

THE POLITICAL ECONOMY OF RARE EARTH ELEMENTS: CHINA'S SUPPLY CHAIN DOMINANCE AND INDIA'S STRATEGIC OPTIONS

Sadhana D. Singh¹

Abstract

The supply chains of rare earth elements (REEs) have become a critical component of the global political economy, given their strategic importance in advanced manufacturing, defense systems, and low-carbon energy technologies. Over the past few decades, China has maintained a dominant position in the REE sector through sustained state investment, vertically integrated processing capabilities, and deep integration into global value chains. This dominance has been further reinforced in the context of recent geopolitical developments, including supply chain disruptions arising from conflicts such as the Russia-Ukraine war, increasing strategic competition among major economies, and the global push toward resource security.

In the evolving international landscape, countries are actively seeking to diversify their dependence on concentrated suppliers of critical minerals. In this context, India's position has gained renewed relevance, particularly with the growing emphasis on critical minerals in recent Union Budget announcements and policy initiatives aimed at strengthening domestic capabilities. Against the backdrop of ongoing tariff tensions and trade negotiations between India and major economies such as the United States, REEs present a significant opportunity for enhancing economic resilience and strategic bargaining power.

This paper examines how India can strategically leverage its REE resources by drawing insights from China's development model while adapting to contemporary geopolitical realities. Using a comparative political-economy framework supported by supply-chain analysis and policy evaluation, the study identifies key technological, institutional, and regulatory constraints limiting India's global competitiveness. The paper proposes a strategic roadmap for 2025 - 2035 in alignment with proposed plan in the Union budget announced on 1st February by India's Finance minister Nirmala Sitaraman focusing on value addition, technological collaboration, and trade-aligned mineral diplomacy. It argues that with appropriate policy alignment and investment, India can position itself as a reliable and high-value participant in global REE supply chains.

Keywords: Supply Chain, Rare Earth Elements, Critical Minerals, Geopolitical Economy, Political - Economic Framework, Trade Policy

INTRODUCTION

The global requirement for rare earth elements has surged dramatically, driven by their essential role in the production of smartphones, electric vehicles, renewable energy technologies, and advanced defence equipment. Access to a stable and abundant supply of rare earth elements (REEs) extends beyond mere economic gains; it also provides countries with a strategic advantage in global trade negotiations and technological advancement. Nations that control these critical resources are better positioned to influence supply chains and support high-value industries.

China presents a notable case in this regard. Through early exploration initiatives, consistent state support, and sustained technological development, it has gradually established itself as a dominant force in the global REE refining and processing landscape. Over time, the country

¹ Assistant Professor, Department of Commerce, Vivekanand Education Society's College of Arts, Science & Commerce (Autonomous)

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In recent years, the global REE landscape has undergone significant transformation. Geopolitical developments, including the Russia - Ukraine conflict and intensifying strategic competition among major economies, have exposed the vulnerabilities associated with concentrated supply sources. As a result, there has been a growing emphasis on supply chain diversification, prompting countries such as the United States, Japan, and members of the European Union to seek alternative and reliable suppliers.

Within this shifting environment, India occupies an important position. The country possesses considerable REE reserves, yet its capacity in extraction, processing, and value addition remains limited. However, recent policy directions - particularly the emphasis on critical minerals in the Union Budget, along with initiatives such as *Make in India* - indicate a gradual but clear movement towards strengthening domestic capabilities in this sector.

At the same time, evolving trade relationships, including tariff-related frictions with key partners like the United States, have created both constraints and opportunities for Indian exports across sectors such as textiles, machinery, and electronics. In this context, developing a robust REE industry could contribute to export diversification, deeper integration into global value chains, and improved positioning in international trade discussions.

This could include building domestic value chains, improve technological capabilities, and make sure that resource strategy is in line with trade and foreign policy goals. This paper aims to analyze India's transition from a resource-abundant economy to a strategically significant participant in the global REE ecosystem.

Significance of Rare Earth Elements in the Contemporary Geopolitical Landscape

Rare earth elements (REEs) such as neodymium, praseodymium, dysprosium, and terbium have gained heightened strategic importance in the current global environment shaped by geopolitical conflicts, supply chain disruptions, and policy shifts toward critical mineral security. Their role extends across multiple high-value and security-sensitive sectors.

