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# Partnerships for Self-Reliance

## Internationalising India's Critical Minerals Sector

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CSEP RESEARCH

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## Internationalising India's Critical Minerals Sector

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## Abbreviations

<b>AICMRH</b>	Australia–India Critical Minerals Research Hub
<b>ANSTO</b>	Australian Nuclear Science and Technology Organisation
<b>AUKUS</b>	Australia, the UK, and the US
<b>CAMYEN</b>	Catamarca Minera Y Energética Sociedad Del Estado
<b>CBMM</b>	Companhia Brasileira de Metalurgia e Mineração
<b>CEEW</b>	Council on Energy, Environment and Water
<b>CEP</b>	Clean Energy Partnership
<b>CET</b>	Critical and Emerging Technologies
<b>CETM</b>	Critical Energy Transition Minerals
<b>CMA</b>	Critical Minerals Agreement
<b>CMI</b>	Critical Materials Institute
<b>CMMI</b>	Critical Minerals Mapping Initiative
<b>CMIP</b>	Critical Minerals Investment Partnership
<b>CMO</b>	Critical Minerals Office (Australia)
<b>CPI</b>	Centre for Process Innovation
<b>CPCB</b>	Central Pollution Control Board
<b>CRMA</b>	Critical Raw Materials Act
<b>CSIR</b>	Council of Scientific and Industrial Research
<b>CSIR-IMMT</b>	CSIR–Institute of Minerals and Materials Technology
<b>CSIR-NGRI</b>	CSIR–National Geophysical Research Institute
<b>CSIRO</b>	Commonwealth Scientific and Industrial Research Organisation
<b>CSO</b>	Civil Society Organisations
<b>CTO</b>	Chief Technical Officer
<b>DFIs</b>	Development Finance Institutions
<b>DISR</b>	Department of Industry, Science and Resources (Australia)
<b>DMF</b>	District Mineral Foundation
<b>DoC</b>	Department of Commerce (US)
<b>DoD</b>	Department of Defense (US)
<b>DoE</b>	Department of Energy (US)
<b>DPA</b>	Defence Production Act
<b>DRC</b>	Democratic Republic of Congo
<b>EC</b>	Empowered Committee
<b>ECAs</b>	Export Credit Agencies
<b>ECTA</b>	Economic Cooperation and Trade Agreement
<b>ENR</b>	Bureau of Energy Resources (US)
<b>EPA</b>	Environmental Protection Agency (US)
<b>ERGI</b>	Energy Resource Governance Initiative
<b>ERMA</b>	European Raw Materials Alliance
<b>ESG</b>	Environmental, Social, and Governance
<b>ETWG</b>	Energy Transition Working Group
<b>EV</b>	Electric Vehicle
<b>FCAB</b>	Federal Consortium for Advanced Batteries

<b>FTA</b>	Free Trade Agreements
<b>FY</b>	Fiscal Year
<b>GoI</b>	Government of India
<b>GP</b>	Office of Global Partnerships
<b>GSI</b>	Geological Survey of India
<b>HCL</b>	Hindustan Copper Ltd.
<b>IBM</b>	Indian Bureau of Mines
<b>iCET</b>	India–US Initiative on Critical and Emerging Technologies
<b>ICRIER</b>	Indian Council for Research on International Economic Relations
<b>IEA</b>	International Energy Agency
<b>IEEFA</b>	Institute for Energy, Economics and Financial Analysis
<b>IfM</b>	Institute for Manufacturing
<b>IIT</b>	Indian Institute of Technology
<b>IPEF</b>	Indo-Pacific Economic Framework
<b>IREL</b>	Indian Rare Earths Limited
<b>IRH</b>	International Resources Holding RSC
<b>JBIC</b>	Japan Bank for International Cooperation
<b>JEMSE</b>	Jujuy Energia y Minería Sociedad del Estado
<b>JNARDDC</b>	Jawaharlal Nehru Aluminium Research Development and Design Centre
<b>JOGMEC</b>	Japan Organization for Metals and Energy Security
<b>JVCs</b>	Joint Venture Companies
<b>KABIL</b>	Khanij Bidesh India Ltd.
<b>MEA</b>	Ministry of External Affairs
<b>MECL</b>	Mineral Exploration & Consultancy Limited
<b>METI</b>	Ministry of Economy, Trade and Industry (Japan)
<b>MMDR</b>	Mines and Minerals (Development & Regulation) Act
<b>MM&amp;P</b>	Mines Minerals & People
<b>MNRE</b>	Ministry of New and Renewable Energy
<b>MoM</b>	Ministry of Mines
<b>MoU</b>	Memorandum of Understanding
<b>MSFN</b>	Minerals Security Finance Network
<b>MSP</b>	Minerals Security Partnership
<b>MSMEs</b>	Micro, Small, and Medium-Sized Enterprises
<b>NALCO</b>	National Aluminium Company Ltd.
<b>NCMM</b>	National Critical Minerals Mission
<b>NEST</b>	New and Emerging Technologies
<b>NIIST</b>	National Institute for Interdisciplinary Science and Technology
<b>NLCIL</b>	NLC India Limited
<b>NMET</b>	National Mineral Exploration Trust
<b>NMP</b>	National Mineral Policy
<b>NSA</b>	National Security Advisor
<b>NSC</b>	National Security Council
<b>NSCS</b>	National Security Council Secretariat
<b>NSF</b>	National Science Foundation

<b>OES</b>	Bureau of Oceans and International Environmental and Scientific Affairs (US)
<b>ONGC</b>	Oil and Natural Gas Corporation
<b>OVL</b>	ONGC Videsh Limited
<b>PGII</b>	Partnership for Global Infrastructure and Investment
<b>PGMs</b>	Platinum Group Metals
<b>PIB</b>	Press Information Bureau
<b>PLI</b>	Production Linked Incentive
<b>PMO</b>	Prime Minister's Office
<b>PPP</b>	Public-Private Partnerships
<b>PSU</b>	Public Sector Undertaking
<b>QUIN</b>	Quad Investors Network
<b>R&amp;D</b>	Research and Development
<b>R&amp;D Hub</b>	Australian Critical Minerals Research and Development Hub
<b>REEs</b>	Rare Earth Elements
<b>Rosgeo</b>	Rosgeologia
<b>SCRI</b>	Supply Chain Resilience Initiative
<b>SEZ</b>	Special Economic Zones
<b>SMEs</b>	Small and Medium-Sized Enterprises
<b>SSEF</b>	Shakti Sustainable Energy Foundation
<b>T20</b>	Think20
<b>TRUST</b>	Transforming the Relationship Utilizing Strategic Technology
<b>TSI</b>	Technology Security Initiative
<b>TTC</b>	Trade and Technology Council (EU-India)
<b>UKTMP</b>	Ust-Kamenogorsk Titanium and Magnesium Plant JSC
<b>UNEP</b>	United Nations Environment Programme
<b>UNSG</b>	United Nations Secretary-General
<b>USGS</b>	United States Geological Survey

## Executive Summary

As India advances its ambitious climate and development goals, access to critical minerals has become a strategic imperative. Minerals such as lithium, cobalt, nickel, and rare earth elements underpin the country's plans for green transition, advanced manufacturing, and national security. Yet India faces acute vulnerabilities: limited domestic reserves, high import dependence (particularly on China, which supplies over half of India's imports), and an underdeveloped processing and refining sector. These constraints expose the country to geopolitical risks, market volatility, and technological dependence at a moment when global competition for minerals is intensifying.

To address these challenges, India launched the National Critical Minerals Mission (NCMM) in 2025, a seven-year framework backed by significant State resources. This study focuses on the NCMM's international dimension, examining how India can secure resilient access by: a) leveraging external partnerships and b) enhancing policymaking structures to integrate domestic and external levels of operation. It asks four guiding questions: (1) What is the utility of international partnerships on critical minerals? (2) Which engagement models—bilateral, multilateral, or minilateral—are most effective? (3) What role should the Indian government play in balancing State-led and market-led approaches while engaging abroad? and (4) What institutional design is most suitable for coordinating domestic and international interests?

This paper provides one of the first comprehensive mapping of India's international partnerships on critical minerals and systematically analyses its domestic policymaking architecture. It identifies clear trends and patterns in both spheres and highlights the trade-offs India faces between external procurement and domestic capacity, upstream extraction and downstream processing, and statist versus market-led approaches.

The study argues that India cannot achieve critical minerals "self-reliance" through domestic measures alone. Instead, a strategic, State-led but partnership-oriented model—combining diplomacy, industrial policy, private sector, and institutional reform—is essential. By deepening Global South ties, leveraging Global North technology, and streamlining its domestic ecosystem, India can build resilient supply chains to support its economic ambitions and climate commitments.

## India's International Engagements

Mapping India's bilateral, multilateral, and minilateral initiatives, the study finds that India's international engagements vary widely in scope and maturity, ranging from early-stage memoranda of understanding to operational joint ventures.

Key trends and patterns in international partnerships:

- **Recent Acceleration but Uneven Maturity:** Most partnerships are nascent or developing. Only a few—most notably with Australia and Japan—are operational, delivering concrete access to upstream resources and technology.
- **Layered Engagement:** Bilateral deals (e.g., with Australia, Argentina, Chile, and Mongolia) provide targeted resource access; minilateral platforms like the Quad and Minerals Security Partnership (MSP) enable policy coordination; while multilateral forums (G20, International Energy Agency [IEA], and UN) remain largely principle-setting.
- **North-South Imbalance:** Partnerships with the Global North emphasise technology, standards, and resilience, while resource-rich Global South engagements in Africa and Latin America remain largely untapped or exploratory.
- **No Engagement with China:** Despite high import dependence, India has avoided cooperation with Beijing, seeking instead to hedge risks through diversification.
- **Strategic Breadth vs Depth:** Many Memorandum of Understandings (MoUs) exist, but few translate into projects that strengthen domestic value chains.

Policy recommendations on international engagement:

- **Prioritise Global South partnerships** to secure upstream access and co-develop value chains, particularly in Africa and Latin America.
- **Advance triangular cooperation** by linking Global North partners' technology and finance with Global South resources.
- **Play a proactive role in multilateral governance** to shape emerging norms on sustainability, equity, and climate justice.

- **Focus partnerships beyond extraction**, emphasising refining, recycling, and technology transfer to build long-term capacity.
- **Consider limited engagement with China**, coupling inward investments with technology transfer and Research and Development (R&D) requirements.
- **Emergence of Multiple Stakeholders:** From defence and atomic energy to industry players, research bodies, and small and medium-sized enterprises (SMEs), a wider set of actors is now shaping mineral policy, though with limited integration.
- **Lessons from Hydrocarbons:** India's past pursuit of energy security shows the dangers of both over-reliance on "self-reliance" rhetoric and risky overseas extraction strategies driven by PSUs.

### India's Policymaking Ecosystem

India's policymaking architecture for critical minerals is still evolving. The NCMM provides a broad framework, but coordination remains fragmented across ministries, Public Sector Undertakings (PSUs), industry, and new entrants such as NITI Aayog.

Key trends and patterns in the domestic ecosystem:

- **Fragmented Institutional Setup:** Multiple ministries and agencies pursue parallel initiatives, leading to overlaps and weak coordination.
- **Tension Between Statist and Market Approaches:** India risks over-centralisation through State-led ventures but leaving the sector entirely to market forces could undermine geo-economic and security interests.
- **Underdeveloped Processing and Recycling Capacity:** Even when resources are secured, India lacks sufficient midstream and downstream infrastructure.
- **Build foreign policy and negotiation capacity** within decision-making institutions through expert integration and training.
- **Engage start-ups, SMEs, and micro, small, and medium-sized enterprises (MSMEs) within the mining ecosystem in international projects** via mapping, financing support, and targeted incentives.
- **Strengthen processing and recycling infrastructure** to capture more value domestically and reduce external dependence.
- **Avoid repeating path dependencies from the hydrocarbons sector** by balancing exploration, acquisition, and long-term technology development.

Policy recommendations on the domestic ecosystem:

## 1. Introduction

Recent years have seen a sharp rise in international partnerships aimed at securing resilient access to critical minerals, reflecting their growing significance in global economic and geopolitical dynamics. As the world transitions towards a low-carbon economy, critical minerals have emerged as strategic resources essential for clean energy technologies, advanced manufacturing, and national security. Recognising the vulnerabilities of existing supply chains—exacerbated by global disruptions such as the COVID-19 pandemic, the Russia–Ukraine war, the US–China tariff war, and China's weaponisation of rare earth magnets—countries are diversifying their sourcing strategies.

The urgency of diversification is driven by two primary concerns: first, the disruptions caused by geopolitical competition, and second, the increasing risk of supply chain weaponisation, particularly due to China's dominance in critical mineral refining and processing. With over 70 per cent of global critical mineral refining capacity controlled by China, many countries, including the US, Japan, the European Union (EU), and Australia, are working to mitigate their reliance on a single supplier.

For India's economic and green climate transition targets at home, this international context poses a particular challenge, requiring more flexible engagements abroad. New Delhi is now an active participant in this evolving landscape, engaging in bilateral, minilateral, and multilateral initiatives such as the MSP, India–US TRUST (Transforming the Relationship Utilizing Strategic Technology) initiative, and the India–UK Technology Security Initiative (TSI).

Although still in its early stages, this strategic shift towards embedding cooperation on critical minerals in its international partnerships marks a crucial step in ensuring India's long-term resource security and economic stability. As a late entrant into the global critical minerals race, India is now aligning itself with

international efforts to reduce dependence on China while simultaneously strengthening its domestic capabilities. This strategic recalibration underscores the need for a robust international engagement framework to secure critical mineral supplies for India's green transition in line with economic development objectives.

The NCMM, announced in January 2025, marks a positive and much-needed development in the country's efforts to secure a stable and sustainable supply of critical minerals. With a strategic timeframe of seven years, it is endowed with an expenditure of Rs 16,300 crore (approximately USD 1.9 billion) and an expected investment of Rs 18,000 crore (approximately USD 2.7 billion) by PSUs and other stakeholders (Ministry of Mines [MoM], Government of India [GoI], 2025c).

This broad, long-term policy framework includes an important international cooperation pillar, signalling the government's recognition that the journey towards self-reliance at home also goes through efficient external partnerships abroad. There is much potential for these partnerships, given the significant overlap in the lists of critical minerals identified by India and key global players such as the US, Japan, or Australia (see comparison in Table 1).

However, significant challenges remain in translating this vision into actionable outcomes. The NCMM is broad and long-term in nature, covering a wide range of goals and multiple priorities, as is often the case for government strategies. The real challenge of implementation lies in identifying specific priority areas and determining the role of the government in orchestrating coordination between various actors to ensure that resources are allocated and utilised effectively. The critical minerals space sits at the complex intersection of economics and geopolitics, requiring an integrated approach that can align domestic industrial policy with foreign partnerships.

**Table 1: List of Critical Minerals: India, Australia, EU, Japan, and the US**

Mineral	India	Australia	EU	Japan	US
Antimony	✓	✓	✓	✓	✓
Arsenic	✗	✓	✓	✗	✓
Beryllium	✓	✓	✓	✓	✓
Bismuth	✓	✓	✓	✓	✓
Cadmium	✓	✗	✓	✓	✓
Chromium	✗	✓	✗	✗	✓
Cobalt	✓	✓	✓	✓	✓
Copper	✓	✗	✓	✓	✓
Fluorine/Fluorspar	✗	✓	✓	✗	✓
Gallium	✓	✓	✓	✓	✓
Germanium	✓	✓	✓	✓	✓
Graphite	✓	✓	✓	✓	✓
Hafnium	✓	✓	✓	✓	✓
High-Purity Alumina	✗	✓	✗	✗	✗
Indium	✓	✓	✓	✓	✓
Lithium	✓	✓	✓	✓	✓
Magnesium	✗	✓	✓	✗	✓
Manganese	✗	✓	✓	✓	✓
Molybdenum	✓	✓	✓	✓	✓
Nickel	✓	✓	✓	✓	✓
Niobium	✓	✓	✓	✓	✓
Phosphorous	✓	✗	✓	✓	✓
Platinum Group Elements	✓	✓	✓	✓	✓
Potash	✓	✗	✓	✗	✓
Rare Earth Elements (REEs)	✓	✓	✓	✓	✓
Rhenium	✓	✓	✓	✓	✓
Scandium	✗	✓	✓	✓	✓
Selenium	✓	✓	✓	✗	✓
Silicon	✓	✓	✓	✓	✓
Strontium	✓	✗	✓	✓	✓
Tantalum	✓	✓	✓	✓	✓
Tellurium	✓	✓	✓	✗	✓
Tin	✓	✗	✓	✓	✓
Titanium	✓	✓	✓	✓	✓
Tungsten	✓	✓	✓	✓	✓
Uranium	✗	✗	✗	✓	✓
Vanadium	✓	✓	✓	✓	✓
Zirconium	✓	✓	✓	✓	✓

Source: Authors' compilation adapted from CSEP blog series on India's international partnerships on critical minerals.

Three priorities stand out in the quest to align India's nascent international partnerships with India's broader strategic and developmental objectives, such as *Viksit Bharat* and *Atmanirbhar Bharat* and a resilient critical minerals ecosystem. First, India's strategic policy framework will have to avoid two extremes: on the one hand, a heavily statist approach that could stifle private sector initiative. On the other hand, the risk of pure market mechanisms that might not align with strategic national interests. Second, an over-emphasis on acquisition, whether through domestic mining or overseas ventures, and a singular focus on self-reliance could overlook the importance of partnerships to build long-term technological capabilities or to co-develop environmental standards that align regionally and globally. Third, the successful implementation of the strategy will depend on effective coordination between domestic and international policy spheres. Deepening and operationalising international partnerships will be crucial, especially in areas such as technology transfer, concessional financing, and industrial collaboration.

This paper contributes to this exercise by systematically mapping India's bilateral, minilateral, and multilateral partnerships on critical minerals, as well as assessing the institutional architecture governing these efforts. It highlights the need for a proactive, state-led strategy that enables targeted international collaboration, particularly in downstream and value-added stages of the supply chain. Drawing lessons from countries like Japan, the US, and the EU, the paper emphasises strengthening India's domestic governance to align international engagements with national priorities.

Ultimately, the study argues that India must adopt a structured and adaptive international cooperation model, with the State playing a central facilitative role, to navigate geopolitical complexities and build resilient, sustainable supply chains.

India stands at a critical juncture where it can either seize this opportunity and emerge as a key player in the critical minerals ecosystem or remain constrained by slow policy implementation and outdated strategic approaches. The decisions made today, whether in securing sustainable international partnerships, reforming its acquisition model, or expediting domestic capacity-building, will determine whether India can reach and soar or struggle and fall short in the race for critical minerals. The path forward requires a strategic recalibration that balances

international collaboration, private sector engagement, and rapid domestic capability enhancement, ensuring that India can navigate the complexities of the critical minerals landscape with diplomatic agility and strategic foresight.

