



Rajasthan's Potential in Rare Earth Mineral Production

Why in News?

Surveys by the [Geological Survey of India \(GSI\)](#) and [Atomic Minerals Directorate \(AMD\)](#) have revealed **large reserves of rare earth minerals** in Bhati Kheda, Siwana tehsil, Balotra, Rajasthan.

- With ongoing surveys and **advancements in technology** and infrastructure, Rajasthan is poised to become a major global supplier in the rare earth market.

Key Points

About Rare Earth Reserves in Rajasthan

- **India's First Hard Rock Rare Mineral Block:** Bhati Kheda in Balotra holds significant reserves of rare earth minerals, confirming the presence of **17 high-demand elements** critical for modern technologies.
 - It is set to become the **country's first block to contain rare earth minerals** in hard rock granite, a more challenging form for mineral extraction.
 - The G2 level survey confirms the large reserves of these minerals, making it a significant find.
- **Survey and Mining Process:** The GSI and AMD have conducted extensive surveys in Balotra and Jalore districts, with the survey in Bhati Kheda nearing completion.
 - The central government will soon **auction mining leases** for these rare minerals, opening up opportunities for both private companies and state agencies.
 - As there are no **wildlife sanctuaries** or similar protected areas nearby, there are minimal environmental or local-level challenges expected in Bhati Kheda.

About Rare Earth Minerals

- **Rare earth minerals** are minerals that contain one or more **rare earth elements (REEs)** as a major metal constituent.
 - Rare earth elements refer specifically to 17 metallic elements: the **15 lanthanides** on the periodic table, plus **scandium and yttrium**.
 - These elements are used heavily in high-tech electronics, magnets, renewable energy technologies, and defense.

RARE EARTH ELEMENTS

Rare Earth Elements are a family of 17 elements in the periodic table - 15 Lanthanide group elements, along with Yttrium and Scandium.

+ PROPERTIES

- Unique magnetic, luminescent, and electrochemical properties
- High - density, melting point, conductivity and thermal conductance
- Share a trivalent charge (+3)

+ TYPE - LIGHT AND HEAVY REES

Element	Symbol	Atomic Number	Element	Symbol	Atomic Number
Light REES			Heavy REES		
Lanthanum	La	57	Terbium	Tb	65
Cerium	Ce	58	Dysprosium	Dy	66
Praseodymium	Pr	59	Holmium	Ho	67
Neodymium	Nd	60	Erbium	Er	68
Samarium	Sm	62	Thulium	Tm	69
Europium	Eu	63	Ytterbium	Yb	70
Gadolinium	Gd	64	Lutetium	Lu	71
			Yttrium	Y	39

+ PRINCIPAL SOURCE

- Carbonatites:** Host world's largest REE deposits
- Alkaline Igneous Systems:** Comprise a group of uncommon igneous rock types (Deficient in silica, relative to sodium, potassium, and calcium)
- Ion-Absorption Clay Deposits:** Southern China (World's primary source of heavy REEs.)
- Monazite-Xenotime-Bearing Placer Deposits:** Principal source of rare earths and thorium in India



+ APPLICATIONS

- In lights, screens, and glass
- As catalysts
- In magnets, electronics and steel alloys
- In defence and energy sectors

+ ISSUES

- Sufficiently available but extraction/ utilisation unviable economically
- Heavy REEs not available in extractable quantities

+ INTERNATIONAL PRODUCTION

- China's monopoly (accounts for 60% of total)

World Reserves of Rare Earths (By Principal Countries)
(In '000 tonnes of REO equivalent content)

Country	Reserves
World: Total (rounded off)	120000
Australia	3300
Brazil	22000
Myanmar	NA
Burundi	NA
Canada	830
China	44000
Greenland	1500
India	6900
Madagascar	NA
Russia	12000
South Africa	790
Tanzania	890
Thailand	NA
USA	1400
Vietnam	22000
Other countries	310

- Critical Minerals:** [Critical minerals](#) are those that are essential for a nation's economic development, technological advancement, or national security, and whose supply may be vulnerable to disruption due to concentrated extraction or processing in a small number of locations, geopolitical risks, or scarcity.
 - The specific list of critical minerals can change over time depending on technological and economic needs.
 - India has identified [30 critical minerals](#), including Antimony, Beryllium, Bismuth, Cobalt, and Germanium.
 - China dominates the global processing of several critical minerals, including rare earths, controlling an estimated 80-90% of processing capacity.
 - India is heavily dependent on imports for critical minerals, particularly from China.
- India's Initiatives for Achieving Self-Reliance on Critical Minerals:**
 - [National Critical Mineral Mission](#)
 - [Khanij Bidesh India Ltd \(KABIL\)](#)
 - [Mineral Security Partnership \(MSP\)](#)
 - [Investment Partnership with Australia](#)
 - 2023 amendment in [Mines and Minerals \(Development and Regulation\) Act, 1957](#)
 - Exploration Projects by [Geological Survey of India \(GSI\)](#)