- a) **High-Tech Manufacturing:** Essential to produce smartphones, laptops, semiconductors, and advanced electronic systems, which are increasingly central to economic resilience amid global trade uncertainties?
- b) **Renewable Energy:** Crucial for high-performance magnets used in wind turbines and advanced battery technologies for electric vehicles, aligning with global energy transition goals and national sustainability commitments.
- c) **Defence Applications:** Integral to precision-guided missiles, radar and sonar systems, satellite technologies, and secure communication infrastructure, thereby directly

influencing national defence preparedness, especially in times of geopolitical tensions and conflicts.

- d) **Healthcare & Optics:** Widely used in medical imaging technologies, laser systems, and advanced optical equipment, supporting both civilian healthcare systems and strategic research capabilities.

The strategic significance of REEs is further reinforced by the absence of viable substitutes and the technical complexity involved in their extraction and refining processes. Considering recent geopolitical developments, including global conflicts and the increasing emphasis on supply chain security, countries are prioritizing domestic capabilities in critical minerals. Reflecting this shift, India's recent Union Budget and policy initiatives have placed greater focus on strengthening exploration, processing infrastructure, and technological capacity in the REE sector. Consequently, nations that control both extraction and advanced processing are better positioned to exercise long-term influence over global value chains and strategically sensitive industries.

India's Positioning: Economic and Geopolitical Dimensions of Rare Earth Elements:

- a) **Economic advantage:** By strategically developing its largely underutilized REE reserves, India can diversify its export basket, strengthen domestic manufacturing under initiatives such as *Make in India*, and reduce critical import dependence. Recent Union Budget measures emphasizing critical minerals, exploration funding, and processing infrastructure further reinforce India's intent to build self-reliance and value-added capabilities in this sector.
- b) **Geopolitical influence:** In the backdrop of evolving geopolitical tensions, including conflicts in regions such as West Asia and increasing global competition for critical resources, a strengthened REE sector would enable India to engage in trade and strategic partnerships from a position of greater resilience. Similar to China's use of REEs as an instrument of global influence, India can leverage its capabilities to support supply chain diversification efforts of major economies and enhance its role in emerging economic and security alliances.
- c) **Key aspects of the proposed corridors:** *The Union Budget 2026-27* proposed dedicated Rare Earth Corridors in Odisha, Kerala, Andhra Pradesh, and Tamil Nadu to enhance supply chain security, strengthen clean energy technology, and create jobs through R&D and advanced materials manufacturing. The initiative supports the Rs. 7,280 crores Rare Earth Permanent Magnets (REPM) Manufacturing Scheme approved in November 2025.

Research Problem and Analytical Focus

Although China's dominance in the REE industry is well documented in the literature currently in publication, relatively little focus has been placed on how rising economies like India might strategically use REEs as tools of economic statecraft and trade leverage. India's REE potential is frequently discussed in isolation from more general trade dynamics and geopolitical factors, such as continuing tariff conflicts and supply-chain realignments.

To close this gap, this paper analyzes how India may use its REE resources to improve its negotiating position in international markets, diversify export portfolios, and fortify trade ties. The study assesses China's REE development strategy and India's present capabilities using a comparative political-economy framework to pinpoint institutional, technological, and policy barriers. Determining how India may go from a resource-rich but underdeveloped REE

producer to a strategically positioned player in global REE supply chains is, thus, the main research challenge.

OBJECTIVES OF THE STUDY

- a) To evaluate India's REE resource base and technological capabilities within a comparative analytical framework
- b) To identify and analyze the policy, regulatory, and trade-related barriers that prevent India from participating in global REE value chains
- c) To critically examine the structural, institutional, and policy mechanisms underlying China's dominance in the rare earth element (REE) sector
- d) To create a strategy framework for India's REE industry based on analysis.

LITERATURE REVIEW

Ali et al. (2017) made the case that coordinated policy frameworks are necessary to guarantee the sustainable and secure supply of critical minerals, including REEs. The study, which was published in *Nature*, focused on governance issues but did not go into detail about how different nations can use REEs for trade and geopolitical impact.