## 1.1 Objectives and Research Questions

Our study assesses how international partnerships can be leveraged to build a resilient and future-ready supply chain of critical minerals for India. Given the growing importance of critical minerals in securing supply chains and enabling the transition to green technologies, the paper evaluates how India can further strengthen its global engagements with key partners to support its domestic developmental and climate transition goals.

The study specifically examines: a) the role of international partnerships in shaping India's critical minerals strategy across different bilateral, minilateral, and multilateral levels of cooperation and b) the Indian government's capacity to enable and coordinate this domain, liaising between domestic and international players. By analysing institutional and policy frameworks adopted by other countries, the paper draws comparisons to offer insights into best practices and models that could inform India's approach.

The aim is to accelerate the efficient implementation of policy initiatives, such as the NCMM, for India to minimise the risks and maximise the returns of international partnerships on critical minerals towards both its development and climate goals. This is the first comprehensive study of India's international strategy on critical minerals with important implications for India's future foreign policy and international political economy, especially resource diplomacy.

There are four key questions this paper addresses:

1. How should India position itself to maximise and securitise access to minerals that are critical for its economic and green transition?
2. How effective are India's existing international engagements in reducing supply chain vulnerabilities for critical minerals and advancing domestic capacity building?
3. How can India improve its policy ecosystem to ensure maximum benefit from engagements in international partnerships?

4. How can the NCMM be operationalised to ensure that the internationalisation of India's critical minerals sector achieves an effective balance between: a) external procurement and domestic exploration; b) mining-centric acquisition of raw materials and downstream, technology-centric processing industries; and c) State- and non-State actors?

## 1.2 Methodology

This paper adopts a qualitative research methodology that is both descriptive and analytical. It is grounded in the theoretical frameworks of resource diplomacy and economic security, aiming to provide a comprehensive understanding of India's international engagement on critical minerals. The research employs three main methods: secondary literature review, expert interviews, and roundtable discussions with policy stakeholders.

First, we conducted an extensive review of secondary literature, including peer-reviewed journal articles, government reports, legislative documents, policy briefs, and media coverage, to systematically map India's international partnerships on critical minerals across bilateral, multilateral, and minilateral levels. This review also facilitated the identification of key domestic stakeholders involved in the formulation and implementation of India's critical minerals strategy at home and abroad.

Second, we conducted expert consultations and semi-structured interviews with a wide range of policy stakeholders. These included government officials from the MoM, National Security Council Secretariat (NSCS), Ministry of External Affairs (MEA), government officials from the US, EU, Japan, and others, multilateral organisations such as the UN, industry leaders, and researchers from think tanks and academic institutions. These interviews, conducted at various stages of the research, provided valuable insights into different institutional perspectives, strategic priorities, and implementation challenges. They also allowed us to understand how international players assess India's policies and engagements abroad.

Third, the study draws on insights from closed-door policy roundtables and focused group discussions involving policymakers, industry representatives, and subject matter experts. These forums offered an opportunity for in-depth dialogue, validation of findings, and critical feedback on the evolving contours of India's international critical minerals strategy.

By triangulating data from these three sources, this study offers a comprehensive assessment of the Indian government's role in shaping international partnerships for critical minerals and highlights the challenges and opportunities that lie ahead.

## 1.3 Structure of the Paper

Following this introduction, Section 2 of the paper examines the significance of critical minerals for India's green growth and situates India's approach within the broader geopolitical competition for resources. We then proceed to the two empirical cores of our study. Section 3 maps and analyses India's emerging international partnerships and discusses some of the other partnerships pursued by other countries such as the US, EU, Japan, and others; and Section 4 assesses India's domestic decision-making architecture on critical minerals and provides a brief comparison with institutional architectures in other economies. Based on this analysis, Section 5 lays out policy options such as encouraging the private sector, focusing international collaboration on downstream value addition and beneficiation rather than upstream asset acquisition, and providing incentives for Indian and international companies to invest in India, among others.

## 2. India's Green Growth Ambitions Amidst Geopolitical Competition

India's economic trajectory and green transition are increasingly tied to the availability of critical minerals. As the country aims to expand its renewable energy capacity, enhance electric vehicle (EV) adoption, and secure its position in high-tech manufacturing, the demand for critical minerals, such as lithium, cobalt, nickel, and rare earth elements, has surged. However, India faces significant supply chain vulnerabilities due to its heavy dependence on imports, particularly from China, driving economic security concerns both across government and industry. Addressing these challenges requires a comprehensive strategy that balances domestic resource development with international partnerships to build both around, as well as with China.

This section highlights the rising demands for critical minerals driven by the green transition and reviews the sources of growing supply vulnerabilities and dependencies. It then surveys India's domestic policy developments in the space to help set the context for the utility of international collaborations.

## 2.1 India's Rising Dependence on Critical Minerals and Supply Chain Vulnerabilities

As of 2025, deployment of green energy technologies is steadily driving the demand for critical minerals.<sup>1</sup> According to the IEA, under the business-as-usual scenarios keeping in line with the Paris commitments, demand for minerals for clean technologies is expected to quadruple by 2040 (IEA, 2021, 2022). According to one estimate, a fast track to net-zero would increase the global demand for minerals by six times by 2040 (IEA, 2022).

India's clean energy and high-tech industries are driving an unprecedented increase in demand for critical minerals. In June 2023, India came out with its list of 30 critical minerals (MoM, GoI, 2023b). Lithium, a key component for battery storage technologies, exemplifies this trend. According to one projection (Chadha & Sivamani, 2024), while India's estimated lithium requirement for the fiscal year (FY) 2025 stands at 58 tonnes, projections for 2047 indicate a massive rise to 20,845 tonnes<sup>2</sup> (Chadha & Sivamani, 2024). The report projects a surge in cobalt from 17 tonnes to 5,914 tonnes, in nickel from 52 tonnes to 18,599 tonnes, and in graphite from 609 tonnes to 2,17,884 tonnes over the same period.

This increasing demand is primarily driven by India's ambitious climate targets. The country aims to achieve 500 GW of non-fossil fuel energy capacity by 2030 and reach net-zero emissions by 2070 (Prime Minister's Office [PMO], India, 2024). Achieving these milestones necessitates a steady and secure supply of minerals essential for solar panels, wind turbines, and battery storage systems. Without access to critical minerals, India risks falling behind in the global energy transition, making resource security a key national priority.

India currently imports 100 per cent of its lithium, cobalt, and key rare earth elements, making it highly dependent on external suppliers (MoM, GoI, 2023b). This dependence arises from the absence of economically viable domestic reserves and ongoing mining activity for these minerals (Bansal & Chadha, 2025). This dependence is particularly concerning given the geopolitical risks associated with mineral trade. Over the past five years (2019–2024), India has imported significant portions of its critical minerals from China, despite ongoing political tensions and

efforts at economic decoupling. Import data highlights India's reliance on China for critical mineral imports is significant, with most key resources sourced from the country. According to an analysis of Ministry of Commerce data, China accounts for 56.3 per cent of India's critical minerals imports (Gera, 2024), with processed minerals accounting for 39.1 per cent of the imports and raw materials accounting for 30.5 per cent of the import share. India's critical minerals imports have increased tenfold in the past ten years, from USD 475 million in FY 2015 to USD 4.93 billion in FY 2024 (Gera, 2024). Recent data also suggests mineral-specific dependence on China, as showcased below by Table 2.

**Table 2: India's Critical Minerals Import Dependence on China**

Mineral	Per Cent of India's Imports from China
Bismuth	85.6
Lithium	82.0
Silicon	76.0
Titanium	50.6
Tellurium	48.8
Graphite	42.4

Source: Adapted from Shetty (2024).

Given China's dominance in refining and processing critical minerals, there is growing concern over potential supply chain disruptions. India's reliance on a single supplier for essential minerals leaves it susceptible to market fluctuations, export restrictions, and geopolitical manoeuvring. Despite ongoing efforts to diversify supply chains, China remains an unavoidable link in India's manufacturing ecosystem, raising concerns about long-term economic security.

Additionally, a report by CSEP (2025) on critical minerals supply chains discusses how foreign ownership of mining assets (often by Chinese companies) and long-term offtake agreements further concentrate control over global supply chains. These dynamics, coupled with India's underdeveloped domestic processing sector, mean that India is often forced to export raw mineral concentrates for processing abroad, losing value addition opportunities (Bansal & Chadha, 2025).

<sup>1</sup> Clean energy technologies already account for 40 per cent of global copper and rare earths, 60–70 per cent for nickel and cobalt and almost 90 per cent for lithium (IEA, 2021).

<sup>2</sup> This number is of "Projections of Total Annual Mineral Requirements for Select Clean Energy Technologies (in Tonnes)."

However, supply chain vulnerabilities extend far beyond the issue of Chinese dominance. Nationalisation of resources is another significant challenge, with many mineral-rich nations imposing export controls to secure domestic supply and maximise economic benefits (Dou et al., 2024). Countries such as Indonesia (Simmons & Marcilly, 2024; Warburton, 2019) and Chile (Johnson et al., 2024) have introduced policies that restrict raw material exports, while others, like the Democratic Republic of Congo (DRC) (Wakenge et al., 2021), continue to face governance and regulatory instability that can disrupt supply. Political instability in key mining regions further exacerbates these risks, as conflicts over land rights, environmental concerns, and corruption create additional layers of uncertainty.

Second, even when minerals are successfully sourced, India remains constrained by its lack of refining and processing capacity (Bansal & Chadha, 2025). While mining activities are distributed globally, China has monopolised the midstream refining process, controlling over 60 per cent of critical mineral refining worldwide. This creates a bottleneck where even minerals extracted from more diverse sources must be processed in China before they can enter global supply chains. The lack of domestic processing infrastructure in India not only increases costs but also deepens its dependence on external actors for value-added materials essential to advanced manufacturing and clean energy technologies.

A third challenge relates to stockpiling practices by major economies such as the US and China that distort market dynamics, creating artificial shortages and price volatility that disproportionately affect import-dependent countries like India (Bardi, Jakobi & Hettiarachchi, 2016).

Finally, there is also the challenge of stringent environmental, social, and governance (ESG) standards, which are set by either resource-rich countries across the Global South or international bodies. While crucial for sustainable and ethical sourcing, these impose compliance burdens that limit the number of viable suppliers India can engage with (ETCFO Research, 2024; Wu & Tham, 2023). The country's limited investment in recycling and circular economy initiatives further exacerbates these vulnerabilities, as a lack of secondary resource recovery forces greater reliance on newly extracted minerals.

India's rising dependence on critical mineral imports exposes it to a wide range of geopolitical, economic,

environmental, and regulatory risks. Without strategic intervention, these vulnerabilities could undermine the country's clean energy ambitions and broader industrial growth. Strengthening domestic capabilities, diversifying international partnerships, and investing in sustainable resource management will be essential to securing a stable and resilient supply chain for India's critical mineral needs.

## 2.2 Domestic Constraints and Policy Initiatives

The NCMM (2025) is the most recent initiative that seeks to comprehensively address many of the challenges (MoM, GoI, 2025a). It follows several other policy steps, including the identification of 30 critical minerals within India (MoM, GoI, 2023b), auctioning of critical minerals blocks (MoM, GoI, 2024c, 2024d), and efforts to boost domestic exploration. Yet India's domestic critical mineral supply remains limited, and given past experiences with India's mineral and mining industry, the NCMM will face several domestic and international headwinds in the short run (MoM, GoI, 2023c; Walia, 2024). This includes geological constraints, high production costs, regulatory bottlenecks, and environmental concerns that have, for many years, hindered large-scale mining and processing operations.

A key challenge lies in the lack of an integrated domestic value chain. Even if India increases mineral extraction, the absence of advanced refining and processing facilities prevents it from fully capitalising on its resources. Research highlights that building a resilient mineral value chain requires simultaneous investments in exploration, mining, processing, and manufacturing capacities rather than sequential development (Bansal & Chadha, 2025). Recent policy measures in India have aimed to promote exploration and mining through auctions and incentives, while also encouraging advancements in refining technologies to reduce import dependence (Bansal & Chadha, 2025). Additionally, land acquisition challenges, infrastructure deficits, and environmental regulations continue to slow down domestic mining projects.

Recognising these limitations, the Indian government has launched several reforms, including the National Mineral Policy (NMP, 2019) and amendments to the Mines and Minerals (Development and Regulation) Act (MoM, GoI, 2023c, 2023e). However, at least in

the short run, these measures remain insufficient to bridge the gap between demand and domestic supply. International partnerships are critical to reduce this gap, at least in the short and medium term until the NCMM can effect structural change at home. Until then, India cannot just bank on “self-reliance” and must dedicate important efforts to engage externally, especially given the increasingly rivalrous geopolitical environment and complexity of economic interdependence and climate transition.

## 2.3 Finding a Policy Balance Between the Domestic and the International

Given the context surveyed, how should India position itself to maximise and securitise access to minerals that are critical for its economic and green transition? How can the NCMM be operationalised to ensure that the internationalisation of India's critical minerals sector achieves an effective balance: a) between external procurement and domestic exploration; b) between mining-centric acquisition of raw materials and downstream, technology-centric processing industries; and c) between State- and non-State actors?

**Table 3: Timeline of India's Domestic Developments on Critical Minerals**

Year	Domestic Policy Developments
2015	<ul style="list-style-type: none"> <li>The Mines and Minerals (Development &amp; Regulation) Act (MMDR), 1957 mandating transparent auctions and transferability of mining leases, is amended to establish the District Mineral Foundation (DMF) for the welfare of the people and areas affected by mining.</li> <li>Establishment of the National Mineral Exploration Trust (NMET) to give thrust to exploration and ensuring stringent penalty for illegal mining.</li> </ul>
2016	<ul style="list-style-type: none"> <li>MMDR Act amended to provide for transfer of captive mining leases granted other than through auction to facilitate legitimate business transactions.</li> </ul>
2019	<ul style="list-style-type: none"> <li>NMP announced to foster sustainable mining practices, increase mineral exploration and ensure access to critical minerals for various industries.</li> <li>Khanij Bidesh India Ltd. (KABIL) established to secure strategic minerals abroad.</li> </ul>
2020	<ul style="list-style-type: none"> <li>MMDR Act amended to remove distinction of captive and non-captive mines, increase private sector participation and foreign investment in the mining sector, and streamlined auctioning process. Production Linked Incentive (PLI) Scheme introduced for 10 key sectors, as part of this initiative, securing a stable supply of critical minerals for battery production is a key focus.</li> </ul>
2021	<ul style="list-style-type: none"> <li>MMDR Act amended to simplify exploration and licensing, auctioning of partially explored blocs, fast tracking of allocation process, relaxed norms for composite licences and increased focus on sustainability.</li> </ul>
2023	<ul style="list-style-type: none"> <li>First list of Critical Minerals released, identifies minerals of strategic importance to India.</li> <li>MMDR Act amended to strengthen the exploration and extraction of critical minerals essential for India's economic development and national security.</li> <li>Auctioning of mineral blocks announced for the exploration and mining of critical minerals.</li> </ul>
2024	<ul style="list-style-type: none"> <li>Critical Minerals Mission to accelerate the exploration, development, and processing of critical minerals essential for India's clean energy transition.</li> </ul>
2025	<ul style="list-style-type: none"> <li>NCMM announced to secure a long-term, sustainable supply chain for critical minerals and strengthen India's critical minerals value chain across all stages of the supply chain.</li> </ul>

Source: Authors' compilation based on various sources.

Critical minerals such as cobalt, lithium, and rare earth elements have become central to foreign policy as they are essential for industries like electronics, defence, and renewable energy (Mancheri et al., 2019). Several countries have used varied approaches to secure critical mineral supply chains as demand grows due to the global energy transition. China, for example, has employed a strategy to secure mineral resources through State-backed investments in Africa, gaining control over a significant portion of the world's rare earth minerals (Andrews-Speed & Hove, 2023; Power et al., 2012; Taylor, 2006). As a result, other countries look at employing strategies focused on reducing dependencies and increasing supply chain resilience. For instance, many nations are investing in domestic mining and refining capacities, while also establishing strategic partnerships and diversifying import sources (Barteková & Kemp, 2016; Burke et al., 2022). Some countries, such as those in Europe, are emphasising circular economy approaches to reduce waste and dependency on imports (Andreoni & Roberts, 2022). The development of alliances for resource sharing and innovation is another key strategy, exemplified by the US and its allies' efforts to create resilient supply chains, such as the MSP, for rare earth elements and other critical materials (Schneider-Petsinger, 2021).

Multilateral initiatives, such as the Quad, the Indo-Pacific Economic Framework (IPEF), and others, have also started engaging on critical minerals, aiming to ensure a stable supply of these minerals while addressing potential geopolitical conflicts and environmental concerns (Arasasingham et al., 2023). Additionally, multilateral initiatives like the US-led Energy Resource Governance Initiative (ERGI) seek to establish responsible sourcing practices and secure mineral supply chains (Mancheri et al., 2019; Vlieger, 2021). African nations, with vast deposits of cobalt and lithium, are emerging as key players in the global supply chain, which has made resource diplomacy and international cooperation increasingly crucial for these States (Kalantzakos, 2019; Maull, 1986; Nakano, 2021). The race for critical minerals is not only a matter of economic security but increasingly also connected to geopolitical strategy, as countries compete to control the supply chains that will power future technologies (Kalantzakos, 2019; Nakano, 2021).

Against this challenging context, our paper builds on two knowledge pillars that serve as policy guideposts for India to fine-tune the role of international engagements and partnerships in its critical minerals policy for the next decades.

The first guidepost is related to lessons from the comparative experience of other economies and their quest for energy security in an increasingly interdependent international political economy shows that domestic "self-reliance" is an ideal objective that may have much political allure but is practically impossible to achieve. As exemplified in India's own experience with the oil and gas sectors, this can also have detrimental effects on setting impossible policy objectives, misallocating resources, and locking in costly path dependencies. Sudarshan and Noronha (2009, p. 9) in the context of the 2000s, argue that there are "four key sources of path dependence in India's energy sector: beliefs and perceptions, institutions and organisations, technology, and relative prices." With reference to coal in the power sector and to oil in the transport sector, they survey the costs of policy stasis on India's declared ambition for energy security to alleviate poverty. Similarly, in today's context, there is a risk of similar path dependencies as a new policy takes shape on critical minerals.

