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Rare Earth Corridors — India's Critical Minerals Strategy

2 April 2026 · ECONOMY · SCIENCE & TECH

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2 April 2026 · 4 min read · 2 tags

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WHY IN NEWS

Union Budget 2026-27 announced dedicated **Rare Earth Corridors** in Odisha, Kerala, Andhra Pradesh, and Tamil Nadu to create integrated rare earth mining, processing, and manufacturing ecosystems — directly targeting India's over-reliance on China's ~90% dominance in global rare earth processing.

WHAT ARE RARE EARTH ELEMENTS?

Rare Earth Elements (REEs) are a group of **17 metallic elements** comprising:

- **15 Lanthanides** (Lanthanum to Lutetium on the periodic table)
- **Scandium (Sc)**
- **Yttrium (Y)**

Despite the name "rare," most REEs are relatively abundant in the Earth's crust — but they rarely occur in economically exploitable concentrations. The real scarcity is in **processing capacity**.

Why Are REEs Critical?

APPLICATION	REES USED
Electric vehicle motors	Neodymium, Dysprosium (permanent magnets)
Wind turbine generators	Neodymium, Praseodymium
Defence electronics, guidance systems	Neodymium, Samarium
Smartphones, hard drives	Neodymium, Terbium, Dysprosium
Catalysts (petroleum refining)	Lanthanum, Cerium
Phosphors (LEDs, displays)	Europium, Terbium, Yttrium
Medical imaging (MRI)	Gadolinium

Without REEs, there are **no EV motors, no wind turbines, no precision guided missiles** — making them a 21st-century strategic resource.

CHINA'S DOMINANCE: THE CORE PROBLEM

METRIC	CHINA'S SHARE
Global REE mining	~60–70%
Global REE processing	**~90%**
Global production of REE permanent magnets	~90%
Separation and refining capacity	Near-monopoly

China's dominance is not just in mining but critically in **separation and processing** — the technically complex and environmentally messy part of turning REE ore into usable metals. This creates a structural dependency for every country that wants to build EVs, turbines, or modern defence systems.

China's REE Export Controls

- **2010:** China cut REE export quotas by ~40%, triggering a global supply shock; WTO ruled against China's restrictions (2014)
- **2023–25:** Progressive tightening of export controls on gallium, germanium, graphite, antimony
- **2026:** Risk of further restrictions as US-China tech war intensifies

INDIA'S REE ENDOWMENT

India is among the world's leading holders of REE reserves:

MINERAL	LOCATION	SIGNIFICANCE
Monazite (contains Th, La, Ce, Nd)	AP, Tamil Nadu, Kerala, Odisha (beach sands)	2nd largest thorium reserves globally
Ilmenite, Zircon, Rutile	Kerala (Chavara), AP (Srikakulam), Odisha	Beach placer deposits
REE in carbonatites	Jharkhand, Andhra Pradesh	Hard rock deposits

IREL (India Rare Earths Limited) — a PSU under the Department of Atomic Energy — currently operates REE beach sand mining and initial processing.

The Processing Gap

India can mine REE-bearing minerals but **lacks commercial-scale separation and refining capacity**. Currently, much of India's monazite concentrate is processed by IREL for thorium (nuclear programme) — the REE byproducts are largely underutilised.

THE RARE EARTH CORRIDORS CONCEPT

Four States Selected

STATE	REE ADVANTAGE
Odisha	Monazite beach sands; Odisha Mineral Development Corporation active
Kerala	Chavara REE deposits; IREL's oldest processing facility
Andhra Pradesh	Beach placer deposits in Srikakulam, Visakhapatnam belt
Tamil Nadu	REE deposits in Kanniyakumari, Tirunelveli districts

What a "Corridor" Means

An integrated corridor would link:

1. **Mining** (extraction of REE-bearing ores)
2. **Beneficiation** (concentration of ore)
3. **Separation** (individual REE elements separated — the currently missing step)
4. **Alloy/metal production** (REE metals and alloys)
5. **Downstream manufacturing** (permanent magnets, phosphors, catalysts)

This vertical integration is exactly what China built over 30 years — and what India needs to replicate.

November 2025 Scheme: Sintered Rare Earth Permanent Magnets

A foundational scheme announced in November 2025 (outlay: Rs 7,280 crore) supports manufacturing of **sintered rare earth permanent magnets** — the end product needed for EV motors and wind turbines. The Rare Earth Corridors build on this by creating the upstream supply chain.

UPSC RELEVANCE

Prelims: REEs = 17 elements (15 lanthanides + Sc + Y), monazite deposits in India, IREL under DAE, China's ~90% processing share, four corridor states.

Mains (GS3 — Economy/Science & Technology):

- Critical mineral security as a component of India's strategic autonomy — parallels with rare earth dependence and China's export restriction history

- How can India use its REE endowment to become a manufacturing hub for clean energy and defence electronics?
- Role of PSUs vs. private sector in REE processing — IREL vs. private firms

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RARE EARTH ELEMENTS (REES):

17 elements: 15 lanthanides + Scandium + Yttrium

Critical for EVs, wind turbines, defence electronics, smartphones

CHINA'S DOMINANCE: ~60-70% MINING; ~90% PROCESSING; NEAR-MONOPOLY ON SEPARATION

INDIA'S DEPOSITS: MONAZITE BEACH PLACER SANDS IN AP, TN, KERALA, ODISHA — 2ND LARGEST THORIUM GLOBALLY

IREL (INDIA RARE EARTHS LTD): PSU UNDER DEPT. OF ATOMIC ENERGY; OPERATES REE PROCESSING PLANTS AT CHAVARA (KERALA), MANAVALAKURICHI (TAMIL NADU), CHATRAPUR (ODISHA)

RARE EARTH CORRIDORS (BUDGET 2026-27): 4 STATES — ODISHA, KERALA, AP, TAMIL NADU; INTEGRATE MINING → PROCESSING → MANUFACTURING

SINTERED REE PERMANENT MAGNETS SCHEME (NOV 2025): RS 7,280 CRORE; FOR EV MOTOR AND WIND TURBINE MAGNET MANUFACTURING

CRITICAL MINERALS LIST: INDIA NOTIFIED A LIST OF 30 CRITICAL MINERALS IN 2023 (INCLUDES REES, LITHIUM, COBALT, NICKEL)

KABIL (KHANIJ BIDESH INDIA LTD): JV OF NALCO, HCL, MECL TO ACQUIRE CRITICAL MINERAL ASSETS OVERSEAS

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