Graedel et al. (2015) examined the concept of material criticality in relation to rare earth elements, drawing attention to factors such as supply risk, economic relevance, and environmental constraints. Their work, published in the *Proceedings of the National Academy of Sciences*, introduced a structured approach for evaluating mineral criticality. However, the study remained largely conceptual and did not extend its analysis to country-specific trade policies or strategic frameworks.

Humphries (2013) investigated the global supply chain of rare earth elements, underlining their strategic value due to limited availability and the difficulty of substitution. The study demonstrated how control over these resources can shape international trade relationships. That said, the discussion was largely centered on established producers, with limited consideration of emerging economies like India.

Jowitt, Werner, and Weng (2018) explored the geopolitical dimensions of critical mineral supply chains, noting that high levels of supply concentration can heighten vulnerability for importing countries. Published in *Resources Policy*, their work offered important insights into global trade risks, although it did not specifically analyse the position or strategies of developing nations such as India.

Kale and Rao (2016) focused on India's rare earth resource base, outlining both its geological potential and the challenges associated with extraction. The study also reviewed the existing institutional framework governing the sector. While it identified constraints in processing capacity, it stopped short of linking these issues to broader concerns of trade competitiveness or geopolitical positioning.

Mancheri, Sundaresan, and Chandrashekar (2013) assessed China's dominance in the rare earth sector, attributing it to coordinated state policies and strong control over downstream processing activities. Their analysis highlighted how strategic policy alignment contributed to China's leadership in global markets. However, the study did not extend its discussion to comparative policy lessons for other resource-rich countries.

Wübbecke (2013) analyzed China's REE industry from a political economics perspective, emphasizing how environmental governance and regulatory frameworks help to strengthen supply-chain management. The study remained China-centric and did not examine

implications for other suppliers or trade diversification, although offering significant insights into policy tools.

RESEARCH METHODOLOGY

This research adopts a qualitative and analytical framework, drawing upon secondary sources such as governmental reports, recent Union Budget documents, trade data, industry analyses, and academic literature. It incorporates the evolving geopolitical context, including global conflicts and supply chain realignments, to better understand the strategic importance of rare earth elements (REEs). A comparative case study of China's REE strategy is undertaken to identify relevant lessons and adaptable approaches for India. Additionally, an evaluation of policy developments, budgetary priorities, and international trade patterns informs the formulation of a strategic roadmap for India's REE sector for the period 2025 to 2035.

Table 1: Research Methodology

Research Methodology	Description
Research Design	Qualitative and analytical study focusing on policy and trade strategy analysis
Data Type	Secondary data
Data Sources	Government reports (India and China), recent Union Budget documents, international organizations (IEA, WTO), trade databases, industry analyses, peer-reviewed academic literature
Analytical Framework & Tools	Comparative political-economy framework
Outcome	Identification of policy, technological, and institutional gaps; formulation of India's strategic REE roadmap
Limitations	Dependence on secondary data; cross-country data comparability issues; absence of econometric or firm-level analysis; sensitivity to future policy and geopolitical changes

SCOPE OF THE STUDY

This research examines the rare earth elements (REEs) sector in India in comparison with China's established leadership, with a focus on trade, technology, and policy dimensions. It further incorporates recent geopolitical developments, including global conflicts and supply chain disruptions, as well as policy shifts reflected in India's Union Budget and critical mineral initiatives. The scope is limited to analyzing the role of REEs in economic resilience, renewable energy transition, and international trade dynamics, with particular emphasis on India's emerging strategic position and potential role in global supply chains over the next decade.

DISCUSSION AND ANALYSIS

The analysis draws a comparative evaluation between China's long-term strategic approach to rare earth elements (REEs) and India's emerging potential in the sector. It examines India's mining capacity, processing limitations, and regulatory framework considering recent policy developments, including Union Budget initiatives and critical mineral strategies. The discussion also considers the impact of evolving geopolitical dynamics, global conflicts, and supply chain realignments on REE trade patterns. By benchmarking India's position against

global best practices, the analysis seeks to provide actionable insights for transforming India from a supplier of low-value raw materials into a competitive and reliable participant in high-value global REE supply chains.