Second, beyond the chimaera of domestic, State-led exploration, there is a twin external danger of "rushing abroad" and becoming entangled in an international competition for natural resources. This strategy of external extraction is equally fraught with many risks, especially if driven by public sector enterprises operating in difficult political and security environments. The pursuit of natural resources has been a core element of statecraft throughout history, influencing global geopolitics and economic policy (Klare, 2001). States have long utilised their foreign policy to secure access to resources necessary for industrial development and economic growth. Resource nationalism is increasingly prevalent, as seen in countries like Venezuela and Saudi Arabia, where control over natural resources has shaped foreign and domestic policies (Stevens, 2016).

Contemporary geopolitics, such as China's Belt and Road Initiative, highlights how resource diplomacy continues to shape global relations, particularly in securing critical energy supplies (Dannreuther, 2013; Downs, 2006; Hill & Gaddy, 2003; Luthra & Gupta, 2023). In the case of India and global oil extraction, we have seen the experience of the Indian State acting as a veto player, affecting internationalisation strategies of national oil companies such as Oil and Natural Gas Corporation (ONGC) and ONGC Videsh Limited (OVL) (Meckling, Kong & Madan, 2015). India's experience has been far from positive, facing massive challenges, including regions like Sudan marked by conflict, lack of governance and regulatory contexts, as well as competition from other players such as China, the US, and France (Patey, 2014).

These two knowledge pillars, based on past quests for domestic energy “self-reliance” or energy security, and comparative experiences of international resource extractive strategies, hold important lessons as India calibrates its external strategy for critical minerals.

### 3. Emerging International Partnerships: Experiments in Cooperation

For India, forging international partnerships is a crucial component of its broader strategy, as highlighted in the NCMM announced in January 2025 (Cabinet, 2025). While the country has primarily focused on strengthening its domestic sector through enhanced exploration, mining, refining, and processing capabilities, global partnerships remain essential for achieving mineral security.

This section provides an evaluation and analysis that helps identify what types of partnerships India should pursue. It begins with a comparative perspective by examining the strategic partnerships established by countries such as the US, Japan, Australia, and others to secure reliable critical mineral supply chains and foster collaboration across various stages of the supply chain. It then provides a comprehensive review of India's international partnership agreements (from intentional/nascent to operational and mature ones), before ending with an analysis of emerging trends and patterns in these collaborations. In doing so the section helps offer comparative insights into India's approach to partnerships vis-à-vis some other key partner countries.

We argue that, while the record is mixed, experimenting with such international partnerships allows Indian policymakers to: (a) learn and adapt from other countries' experiences; (b) better coordinate policies; (c) divide labour and develop comparative advantages; (d) increase resilience of supply chains in times of crisis or threats of weaponisation; and (e) calibrate the government's role in coordination with private sector.

Despite India's ambition to become self-reliant and build a strategic stockpile of critical minerals, international collaborations play a pivotal role in ensuring access to advanced mining and processing technologies, as well as in expanding access to global markets. India's former Secretary at the MoM, Vivek Bharadwaj, thus emphasised that the government is “leaving no stone unturned to ensure that we are self-reliant

in critical minerals, whether it is domestic availability through heightened exploration or through tie-ups with the rest of the world...”<sup>3</sup>

This is particularly relevant as India seeks to position itself as a major manufacturing and processing hub for clean energy solutions, such as lithium-ion batteries, EVs, and renewable energy components (Express News Service, 2022; Ministry of Heavy Industries, 2024; Ministry of New and Renewable Energy, 2025). Even if India were to develop significant domestic capabilities, access to diversified and reliable sources of critical minerals would still be necessary to mitigate supply risks. Hence, expanding trade relations and forging international partnerships is imperative for India to ensure access to larger markets for its products.

#### 3.1 New International Partnerships: Comparative Models

India is not alone in recognising the need for global cooperation in securing critical minerals. Many countries have pursued international partnerships to safeguard their mineral supply chains. The US, for instance, has established the MSP alongside key allies such as the EU, Canada, Australia, the UK, India, and Japan to ensure a sustainable and diversified supply of critical minerals (US Department of State, 2024). Additionally, the US has signed agreements with Japan (Ministry of Foreign Affairs of Japan, 2023), Argentina (US Embassy in Argentina, 2024), the DRC, and Zambia (Soulé, 2023), strengthening cooperation on mining and refining. Similarly, the EU has launched the Critical Raw Materials Act (CRMA) (Official Journal of the EU, 2024), a policy framework aimed at reducing dependency on single-source suppliers, particularly China and Russia. It has also entered into agreements with Rwanda (European Commission, 2024a), Australia (European Commission, 2024b), and Argentina (European Commission, 2024c), among others, to expand its mineral import sources (European Commission, n.d.).

Since 2023, the EU has intensified its engagement with Latin America, leading to significant advancements in cooperation on critical raw materials. This includes agreements with Argentina, Brazil, Chile, and the broader Mercosur bloc, all aimed at strengthening sustainable raw material value chains and ensuring a stable supply for the EU (Jütten, 2024). Notably, the EU signed a memorandum of understanding with Argentina and Chile, ratified an interim trade agreement with Chile in late 2024, and

<sup>3</sup> Speech by Vivek Bharadwaj at the launch of list on critical minerals for India, June 28, 2023, India International Centre, New Delhi.

reached a long-awaited political consensus on the EU–Mercosur partnership (Jütten, 2024). The EU's engagements have utilised the Global Gateway and trade strategies to enhance cooperation with partner countries in this sector.

Japan and South Korea have also taken proactive steps by investing in overseas mining projects. Japan has strengthened partnerships with Australia (King, 2022) on securing reliable supply chains for critical minerals. Being one of the first countries to experience the geoeconomic impacts of hindered access to these minerals in 2010, Japan also has strong ties with countries in Southeast Asia, such as Vietnam, to secure rare earth elements (Willing, 2023). Recently, Japan signed a joint statement with Peru to strengthen critical minerals supply chains (Reuters, 2024). Through Japan Organization for Metals and Energy Security (JOGMEC) and Sojitz Corporation (a Japanese company), Japan has been supporting Lynas Rare Earths Ltd., an Australian mining company based in Malaysia, since 2011 (Sojitz Corporation, 2023). Toyota Tsusho Corporation and Orocobre Ltd. (also called Alkem), an Australian company, have been cooperating in Argentina's Salar de Olaroz Salt Lake for lithium mining since 2011 (Toyota Tsusho Corporation, 2024). South Korea has deepened engagements with Canada (IEA, 2024) and Australia (IEA, 2023) to secure clean energy supply chains.

Meanwhile, China, as the dominant global player in the critical minerals supply chain, has long pursued strategic acquisitions and partnerships across Africa, Latin America, and Southeast Asia, securing extensive access to lithium, cobalt, and rare earth elements (Chang et al., 2023; Nakano, 2021). In November 2024, Bolivia signed a USD 1 billion contract with a Chinese firm to build two lithium carbonate plants (Ramos, 2024). One of China's single largest investments in Africa comes under the China–Namibia partnership for uranium, with China investing USD 5.1 billion (Nyabiage, 2025) in a shareholding project between the two countries.

### 3.2 India's Bilateral, Multilateral, and Minilateral Partnerships

India's engagement in critical mineral partnerships reflects a strategic effort to secure diversified, resilient, and sustainable supply chains, underpinned by global cooperation and adherence to responsible sourcing norms.

For example, the partnership with Australia, operationalised through the India–Australia Critical Minerals Investment Partnership (CMIP), prioritises

supply chain resilience for lithium and cobalt while incorporating collaboration on ESG standards and capacity-building initiatives. With Argentina, bilateral engagement centres on lithium resource development via joint ventures and targeted investments, supported by technology transfers aimed at advancing sustainable mining practices. Collaboration with Chile similarly concentrates on lithium, emphasising technology transfer, sustainable extraction methods, and enhanced market access. India's partnership with Mongolia, while historically anchored in coking coal and rare earth elements, is evolving to encompass copper and fluorspar, bolstered by Indian investments in resource mapping and associated infrastructure.

South Africa continues to hold strategic significance, particularly in coal, manganese, and platinum group metals (PGMs), with cooperation extending to beneficiation capacity-building and deeper value chain integration. Broader African engagement, notably with Namibia, Tanzania, and Zambia, is increasingly focused on cobalt, lithium, and copper, with India exploring opportunities for both upstream investment and downstream processing within African States.

In the Gulf region, partnerships with Saudi Arabia and the United Arab Emirates are oriented towards securing access to key industrial minerals and rare earths, supported by investment facilitation and logistics cooperation under broader energy and trade frameworks. Relations with Russia, traditionally centred on hydrocarbons, are expanding into rare earths and strategic metals, with joint exploration projects and technology exchange under discussion despite broader geopolitical complexities.

Engagement with the US has intensified under the MSP and Quad frameworks, enabling joint research, coordinated policy action on responsible sourcing, and supply chain diversification. Similarly, the UK partnership, situated within the broader UK–India Roadmap 2030, combines commercial collaboration with policy dialogue, targeting graphite, lithium, and rare earths through investment facilitation and technological cooperation. India's collaboration with the EU involves aligning regulatory and ESG frameworks, developing joint research projects under the India–EU Trade and Technology Council (TTC), and facilitating market access for critical minerals through mutually beneficial trade arrangements.

Collectively, these partnerships reflect India's overarching strategy of aligning with global ESG frameworks, enhancing domestic processing capabilities, and strengthening its position within an increasingly competitive global critical minerals landscape, as further detailed in Appendix A.

**Table 4: India's International Partnerships on Critical Minerals: Sectors and Scope**

	Exploration and Mapping	Foreign Mine Acquisition	Trade Agreements	Financing	Investments in Indian Mines	Technology Sharing	Refining and Processing	Knowledge Sharing	Joint Research	Recycling	Capacity Building	Standards Setting	Supply Chain Resilience	Just/Green Transition
<b>Bilateral</b>														
Argentina	✓	✓												
Australia	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	
Brazil		✓					✓	✓	✓					
Canada		✓					✓							
Chile	✓	✓												
Côte D'Ivoire	✓					✓		✓						
DRC	✓	✓												
EU						✓	✓	✓	✓	✓		✓	✓	✓
Ghana	✓	✓												
Japan	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
Kazakhstan				✓		✓	✓	✓						
Malawi	✓							✓						
Mali	✓							✓						
Mongolia	✓	✓												
Morocco								✓						
Mozambique	✓							✓						
Namibia	✓	✓												
Russia	✓						✓	✓	✓					
Saudi Arabia						✓	✓							
United Arab Emirates	✓	✓		✓										
UK						✓	✓	✓	✓	✓		✓		
US		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Zambia	✓	✓						✓						
Zimbabwe	✓							✓						
<b>Multilateral</b>														
G20											✓	✓	✓	✓
IEA							✓	✓	✓	✓				
UN								✓		✓		✓		✓
<b>Minilateral</b>														
G7						✓	✓			✓			✓	
IPEF			✓			✓	✓	✓		✓			✓	
MSP		✓		✓	✓	✓	✓	✓	✓	✓		✓		✓
Quad		✓				✓	✓	✓	✓				✓	

Source: Authors' compilation.

### Definition of Sectors:

- **Exploration and Mapping:** Systematic identification and geological surveying of critical mineral reserves.
- **Foreign Mine Acquisition:** Securing ownership or equity stakes in overseas mineral assets.
- **Trade Agreements:** Bilateral or multilateral accords facilitating mineral access, tariffs, or export-import rules; signing of Free Trade Agreements (FTAs) that mention/discuss collaborations on critical minerals.
- **Financing:** Provision of capital or credit mechanisms to support critical mineral projects.
- **Investments in Indian Mines:** Foreign investments in exploration, extraction, or processing projects within India.
- **Technology Sharing:** Transfer of technical know-how, processes, or equipment across partners.
- **Refining and Processing:** Industrial conversion of raw minerals into usable forms for clean technologies.
- **Knowledge Sharing:** Exchange of best practices, data, and expertise among stakeholders.

- **Joint Research:** Collaborative scientific or technological R&D initiatives on critical minerals.
- **Recycling:** Recovery and reuse of minerals from end-of-life products or industrial waste.
- **Capacity Building:** Enhancing institutional, regulatory, and human resource capabilities in the sector.
- **Standards Setting:** Development of common benchmarks for ESG, safety, or trade compliance in minerals.
- **Supply Chain Resilience:** Strategies to diversify, secure, and stabilise critical mineral supply networks.
- **Just/Green Transition:** Aligning mineral strategies with equitable, low-carbon, and sustainable development goals.

### Definition of Scope:

We define scope as the breadth of coverage, focus areas, and intended outcomes of each partnership.

- **Narrow:** Focuses on limited sectors for collaboration. (< five sectors)
- **Wide:** Spans collaborations across the value chain. (≥ five sectors)

**Table 5: India's International Partnerships: Development Stages**

Stage	Definition	Examples
<b>Nascent/ Intentional</b>	Early-stage frameworks, declarations of intent, or MoUs without follow-up action; cooperation is aspirational and exploratory.	<ul style="list-style-type: none"> <li>● <b>Brazil, Chile, DRC, Ghana, Malawi, Mali, Mongolia, Morocco, Mozambique, Saudi Arabia, and Zimbabwe:</b> Primarily MoUs or political statements focused on exploration or diplomatic cooperation; no evidence of follow-up projects or investment.</li> <li>● <b>Canada (bilateral dialogue, 2023):</b> Talks on lithium and cobalt, early-stage project design.</li> <li>● <b>G20 (2023 Indian Presidency):</b> Broad language on critical minerals supply chain sustainability, no binding projects.</li> <li>● <b>IPEF:</b> Dialogue mechanism under IPEF, focusing on mapping supply chains and setting principles; still in early coordination stages with no concrete projects.</li> <li>● <b>UN:</b> Engagement remains at the level of principle-setting (sustainability, just transition), with no binding mechanisms or operational delivery.</li> </ul>
<b>Developing</b>	Partnerships that have moved beyond intent, with frameworks, pilot projects, or asset-level negotiations underway; implementation is progressing, but no significant operational delivery or secured offtake yet.	<ul style="list-style-type: none"> <li>● <b>US:</b> Bilateral MoU on critical minerals, with exchanges on technology and supply chain resilience; discussions ongoing, but no fully operational mines or secured supply yet.</li> <li>● <b>UK:</b> Collaboration on R&amp;D, supply chain resilience, and standards; project discussions underway.</li> <li>● <b>EU:</b> Dialogue under EU's Global Gateway, but no project-level outcomes; discussions underway at the India-EU TTC; also negotiating the India-EU FTA.</li> <li>● <b>Africa (Zambia, Namibia, South Africa, MoUs 2021–2023):</b> KABIL signed MoUs, identified sites for lithium/cobalt; negotiations ongoing, no extraction yet.</li> <li>● <b>Argentia (via KABIL, 2022-2024):</b> Equity stakes in lithium, India to start exploration and mining of 5 lithium brine blocks. KABIL has also set up an office in Argentina.</li> <li>● <b>Saudi Arabia (Strategic Partnership Council, 2023):</b> Agreement to explore critical mineral collaboration, still in negotiation.</li> <li>● <b>Kazakhstan, Namibia, Russia, UAE, Zambia:</b> Partnerships include discussions of processing, investments, or mine stakes, but still pipeline-focused with no delivery of minerals.</li> <li>● <b>MSP, 2022:</b> India joined MSP, discussions on co-investment in critical mineral supply chains; no mines secured yet.</li> <li>● <b>Quad:</b> Technology sharing and recycling frameworks exist, but no evidence of secured supplies or operating projects yet.</li> <li>● <b>IEA:</b> Focused on data, policy advice, and knowledge exchange on critical minerals; cooperation is active but remains in capacity-building rather than mine-level operations.</li> </ul>
<b>Operational/ Mature</b>	Fully functioning partnerships with tangible outcomes such as active mine stakes, secured supply, joint ventures, or processing/trade flows already underway.	<ul style="list-style-type: none"> <li>● <b>Australia (MoU 2022, follow-up projects 2023):</b> KABIL and Australian firms collaborating on lithium and cobalt mines; exploration licences and JV agreements already active; research collaborations are underway</li> <li>● <b>Japan (renewed agreements 2022, longstanding cooperation since 2006):</b> Collaboration on rare earths has been underway with supply chain developed; operational collaboration on exploration, supply chain resilience, and technology transfer; Japanese firms investing in Indian mining and joint processing projects.</li> </ul>

Source: Authors' compilation.

### 3.3 Trends and Patterns in India's Emerging International Partnerships

India's international partnerships on critical minerals operate across bilateral, multilateral, and minilateral levels, reflecting the country's evolving strategy to secure diverse and resilient supply chains. As global demand rises and supply chain risks intensify, India has expanded its engagement with key partners to access resources, technology, and markets. These partnerships vary in scope and depth, enabling India to hedge geopolitical risks and align its mineral security goals with broader diplomatic, economic, and climate objectives.

Based on our detailed survey of these partnerships (and Appendix A), this section analyses key trends. Six patterns emerge:

#### 1. Recent Emergence in the Last 5–10 Years:

India's active engagement in critical minerals partnerships has significantly increased in the last decade, particularly in response to the accelerating global shift toward renewable energy and advanced technologies. The urgency to secure these minerals has been further heightened by the growing awareness of supply chain vulnerabilities and the potential weaponisation of supply chains by dominant players such as China. Only Japan and Australia qualify as fully "Operational." Japan secures rare earths supply chains, while Australia delivers mine-level stakes in lithium and cobalt. The rarity of such examples highlights the gap between India's extensive MoUs and actual mineral flows. Partnerships with Australia, Japan, US, UK, EU, IPEF, Quad, and MSP cover multiple areas from exploration to recycling, and are accordingly classified as "Developing" or "Operational." By contrast, partnerships in Africa and Latin America (e.g., Brazil, Chile, DRC, Ghana, and Morocco) focus only on mine acquisition and remain largely "Nascent." This suggests that the breadth of engagement correlates with greater institutional maturity. The evolving global landscape, characterised by geopolitical tensions and the international push for supply chain resilience, has further reinforced India's commitment to diversifying and securing its partnerships to encompass cooperation on mineral resources.

