# India's Critical Mineral Mission (NCMM)

## Introduction

- Critical minerals are essential resources for clean energy, advanced technology, electronics, transport, and defense.
- In 2025, India launched the **National Critical Mineral Mission (NCMM)** to reduce import dependence, strengthen supply chains, and ensure mineral security for the **green and digital economy of the future**.
- The Mission is a **strategic blueprint** that goes beyond mining, covering exploration, recycling, R&D, patents, and international cooperation.

# **Key Features of NCMM**

## 1. Launch & Duration

Launched: January 2025

Duration: 7 years (2024-25 to 2030-31)

# 2. Financial Outlay

Proposed expenditure: ₹16,300 crore

Expected PSU and stakeholder investment: ₹18,000 crore

### 3. Incentive Scheme

- ₹1,500 crore scheme to boost recycling capacity from secondary sources like e-waste, lithium-ion batteries, and end-of-life vehicles.
- Target:
  - Build 270 kilo ton annual recycling capacity
  - Produce 40 kilo ton of minerals
  - Attract ₹8,000 crore investments
  - Create **70,000 jobs**

#### 4. Institutional Framework

- NCMM is backed by amendments to the Mines and Minerals (Development & Regulation) Act (MMDR Act).
- The Central Government has the exclusive power to auction 24 out of 30 identified critical minerals.

# What are Critical Minerals?

- **Definition**: Minerals that are **economically vital** and **strategically important**, but face **supply chain risks**.
- **Importance**: Key for clean energy, electronics, EVs, telecom, space, and defense.
- India's Critical Mineral List (2023) 30 identified minerals:
  Antimony, Beryllium, Bismuth, Cobalt, Copper, Gallium, Germanium, Graphite,
  Hafnium, Indium, Lithium, Molybdenum, Niobium, Nickel, Platinum Group
  Elements (PGE), Phosphorus, Potash, Rare Earth Elements (REE), Rhenium,
  Silicon, Strontium, Tantalum, Tellurium, Tin, Titanium, Tungsten, Vanadium,
  Zirconium, Selenium, Cadmium.

# Why Critical Minerals Matter for India

## 1. Energy Transition

- Vital for solar, wind, and EV industries.
- Without secure supply, India's **renewable and net-zero targets** are at risk.

## 2. Clean Energy Applications

- Solar Panels: Silicon, Tellurium, Indium, Gallium
- **Wind Turbines**: Neodymium, Dysprosium (for high-strength magnets)
- **EV Batteries**: Lithium, Nickel, Cobalt
- **Energy Storage**: Lithium-ion systems (Lithium, Nickel, Cobalt)

## 3. Strategic Security

• Rare earths and other minerals are critical for **defense equipment**, **missiles**, **satellites**, **and advanced electronics**.

#### 4. Economic Growth

 Ensures India's role in global supply chains and strengthens domestic manufacturing under Make in India.

# **Components of NCMM**

# 1. Exploration & Mining

- Launch **1000+ projects** to discover new reserves in India.
- Encourage overseas acquisitions of mineral assets by PSUs and private players.

# 2. Processing & Value Addition

- Develop processing parks for critical minerals.
- Promote domestic refining instead of exporting raw ores.

# 3. Recycling & Circular Economy

- Incentivize recovery from mine tailings, fly ash, red mud, e-waste.
- ₹100 crore set aside for **pilot projects** on unconventional sources.

#### 4. Research & Innovation

- Target: 1,000 patents by 2030.
- Support R&D in extraction, processing, advanced applications.

#### 5. Centres of Excellence (CoE)

- 7 CoEs established at IITs and national labs:
  - IIT Bombay, IIT Hyderabad, IIT (ISM) Dhanbad, IIT Roorkee
  - CSIR-IMMT Bhubaneswar, CSIR-NML Jamshedpur, NFTDC Hyderabad
- Role: Drive cutting-edge innovation, supported by industry and VC funding.

# 6. Human Resource Development

Skill training, upskilling workforce in mining and advanced metallurgy.

### 7. Strategic Reserves

• Creation of **mineral stockpiles** to ensure uninterrupted supply.

# **Patent Push under NCMM**

• **Objective**: Promote indigenous technology for critical mineral value chains.

## • Progress:

May 2025: 21 patents filed

June 2025: 41 patents filed

Patents granted: 10 (in two months)

# Examples of Innovations:

- Ytterbium-doped nanoparticles
- Tungsten-polymer composite molds
- Tantalum-doped NASICON electrolytes (for sodium-ion batteries)
- Nickel vanadate thin films
- **Significance**: Strengthens **R&D ecosystem**, reduces import dependency.

# **Global Dimension**

- Critical minerals are at the center of geopolitics.
- Countries like US, EU, Japan, Australia are forming alliances to secure supply chains.
- India is pursuing **bilateral agreements** and **global partnerships** for mineral sourcing.

# **Conclusion**

- Critical minerals are the "new oil" of the 21st century.
- They are scarce, strategic, and vital for clean energy, digital economy, and defense security.
- India's National Critical Mineral Mission (NCMM) ensures:
  - Energy security & clean mobility

- Technological self-reliance
- Global competitiveness in green industries
- With targets for recycling, patents, R&D, and exploration, the mission is a game-changer for India's net-zero journey (2070) and its emergence as a critical mineral hub.

# **UPSC Pointers**

• **Launched**: 2025

• **Duration**: 2024-25 to 2030-31

• **Budget**: ₹16,300 crore (Govt) + ₹18,000 crore (PSUs/Stakeholders)

• Critical Mineral List: 30 (released in 2023)

• Incentive Scheme: ₹1,500 crore (recycling)

• Targets: 1,000 patents, 7 CoEs, 270 KT recycling capacity

• Institutions: IITs (Bombay, Hyderabad, Dhanbad, Roorkee), CSIR labs, NFTDC

**Facebook** 

<u>Instagram</u>

**Youtube**