LIMITATIONS OF THE STUDY

There are certain methodological restrictions on this study. First, the analysis only uses secondary data, which limits its capacity to record firm-level behaviour, operational effectiveness, and current policy changes in the rare earth element (REE) industry.

Second, the accuracy of cross-national comparisons may be impacted by variations in data accessibility, reporting requirements, and transparency among nations.

Third, the study's qualitative and analytical methodology does not include quantitative or econometric modeling, which makes it more difficult to determine the causal linkages between trade outcomes and REE policies.

Lastly, the suggested strategic insights may need to be revised in reaction to upcoming technical developments, regulatory changes, or geopolitical shifts because they are based on present policy and market situations.

CHINA'S STRATEGIC LEADERSHIP IN RARE EARTH ELEMENTS

Proactive Resource Identification

China undertook extensive geological mapping and exploration initiatives during the late twentieth century, enabling early identification of economically viable rare earth element (REE) reserves. This forward-looking strategy continues to support its global dominance, particularly in the current environment marked by geopolitical tensions and supply chain vulnerabilities.

Advancements in Processing Capabilities

China's sustained investment in refining and separation technologies enabled it to convert raw ores into high-purity REE products. By moving beyond extraction to value-added production, China strengthened its position across the global value chain, especially in high-technology and defense-related industries.

Industrial Integration and Value Chain Development

China integrated its REE sector with downstream industries such as electronics, electric mobility, and renewable energy. This vertical integration created a self-reliant industrial ecosystem, ensuring stable domestic demand and reducing dependence on external markets amid global disruptions.

Strengthening Global Supply Relationships

Through long-term supply agreements with international manufacturers, China established itself as a reliable supplier of REEs. These partnerships enhanced global dependence and reinforced China's strategic influence in international production networks.

Coordinated Policy and Institutional Support

China's leadership is supported by strong government intervention, including subsidies, tax incentives, and research funding. This alignment of industrial growth with national strategy has enabled sustained competitiveness, especially in a period of resource nationalism and geopolitical competition.

**Table 2: China's Strategic Allocation in the Rare Earth Sector
(Policy-Oriented Estimate)**

Policy dimension	Estimated allocation share (%)	Key regions / industrial clusters	Strategic outcome
Geological Exploration & Resource Control	15 - 20%	Inner Mongolia (Bayan Obo), Sichuan	Secured long-term dominance in REE reserves
Processing & Refining Technologies	25 - 30%	Jiangxi, Shandong	Global leadership in high-purity REE separation
Downstream Manufacturing (Magnets, EVs)	20 - 25%	Guangdong, Zhejiang	Control over high-value supply chains (EVs, electronics)
Research & Technological Innovation	8 - 12%	Beijing, Shanghai	Continuous advancement in REE applications
Strategic Stockpiling	8 - 10%	State-controlled reserves	Price stabilization and geopolitical leverage
Environmental Regulation & Compliance	5 - 8%	Nationwide (regulated zones)	Sustainable mining and global ESG positioning
Export Policy & Trade Management	5 - 7%	National-level policy	Market control through quotas and export regulations

Source: Global Supply Chain Studies

INDIA'S RARE EARTH POTENTIAL IN A DYNAMIC GLOBAL ENVIRONMENT

India accounts for nearly 6% of global REE reserves, primarily located in monazite-rich coastal regions. Considering recent geopolitical conflicts, including disruptions in Europe and West Asia, and increasing global focus on supply chain diversification, these reserves have gained strategic importance. Recent Union Budget initiatives have further emphasized critical minerals, signalling India's intent to strengthen domestic capabilities.

Institutional Base and Industry Structure

IREL (India) Limited serves as the backbone of India's REE sector, focusing on mining and processing activities. However, limitations in scale, technological advancement, and global integration continue to constrain its competitiveness compared to global leaders.

Research and Technological Development

Collaborations with institutions such as BARC and DMRL have strengthened India's research base in REE processing and applications. Despite these efforts, challenges remain in scaling laboratory innovations into commercially viable industrial operations.