2. **Different Levels of Partnerships (Bilateral, Multilateral, and Minilateral):** India's approach to critical minerals partnerships spans bilateral, multilateral, and minilateral frameworks, reflecting its strategic intent to hedge risks and build diversified supply chains. Bilateral agreements, such as those with Australia and the US, allow for deep, country-specific collaborations on extraction, processing, and technological exchange. Multilateral platforms, such as engagements through the IEA, G20, and UN, help India integrate into broader global initiatives while reinforcing its role in shaping governance norms. Minilateral initiatives, including the Quad and the MSP, provide avenues for shared investments and coordinated strategies. By adopting a multi-layered engagement strategy, India aims to reduce dependence on any single country or supply chain while maximising economic and strategic benefits. Yet, given the capacity constraints within the Indian bureaucracy, it becomes essential for India to focus on the most beneficial and sustainable partnerships to ensure mineral security. Broad multilateral forums (G20, UN, IEA, and G7) are limited to principles and knowledge exchange, remaining "Nascent" or "Developing." By contrast, minilateral platforms (Quad, IPEF, and MSP) have a wider scope, including investments, supply chains, and recycling, yet still fall short of full operationalisation. These remain strategically important but in a pipeline stage.
3. **Embedded in Different Domains:** Given the cross-cutting nature of critical minerals, India's international partnerships are embedded within multiple policy domains, including energy security, trade and supply chain resilience, technological advancement, and geopolitics. Each of these domains requires tailored cooperation mechanisms and agreements, reflecting the different demands of critical minerals. Ranging from renewable energy and EV manufacturing to semiconductor production and defence applications. Few partners (Australia, Japan, US, UK, and EU) connect directly to India's refining, recycling, or technology base. Most African and Latin American ties are outward-facing, centred on overseas mines without domestic integration. India's strategy remains externally skewed, underutilising partnerships for domestic capacity-building. By aligning its international partnerships with various industrial and technological needs, India seeks to build a resilient and future-proof supply chain for critical raw materials.

**4. Driven by Different GoI Stakeholders:** India's critical minerals strategy is driven by a wide array of governmental stakeholders, each contributing to different facets of policy formulation, international negotiation, and execution. The sectoral overlap explains the wide range of governmental stakeholders involved in critical minerals diplomacy, with different ministries prioritising specific aspects of cooperation. The new Empowered Committee (EC) established by the NCMM is responsible for the administration and coordination of India's critical minerals strategy, including overseeing international cooperation. The MoM plays a central role in envisioning and driving policy formulation as well as identifying potential partners. KABIL is mandated to secure critical mineral resources, while the MEA facilitates diplomatic engagement with partner countries. The Ministry of Commerce and Industry supports trade and investment, ensuring economic viability and competitiveness. Additionally, national security considerations are increasingly influencing India's critical minerals diplomacy, as seen in high-level engagements such as the India-US Initiative on Critical and Emerging Technologies (iCET) and the India-UK TSI, both of which involve the National Security Advisor (NSA). While this multi-stakeholder approach enhances India's ability to navigate complex international partnerships, it also presents challenges in policy coordination and execution, necessitating clearer institutional frameworks and inter-ministerial cooperation. Oftentimes, partner countries are unsure of which ministry to approach to coordinate and collaborate with India due to the vast number of stakeholders.

**5. Initial Focus on Partnerships with the Global North:** India's Global South partnerships (Argentina, Zambia, Namibia, DRC, and Chile) centre on foreign mine stakes and remain "Nascent" or "Developing." Those with the Global North partners (Japan, Australia, EU, US, and UK) involve technology transfer, refining, recycling, and standards, with deeper frameworks that reach "Developing" or "Operational" stages. India currently has more developed partnerships with the Global North States and views them as technology and standards collaborators. While

the limited engagement with the resource-rich partners shows how that engagement is low, it is expanding. This also signals how India is focusing on developing its own domestic capacity for mineral exploration and mapping, a key focus point of the NCMM. India has largely focused its critical minerals partnerships on developing economies such as the US, UK, Japan, Australia, and the EU, driven by technological compatibility, geopolitical alignment, and access to advanced extraction and processing capabilities. These collaborations provide India with innovation, research opportunities, and expertise in refining and value-addition—areas where it seeks to build comparative advantage. However, this emphasis on industrialised partners has seen India's engagements with the resource-rich Global South partners take a backseat. While cooperation with Argentina has begun, broader ties with countries like DRC, Chile, and Indonesia are yet to materialise. Strengthening such partnerships could not only enhance India's supply security but also advance its South-South cooperation agenda and reinforce its leadership role amongst developing economies.

**6. No Engagement with China:** Our survey also indicates that despite India's substantial import dependence on China (see Table 2), there has been no significant formal partnership or dialogue on critical minerals between India and China. The 2020–2025 period of bilateral tensions and disengagement further froze any potential for cooperation. India has been concerned about supply chain manipulation and dependence on China for key industrial inputs. However, China's dominance in refining and processing critical minerals poses a significant challenge for India, as it continues to rely on Chinese suppliers for many essential materials. Restrictions imposed by China in early 2025 have reinforced Indian concerns about weaponisation and the need for diversification through partnerships with the US, Australia, the EU, and others. While this approach reduces direct exposure to Chinese supply chain risks, it also increases reliance on Western partners, raising questions about long-term sustainability and strategic autonomy in critical mineral sourcing.

## 4. Evolving Policymaking Architecture: Balancing Domestic and International Interests

Securing access to critical minerals is now central to any country's green growth agenda. As outlined in the previous sections, identifying these minerals and establishing processes and institutions to secure access are key steps taken by various countries. These minerals are indispensable to multiple economic sectors and are essential for sustainable economic development. Due to their cross-cutting nature, numerous stakeholders exert influence over the decision-making framework across domestic and international domains.

The case of India is more recent but not significantly different. Here, we observe a wide array of established actors across government, the public sector, and industry that have been key actors in the mining and minerals ecosystem for several decades. These players have been traditionally active in the oil, gas, and coal industries across different domestic segments, from extraction to downstream distribution and from regulation to price-setting. They have also engaged internationally in terms of acquisition and procurement, focused on pursuing energy security, particularly since the 1970s and in tandem with growing domestic demand since the country's economic liberalisation in 1991. Many of these public institutions are now also taking a lead in shaping India's objectives and policies on critical minerals. Other new actors have also emerged, leading to a variety of policy stakeholders that often push in different directions, naturally reflecting different perspectives and interests, from energy security to technology transfer.

While the MoM has been mandated to execute and coordinate all activities related to critical minerals, other ministries and institutions also play significant roles. Critical minerals have also emerged as a national security concern, with significant decision-making now also with the NSCS, the MEA, as well as the EC instituted by the NCMM, which holds Cabinet-level authority. NITI Aayog has also played a growing—and in some cases even leading—role in shaping the domestic critical minerals ecosystem. Finally, the Ministry of Defence and the Department of Atomic Energy are integral to India's critical minerals framework, particularly given their focus on strategic minerals essential for defence manufacturing or nuclear applications through secure supply chains.

Marked by the continuity of older, established actors and the emergence of new interests across industry, research, and non-governmental players, the Indian policy ecosystem on critical minerals is relatively new and still evolving. Strategies and institutions focused on hydrocarbons and energy security since the 1970s may no longer be relevant to the new context in which India operates today. One consequent challenge will be to resist the reflexive temptation to replication of old policy models, for example, focused on acquisition abroad led by State-owned enterprises.

On the other hand, India's past decades of experience in pursuing energy security in the international context hold important lessons as it seeks to build critical minerals into its regional and global partnerships. Critical minerals are at the heart of a rapidly changing international political economy and an evolving geopolitical order, warranting greater coordination across government and, more importantly, strategic decision-making that enhances India's domestic interests while maximising external opportunities and minimising external risks.

Against this context, this second core part of our study surveys institutional structures in other countries, offering comparative insights into how India's domestic institutional architecture for the sector could be improved. We then map the various domestic stakeholders within India's critical minerals ecosystem and outline their interests as well as their role or influence in decision-making. The analysis concludes with findings and patterns regarding India's decision-making framework that should inform attempts to enhance India's opportunities and minimise risks in international engagements.

### 4.1 Policy Frameworks for Critical Minerals: Comparative Models

This section provides a comparative overview of the domestic institutional architectures for critical minerals in four key partner countries of India: Japan, the US, the EU, and Australia. These are four of the five "wide" scope partnerships that we identified in the previous section, spanning five or more areas of engagement (see Table 4). They are also partnerships that are progressing beyond the first (nascent) stage, having translated declarations of intention into tangible outcomes. Two of these (US, EU) are at the second stage (developing), and the two others (Australia, Japan) are at the third, most advanced (operational, mature) stage (Table 5).

We also chose these countries based on a combination of economic, geopolitical, and institutional considerations that make them particularly relevant for India's international critical minerals engagement.

First, they are all Global North countries that have expressed willingness to invest in or work with India on supply chain resilience and green transitions. Second, they are geopolitically largely aligned with or acceptable to India's foreign policy interests, marked by high levels of trust, and this enables more meaningful cooperation. Third, they also have a strong interest in securing critical mineral supply chains, making them active players in this space. And fourth, they possess developed, dedicated, and sophisticated institutional mechanisms and decision-making frameworks focused on critical minerals governance.

Given these four factors, we expect that these comparative models may help Indian policymakers to: a) identify how to maximise the impact of current or emerging partnerships through improved coordination and interoperability; and b) explore potential institutional and policy models that India can adopt or adapt to strengthen its own strategy in the critical minerals sector.

## Japan

Japan has established a comprehensive institutional framework to ensure the security of its critical minerals supply, integrating government policy, State-backed enterprises, private sector initiatives, and international partnerships. Given its scarcity of domestic mineral resources, Japan has prioritised a strategy focused on diversification, resource diplomacy, stockpiling, and technological innovation to mitigate supply chain vulnerabilities, particularly its dependence on China for REEs and other strategic minerals.

At the core of Japan's critical minerals strategy is JOGMEC, a State-owned entity responsible for securing overseas mineral resources, supporting private sector investments, and advancing research in mineral processing and recycling technologies. JOGMEC was created in 2004 when Japan's Ministry of Economy, Trade and Industry (METI) decided to integrate the Japan National Oil Corporation and the Metal Mining Agency. This was following a 2002 act that established JOGMEC as an independent government agency. JOGMEC provides financial backing through bonds, risk insurance, and technical expertise to Japanese companies investing in overseas mining and refining projects (IEA, 2002). Through its equity investments and joint ventures, JOGMEC

has and continues to play a crucial role in securing long-term access to critical minerals (Seth, 2024).

METI oversees Japan's critical minerals policy, formulating strategic roadmaps and coordinating international cooperation. JOGMEC implements this policy and is considered a "one-stop shop" for all that concerns Japan's access to critical minerals (Seth, 2024). Japan's approach and strategy to secure critical minerals emphasises supply diversification, recycling, and innovation in material substitution, as mentioned in the Five-Point Plan for Critical Minerals Security (METI, 2023). Thus, ensuring that Japan remains competitive in sectors such as advanced manufacturing, EVs, and renewable energy. Additionally, the Japan Bank for International Cooperation (JBIC) also provides large-scale financial support to overseas mineral resource development projects.

Through a combination of government-led initiatives, private sector engagement, R&D, and international collaboration, Japan has built a resilient and forward-looking strategy for critical minerals security, ensuring long-term access to essential materials for its high-tech and clean energy industries.

### Box 1: Japan's Public-Private Partnership Model

Japanese companies have been partnering with international corporations through JOGMEC for mining and processing of critical minerals. In Argentina's Olaroz Salt Lake region, Toyota Tsusho, in partnership with Allkem, known as Orocobre Ltd., and Jujuy Energia y Minería Sociedad del Estado (JEMSE), is involved in lithium extraction and processing, supported by JOGMEC through debt guarantees (Gasgoo New Energy, 2022; Harada, 2023; Toyota Tsusho, n.d.). In the Mt. Weld rare earth project in Australia, Sojitz Corp. collaborates with Lynas Rare Earths to supply light and heavy rare earth elements, reducing dependence on China (Harada, 2023). This is then processed by Lynas at its Malaysia plant, which is also supported by JOGMEC (Sojitz Corporation & JOGMEC, 2023). For niobium, Japanese firms such as Nippon Steel Corp., JFE Steel, and Sojitz have partnered with Brazil's Companhia Brasileira de Metalurgia e Mineração (CBMM) to secure supply for high-grade steel production. Meanwhile, in South Africa's Limpopo Platreef, ITOCHU Corp. and JGC Holdings have equity investments in Ivanhoe Mines to develop PGMs, copper, and nickel, with production ramp-up planned for 2025 (Harada, 2023).

## *The United States*

The US institutional framework to secure critical mineral supply chains involves multiple federal agencies, research institutions, and international partnerships. The US has a plethora of domestically focused policies on developing critical minerals security and ensuring reliable and stable supply chains not dependent on China (Sinh, 2024b).

The United States Geological Survey (USGS) plays a key role in identifying and assessing both domestic and global critical mineral deposits, providing essential data for policymakers and industry. The Department of Defense (DoD) leverages the Defence Production Act (DPA) to support domestic mining and refining of strategic minerals crucial for defence applications (US Government Accountability Office, 2024). The Department of Commerce (DoC) works on trade policies and international coordination to mitigate supply chain vulnerabilities. All engagement with partner countries, allies, and international institutions is undertaken by the Department of State on critical minerals issues. It is supported by the Bureau of Energy Resources (ENR), Bureau of Oceans and International Environmental and Scientific Affairs (OES), and the Office of Global Partnerships (GP). The Department of Energy (DoE) focuses on funding research for mineral processing, recycling, and alternative materials, with the Critical Materials Institute (CMI) leading efforts to develop sustainable supply chains. This institute is led by Ames National Laboratory and has received funding of about USD 25 million a year since 2011 (US Congress, 2022).

Additionally, institutions such as the National Science Foundation (NSF) and the national laboratories support research on advanced materials and processing technologies. Many of these initiatives are supported by the bipartisan Infrastructure and Jobs Act of 2021 (IEA, 2022). The Federal Consortium for Advanced Batteries (FCAB), a collaboration between the DOE, DoD, DoC, and the Environmental Protection Agency (EPA), focuses on securing lithium-ion battery supply chains essential for EVs and grid storage (US Congress, 2022). These coordinated efforts aim to strengthen domestic mining, refining, and recycling capacities while ensuring environmental sustainability and reducing dependency on China-dominated supply chains.

## *The European Union*

The EU has developed specific policies and institutions to ensure access to critical minerals, to diversify its supply chains, and to promote self-reliance within Europe (Sinh, 2024a). The European CRMA adopted in 2024 serves as the cornerstone of this strategy, outlining measures to enhance domestic extraction, processing, and recycling of key minerals while securing diversified global supply chains. The European Raw Materials Alliance (ERMA), established under the European Commission's Raw Materials Initiative (2008), plays a pivotal role in mobilising stakeholders across the value chain, promoting investments, and fostering innovation in critical minerals processing and recycling. The EU has also identified a list of critical raw materials, regularly updated based on economic importance and supply risks, guiding policy interventions and investment priorities (Council of the European Union, 2023).

A significant aspect of the EU's approach is its emphasis on sustainability and environmental standards in critical minerals development. The European Green Deal and the Circular Economy Action Plan encourage recycling, secondary sourcing, and responsible sourcing practices, ensuring that mineral security does not come at the cost of environmental degradation (European Commission, 2019; European Commission, 2020a).

However, despite these efforts, challenges remain in scaling domestic mining due to regulatory hurdles, permitting delays, and public opposition to new extractive projects. To mitigate these challenges, the EU is working to streamline regulatory processes while incentivising private sector participation through funding mechanisms like the InvestEU programme, the European Battery Alliance, and the Innovation Fund, ensuring a balance between economic security and sustainability in critical minerals supply.

## *Australia*

The Critical Minerals Office (CMO) is a central pillar in Australia's critical minerals governance, tasked with coordinating national policy, facilitating project development, and international coordination. The CMO operates within the Department of Industry, Science and Resources (DISR), serving as the nodal agency for critical minerals policy and strategy. Its responsibilities include working with industry, state and territory governments, and international

partners to advance Australia's critical minerals sector, support investment attraction, and ensure the alignment of domestic and international priorities (Austrade, 2023; Geoscience Australia, n.d.).

The first Australian Critical Minerals Strategy was released in 2019, marking the federal government's recognition of the strategic importance of critical minerals for economic security and the energy transition (DISR, 2023a). This inaugural strategy set the stage for federal coordination, international engagement, and investment attraction in the sector. The 2023–2030 Critical Minerals Strategy, released in July 2023, is a refreshed and more comprehensive framework (DISR, 2023b).

Supporting the CMO are several key institutions with distinct histories and roles. Geoscience Australia, with roots tracing back to the early 20th century, provides technical advice, scientific research, and data services to inform policy and attract investment. The Australian Nuclear Science and Technology Organisation (ANSTO) has over 70 years of experience in minerals research, particularly in rare earths and processing technologies. The Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia's national science agency, hosts the Australian Critical Minerals Research and Development Hub (R&D Hub), which was announced in October 2022. The R&D Hub, working closely with the CMO, brings together CSIRO, ANSTO, and Geoscience Australia to coordinate research, support commercialisation, and foster international collaboration.

Australia collaborates through initiatives such as the Critical Minerals Mapping Initiative (CMMI) with Canada and the US, and works with global partners including the EU, India, Japan, South Korea, and the UK to diversify supply chains and promote responsible resource development (Geoscience Australia, n.d.; Sinh, 2025).

## 4.2 India's Evolving Policy Ecosystem for Critical Minerals: Key Stakeholders

India's critical minerals policy landscape has undergone significant institutional consolidation in recent years, reflecting a shift towards more coordinated governance and strategic engagement. The ecosystem comprises a dense network of central and state government bodies, industry actors, research institutions, and civil society organisations (CSOs), each contributing to domestic capacity building and international cooperation. Despite progress, chal-

lenges remain in inter-agency coordination, clarity of mandates, and institutional capacity, which limit the effectiveness of the current framework.

Government leadership remains the backbone of India's approach, with the MoM as the nodal authority overseeing the formulation and execution of the critical minerals policy. The establishment of the NCMM in 2025, anchored by an EC on Critical Minerals, has formalised inter-ministerial coordination and set clear priorities for exploration, processing, and international partnerships. The EC, supported by the MoM secretariat, is backed by significant public expenditure commitments and complemented by investments from PSUs. Other central stakeholders include the MEA, which serves as the primary diplomatic channel for critical minerals engagement; the NSCS, which integrates supply chain resilience into national security planning; and NITI Aayog, which provides policy advice and supports long-term self-reliance strategies. Multiple other ministries contribute sector-specific expertise and representation in inter-ministerial mechanisms, while mineral-rich state governments remain crucial for licensing, land access, and local implementation under the revised Mines and Minerals (Development and Regulation) Act.

Industry participation has expanded, with both PSUs and private companies engaging across the value chain. State-owned entities such as KABIL are mandated to secure overseas mineral assets, conduct due diligence, and facilitate project development abroad, particularly in Latin America, Africa, and Australia. Other PSUs, including Indian Rare Earths Limited (IREL [India] Limited), play specialised roles in rare earth extraction and processing, often in partnership with foreign firms. Oil and coal PSUs have been tasked with pursuing critical mineral assets overseas, leveraging their financial capacity and resource diplomacy experience. The private sector, led by conglomerates such as Vedanta, Tata Group, Adani, and JSW, is diversifying into strategic minerals acquisition and refining, supported by start-ups innovating in recycling and processing. This diversification reflects both commercial opportunity and strategic imperatives to reduce import dependency.

