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DAILY CURRENT AFFAIRS DATED 01.03.2026

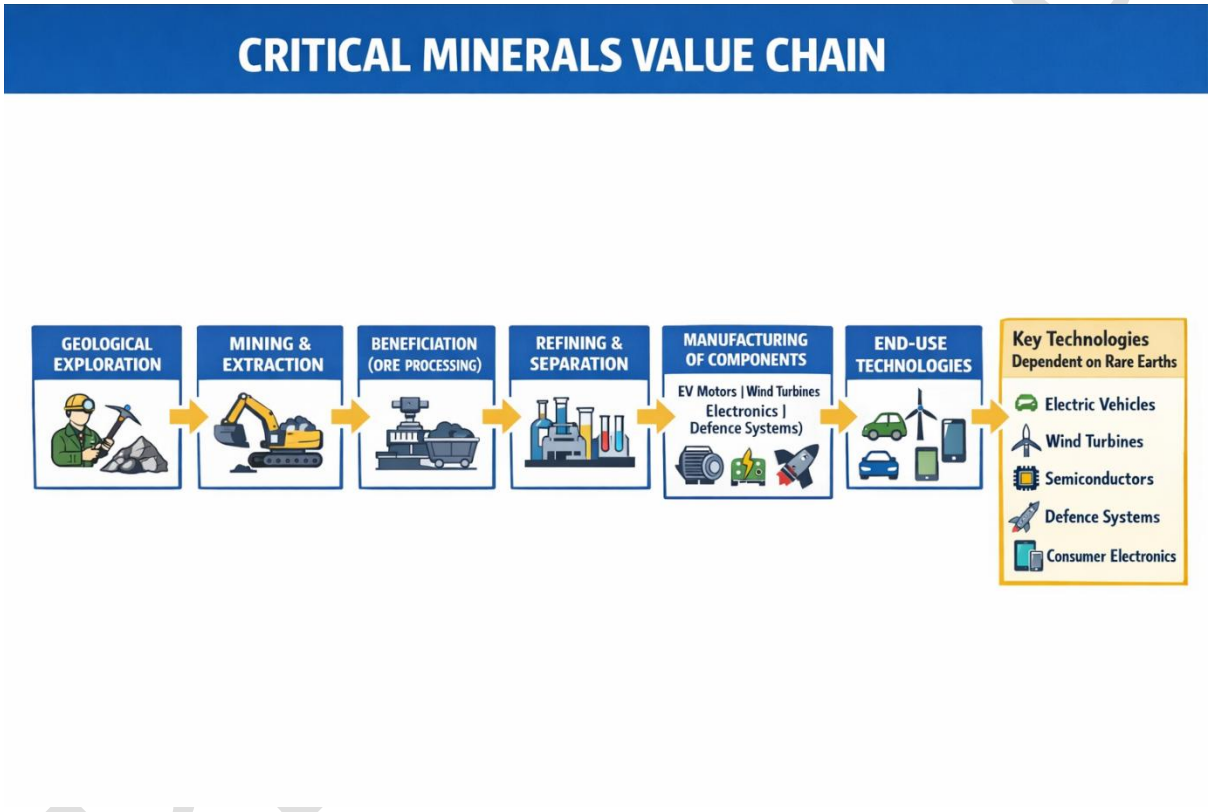
GS Paper II: International Relations

1. Rare Earth Memorandum of Understanding with Brazil

a. Context

India and Brazil signed a Memorandum of Understanding on cooperation in rare earths and critical minerals during the state visit of Brazilian President Luiz Inácio Lula da Silva to India in February 2026.

The agreement seeks to develop collaboration across the entire critical mineral value chain, beginning with geological exploration and extending to mining, processing, refining, and recycling. In strategic terms, the initiative reflects the growing global effort to diversify supply chains for minerals that are essential for advanced technologies and the global energy transition.



b. Rare Earths and Critical Minerals: Conceptual Background

Understanding the India–Brazil partnership requires clarity regarding the nature and importance of rare earth elements and critical minerals.

i. Rare Earth Elements

Rare earth elements constitute a group of seventeen metallic elements in the periodic table, including lanthanum, cerium, neodymium, and dysprosium. Despite the name, these elements are not always geologically rare; rather, they are rarely found in economically viable concentrations.

These elements possess unique magnetic, luminescent, and electrochemical properties that make them indispensable for modern technologies.

Key technological applications

- Neodymium and dysprosium are used in high-performance permanent magnets that power electric vehicle motors.

- Rare earth magnets are essential components in wind turbine generators used in renewable energy systems.
- These elements are also used in lasers, optical devices, advanced electronics, and defence systems.

ii. Critical Minerals

Critical minerals refer to minerals that are essential for economic development, technological advancement, and national security, but whose supply chains face a high degree of vulnerability.