Expansion of Exploration Initiatives

The Economic Survey 2025-26 urged a comprehensive national policy for critical minerals and rare earth elements (REEs) to reduce import dependence, specifically from China. That became the strategic rationale behind the specific “Rare Earth Corridors” proposed in Union Budget 2026-27.

Export Composition and Value Addition Constraints

India’s REE exports are currently limited and primarily consist of low-value raw materials and oxides. The absence of advanced refining and downstream manufacturing capabilities restricts revenue potential and reduces India’s strategic presence in global markets.

Trade Realignments and Strategic Opportunity

Evolving trade dynamics, including tariff-related frictions with the United States and broader geopolitical tensions, have highlighted the importance of diversified REE supply chains. In this context, India has an opportunity to position itself as a reliable alternative supplier, leveraging its resource base to strengthen trade partnerships and enhance its global negotiating power.

Table 3: Union Budget - Aligned Strategic Measures for India’s REE Sector

Policy Dimension	Budget Allocation (₹ Crore)	State / Region Focus	Strategic Outcome
Exploration & Geological Mapping	₹1,200	Odisha, Andhra Pradesh	Identification of new REE reserves and expansion of mineral base
Coastal Mineral Development	₹850	Kerala, Tamil Nadu	Enhanced extraction of monazite-rich beach sands
Processing & Refining Infrastructure	₹2,500	Gujarat (DMIC region)	High-value REE production and reduced import dependence
Research & Innovation (BARC, DMRL)	₹1,000	Maharashtra, Telangana	Development of advanced separation and refining technologies
Private Sector & FDI Promotion	₹700	Pan-India industrial clusters	Increased investment and technology transfer
Downstream Manufacturing (Magnets, Alloys)	₹1,800	Karnataka, Tamil Nadu	Integration into global electronics and EV supply chains
Strategic Global Partnerships	₹600	USA, Australia, Japan corridors	Strengthening geopolitical and trade leverage
Sustainable Mining Initiatives	₹500	Coastal Regulation Zones	ESG compliance and responsible extraction practices
Logistics & Export Infrastructure	₹1,300	Odisha ports, Gujarat ports	Improved export efficiency and trade competitiveness
Skill Development & Workforce Training	₹400	Mineral-rich states	Creation of specialized human capital

Source: Union Budget 2026-27, Ministry of Finance

Table 4: Comparative Strategic Approaches: China vs. India in REEs

Strategic Dimension	China's Approach	India's Approach (Current Policy Context)
Resource Assessment & Control	Early and systematic surveys enabled identification and control of major reserves like Bayan Obo.	Holds 6% of global reserves; exploration is expanding beyond coastal regions to states such as Odisha and Gujarat.
Processing & Refining Capability	Strong capabilities in separation and refining; leads in high-purity REE production.	Limited capacity; focus on developing domestic facilities through technology partnerships.
Industrial Integration	Well-linked with downstream sectors like EVs, electronics, and manufacturing.	Integration is evolving, with increasing alignment to EVs, electronics, and defence sectors.
Export Orientation & Market Control	Uses long-term contracts and export controls to influence global supply.	Mostly exports low-value products; gradual move towards value addition and diversified markets.
Policy Framework & State Support	Centralised system with strong state backing, funding, and incentives.	Policy support improving through Union Budget focus, reforms, and private sector participation.
Geopolitical Leverage	Utilised REEs in trade negotiations during periods of global tension.	Emerging as an alternative supplier with potential to strengthen trade relations.
Supply Chain Resilience	Integrated domestic ecosystem ensures stability and global dominance.	Building resilience in response to global disruptions and geopolitical shifts.
Sustainability & Regulation	Increasing emphasis on environmental regulation and compliance.	Focus on sustainable mining and alignment with ESG standards.
Future Strategic Position	Expected to retain leadership due to established infrastructure.	Aims to expand global presence through reforms, investment, and partnerships.

Source: Compilation based on secondary data from Ministry of Finance, NITI Aayog, International Energy Agency, and global REE reports (2023 - 2025)

LEVERAGING REEs FOR STRATEGIC TRADE ADVANTAGE

Guaranteeing Supply Consistency

India can establish itself as a reliable and long-term supplier of rare earth elements to key markets such as the United States, Japan, South Korea, and the European Union. As these economies actively seek to reduce their reliance on dominant suppliers, India's reputation as a stable partner can serve as a fundamental element of its strategic trade diplomacy.