Research institutions and think tanks provide technical expertise, policy analysis, and innovation capacity. National research bodies such as the Council of Scientific and Industrial Research (CSIR) and Indian Institutes of Technology (IITs) are advancing exploration technologies, refining methods, and sustain-

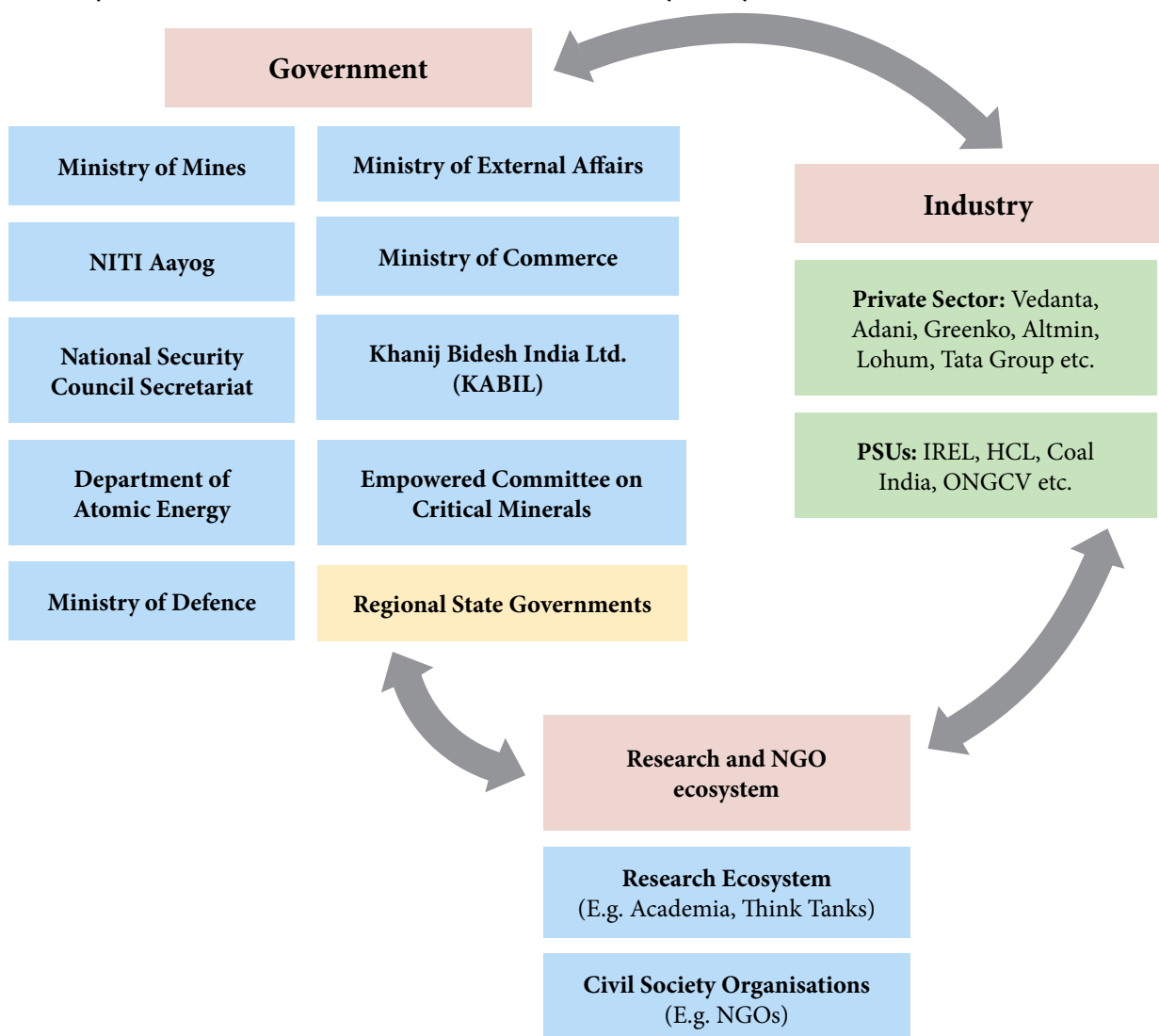
able extraction processes, often through international collaborations like the Australia–India Critical Minerals Research Hub (AICMRH) and UK–India TSI. Domestic partnerships, including between PSUs and research centres, are also expanding under NCMM's framework. Policy think tanks such as the Council on Energy, Environment and Water (CEEW), the Indian Council for Research on International Economic Relations (ICRIER), and CSEP serve as key knowledge brokers, producing criticality assessments and convening multi-stakeholder dialogues that inform government decision-making.

CSOs play a watchdog and advocacy role, particularly on environmental justice, indigenous rights, and governance accountability in mining-affected regions. NGOs such as Samata, Mines Minerals & People (MM&P), and Environics Trust work at the grassroots level to ensure mining expansion aligns with community rights and ecological safeguards.

Their involvement helps shape socially responsive policy, ensuring that India's mineral strategy integrates sustainability and equity alongside economic and security objectives.

Overall, India's critical minerals governance has moved towards a "whole-of-government" and multi-stakeholder model. The formalisation of institutions like the NCMM has created a more coherent strategic framework, yet the system's effectiveness will depend on addressing persistent coordination gaps, enhancing technical and administrative capacity, and deepening linkages between domestic priorities and international engagement. More detailed information about the different stakeholders can be found in Appendix B. Figure 1 showcases the various stakeholders domestically and highlights the government's intermediate role between domestic and international actors.

**Figure 1: Key Stakeholders in India's Critical Minerals Policy Ecosystem**



Source: Created by the authors.

### 4.3 Trends and Patterns in India's Policy Ecosystem

India's institutional landscape for critical minerals is shaped by a wide array of domestic stakeholders, including government ministries, PSUs, private companies, and research institutions. As demand for critical minerals grows, understanding the roles, coordination mechanisms, and capacity gaps within this ecosystem becomes essential to maximise opportunities and minimise risks in an increasingly complex and competitive international political economy

Based on our survey, this section analyses emerging patterns and institutional trends, offering insights into how India can streamline governance, enhance inter-agency coordination, and build a more effective policy framework for international partnerships. We identify five trends, mainly signalling towards: a) growth of the sector and more policy attention to mining; b) rising complexity due to the cross-cutting nature of critical minerals and their applications ranging from defence to green technologies; and c) the need for India to define its international comparative advantage.

**1. Rapid Growth:** India's critical minerals ecosystem has expanded significantly in recent years, reflecting the government's strategic push to secure essential resources for energy transition, advanced manufacturing, and defence. The establishment of KABIL marks a crucial step in acquiring mineral assets abroad, reducing India's reliance on external sources. Domestically, the identification of 30 critical minerals provides a focused framework for policy development and industrial planning. The government's commitment is evident in the launch of the NCMM. Additionally, the MoM's budget allocation has increased to Rs 410 crore (approximately USD 49 million) in the 2025–2026 Union Budget, reflecting a sustained push toward enhancing domestic capabilities.

Private sector participation in exploration and processing is also on the rise, encouraged by policy initiatives and growing market demand. Concurrently, India has strengthened its bilateral and multilateral partnerships through MoUs that focus on securing supply chains, technological cooperation, and investment in refining capacity. These developments indicate a push towards strategic thinking and a strong momentum in establishing a robust critical minerals framework.

**2. Increasing Complexity:** The expansion of India's critical minerals sector brings inherent complexities due to its cross-cutting nature, requiring coordination across diverse stakeholders. Critical minerals are fundamental to industries such as renewable energy, electronics, and defence, necessitating collaboration between multiple ministries, regulatory bodies, and private players. While institutional capacity is expanding, gaps persist in policy coherence, supply chain integration, and industrial value addition. India is yet to establish a fully integrated critical minerals value chain, with most domestic efforts focused on mining rather than refining, processing, and end-use manufacturing. Addressing technological and infrastructure gaps is essential to move beyond resource extraction and into higher-value segments of the supply chain.

Furthermore, financing mechanisms for mineral exploration and processing remain underdeveloped, limiting private sector involvement. The challenge lies in ensuring that India's policy framework is forward-looking, well-integrated, and capable of addressing evolving industry needs while aligning with broader economic and geopolitical objectives.

**3. Competition Without Coordination:** The development of India's critical minerals ecosystem is also shaped by competition within the institutional and policy landscape. Overlapping ministerial mandates and differing priorities among key stakeholders—such as the MoM, Ministry of Commerce and Industry, MEA, and NITI Aayog can sometimes lead to fragmented decision-making and policy inconsistencies. In our discussions with officials, we noticed two different schools of thought: one that prioritises developing India's upstream capabilities and another that privileges developing midstream and downstream capacity. These differing (yet not always incompatible) trends may explain why India has inked several partnerships with countries across the critical minerals supply chain. While different policy interests, objectives, and organisational cultures are inevitable, it is imperative that Indian policymakers identify a future-proof vision for India's role in the global critical minerals ecosystem.

The absence of a single-window clearance mechanism, also floated by the industry, for mining and processing projects further complicates

investment and operational timelines (Suneja, 2024). The success of initiatives like the National Single Window System, launched in 2021 to improve the ease-of-doing business, showcases how such streamlining processes can improve the ecosystem (News Arena India, 2024; Press Information Bureau [PIB], 2021). Additionally, private sector engagement, while growing, faces challenges related to regulatory uncertainty, land acquisition, and financial risks, making large-scale investments in refining and processing facilities less attractive.

On the international front, India often finds itself competing with established players like China, the US, and Australia, which have more mature ecosystems for critical minerals extraction, processing, and manufacturing. Without a streamlined approach to governance and a stable policy environment, India risks lagging in the race to become a key player in global critical minerals supply chains.

4. **Limited Technical and Institutional Capacity:** A critical challenge within India's domestic critical minerals strategy is the limited technical and institutional capacity as the country seeks to balance domestic and external demands. On the technical front, there are significant challenges to support large-scale exploration, extraction, and processing. The geological surveys and exploration capabilities in India remain underdeveloped compared to global leaders like Australia and China, primarily due to a delayed start (Kumar, 2019). The Geological Survey of India (GSI) and other institutions have made progress in mineral mapping, but there is still a long way to go in terms of identifying viable reserves and developing them efficiently. Additionally, India lacks advanced processing and refining capabilities for minerals such as lithium, cobalt, and REEs (Bansal & Chadha, 2025; Konda & Rakheja, 2024), which are crucial for high-tech industries, leading to continued dependency on China. Without significant investment in technological expertise, workforce development, and R&D, India risks remaining a marginal player in global critical mineral supply chains, unable to capitalise on its growing domestic demand for these resources.

On the institutional side, there are also challenges in terms of expertise at key coordination, pol-

icy- and decision-making bodies. The NCMM has announced the creation of a dedicated secretariat within the MoM, but this is still pending. Currently, portfolio responsibilities are handled by existing Ministry staff, with an Additional Secretary overseeing NCMM activities. According to officials and experts interviewed, frequent changes in key ministry positions have contributed to some inconsistency within the system.<sup>4</sup> These institutional capacity limitations within the nodal agency can affect India's external positioning in critical minerals. As a result, India's policies and international engagements often seem reactive, responding to partner needs more than proactively advancing its own interests and security.

5. **Weak Public-Private Linkages:** India's approach to critical minerals has largely been State-led, with PSUs and joint venture companies (JVCs) taking the lead, mirroring the trajectory of its oil and gas sector. At the same time, reliance on public sector companies like ONGC and OVL did not lead to significant global breakthroughs. The same cannot be the case for critical minerals due to the nature of these resources—these mineral deposits are geologically different from older resources and are found much deeper beneath the Earth's surface and in compound forms. Most deposits are scattered, extraction requires specialised expertise, and the value chain is highly fragmented, starting from the mining, refining, component manufacturing, and end-use industries. Unlike hydrocarbons, which were developed and controlled by State-run enterprises, critical minerals require a market-driven approach with active private sector participation and require more public-private partnerships (PPPs). So far, limited Indian private firms have undertaken some steps in securing critical mineral assets abroad or investing in processing capabilities. Without enhanced private sector involvement, India's efforts will remain limited to government-to-government engagements, which are insufficient to build a competitive and self-sustaining ecosystem. The government must create a policy environment that incentivises private investment, allows for foreign companies to enter the Indian market, encourages technology transfer, and facilitates joint ventures with global players to ensure that India is not left behind in the evolving critical minerals landscape.

<sup>4</sup> Interviews with researchers on India's critical minerals, October 2024–December 2024.

## 5. Conclusion: Policy Choices Towards Internationalising India's Critical Minerals Sector

Sections 3 and 4, the two empirical cores of our paper, respectively: a) mapped India's bilateral, minilateral, and multilateral partnerships on critical minerals; and b) surveyed the institutional policy architecture governing these efforts at home. The patterns and trends we identify at the end of each of these sections offer insights into gaps in policymaking that may be hindering India's internationalisation efforts towards achieving its developmental and climate transition targets.

First, in relation to India's growing international partnerships, it is questionable to what extent India is an indispensable partner in global critical minerals supply chains, apart from the geopolitical and strategic desire to diversify away from China. While this need has helped open doors for India, it is not a long-term guarantee of sustained partnerships.

India must accordingly identify and develop its comparative advantage to ensure its relevance in the sector. This could come from building refining and processing capabilities, leveraging its growing manufacturing base, or positioning itself as a leader in specific minerals that are underdeveloped elsewhere. For example, Australia has established itself as a dominant lithium player, while Indonesia has capitalised on its nickel resources. India must figure out where it can provide value—whether through lower-cost production, technological innovations, or policy-driven incentives for foreign players to invest in the Indian market. Without a clear industrial strategy for critical minerals that encompasses trade and technology considerations, India risks missing this window of opportunity.

Second, while India's policy ecosystem has been growing, it faces significant challenges such as a lack of coordination, limited institutional capacity, and weak public-private linkages. Ensuring a strategically aligned and well-coordinated domestic ecosystem is essential for India to develop a sustainable and competitive critical minerals sector. A unified policy approach that aligns mining, refining, and manufacturing industries will not only enhance self-sufficiency but also strengthen India's global positioning. Addressing supply chain bottlenecks, incentivising private investment, and fostering R&D in processing technologies will be crucial in making

India a credible and reliable player in the global critical minerals market. By overcoming governance challenges and building a seamless institutional framework, India can secure its place in the evolving global critical minerals landscape.

The NCMM is a first step for an integrated approach that lends strategic direction to India's critical minerals sector. Our paper examines what India's priorities should be at the international level. Based on the mapping, surveys, and analysis undertaken in the previous sections, including several challenges identified, this section lays out a few concrete policy options towards a more effective and sustainable international strategy for critical minerals. These recommendations have been developed considering the dynamic nature of this emerging sector in India and globally. They also build on many of the proposed avenues under the NCMM to maximise opportunities and minimise risks in India's international engagements.

Based on the analysis of trends and patterns undertaken in Sections 3.3 and 4.3, the following policy recommendations are outlined under two categories: 1) India's international partnerships; and 2) India's international policy ecosystem.

### 5.1 India's International Partnerships

These recommendations focus on how India can leverage, extend, and deepen the scope of its experimental international partnerships on critical minerals.

- 1. Prioritise Strategic International Partnerships with Global South Countries:** Based on the analysis undertaken in Section 3.3 of the trends in India's growing international partnerships, it is evident that India needs to prioritise building partnerships with resource-rich countries in the Global South. India's international engagements on critical minerals have primarily focused on partnerships with strategic actors in the Global North. Countries of the Global South, particularly in Africa and Latin America, are central to global critical mineral supply chains but remain underrepresented in India's partnership framework. India could consider pursuing bilateral collaborations to support mining, capacity-building, and value chain development initiatives in the Global South, especially in Africa. Such an approach would not only diversify India's supply base but also enhance its leadership in South-South cooperation.

- 2. Leverage Triangular Partnerships to Deepen International Engagement:** India should diversify its international critical minerals strategy by advancing triangular partnerships that bring together strategic partners from the Global North and resource-rich countries in the Global South. While most existing engagements remain concentrated on bilateral ties with developed economies, triangular cooperation can help India secure access to untapped reserves, support local value addition in partner countries, and build more resilient supply chains with a focus on energy and climate interests (Ramamurthi, 2024). Triangular engagements with Global North allies to co-invest in mining, processing, and capacity building across Africa, Latin America, and Southeast Asia will also enhance India's credibility as a leader in inclusive and sustainable global mineral governance.
- 3. Play a Proactive Role in Shaping Multilateral Governance:** Compared to bilateral and multilateral initiatives, India's engagement in the multilateral space has been limited. Aligned with its ambitions to become a global leader, India must consider a more active role in multilateral platforms to influence the emerging global governance architecture around critical minerals. Forums such as the UN Secretary General's Panel on Critical Energy Transition Minerals (CETM) offer an opportunity to promote equity, sustainability, and fair access in global supply chains. By engaging constructively in such initiatives, India can advocate for the interests of developing countries, contribute to norm-setting on responsible sourcing, and align its mineral diplomacy with broader goals of climate justice and energy transition equity.
- 4. Consider Limited Engagement with China:** Despite China's dominance in the global processing of critical minerals and its position as a key supplier, India has had no significant discussions or engagements with China, given the breakdown in bilateral relations after 2020. However, as both countries re-engage, there may be a window of opportunity for focused, functional partnerships. In one of the first substantive bilateral engagements between both foreign ministers, in August 2025, the Chinese side reportedly "committed" to addressing rare earths as one of India's "three key concerns" (ANI, 2025). There are also several bilateral mining and geology-related MoUs signed between 1995 and 2015 (MoM & GSI, 2015) that may be revived and taken forward with a focus on critical minerals. As economic relations experience a thaw, India will have to tailor its engagements to maximise opportunities and minimise risks: this may entail, for example, ensuring that Chinese inward investments in the Indian EV manufacture segment are subject to technology transfer and local R&D in the processing sector.
- 5. Facilitate Internationalisation of the Private Sector:** The GoI should create targeted incentives that empower private companies to actively participate in both domestic exploration and international acquisition of critical mineral assets. By designing schemes that offer tax breaks, low-interest loans, and grants, the government can further encourage private enterprises to invest in upstream asset acquisition abroad. In parallel, facilitating private sector engagement through government-backed matchmaking events and PPP platforms will complement State-led initiatives. Creating platforms for regular dialogue between government, industry, and the research ecosystem will help ensure more effective international partnerships.
- 6. Attract International Investment to Enhance Downstream Capabilities:** To reduce its dependence on foreign refining and processing technologies, especially from China, India must prioritise building robust downstream capabilities by lowering entry barriers for international players. This may involve subsidising foreign companies to develop local partnerships to set up plants in India. This will enable technology transfer and support the establishment of world-class processing and refining plants within the country. Removing both tariff and non-tariff barriers that currently hinder competitiveness is critical and drawing on international best practices can help create an environment where local players can thrive. Several international companies want to invest in India, especially Japanese and European ones, but find it difficult to move their operations out of Southeast Asia, China, and elsewhere because of India's trade and investment barriers. The creation of special economic zones (SEZs) dedicated to advanced material processing would further stimulate innovation and industrial growth, ensuring that India can add value to its critical mineral resources.