Sources of supply vulnerability

- Limited geographical distribution of mineral deposits.
- Technological barriers to extraction and processing.
- Geopolitical concentration of production in a few countries.

Major examples of critical minerals

- Lithium
- Cobalt
- Nickel
- Graphite
- Rare earth elements

These minerals form the backbone of industries such as battery manufacturing, semiconductors, renewable energy equipment, and advanced defence systems.

Thus, the India–Brazil agreement must be viewed as part of the global effort to secure access to these strategic resources.

c. Key Features of the India–Brazil Rare Earth Cooperation

The Memorandum of Understanding between India and Brazil establishes a framework for cooperation rather than a legally binding agreement.

i. Scope of Cooperation

Coverage of the entire mineral value chain

- Geological exploration of mineral deposits.
- Mining and extraction of rare earth ores.
- Beneficiation and refining processes.
- Recycling and recovery of rare earth materials.

Research and technological collaboration

- Promotion of joint research initiatives.
- Exchange of technological expertise in mineral processing.
- Development of innovative extraction and refining technologies.

Institutional and industrial collaboration

- Cooperation between public sector institutions and research organisations.
- Partnerships involving private industries in both countries.
- Encouragement of investment in critical mineral projects.

Strategic supply chain diversification

- Reduction of excessive global dependence on a single supplier.
- Creation of alternative sources of rare earth minerals.

Brazil possesses one of the largest rare earth reserves in the world, estimated at approximately twenty-one million tonnes of rare earth oxides. However, a large portion of these reserves remains unexplored, creating opportunities for joint exploration and investment.

The scope of cooperation therefore extends beyond simple trade and aims at long-term strategic collaboration.

d. Strategic Importance of Rare Earths for India

Rare earth elements occupy a central position in the technological and industrial landscape of the twenty-first century.

i. Role in Electric Mobility — Permanent magnet motors

- Rare earth magnets enable high-efficiency electric vehicle motors.
- These magnets provide strong magnetic fields while remaining lightweight.
- This combination improves vehicle performance and energy efficiency.

ii. Role in Renewable Energy — Wind turbine technology

- Permanent magnets containing rare earth elements are used in wind turbines.
- They allow efficient electricity generation with fewer mechanical components.
- Expansion of renewable energy capacity increases demand for these materials.

iii. Role in Defence Technologies — Strategic defence applications

- Missile guidance systems.
- Radar and advanced communication systems.
- Precision-guided munitions and surveillance equipment.

iv. Role in Electronics and Semiconductor Manufacturing — Advanced electronic components

- Smartphones and consumer electronics.
- Computer processors and sensors.
- Optical and communication technologies.

Despite this growing importance, global production and processing remain highly concentrated.

China currently accounts for roughly seventy percent of global rare earth mining and an even larger share of processing capacity. This concentration creates strategic vulnerabilities for countries dependent on these materials.

The need to reduce such dependence forms the strategic basis of India's global partnerships in the critical minerals sector.

e. India's Strategy for Securing Critical Minerals

Recognising the strategic significance of these resources, India has adopted a multi-layered policy framework to strengthen its access to critical minerals.

i. National Critical Mineral Mission

The National Critical Mineral Mission aims to develop the entire mineral value chain from exploration to recycling.

Key objectives

- Reduce dependence on imports of critical minerals.
- Strengthen domestic exploration capabilities.
- Promote recycling and sustainable resource management.

The mission is expected to operate from the financial year 2024–25 to 2030–31.

ii. Identification of Critical Minerals

In 2023, the Government of India identified a list of thirty critical minerals considered essential for national economic and technological development.

Major minerals included

- Lithium
- Cobalt
- Graphite
- Rare earth elements

These minerals are crucial for battery technologies, clean energy systems, and advanced electronics.

iii. Amendments to the Mines and Minerals Law

The Mines and Minerals Development and Regulation Amendment Act of 2023 granted the Central Government greater authority to auction blocks containing strategic minerals.

Policy objectives

- Accelerate mineral exploration.
- Encourage private sector participation in mining.
- Improve transparency in mineral allocation.

iv. Overseas Resource Acquisition

India has adopted an outward-looking strategy to secure mineral resources abroad.

Institutional mechanism

- Establishment of Khanij Bidesh India Limited (KABIL).

Key initiatives

- Lithium exploration projects in Argentina.
- Partnerships with countries such as Chile and Brazil.

v. Domestic Manufacturing Initiatives

India is attempting to develop domestic manufacturing capacity in sectors dependent on rare earth materials.

Industrial objectives

- Initiation of domestic production of rare earth permanent magnets by 2026.
- Support for industries such as electric mobility and electronics manufacturing.
- Strengthening of defence manufacturing capabilities.