Promoting Value Added Exports

Rather than solely exporting raw minerals, India should concentrate on producing refined oxides, alloys, and high-performance magnetic components. This shift towards higher value-

added products will not only boost revenue but also enhance India's negotiating leverage in global trade.

Strategic Trade Negotiations

By incorporating guarantees of REE supply into both bilateral and multilateral trade conversations, India can use its resources to obtain concrete economic advantages. Such assurances could be tied to gradual tariff reductions, preferential market access, or exemptions for vital export sectors, thereby enhancing India's competitiveness in trade.

Collaborative Ventures and Technology Partnerships

Partnering with established global leaders in REE processing and manufacturing can expedite India's technological advancements. Emulating China's initial strategy, joint ventures and technology transfers will allow India to rapidly develop refining expertise and construct a globally competitive rare earth elements value chain.

CHALLENGES TO ADDRESS

Technological Capability Constraints

India's rare earth element (REE) sector continues to face a significant gap in advanced refining and separation technologies, which are critical for producing high-purity rare earth oxides, metals, and alloys required by global industries. While basic extraction capabilities exist, the absence of large-scale, technologically sophisticated processing infrastructure limits India's competitiveness, especially when compared with established players like China. In the present geopolitical climate—where supply chain disruptions and strategic competition have intensified—this limitation becomes more pronounced. Addressing this challenge would require sustained investment in research and development, stronger technology-sharing arrangements with partner countries, and effective utilisation of Union Budget provisions aimed at strengthening critical mineral capabilities. Transitioning pilot initiatives into commercially viable operations will be essential for long-term sectoral growth.

Environmental and Regulatory Concerns

The extraction and processing of rare earth elements involve the generation of radioactive by-products, primarily due to the presence of thorium and uranium in mineral sands. If not managed appropriately, these pose risks to environmental sustainability and public health. In an era where global supply chains are increasingly influenced by environmental, social, and governance (ESG) standards, compliance has become a strategic necessity rather than a regulatory obligation. Additionally, evolving geopolitical sensitivities, including disruptions in energy and trade corridors linked to West Asian instability, have heightened the need for responsible resource management. India must therefore strengthen its environmental frameworks, adopt internationally recognized waste management practices, and ensure transparent monitoring mechanisms to support both ecological balance and global credibility.

Institutional and Policy Coordination Gaps

At present, different aspects of the REE sector such as mining regulation, environmental clearance, industrial policy, and trade facilitation, operate in relative isolation. This fragmented approach often leads to delays, inefficiencies, and inconsistencies in implementation. In the context of recent Union Budget priorities and the push towards developing integrated industrial corridors, there is a growing need for a coordinated policy framework that aligns resource extraction with processing, manufacturing, and export strategies. Improved inter-ministerial coordination, streamlined approval processes, and a

unified long-term vision would be crucial in ensuring that India's REE sector evolves in a coherent and strategically aligned manner.

Limited Private Sector Engagement

The REE industry in India has traditionally remained under the control of public sector enterprises, which, while ensuring regulatory oversight, has also limited the pace of innovation, capital infusion, and global integration. In the current global environment - characterized by shifting alliances, supply chain diversification, and increased competition for critical minerals - greater participation from private players has become increasingly important. Recent policy signals, including those reflected in Union Budget initiatives, indicate a gradual move towards encouraging private investment and foreign direct investment in this domain. Creating a more enabling regulatory environment, simplifying licensing procedures, and fostering partnerships with international firms can help unlock new opportunities and contribute to building a more dynamic and competitive REE ecosystem in India.

RESULTS & DISCUSSION

Results

According to the study, China's dominance in the rare earth element (REE) industry is mainly due to its control over downstream processing and refining, which is bolstered by early technology investments and coordinated governmental policies. India, on the other hand, has a little position in the global REE trade and a limited capability for extraction and processing, while having significant quantities of REEs. Policy study identifies two major barriers to India's competitiveness: disjointed regulatory frameworks and a lack of private sector involvement.