- 7. Include Critical Minerals in Trade Agreements:** Incorporating provisions on critical minerals within trade agreements is essential for securing resilient supply chains and advancing green trade priorities. By explicitly addressing exploration, extraction, processing, and recycling of critical minerals in these agreements, partner countries can harmonise regulatory frameworks, lower barriers to technology transfer, and strengthen collaboration on sustainable mining practices. Such commitments not only diversify and safeguard mineral supply chains against potential disruptions but also foster innovation and responsible resource management. This approach ultimately promotes a balanced, forward-looking trade regime that supports the global clean energy transition and drives inclusive economic growth.
- 8. Formulate Mineral-Specific International Engagement strategies:** India must develop tailored international engagement strategies for specific critical minerals such as lithium, cobalt, nickel, and REEs. By identifying the minerals most essential to its industrial and energy needs, the government can align these with the resource strengths of targeted partner countries. Mineral-specific strategies should include plans for joint exploration, co-investment initiatives, and technology-sharing agreements that secure long-term, stable supply contracts. Leveraging both bilateral and multilateral forums, India can ensure that these tailored engagements support its broader national security and economic goals.
- 9. Invest in Research, Development, and Innovation Through Global Partnerships:** India's strategic objectives demand a significant focus on research, development, and innovation across the entire critical mineral value chain. Increased funding for research institutions must be allocated to develop commercially viable technologies for refining, processing, recycling, and recovery of these minerals. By expanding international partnerships, the government can promote the exchange of knowledge and drive innovation. These can be facilitated through international frameworks and bilateral MoUs, as is the case with the TSI with the UK, or through the Strategic Mineral Recovery Initiative with the US. Another possibility is to foster India as a research hub on critical minerals in partnership with resource-rich countries in Africa and across

the Global South. Such research collaborations should be extended to all levels of research institutions, public and private. This will also help leverage global expertise and further propel India's capacity for indigenous technological advancement in the critical minerals sector.

## 5.2 India's International Policy Ecosystem

These recommendations focus on how India can balance its domestic and international interests to ensure external priorities are better defined and implemented globally.

- 1. Strengthen Foreign Policy Decision-Making:** Institutions like KABIL will require more capacity to engage abroad and ensure India's upstream acquisitions or partnerships are both sustainable and effective. This requires expertise on the regulatory frameworks of specific countries and the ability to conduct political and security risk assessments. The government should integrate expert consultants and non-government specialists to support decision-making processes on all international engagements. Structured consultative bodies that include industry experts, academics, and experienced private sector professionals can provide strategic direction and specialised inputs on international opportunities and risks. Furthermore, investing in ongoing training programmes and capacity-building initiatives will enhance institutional efficiency and help these agencies respond more effectively to country-specific requirements (especially in Africa and Latin America) as well as to the changing geopolitical context.
- 2. Map Start-Ups, SMEs, and MSMEs to Facilitate Global Partnerships:** A thorough mapping exercise to identify and profile domestic players across the critical minerals value chain, from exploration to recycling, is essential for targeted international policy engagement. It will allow the government to engage on a front footing with international partners to facilitate business partnerships, investments, and technology transfer. By understanding the landscape of start-ups, SMEs, and MSMEs engaged in this sector, the government can help facilitate international collaborations focused on specific interventions such as capacity-building programmes, improved access to finance, and tailored subsidies that address their unique needs.

- 3. Strengthen Financial Instruments for Competitiveness:** Robust financial instruments and risk mitigation tools are needed to support Indian companies investing in both downstream processing and alternative technology development, within India and internationally. Establishing dedicated financing facilities through State development banks or government agencies can help secure necessary capital for critical minerals projects. Moreover, offering subsidies like debt guarantees, export credits, and other risk-sharing mechanisms will allow domestic players to compete globally. Dedicated financing facilities, potentially through development banks, could also be extended to foreign firms investing in India, thus fostering deeper international partnerships. These tools can enhance India's competitiveness, attract global capital, and help position India as a credible alternative to China in global value chains, while also contributing to a more liquid and resilient international critical minerals market.
- 4. Promote Circular Economy Initiatives:** India already has a regulatory framework through the E-Waste Management Rules (Central Pollution Control Board [CPBC], 2022; 2023; 2024), which provides a foundation for the recovery and recycling of materials from end-of-life products. The government may implement policies that incentivise the recycling and recovery of critical minerals from end-of-life products, thereby promoting a circular economy. Partnerships like the Strategic Mineral Recovery Initiative with the US are a good example of how India is expanding its focus on recycling. Enhancing efficiency in existing e-waste collection and management systems, while aligning with global best practices like the EU's Circular Economy Action Plan and recycling models in Switzerland and Rwanda, will be helpful. Such measures not only support environmental sustainability but also help mitigate supply risks by maximising the use of recovered materials, ultimately decreasing reliance on imported resources.

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## Appendix A: India's Bilateral, Multilateral, and Minilateral Partnerships

### 1. Bilateral Partnerships

*Bilateral partnerships, formal collaborations between two countries through agreements and MoUs, form a core component of India's international strategy for securing critical minerals. This section examines how India engages key partner countries through such agreements to access resources, foster technology transfer, and build resilient supply chains.*

#### **African Countries**

The Indian government, through the MoM, has reportedly engaged in discussions with several African nations, including Zambia, Namibia, the DRC, and Ghana, to explore opportunities for collaboration in the critical minerals sector (Arora, 2024). These discussions centre around securing access to minerals such as copper, cobalt, and other strategic resources that are vital for India's growing industrial and technological sectors. The 19th CII India Africa Business Conclave served as a platform to underscore India's strong interest in deepening its engagement with Africa, particularly in the pursuit of critical minerals cooperation (Confederation of Indian Industry, 2024). This initiative reflects a broader strategy to diversify India's supply chains and reduce its dependence on a limited number of sources for these essential materials.

Many of the critical minerals partnerships and MoUs are built on already existing MoUs that the MoM or GSI has on geology and mining. In 2024, India and Côte d'Ivoire signed an MoU to foster cooperation in Geology and Mineral Resources (MoM, GoI, 2024b). This agreement is intended to facilitate the exchange of knowledge, expertise, and technology in the mining sector, paving the way for potential joint ventures and investments in critical minerals exploration and development projects within Côte d'Ivoire. India has pre-existing MoUs with other AU partners focused on the mining and minerals sector, such as Malawi (MoM, GoI, 2010b), Mali (MoM, GoI, 2012), Morocco (MoM, GoI, 2018a), Mozambique (MoM, GoI, 2010a), Zambia (MoM, GoI, 2019b), and Zimbabwe (MoM, GoI, 2018b). This collaboration aligns

with India's strategy to diversify its sources of critical minerals and strengthen its partnerships with African nations. The African continent, with its rich mineral reserves, presents a significant opportunity for India to establish long-term partnerships that can support its economic development and technological advancement (Vaidyanathan, 2025).

#### **Argentina**

India's engagement with Argentina has been principally driven by Argentina's vast lithium reserves, which are among the largest in the world. Argentina is part of the "Lithium Triangle" along with Chile and Bolivia, a region that holds over 50 per cent of the world's known lithium deposits (Baskaran & Yu, 2024). Cooperation with Argentina has been the first tangible development undertaken by KABIL.

Through KABIL, India has been negotiating agreements with Argentinian mining firms to acquire stakes in lithium projects. In January 2024, KABIL signed agreements with Argentina's State-owned company Catamarca Minera Y Energética Sociedad Del Estado (CAMYEN) to acquire exclusivity and exploration rights for five lithium brine blocks (MoM, GoI, 2024a). To secure long-term lithium supplies for India's growing EV and renewable energy industries. Alongside KABIL, Coal India and Indian private sector company Greenko, have been conducting lithium exploration in Catamarca (Reuters, 2025). India has also been considering partnerships with the other two countries in the Lithium Triangle<sup>5</sup> to ensure stable access to critical minerals.

#### **Australia**

India's partnership with Australia on critical minerals has been one of its most advanced and important collaborations. Australia is a major global supplier of lithium, cobalt, and REE, resources that are essential for India's growing ambitions in clean energy, EV manufacturing, and high-tech industries. Recognising this, India and Australia signed a CMIP in 2022 (MoM, GoI, 2023a), under which Australia committed to supplying India with critical minerals, particularly lithium and cobalt (MoM, GoI, 2024a).

The India–Australia Economic Cooperation and Trade Agreement (ECTA) also aims to further support growth in critical minerals cooperation between

<sup>5</sup> Chile, Argentina and Bolivia hold up to 75 per cent of the world's lithium deposits underneath their salt flats. Hence, this Andean region is referred to as the Lithium Triangle.

the two partners (Department of Foreign Affairs and Trade, n.d.). Under this framework, KABIL has signed agreements with Australian mining firms to acquire stakes in key mineral assets (Ministry of Coal, GoI, 2024). An MoU was signed between the MoM and Australia's DISR in 2020, further solidifying cooperation in the field of mining and processing of critical and strategic minerals (MoM, GoI, 2020b). DISR has also been facilitating bilateral research collaborations in sectors such as critical minerals, critical technologies, and new and renewable energy through the India–Australia Strategic Research Fund.<sup>6</sup> From 2025, the Australian government will invest USD 3.8 million annually towards this strategic collaboration (DISR, 2022). This partnership not only enhances India's supply security but also provides access to Australia's advanced mining and refining technologies, helping India develop its domestic capabilities.

To foster R&D in this field, IIT Hyderabad and Monash University have jointly established the AIC-MRH (Monash University, 2023). This Consortium held the second Australia–India Critical Minerals Symposium and Workshop in January 2025 to further the bilateral partnership by bringing together stakeholders from across industry, government, and academia (Monash University, 2025). In addition to these initiatives, there is a 2015 MoU between the GSI and Geoscience Australia on scientific and technical cooperation, enhancing collaboration in geological research and mineral resource assessment (MoM, GoI, 2015). India and Australia have also engaged on critical minerals from a geopolitical and economic security perspective through various Quad and IPEF working groups and consultations on supply chains.

### **Bolivia**

India is actively pursuing opportunities to deepen its involvement in lithium exploration with Bolivia, recognising the country's significant lithium reserves through KABIL and other private sector players (Siddiqui, 2024). A MoU was signed in 2019 between the two countries, outlining cooperation in the field of geology and mineral resources (MoM, GoI, 2019a). This MoU serves as a foundation for further collaboration and paves the way for potential joint ventures and investments in lithium exploration and development projects within Bolivia.

### **Brazil**

Brazil and India have identified critical minerals as a key area for enhanced bilateral cooperation. The country has significant reserves of nickel, graphite, lithium, rare earths, and more, making it a critical player in the drive to diversify critical minerals supply chains (Moerenhout & Prado, 2024). In 2020, the Mine ministries of both countries signed an MoU, focusing on cooperation in geology and mineral resources (MoM, GoI, 2020a). It provides a framework for sharing expertise, conducting joint research, and exploring potential investment opportunities in the mining sector. During a defence and foreign ministerial dialogue in 2024, both countries discussed expanding their collaboration on critical minerals, recognising the strategic importance of these resources for their respective economies (PTI, 2024a).

### **Canada**

India's former Union minister in charge of Mines, Pralhad Joshi and a Canadian delegation led by the Premier of Yukon, Ranj Pillai held a meeting in 2023 to discuss opportunities for strengthening cooperation in the mining sector (MoM, GoI, 2023e). The discussions focused on enhancing collaboration across the critical minerals value chain, from exploration and extraction to processing and refining. Both sides expressed their commitment to fostering a more resilient and diversified supply chain for critical minerals, recognising the mutual benefits of closer cooperation in this strategic area. Canada has a wealth of mineral resources and expertise in mining and could become a key partner for India in its efforts to secure access to critical minerals.

### **Chile**

Chile holds significant lithium reserves and is a key player in the global lithium market. India is looking to explore opportunities to secure lithium. KABIL has entered into a non-disclosure agreement with ENAMI, a State-owned company in Chile, to facilitate discussions and explore potential opportunities for lithium exploration in the country (MoM, GoI, 2024d). This agreement allows KABIL to access confidential information and conduct due diligence on potential brine-type lithium projects in Chile. In addition to KABIL's efforts, Coal India Ltd. is also exploring opportunities to invest in lithium mining

<sup>6</sup> Australia's largest bilateral fund to promote science and technology cooperation which has been in place since 2006.

in Chile, further demonstrating India's strategic interest in the country's lithium resources (Reuters, 2024b).

### **European Union (EU)**

India and the EU have recognised the strategic importance of critical minerals and have taken concrete steps to collaborate on securing their supply chains. This collaboration is driven by shared climate goals and a recognition of the need to diversify supply sources (Sinh, 2024a).

A key framework for this cooperation is the EU–India TTC, established in 2023 (European Commission, 2023). Within the TTC, Working Group II on Green and Clean Energy Technologies and Working Group III on Trade, Investment, and Resilient Value Chains allude to and have impacts on the critical mineral supply chains (Sinh, 2024a). These working groups facilitate discussions and initiatives related to battery technology, recycling, and supply chain resilience. Steps like facilitating matchmaking events for companies working on developing battery chemistry and other low-carbon technology have been organised by the Council (Ministry of Science and Technology, Office of Principal Scientific Adviser, GoI, 2024). These have built bridges between various Indian and European companies, promoting technology sharing and collaboration (Delegation of the EU to India and Bhutan, 2024).

Both India and the EU are members of the MSP, demonstrating a shared commitment to building secure critical mineral supply chains. Furthermore, existing partnership frameworks, such as the India–EU Clean Energy & Climate Partnership, can be leveraged to promote joint research and knowledge transfer in this area (Delegation of the EU to India and Bhutan, 2023).

### **Japan**

India and Japan have established strong bilateral ties in the critical minerals sector, engaging in consultations through various working groups at the Quad, IPEF, and the Supply Chain Resilience Initiative (SCRI). These consultations aim to identify opportunities for collaboration in mineral exploration, processing, and supply chain development. Japan's METI is developing an international resource strategy to secure rare metals. In March 2022, India and

Japan announced a Clean Energy Partnership (CEP) to promote bilateral energy cooperation, aiming for energy security, carbon neutrality, and economic growth (Bansal & Chadha, 2024). India and Japan are partnering to refine rare-earth oxides through the Japanese company Toyotsu Rare Earth India Limited. Since 2012, IREL has had a supply agreement with Toyota Tsusho Corporation, Japan to export REEs to Japan (MEA, GoI, 2012). The Indian subsidiary, Toyotsu Rare Earths India Pvt Ltd, purifies the concentrates in India and does further beneficiation in Japan with an annual target of 4,000 tonnes (PTI, 2012). Japan is also looking to sign a partnership with India along the lines of the US–India iCET to further cooperation in the critical minerals sector.<sup>7</sup>

### **Kazakhstan**

India and Kazakhstan are actively forging a strategic partnership in the critical minerals sector to ensure a stable and diversified supply chain for rare earth elements. IREL signed an agreement with Ust-Kamenogorsk Titanium and Magnesium Plant JSC (UKTMP) to establish an Indo-Kazak joint venture company, IREUK Titanium Limited (Department of Atomic Energy, GoI, 2024). It will process low-grade Ilmenite into high-grade titanium feedstock, with UKTMP providing technology, investment, and offtake. Furthermore, the proposed "India-Central Asia Rare Earths Forum," established at the Second India-Central Asia NSA meeting in April 2024, aims to foster bilateral training, joint mining ventures, and expertise exchange (ANI, 2024). It allows for partnership not only with Kazakhstan but with the four other Central Asian countries as well, Turkmenistan, Uzbekistan, Tajikistan, and Kyrgyzstan.

### **Mongolia**

India and Mongolia are strengthening ties to bolster cooperation in the critical minerals sector, focusing primarily on securing supplies of copper which is vital for India's industrial growth (MoM, GoI, 2023f; Reuters, 2024). An impending preliminary agreement, already approved by India's cabinet and soon to be formalised through a MoU, will establish formal mineral shipments between the two nations. Indian companies like Adani, Hindalco, Vedanta, JSW Steel, and SAIL have already expressed interest in sourcing copper and coking coal from Mongolia, capitalising on Mongolia's rich reserves and superior grades

<sup>7</sup> Interview with a Japanese official from the Embassy of Japan in New Delhi, December 2024.

(Reuters, 2024). This partnership will focus mostly on the transit of minerals. A strategic preference to avoid reliance on China is reflected in the choice of supply routes through Vladivostok.

### **Russia**

India and Russia have a MoU on cooperation in geosciences between Rosgeologia (Rosgeo) and GSI, facilitating collaboration in geological research and mineral resource assessment (MoM, GoI, 2021). Building on this, the two countries are also exploring possible cooperation on REEs, recognising the strategic importance of these materials for various industries (Kumar & Chakraborty, 2024). In April 2025, India's CSIR, through its mineral research body, the Institute of Minerals and Materials Technology (CSIR-IMMT) signed two joint declarations of intent with two Moscow-based organisations. One being the State Research and Design Institute of the Rare Metal Industry (JSC Giredmet) under the Russian State Atomic Energy Corporation, Rosatom, and the second with National University of Science and Technology. This partnership aims to focus on strengthening cooperation in critical minerals processing (Ministry of Science and Technology, GoI, 2025). In August 2025, the two partners discussed exploring opportunities for REEs and critical minerals extraction at the India-Russia Working Group on Modernization and Industrial Cooperation (PTI, 2025b). This is under the India-Russia Intergovernmental Commission on Trade, Economic, Scientific, Technology and Cultural Cooperation.

### **Saudi Arabia**

Union Minister of Coal and Mines Shri G. Kishan Reddy met with Saudi Arabian counterparts in February 2025 to discuss avenues to strengthen cooperation in the critical minerals sector (MoM, GoI, 2025d). This partnership, beyond ensuring a resilient supply chain for critical minerals, is focused on exploring new avenues for investments in value-added processing and technological collaborations.

### **United Arab Emirates (UAE)**

In 2024, KABIL, along with Oil India, and OVL, signed a MoU with International Resources Holding RSC (IRH) of the UAE to jointly acquire and develop critical mineral projects globally (KABIL, 2024). This agreement represents a significant step in India's efforts to secure access to critical minerals

through international partnerships. By collaborating with a UAE-based company, India aims to leverage its expertise and financial resources to develop critical mineral projects in various regions of the world.