This domestic strategy complements India's international partnerships for resource security.

f. Strategic Significance of the Brazil Partnership

The cooperation agreement with Brazil offers several important advantages for India.

i. Supply Chain Diversification

- Present global supply chains are dominated by a limited number of producers.
- Brazil provides an alternative source of rare earth minerals.

ii. Improved Bargaining Power

- Access to multiple suppliers improves negotiating capacity.

- Countries can secure more favourable pricing and long-term contracts.

iii. Investment Confidence for Industry

- Electric vehicle manufacturing.
- Semiconductor production.
- Renewable energy equipment.

Government commitment to securing mineral supplies encourages private sector investment.

iv. Opportunities for Value Addition

- Development of refining facilities.
- Production of advanced rare earth materials.

Brazil has shown interest in moving beyond raw ore exports toward domestic processing industries. Cooperation with India may support this transition.

g. Relationship with the Pax Silica Initiative

India recently joined the United States-led Pax Silica initiative, which aims to secure the technological supply chain associated with silicon-based industries.

i. Focus of the Pax Silica Initiative

- Raw material supply chains.
- Semiconductor fabrication.
- Advanced computing infrastructure.
- Artificial intelligence hardware.

ii. Complementarity with Rare Earth Cooperation

- Semiconductor technologies depend on silicon materials.
- Advanced electronics also require rare earth components.

Thus, securing both semiconductor materials and rare earth minerals strengthens India's technological ecosystem.

Brazil, however, is not a member of the Pax Silica initiative. The rare earth cooperation therefore represents a parallel partnership rather than an integrated institutional framework.

h. Benefits for Brazil

The partnership also offers several advantages for Brazil.

i. Increased Investment in Mineral Exploration

- Brazil possesses large but underexplored rare earth deposits.
- Indian investment can support geological exploration and mining.

ii. Technological Collaboration

- Development of advanced mineral processing capabilities.
- Access to technological cooperation with Indian institutions.

iii. Access to a Large Industrial Market

- Rapidly growing electric mobility sector.
- Expansion of renewable energy infrastructure.
- Growth of electronics manufacturing.

iv. Moving Up the Mineral Value Chain

- Transition from exporting raw ore to refined materials.
- Development of domestic processing industries.

Thus, the partnership represents a mutually beneficial strategic cooperation.

i. Key Challenges

Despite the strategic advantages, several structural challenges remain.

i. Environmental Concerns

- Rare earth mining generates toxic waste.
- Processing may produce radioactive by-products.

ii. Technological Constraints

- Advanced rare earth refining technologies remain concentrated in a few countries.
- China continues to dominate processing technologies.

iii. Structural Supply Chain Concentration

- Mining may be geographically diversified.
- Processing and refining facilities remain limited outside China.

iv. Geopolitical Competition

- Major powers increasingly view critical minerals as instruments of strategic influence.
- Competition for access to resources is rising in regions such as Latin America and Africa.

These challenges highlight the need for sustained technological and diplomatic efforts.

j. Way Forward

India must adopt a comprehensive long-term strategy to secure critical mineral supplies and technological independence.

i. Expansion of Strategic Partnerships

- Latin America
- Australia
- Africa

ii. Intensification of Domestic Exploration

- Identification of new mineral deposits within India.
- Expansion of exploration programmes.

iii. Development of Processing Capacity

- Establishment of refining facilities.
- Development of advanced material processing technologies.

iv. Promotion of Recycling

- Recovery of rare earth elements from electronic waste.
- Reduction of dependence on primary mining.

v. Creation of Strategic Mineral Reserves

- Stockpiling of critical minerals.

- Buffer against geopolitical or market disruptions.

Conclusion

The India–Brazil Memorandum of Understanding on rare earth cooperation represents an important step in India's strategy to secure critical mineral supply chains. By diversifying sources of rare earths and promoting collaboration in exploration, processing, and technology development, the partnership strengthens India's industrial resilience and technological sovereignty.

At a broader level, such initiatives reflect the emerging geopolitical significance of critical minerals in the global energy transition and advanced technology industries. Ensuring secure and sustainable access to these resources will therefore remain a central priority for India's economic and strategic policy in the coming decades.

Reader's Note — About This Current Affairs Compilation

Dear Aspirant,

This document is part of the PrepAlpine Current Affairs Series — designed to bring clarity, structure, and precision to your daily UPSC learning.

While every effort has been made to balance depth with brevity, please keep the following in mind:

1. Orientation & Purpose

This compilation is curated primarily from the UPSC Mains perspective — with emphasis on conceptual clarity, analytical depth, and interlinkages across GS papers.

However, the PrepAlpine team is simultaneously developing a dedicated Prelims-focused Current Affairs Series, designed for:

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- data recall
- Prelims-style MCQs
- objective pattern analysis

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2. Content Length

Some sections may feel shorter or longer depending on topic relevance and news density.
To fit your personal preference, you may freely resize or summarize sections using any LLM tool (ChatGPT, Gemini, Claude, etc.) at your convenience.

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