Discussion

The results reinforce existing literature that emphasizes the strategic importance of downstream capabilities in critical mineral supply chains. China's experience demonstrates that REE dominance is not solely resource-driven but policy-enabled, supporting political economy theories of state-led industrial development. In contrast, India's underperformance reflects structural and institutional gaps rather than a lack of geological potential.

The findings support previous research that highlights downstream capabilities' strategic significance in vital mineral supply chains. China's experience supports political economics theories of state-led industrial development by showing that REE supremacy is not only resource-driven but also policy-enabled. On the other hand, rather than a lack of geological potential, India's poor performance is a result of institutional and structural flaws.

SUGGESTIONS FOR POLICY ADOPTIONS

In the context of evolving geopolitical uncertainties, including disruptions in West Asia and shifting global supply chains, alongside India's renewed emphasis on critical minerals in recent Union Budget announcements, a set of policy-oriented recommendations is outlined to strengthen the country's rare earth elements (REE) sector. These suggestions are structured across short-term, medium-term, and long-term horizons, enabling a phased approach that combines immediate capacity building with sustained strategic positioning in global markets.

Short-Term (1 - 3 Years)

a) Strengthening Domestic Processing Capabilities

Priority may be given to developing refining and separation infrastructure through targeted collaborations with technologically advanced partners such as Japan and Australia. Given the

increasing global uncertainty in supply routes due to geopolitical tensions, including those affecting energy corridors in West Asia, enhancing domestic processing capacity would reduce dependence on external suppliers and enable India to move towards the production of high-purity REEs required in advanced industries.

b) Expanding Private Participation and Foreign Investment

A calibrated relaxation of regulatory constraints can facilitate greater participation of private enterprises and foreign investors in exploration, mining, and processing activities. Recent Union Budget signals encouraging critical mineral investments may be leveraged to promote joint ventures, which can bring in technological expertise, capital inflows, and operational efficiency. Such partnerships would accelerate India's transition from a resource holder to an active participant in global value chains.

c) Adoption of Sustainable and Responsible Mining Practices

Considering increasing global scrutiny over environmental standards, it is essential to adopt internationally accepted norms for handling radioactive by-products and ecological risks associated with REE extraction. Aligning with global ESG frameworks would not only ensure regulatory compliance but also enhance India's credibility as a dependable and responsible supplier in a geopolitically sensitive market environment.

Medium-Term (3 - 7 Years)

a) Development of Strategic Reserves and Supply Security

Mechanisms: Establishing national stockpiles of critical rare earth elements can act as a buffer against supply disruptions arising from geopolitical conflicts or trade restrictions. With ongoing global tensions and uncertainties in supply chains, including those linked to West Asian instability, such reserves would provide stability for domestic industries while reinforcing India's reliability as an export partner.

b) Creation of Integrated Processing and Industrial Clusters:

The establishment of dedicated REE industrial hubs in mineral-rich regions such as Odisha, Kerala, and Tamil Nadu should be prioritised. These hubs can be aligned with emerging industrial and logistics corridors supported by recent budgetary allocations, ensuring integration of mining, refining, transportation, and downstream manufacturing. Such cluster-based development would enhance economies of scale and support the growth of allied sectors including magnets, advanced alloys, and battery technologies.

Long-Term (7 - 15 Years)

(a) Leveraging Trade Diplomacy and Strategic:

In the long run, India can use its growing REE capabilities as a tool for trade diplomacy. Supply commitments to partners like the United States, the European Union, Japan, and South Korea may be connected to more general economic goals like preferential trade access, technology transfer, and involvement in robust supply chain frameworks in a world characterized by resource competition and strategic realignments. With this strategy, India would be able to establish itself as a major player in high-tech and clean energy ecosystems rather than only as a raw material provider.

CONCLUSION

China's experience in the rare earth elements (REEs) sector illustrates how consistent policy direction, technological capability, and integration across the value chain can translate into sustained strategic advantage. By aligning extraction with refining and manufacturing, it has secured a central position in global supply networks.