### **United Kingdom (UK)**

The UK and India have established a landmark partnership to boost innovation and sustainable handling of critical minerals, essential for modern technology and clean energy solutions (Ashcroft, 2024). The India-UK Roadmap 2030 and the UK-India TSI, designed to strengthen supply chains and promote growth in both countries is the driving vision for critical minerals collaboration between the two partners (MEA, GoI, 2024). One of the key drivers of this cooperation is the TSI, which has avenues for pursuing cooperation and research collaboration on critical minerals. This collaboration involves the Centre for Process Innovation (CPI), the Institute for Manufacturing (IfM) at the University of Cambridge, and the IIT Bombay, aiming to enhance the entire lifecycle of critical minerals, from extraction to recycling (Brinded, 2024; MEA, GoI, 2024). Integral to this initiative is the development of an "observatory" to monitor the supply chain and material flow of critical minerals like lithium, cobalt, nickel, and copper (CPI, 2024). The initiative aims to utilise industrial data to boost supply chain resilience, improve understanding of materials and recycling, and identify potential shortages and risks (Hargreaves, 2024).

### **United States**

India's partnership with the US on critical minerals has been shaped by a shared strategic interest in securing resilient supply chains and reducing dependence on China. In October 2024, the two signed an MoU on Critical Minerals (Jha, 2024). This MoU aims to promote investment and collaboration in the extraction, processing, and recycling of critical minerals. India and the US have various bilateral collaboration frameworks on clean energy that include securing supply chains and advancing technological cooperation (Sinh, 2024b).

Much of the collaboration between the two partners will occur under the TRUST initiative announced in the Joint Statement from February 2025, which focuses on building resilient supply chains for critical minerals and emerging technologies. While focusing on promoting R&D for critical minerals, one of the focus areas of this initiative is mineral recovery. Under

this statement, India and the US also announced the Strategic Mineral Recovery initiative “to recover and process critical minerals (including lithium, cobalt, and rare earths) from heavy industries like aluminium, coal mining and oil and gas” (MEA, GoI, 2025). There is also potential for the two countries to collaborate and even develop new multilateral cooperation frameworks focusing not only on the Indo-Pacific but also the Gulf region for ensuring critical minerals security (MEA, GoI, 2025).

The TRUST initiative has since February 2025 replaced the iCET which aimed at developing a partnership to secure supply chain access for graphite, gallium, and germanium (Jha, 2025; Sinh, 2024b). Projects have been prepared for taking up under iCET by involving GSI, Indian Bureau of Mines (IBM), and IREL along with concerned institutes/ organisations in USA (MoM, GoI, 2025b).

Additionally, India is a part of the US-led MSP, a coalition that includes countries all working to develop diverse and sustainable supply chains for critical minerals. It became a member of this framework in June 2023 (MoM, GoI, 2023d). There is a focus on promoting India's role in the MSP through co-investments in Africa, South America, and supply chain diversification, in turn enhancing India's participation in global critical mineral initiatives (Peri, 2024).

India and the US have also been exploring deeper collaboration on rare earth elements. IREL was one of the countries delisted by the American government to ensure the successful implementation of the civil nuclear deal (Roy, 2025). Analysts suggest that this move could strengthen IREL's role in critical minerals supply chain (Chaudhury, 2025). Given the US's focus on expanding clean energy and EV supply chains, India's role as a manufacturing and processing hub is expected to grow under this partnership.

## 2. Multilateral Partnerships

*In the critical minerals sector, India engages in multilateral frameworks such as the IEA, the UN, and others. These engagements help India align with international standards, attract investment and technology, and strengthen its position in global critical minerals governance.*

### G20

Under India's presidency, the G20 placed a strong emphasis on critical minerals and their role in the global energy transition. The 2023 Delhi Declaration included “Voluntary High-level Principles for Collaboration on Critical Minerals for Energy Transitions,” providing a framework for international cooperation in this area. Critical minerals and resilient supply chains were also a key focus of discussions under the Energy Transition Working Group (ETWG), highlighting the importance of these resources for achieving global climate goals. Various Think20 (T20) papers were published, offering policy recommendations on securing access to critical minerals and promoting sustainable mining practices. Building upon India's efforts, Brazil's presidency in 2024 has continued to prioritise critical minerals, with the Rio de Janeiro declaration supporting diversified mineral supply chains.

### International Energy Agency (IEA)

In November 2024, the MoM and the IEA signed an MoU that lays out a cooperation framework on critical minerals, recognising their essential role in clean energy technologies (IEA, 2025). The MoU facilitates India's access to reliable data, analysis, and policy recommendations, aligning its strategies with global standards and best practices (PIB, 2025). This collaboration promotes capacity building and knowledge exchange between India and IEA member States through technical expertise, training, and joint research (PIB, 2025). These activities aim to improve India's capabilities in mineral extraction, processing, and recycling techniques. Joint research projects, workshops, and training programmes will foster collaboration and innovation in technology development, extraction techniques, and recycling methods for critical minerals.

### United Nations

India is a member of the Secretary-General's (UNSG) Panel on CETM, which was set up in April 2024 and published its first report in September 2024. The Joint Secretary, MoM represented India at the discussion and launch<sup>8</sup>. It focuses on developing a set of common voluntary principles to build trust between nations and ensure an equitable and just energy transition (United Nations, n.d.). This panel brings together experts from various fields to provide rec-

<sup>8</sup> Interviews with UNEP representatives, December 2024 and January 2025, online.

ommendations on how to ensure a sustainable and equitable supply of critical minerals for the global energy transition. The second phase of the project will look to provide more actionable recommendations for cooperation on critical minerals and sustainable mining that are inclusive, transparent, and ensure circularity in the economies<sup>9</sup>. The United Nations Environment Programme (UNEP) is also leading work on just and equitable access to critical minerals, promoting responsible mining practices and ensuring that the benefits of mineral extraction are shared equitably with local communities.

### 3. Minilateral Partnerships

*Minilateral partnerships refer to small-group cooperative arrangements involving a limited number of countries, often formed to address specific strategic, economic, or regional issues.* This approach tends to privilege informal, non-binding cooperation, reflects new geopolitical alignments, and operates in parallel to multilateral forums, whether complementary or competitive. With a focus on specific goals, they can allow for quicker decision-making and more targeted collaboration. Some examples include the MSP, the Quad (India, US, Japan, and Australia), and the AUKUS (Australia, the UK, and the US) partnership. These examples illustrate the growing relevance of minilateralism as a flexible tool in contemporary international diplomacy, particularly for as a clustered approach to complex and cross-cutting global challenges.

#### G7

The G7 has also recognised the strategic importance of critical minerals and has taken steps to enhance their security of supply. In 2023, the G7 adopted a Five-Point Plan for Critical Mineral Security, outlining actions to diversify supply chains, promote sustainable mining practices, and foster innovation in mineral processing (METI, 2023; White House, 2023). India's minister of commerce and industry, Piyush Goyal, has emphasised the importance of collaboration to reinforce global supply chains in critical minerals, semiconductors, pharma, and green energy at G7 meetings (PIB, 2023).

The G7 have agreed to develop new mines with high ESG standards and promote responsible supply chains. They have also committed to consolidating

mineral cooperation through the Partnership for Global Infrastructure and Investment (PGII) and MSP (Geopolitical Monitor, 2024). The G7 also supports the Sustainable Critical Minerals Alliance led by Canada and the EU's proposal to establish a Critical Raw Materials Club to facilitate investment in materials supply chains (METI, 2023). Fiscal support measures of USD 13 billion have been provided for domestic and foreign projects in critical minerals across G7 countries (METI, 2023).

#### *Indo-Pacific Economic Framework (IPEF)*

India is an active participant in the IPEF, which includes Pillar II on Supply Chains and Pillar III on Clean Economy (US Department of Commerce, 2024). These focus on cooperation and engagement in the critical minerals sector. IPEF has a Critical Minerals Dialogue, which aims to undertake a mapping of critical minerals resources in the member countries, develop a database on trade flows of minerals, promote and enhance regional trade, enhance business investments, and cooperation specifically on downstream capacity, such as refining and recycling (PIB, 2024a). As vice chair of the Supply Chain Council, India is playing a key role in developing an action plan for critical minerals, with a particular focus on securing access to materials needed for battery production (PIB, 2024b). In September 2024, the MoM presented in a Trade Promotion Workshop under the IPEF Critical Mineral Dialogue, highlighting India's initiatives to develop the critical mineral value chain and other domestic initiatives to strengthen India's mineral security (MoM, GoI, n.d.).

#### *Minerals Security Partnership (MSP)*

India has significantly enhanced its engagement in critical minerals security through its involvement with the US-led MSP and its offshoot, the Minerals Security Finance Network (MSFN). India officially joined the 14-member MSP in June 2023, becoming the first and only Global South nation in the grouping (Press Information Bureau, 2023). The MSP aims to catalyse public and private investment in critical mineral supply chains globally, ensuring that these minerals are produced, processed, and recycled sustainably (US Department of State, n.d.). In September 2024, India further solidified its commitment by joining the MSFN, a new initiative designed to unite development finance institutions (DFIs) and

<sup>9</sup> Interview with UNEP representative, December 2024, online.

export credit agencies (ECAs) from member nations to finance critical mineral projects (Sasi, 2024). This network aims to strengthen cooperation, promote information exchange, and co-financing to advance diverse, secure, and sustainable supply chains for critical minerals, reducing dependency on countries like China (US Department of State, n.d.). The MSP is weighing collaborative work on projects, including fostering a critical minerals and metals cooperation forum for sharing expertise, developing battery materials, and jointly developing a minerals processing facility in South America (Sasi, 2024). Through the MSP, India can advocate for global ESG standards, make strategic investments in the critical minerals value chain, and harmonise tariffs for global critical minerals, promoting stability and incentivising private sector investments in clean energy technologies (Pruthi, 2023).

### Quad

The Quad partnership, comprising India, the US, Japan, and Australia, has been fostering cooperation on critical minerals since 2021 to combine resources and build a more robust supply chain. This can be seen with the launch of the Quad Critical Minerals Initiative in July 2025 (MEA, 2025), as well as the launch of the two working groups on Climate and Critical and Emerging Technologies (CET) (MEA, 2021). These working groups address issues related to critical minerals, promoting collaboration in R&D, investment, and supply chain diversification. The private sector-led Quad Investors Network (QUIN), launched in 2022, identifies areas of cooperation, with critical minerals being one of them. In 2023, the Quad announced a statement of “Principles on Clean Energy Supply Chains in the Indo-Pacific” which aims to build resilient clean energy supply chains in the region (MEA, 2023). Further developments are taking place at bilateral and multilateral levels, with a few Quad members having exclusive critical mineral agreements or negotiating separate agreements. Indian think tanks are also partnering with other research institutions in Quad countries to work on enhancing critical minerals cooperation, such as through the Quad CET Forum (Near East South Asia Center for Strategic Studies et al., 2023). The Quad's strategy strives to achieve mineral security and help build a more robust supply chain.

## Appendix B: India's Evolving Policy Ecosystem

India's critical minerals ecosystem involves a diverse set of stakeholders, including government agencies, public and private sector enterprises, research institutions, and international partners. As with other countries surveyed in the previous section, this policymaking space is becoming increasingly complex, with competing domestic and international interests.

This section surveys and describes the current landscape of key stakeholders involved in India's critical minerals sector.

### 1. Government

*The government remains the central actor in India's critical minerals ecosystem, with key roles played by central ministries, state governments, and quasi-government bodies.* While recent reforms have improved coordination, there is still a need for clearer institutional mandates and stronger inter-agency collaboration.

#### *Empowered Committee on Critical Minerals*

The EC was established under the NCMM in January 2025 to administer and coordinate efforts to secure the country's critical minerals supply chain (MoM, GoI, 2024; PIB, 2024). This Cabinet-level body is responsible for policy direction, inter-ministerial coordination, and strategic decision-making related to exploration, extraction, processing, and international partnerships for critical minerals. The committee includes representatives from key government bodies such as the National Security Council (NSC), MoM, NITI Aayog, Department of Atomic Energy, the MEA, and many others, alongside experts from industry and research institutions. Administrative support for this Committee will be undertaken by the MoM, which will appoint a Joint Secretary to coordinate the workings of the NCMM. The Union Cabinet approved an expenditure of Rs 16,300 crore (approximately USD 1.89 billion) over seven years, from FY 2024–2025 to 2030–2031 for the NCMM. This includes Rs 1,500 crore (approximately USD 179.5 million) for incentives to establish recycling facilities. Additionally, an expected investment of Rs 18,000 crore (approximately USD 2.7 billion) is anticipated from PSUs and other stakeholders (PIB, 2025). It plays a vital role in identifying priority minerals, facilitating investments in domestic and overseas

mineral assets, and ensuring a stable supply of materials essential for India. Through various coordination efforts, the committee aims to strengthen India's strategic autonomy in critical minerals and reduce dependency on global supply chain vulnerabilities.

### ***Ministry of Mines (MoM)***

The MoM has been the spearheading agency on all work related to critical minerals in India, both domestically and internationally. The Ministry's allocation of business rules mention that it coordinates and executes all work related to critical minerals, oversees the workings of KABIL, coordinates on international platforms working on critical minerals such as the MSP and the Critical Raw Materials Club, and coordinates and convenes the inter-ministerial committee within the GoI on critical minerals. As the institutional organisation mandated to oversee all matters related to minerals and mining, the MoM has been designated as the nodal ministry for coordinating India's critical minerals strategy. It has also been the ministry representing India at some of the largest international mining conferences, such as the Mining Indaba, PDAC, and many more (MoM, GoI, 2024a).

The MoM released the list of critical minerals for India in June 2023, as well as the NCMM in January 2025 (MoM, GoI, 2024b; PIB, 2024). The NCMM has set up an EC and the secretariat for this committee is to be housed within the MoM.<sup>10</sup> The ministry is mandated to be the convener of this committee and, with the establishment of the secretariat, will have an entire section dedicated to working on the administration of everything related to critical minerals. As of January 2025, a new joint secretary position has also been established for the NCMM at the Ministry.

The Joint Secretary of the Ministry has been India's representative at various minilateral and multilateral platforms working in international cooperation mechanisms on critical minerals. These include the MSP, the UNSG's Panel on CETM (UNEP officials, personal communication, December 2024 and Janu-

ary 2025), and others.<sup>11</sup> The Mines Secretary is also a crucial representative at many of these international and bilateral cooperation meetings. The union minister of mines has also been present at many of these meetings with international partners.

Other crucial stakeholders in the domestic critical minerals sector, which includes the GSI, IBM, as well as other mining and minerals-related PSUs, are all overseen under the MoM, which coordinates all their activities.

### ***Khanij Bidesh India Limited (KABIL)***

A crucial component of India's international engagement in critical minerals has been its State-owned entity, KABIL. Established as a joint venture between three Indian public sector enterprises, KABIL has played a significant role in securing access to key minerals from overseas markets. The three PSUs are National Aluminium Company Ltd. (NALCO), Hindustan Copper Ltd. (HCL), and Mineral Exploration & Consultancy Limited (MECL). The entity has been actively negotiating projects in Latin America, particularly in Argentina and Bolivia, to secure lithium assets. Additionally, KABIL has been working to establish partnerships in Africa and Australia, recognising the strategic importance of securing critical mineral reserves outside of India. It has also signed partnerships with the UAE along with India's oil PSUs—Oil India and OVL—who have been mandated by the government to pursue critical minerals assets abroad.<sup>12</sup> KABIL is also collaborating with various research institutions in India to develop domestic technology for processing, geospatial mapping, recycling, and more to ensure mineral security (Press Information Bureau, 2024).

KABIL's mandate is to secure access to resources, and most of its role includes doing due diligence on projects to ensure legitimacy. It aims to ensure that partner mining companies are financially viable, free from adverse ownership structures, particularly those with Chinese affiliations, and meet other due

<sup>10</sup> Interview with senior government of India official, February 2025

<sup>11</sup> Interview with UNEP officials, December 2024 and January 2025.

<sup>12</sup> Interview with senior government of India official, February 2025.

diligence criteria. Once the due diligence has been undertaken and cleared, KABIL passes on the project to the MoM and other stakeholders within the domestic ecosystem to take the coordination forward. KABIL, as of December 2024, had 4.5 employees, which includes one full-time technical officer, two members from Coal India, one from HCL and one part-time from GSI who works out of the MoM and not out of the KABIL office on Sansad Marg, New Delhi.<sup>13</sup> The key personnel at KABIL are the chief technical officer (CTO), who has been in charge since December 2024 and the CEO, who was appointed in June 2025. Before the present CEO took charge, the current director for commercial affairs of NALCO was given the additional charge as the director of KABIL from November 2024. KABIL reports to and coordinates directly with the MoM representatives, such as the secretary and joint secretary.

### *Ministry of External Affairs (MEA)*

The MEA is the lead ministry on all foreign policy issues and facilitates all international cooperation with member States on critical minerals. Even though the MoM is in charge and has an International Cooperation wing, much of the international coordination happens through the MEA. The first point of entry into the Indian ecosystem for all foreign governments and partners is the MEA. The different desks within the MEA, such as the Americas, Europe (West), New and Emerging Technologies (NEST), coordinate India's critical minerals diplomacy with partner countries such as the US, UK, EU, and others. While the NEST division is in charge of overseeing critical mineral issues, it is the territorial desks and the different Joint Secretaries that handle international cooperation with India's international partners on critical minerals. While the MEA is not the only coordinating ministry on India's critical minerals diplomacy and the GoI has adopted a "whole-of-government" approach, it is the facilitating institution of Indian international cooperation. Not only does the MEA facilitate the GoI's efforts, be it through coordination with the MoM, KABIL, the different PSUs, and other players, it also helps open channels of engagement for the private sector.

### *National Security Council Secretariat (NSCS)*

The NSCS is a supporting institution that provides briefings and advice to the PMO, the NSC, and the NSA. It is headed by the Deputy NSA who holds the position of secretary, NSCS. It is staffed by officers on deputation from various ministries, the military, and intelligence services, as well as people from outside the government on contract (Madan, 2015). The NSCS provides the strategic thinking and direction to the larger bodies within the government and does the same on the matter of critical minerals. It looks at the issue of supply chain resilience and India's national security through the lens of critical minerals and how India can future-proof itself against emerging risks and threats. Some of India's international cooperation mechanisms and frameworks on critical minerals with partner countries, such as the iCET with the US and the TSI with the UK, are coordinated by the NSA and the Deputy NSA (Chaudhuri et al., 2024; MEA, 2024). Another announcement was made during the Second NSAs meeting between India and the Central Asian countries (ANI, 2024). The NSCS also has a separate team that is focused on looking at how India can secure access to critical minerals. The NSCS has been part of various official meetings with India's partners and provides inputs for India's international cooperation on critical minerals. It played a crucial role in supporting and facilitating India's entry into the MSP, supporting the MoM's proposal to become a member despite objection from other GoI stakeholders.

