC	Critical Minerals Intelligence Centre
32	CMiPTI	Critical Minerals Production Tax Incentive
33	CMNPI	Critical Minerals National Productivity Initiative
34	CMO	Critical Mineral Office

35	CMPA	Critical Minerals Partnership Agreements
36	CMRDD	Canada's Critical Minerals Research, Development and Demonstration Program
37	CODELCO	Corporación Nacional del Cobre de Chile
38	CoE	Center of Excellence
39	COFEMIN	Consejo Federal de Minería
40	COMIBOL	Corporación Minera de Bolivia
41	CRM	Critical Raw Materials
42	CRML	Critical Raw Materials List
43	CSEP	Centre for Social and Economic Progress
44	CSIR-IMMT	Council of Scientific & Industrial Research- Institute of Minerals and Materials Technology
45	CSIRO	Commonwealth Scientific and Industrial Research Organisation
46	DBT	Department of Business and Trade
47	DESNZ	Department of Energy Security and Net Zero
48	DFC	Development Finance Corporation
49	DFIs	Development finance institutions
50	DISER	Department of Industry, Science and Resources
51	DLE	Direct Lithium Extraction
52	DoD	Department of Defense
53	DOE	Department of Energy
54	DOM	Deep Ocean Mission
55	DPA	Defense Production Act
56	DRC	Democratic Republic of the Congo
57	DSIT	Department for Science, Innovation and Technology
58	EBRD	European Bank for Reconstruction and Development
59	ECTA	Economic Cooperation and Trade Agreement
60	EEA	European Economic Area
61	EIA	Environmental Impact Assessment
62	EIS	Environmental Impact Statement
63	EITI	Extractive Industries Transparency Initiative
64	ERGI	Energy Resource Governance Initiative
65	ESDM	Ministry of Energy and Mineral Resources of the Republic of Indonesia
66	ESG	Environmental, Social, and Governance
67	ESS	Energy Storage Systems
68	EU	European Union

69	EV	Electric Vehicle
70	FCA	Fair Cobalt Alliance
71	FDI	Foreign Direct Investment
72	FEOC	Foreign entity of concern
73	FEOC	Foreign Entity of Concern
74	FEOC	Foreign Executive Order Committee
75	FMF	Future Minerals Forum
76	FTAs	Free Trade Agreements
77	GA	Geoscience Australia
78	GDP	Gross Domestic Product
79	GoI	Government of India
80	GSI	Geological Survey of India
81	GWh	Gigawatt hour
82	HCL	Hindustan Copper Limited
83	HPA	High Purity Alumina
84	HPAL	High-Pressure Acid Leaching
85	HS Codes	Harmonized System Codes
86	IBM	Indian Bureau of Mines
87	iCET	Initiative on Critical and Emerging Technology
88	ICT	Information and Communications Technology
89	IEA	International Energy Agency
90	IFC	International Finance Corporation
91	IGF	Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development
92	IIT	Indian Institute of Technology
93	IMF	International Monetary Fund
94	IP	Intellectual Property
95	IPEF	International Collaboration- Indo-Pacific Economic Framework
96	IRA	Inflation Reduction Act
97	IREL	Indian Rare Earths Limited
98	IRENA	International Renewable Energy Agency
99	IRH	International Resource Holdings
100	ISA	International Seabed Authority
101	ISM	Indian School of Mines
102	JEMSE	Jujuy Energía y Minería. Sociedad Del Estado
103	JUMP	Junior Mining Programme
104	JVs	Joint Ventures

105	KABIL	Khanij Bidesh India Limited
106	KIGAM	Korea Institute of Geoscience and Mineral Resources
107	LCA	Life Cycle Assessment
108	LCE	Lithium Carbonate Equivalent
109	LFP	Lithium Iron Phosphate
110	LME	London Metal Exchange
111	LMFP	lithium manganese iron phosphate
112	LMFP	Lithium Manganese Iron Phosphate
113	LPO	Loan Programs Office
114	MEA	Ministry of External Affairs
115	MECL	Mineral Exploration and Consultancy Limited
116	MENA	Middle East and North Africa
117	METC	Mineral Exploration Tax Credit
118	MHP	Mixed Hydrate Precipitate
119	ML	Mining License
120	MMDR	Mines and Minerals Development and Regulation
121	MoES	Ministry of Earth Sciences
122	MOTIE	Ministry of Trade, Industry and Energy
123	MoU	Memorandum of Understanding
124	MSP	Minerals Security Partnership
125	MSP	Mixed Sulphide Precipitate
126	MSPFN	Minerals Security Partnership Finance Network
127	MT	Metric Tonnes
128	NALCO	National Aluminium Company Limited
129	NASA	National Aeronautics and Space Administration
130	NCMM	National Critical Mineral Mission
131	NGDR	National Geoscience Data Repository
132	NICER	National Interdisciplinary Circular Economy Research
133	NLS	Chile’s National Lithium Strategy
134	NMET	National Mineral Exploration Trust
135	NRFC	National Reconstruction Fund
136	NTCF	National Trade Corridors Fund
137	ODA	Official Development Assistance
138	OECD	Organisation for Economic Cooperation and Development
139	OIL	Oil India Limited
140	OPC	Office Chérifien des Phosphates
141	OVL	ONGC Videsh Limited
142	PCM	Precursor Cathode Material

143	Pes	Private Exploitation Permits
144	PGE	Platinum Group of Elements
145	PIF	Public Investment Fund
146	PLANGEO	National Geology Plan
147	PMSTIAC	Prime Minister's Science, Technology, and Innovation Advisory Council
148	PPA	Purified Phosphoric Acid
149	PSUs	Public Sector Undertakings
150	QIN	Quad Investors Network
151	QUAD	Quadrilateral Security Dialogue
152	REE	Rare Earth Elements
153	ReLiB	Recycling of Lithium Ion Batteries
154	RIGI	Régimen de Incentivo para-Grandes Inversiones
155	RIGI	Régimen de Incentivo para-Grandes Inversiones
156	RISE	Australia Rapid Innovation and Startup Expansion
157	ROK	Republic of Korea
158	SEGEMAR	Servicio Geológico Minero Argentino
159	SERNAGEOMIN	Servicio Nacional de Geología y Minería
160	SIACEM	Information System Open to the Community on Mining Activity in Argentina
161	SIF	Strategic Innovation Fund
162	SMM	Sumitomo Metal Mining
163	SOPs	Standard Operating Procedures
164	SQM	Sociedad Química y Minera de Chile
165	SREPs	Smart Renewables and Electrification Pathways Programme
166	SRML	Strategic Raw Materials List
167	TRL	Technology Readiness Levels
168	TSX	Toronto Stock Exchange
169	TWh	Terawatt hour
170	UAE	United Arab Emirates
171	UKEF	UK Export Finance
172	UKRI	UK Research and Innovation
173	UK-TSI	India-UK Technology and Security Initiative
174	UNCTAD	United Nations Conference on Trade and Development
175	USAID	U.S. Agency for International Development
176	USGS	U.S. Geological Survey
177	VAT	Value-Added Tax

178	WTO	World Trade Organisation
179	YLB	Yacimientos de Litio Bolivianos
180	ZDA	Zambia Development Agency

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