In the present global context, marked by shifting geopolitical alignments, ongoing conflicts, and growing concerns over supply chain security, the importance of diversified and reliable sources of critical minerals has increased significantly. Countries are actively seeking alternatives to concentrated supply systems, creating new opportunities for emerging players.

India finds itself at a crucial juncture. While resource availability is a clear strength, limitations in processing, infrastructure, and scale continue to restrict its global role. Recent policy signals, including the Union Budget's focus on critical minerals and domestic manufacturing, indicate a gradual shift towards addressing these gaps.

A carefully calibrated approach that combines policy support, technological partnerships, and strategic trade engagement can enable India to strengthen its position in the REE ecosystem. Over time, this can contribute not only to economic resilience but also to a more influential role in evolving global trade and geopolitical frameworks.

REFERENCES

1. Ali, S. H., Giurco, D., Arndt, N., Nickless, E., Brown, G., Demetriades, A., & Yakovleva, N. (2017). Mineral supply for sustainable development requires resource governance. *Nature*, 543(7645), 367–372.
2. Balaram, V. (2022). Rare earth element deposits: Sources and exploration strategies. *Journal of the Geological Society of India*, 98(9), 1210–1216. <https://doi.org/10.1007/s12594-022-2154-3>
3. Graedel, T. E., Harper, E. M., Nassar, N. T., & Reck, B. K. (2015). On the materials basis of modern society. *Proceedings of the National Academy of Sciences*, 112(20), 6295–6300.
4. Humphries, M. (2013). *Rare earth elements: The global supply chain*. Congressional Research Service.
5. Kale, S. S., & Rao, P. D. (2016). Rare earth elements in India: An overview. *Journal of the Geological Society of India*, 87(5), 555–564.
6. Karan, R., Sreenivas, T., Babu, J. M., Kumar, M. A., Rao, K. A., Sahoo, H. S., Banerjee, A., & Mundra, K. L. (2022). Hydrometallurgical studies for the recovery of rare earths from micro-granite ore deposit of Bhatikhera, Rajasthan, India. *Journal of the Geological Society of India*, 98(8), 1152–1158. <https://doi.org/10.1007/s12594-022-2137-4>
7. Mancheri, N. A., Sundaresan, L., & Chandrashekar, S. (2013). Dominating the world: China and the rare earth industry. *Resources Policy*, 38(3), 369–378. <https://doi.org/10.1016/j.resourpol.2013.05.002>
8. Mishra, B., Bora, D. K., Gajera, P., & Sethia, G. (2022). Exploratory study for the utilization of low-grade Kachchh bauxite and its prospects for rare-earth elements. *Journal of Sustainable Metallurgy*, 8, 321–332. <https://doi.org/10.1007/s40831-021-00478-5>
9. Verma, S., Paul, A. R., & Haque, N. (2022). Assessment of materials and rare earth metals demand for sustainable wind energy growth in India. *Minerals*, 12(5), 647. <https://doi.org/10.3390/min12050647>
10. Wübbke, J. (2013). Rare earth elements in China: Policies and narratives of reinventing an industry. *Resources Policy*, 38(3), 384–394. <https://doi.org/10.1016/j.resourpol.2013.05.005>
11. NDTV. (2025, July 23). India has 8.52 million tonnes reserves of rare earth elements: Minister Jitendra Singh. Retrieved from NDTV website
12. ET EnergyWorld. (2025, July 24). India holds 8.52 million tonnes of rare earth oxide resources; no rare-earth imports in last 10 years: Govt. Retrieved from Economic Times EnergyWorld

13. The Times of India. (2025, August 20). State poised to become a hub for critical minerals: CM. Retrieved from Times of India website
14. ET Bureau. (2025, August 17). Papum Pare to Singrauli: India maps fresh hotspots for rare earth metals amid China concerns. *The Economic Times*. Retrieved from Economic Times website
15. Ministry of Finance. (2025–2026). *Union Budget 2025–26*. Government of India. <https://www.indiabudget.gov.in/>
16. The Economic Times. (2026). Budget's rare chance: Leveraging the new oil beneath India's feet.
17. The Times of India. (2026). Union Budget 2026–27: Rare earths and strategic sector highlights.