### *NITI Aayog*

NITI Aayog is the apex GoI think tank that provides public policy advice, promotes sustainable economic development, and encourages cooperative federalism (NITI Aayog, n.d.). It has various divisions that look into the critical minerals question, such as the industry and security divisions. Most of NITI's efforts have been directed towards the domestic landscape, where it has done a considerable amount of work on advising the MoM on the identification of critical minerals for India, on the NCMM, as well on various other steps taken by the government to ensure India's ability to be self-reliant on critical minerals (MoM, GoI, n.d.-a; MoM, GoI, n.d.-b). NITI has been promoting more domestic exploration and ensuring proper domestic industry structure and support for India to become self-reliant in this space (NITI Aayog & Ernst &

<sup>13</sup> Interview with KABIL official, December 2024.

Young LLP, 2023). It is also an important representative at the inter-ministerial committee convened by the MoM on critical minerals, which meets once every quarter. NITI, in 2011, was one of the first government institutions to identify certain minerals as strategic minerals, for which India lacked resources.<sup>14</sup>

### **Other Government Actors**

India's domestic critical minerals ecosystem involves a wide range of stakeholders beyond the ones surveyed above. These include but are not limited to the ministries of Commerce, Power, Heavy Industries, Coal, New and Renewable Energy (MNRE), Petroleum and Natural Gas, Science and Technology, and Expenditure, all of which have a vested interest in the sector. Representatives from these ministries are part of both the EC and the Inter-Ministerial Committee on Critical Minerals convened by the MoM. Thus, ensuring a coordinated approach to policy and strategic decision-making. Beyond government bodies, think tanks and CSOs play a crucial role in navigating challenges, addressing key issues, and providing policy advice to shape India's domestic and international engagements in the critical minerals landscape. These stakeholders contribute to research, advocacy, and fostering partnerships that enhance India's supply chain security and global positioning in critical minerals diplomacy.

### **Regional State Governments**

India's regional states are foundational to the country's critical minerals architecture, serving as both resource bases and operational partners for exploration, mining, and value addition. The mineral-rich states form the backbone of India's mining belt, supporting the national strategy for clean energy, advanced manufacturing, and strategic sectors. While the central government, primarily through the MoM and the NCMM, sets policy and regulatory frameworks, State governments play a vital role in facilitating land access, local clearances, and community engagement. Their cooperation is essential for successful project development, infrastructure support, and the implementation of central initiatives such as regulatory fast-tracking and financial incentives.

With the 2023 amendments to the Mines and Minerals (Development and Regulation) Act, the central government now holds exclusive authority to auction mining leases and composite licences for 24 notified

critical minerals, but state governments remain key partners in implementation and post-auction processes (PRS Legislative Research, n.d.). Most of the recent auction blocks for critical minerals have been located in states such as Chhattisgarh, Karnataka, Rajasthan, Odisha, Gujarat, Maharashtra, Madhya Pradesh, and Uttar Pradesh (MoM, GoI, n.d.). For instance, in the fifth tranche of auctions (January 2025), 15 blocks across these states were put up for bidding, covering minerals like graphite, vanadium, tungsten, rare earth elements, glauconite, phosphorite, potash, and nickel (PTI, 2025a). Offshore mineral block auctions have also begun, with Gujarat as well as the Andaman Islands, emerging as a new frontier (PIB, 2024).

## **2. Industry**

*Industry is emerging as a rising force in India's critical minerals sector. Both PSUs and private companies are increasingly involved across the value chain, from exploration and processing to international joint ventures. Their growing engagement reflects both policy shifts encouraging private participation and the strategic importance of building resilient supply chains through industry-led innovation and investment. This section maps the different industry players, including PSUs and private businesses, in India's critical minerals architecture.*

### **Indian Rare Earths Limited (IREL)**

IREL plays a crucial role in India's critical minerals ecosystem, particularly in the extraction and processing of REEs and other strategic minerals. As a State-owned enterprise under the Department of Atomic Energy, IREL is responsible for mining and refining heavy minerals such as monazite, which contains valuable REEs like neodymium, praseodymium, and cerium—essential for high-tech industries, renewable energy, and defence applications (IREL [India] Limited, n.d.; PIB, 2023). With operations across Odisha, Tamil Nadu, and Kerala. IREL is India's primary domestic producer of rare earth compounds, making it a key player in reducing dependence on imports from countries like China (IREL [India] Limited, n.d.). The company has been expanding its capacity through investments in value-added processing and partnerships with research institutions to develop advanced refining technologies (IREL [India] Limited, 2024).

<sup>14</sup> Interview with senior government of India officials, December 2024.

IREL has been partnering with other private sector and public sector companies internationally along with the REE supply chain to help mitigate India's dependency on China. It has a partnership with Kazakh-based joint venture company to produce Titanium Slag in India (Press Information Bureau, 2024). The India branch of Toyota Tsusho Corporation, Japan called the Toyotsu Rare Earths India Ltd. is engaged in refining REEs sourced through IREL (Press Information Bureau, 2023). The US also removed IREL from its export control list in January 2025 (The Economic Times, 2025). Given India's growing focus on critical minerals security, IREL's role is expected to strengthen through policy support, enhanced exploration, and increased collaboration with private sector players in refining and downstream manufacturing.

### *Coal and Oil PSUs*

These have been mandated by the government to pursue asset acquisition abroad for critical minerals because they have capital available as well as the appetite for risk.<sup>15</sup> This is important because exploration and setting up of a mine, especially abroad, requires a large amount of capital. India's oil and coal PSUs, such as Coal India, Oil India, OVL, and others also have experience in resource diplomacy given their history of investment abroad for oil, petroleum, and natural gas. Making them suited for pursuing mineral exploration and asset acquisition.

### *Private Sector*

India's private sector is emerging as a key driver in the country's critical minerals ecosystem, actively investing in exploration, processing, and supply chain development to reduce import dependency. Major corporations like Vedanta, Ola, Adani, and Jindal Group are expanding their portfolios to include strategic minerals such as lithium, nickel,

cobalt, and REEs, recognising their importance for EVs, renewable energy, and advanced manufacturing (PTI, 2024; Mishra, 2024; Bloomberg, 2024; Business Today Desk, 2024). These companies are leveraging international partnerships to secure raw material supplies, such as Tata Group's engagement with Australian lithium projects and Vedanta's interest in African mineral assets (McKay, 2025). Adani and JSW Group have also expressed intentions to participate in overseas mining projects and acquire critical mineral assets to support India's battery and renewable energy ambitions (MoM, GoI, 2024; PTI, 2024).

Other private sector companies investing in and exploring both domestically and abroad include Mamco Mining Pvt. Ltd. (PIB, 2024) and Greenko Energy Holdings (Reed et al., 2024). Beyond large conglomerates, Indian start-ups and technology firms such as Lohum, BatX Energies, and Evergreen RecycleKaro are innovating in mineral processing, battery recycling, and extraction efficiency, contributing to a more sustainable and circular economy approach.

Private players are also driving investment in domestic refining and beneficiation projects, crucial for reducing reliance on raw mineral exports and enhancing India's position in global value chains. The recent auction tranches have seen companies like Vedanta, JSW, and others bidding for lithium, graphite, vanadium, and rare earth element assets across states such as Chhattisgarh, Karnataka, Rajasthan, and Odisha (MoM, GoI, 2024; PTI, 2025). However, challenges such as limited industry participation in some auctions highlight the ongoing need for regulatory reform and investment incentives.

As global demand for critical minerals surges, India's private sector is not only capitalising on commercial opportunities but also strengthening the country's strategic resilience in securing essential raw materials.

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<sup>15</sup> Interviews with government officials, December 2024 and February 2025.

**Table A1: Indian Private Sector Actors Engaged in the Critical Minerals Value Chain (Selection)**

Actor	Key Minerals	Value Chain Activities	Recent Developments and International Engagements
Adani Enterprises	Copper, lithium, nickel	Mining, project development	Exploring international mining projects and supply agreements.
BatX Energies	Lithium, cobalt, nickel	Battery recycling, extraction	Innovating in extraction efficiency and recycling.
Evergreen RecycleKaro	Battery minerals, lithium, cobalt	Battery recycling, processing	Scaling up recycling operations for EV batteries and electronics.
Greenko Group	Battery minerals, lithium, recycling	Battery recycling, processing	Investing in battery recycling and mineral recovery technologies.
Hindalco Industries	Bauxite, copper, rare earths	Mining, processing, refining	Focused on resource security, exploring technology partnerships.
JSW Group	Lithium, nickel, cobalt	Mining, processing, potential refining	Expressed interest in overseas acquisitions and partnerships for battery minerals.
Lohum	Lithium, cobalt, nickel	Battery recycling, material recovery	Developing advanced battery recycling tech; expanding partnerships.
Tata Group	Lithium, battery materials, REEs	Sourcing, refining, battery manufacturing	Engaged in partnerships with Australian lithium projects.
Vedanta Ltd	Rare earths, zinc, copper, nickel	Exploration, mining, processing	Exploring acquisitions in Africa and other regions; focus on high-tech mining.

Source: Authors' compilation based on various sources.

### 3. Research and Civil Society Organisations

India's research and civil society ecosystem—comprising think tanks, universities, and NGOs—plays a critical supporting role in the sector. These actors contribute through evidence-based policy inputs, technical expertise, and advocacy on sustainability, transparency, and community engagement. Their role in capacity building and shaping public discourse is essential to creating a more informed, inclusive, and future-oriented critical minerals strategy. They offer value for India to emerge as a global research and innovation hub for critical minerals through international partnerships and collaborations. This is critical for resource-rich countries of the Global South seeking to develop new norms, standards, as well as access to cost-efficient processing technologies for critical minerals.

#### Indian Research Institutions

Indian research institutions are playing a crucial role in completing the critical minerals ecosystem by focusing on exploration, processing, recycling, and sustainable extraction technologies, both domestically and through international collaborations. Insti-

tutions like the CSIR (CSIR–NML, n.d.; PIB, 2024) and IITs (UQ–IITD Research Academy, 2024) are actively developing advanced metallurgical techniques to enhance the efficiency of mineral refining and REE separation. The CSIR–NGRI (PIB, 2024) and the CSIR–IMMT are leading efforts in mineral exploration, deep-sea mining research, and the development of environmentally friendly extraction methods to reduce waste and emissions (Council of Scientific & Industrial Research, 2023).

Indian research institutions also have collaborations with other foreign research centres to improve global critical minerals supply chains drive global innovation and develop sustainable mining practices. The AICMRH established by IIT Hyderabad and Monash University (AICMRH, n.d.) and the setting up of an observatory under the UK–India TSI between IIT Bombay and IfM, University of Cambridge, are examples of this (IfM, University of Cambridge, 2024).

India has also seen the development of joint research and collaborations across domestic institutions to further technical critical minerals research. These

collaborations have emerged as a result of the NCMM. This includes Jawaharlal Nehru Aluminium Research Development and Design Centre (JNARDDC), Nagpur signing an MoU with the CSIR laboratory, the National Institute for Interdisciplinary Science and Technology (NIIST) in Thiruvananthapuram to pursue joint research for critical minerals (Deshpande, 2025). Another such development is the MoU between NLC India Limited (NLCIL) and IREL to jointly develop REE and critical minerals assets both domestically and globally (Chemical Industry Digest Bureau, 2025).

### **Think Tanks**

Think tanks and research institutions have emerged as key epistemic communities in shaping India's critical minerals policy. Through empirically grounded research, policy-relevant analysis, and sustained engagement with decision-makers, they have contributed to the formulation of frameworks for identifying and securing critical minerals essential to the energy transition. Institutions such as the CEEW, International Institute for Sustainable Development (IISD), ICRIER, CSEP, Shakti Sustainable Energy Foundation (SSEF), and others such as Institute for Energy, Economics and Financial Analysis (IEEFA) have conducted extensive analyses on mineral criticality, global value chains, and geopolitical risk assessments (Chadha et al., 2025; Ganesan et al., 2023; Konda & Rakheja, 2024). They have also conducted joint research, such as the report "*State of the Sector: Critical Energy Transition Minerals for India*," which directly informed governmental initiatives, including the constitution of expert groups by the MoM (Chadha et al., 2025). They have also been recognised by the Ministry for the identification of India's official list of critical minerals (MoM, GoI, n.d.).

These institutions routinely organise multistakeholder workshops, technical roundtables, and policy dialogues, creating deliberative spaces where academia, industry, and government converge to co-produce actionable knowledge. Their contributions have been central to promoting a more coordinated, evidence-based, and future-oriented approach to critical mineral governance in India.

### **Civil Society**

CSOs and NGOs play a vital, though often under-acknowledged, role in India's critical minerals ecosystem. Positioned at the intersection of advocacy, fieldwork, and policy engagement, these actors serve as both watchdogs and partners in ensuring that mineral development processes align with environmental justice, community rights, and inclusive governance. NGOs such as Samata, MM&P, and Environics Trust have a longstanding presence in mineral-rich regions, particularly in states like Odisha, Jharkhand, and Chhattisgarh. Their work includes documenting the environmental and social impacts of mining, supporting the rights of tribal and marginalised communities, and advocating for fair implementation of laws such as the Forest Rights Act (2006) and the Panchayats (Extension to Scheduled Areas) Act (1996). These organisations often engage in participatory research, conduct capacity-building workshops for affected communities, and submit policy recommendations to national and state governments.

By foregrounding voices from the ground, they contribute to more socially responsive mining policies and help develop frameworks for benefit-sharing and accountability. Their involvement is especially critical at a time when India seeks to expand its mining footprint for energy transition minerals, ensuring that development does not proceed at the cost of human rights, ecological degradation, or democratic process.

## About the authors



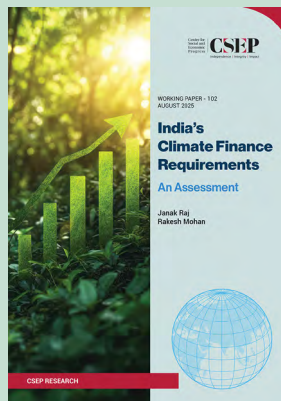
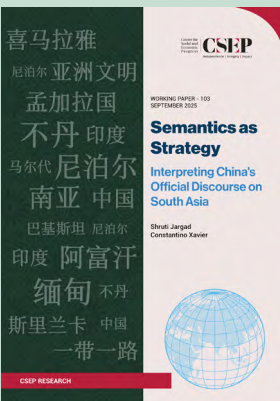
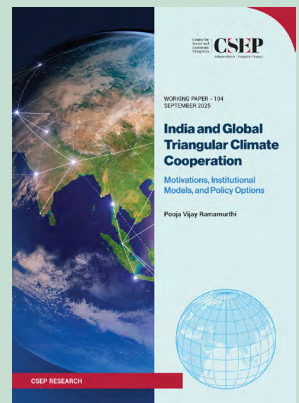
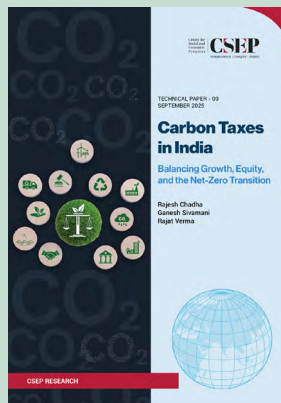
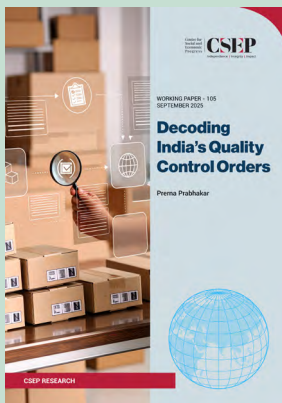
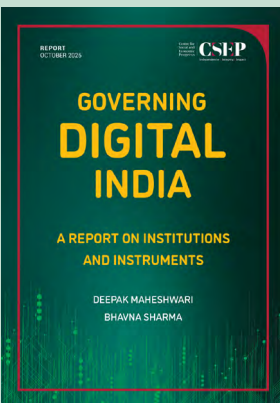
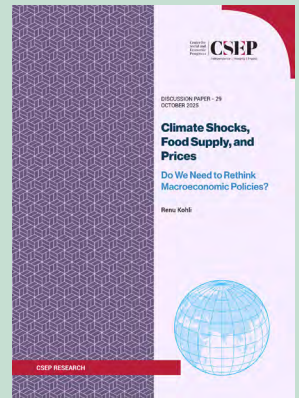
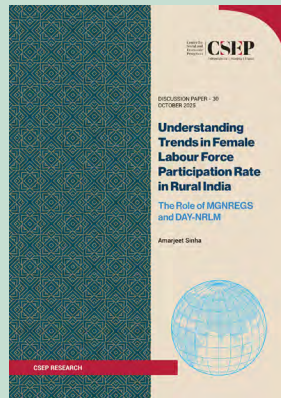
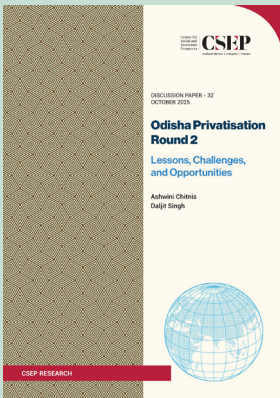
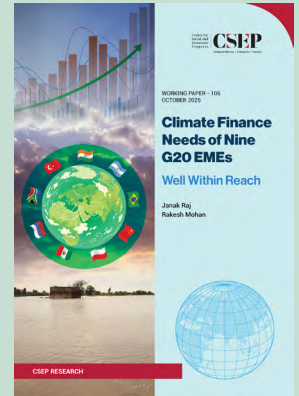
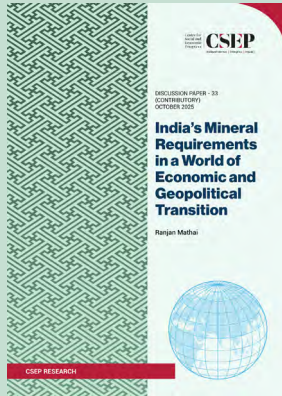
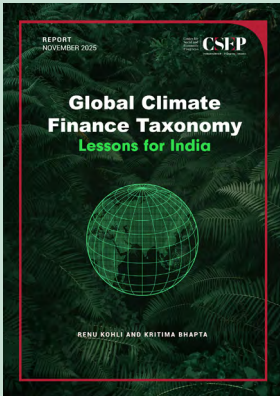
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