INDIA'S EARTH MAGNET CRISIS: GEOGRAPHY

NEWS: India's rare earth magnets crisis: What lies ahead for the EV sector?

WHAT'S IN THE NEWS?

China's export curbs on rare earth magnets have raised concerns in India's automobile and defense sectors due to high import dependency. Despite having reserves, India lacks refining and manufacturing capabilities to process rare earths into usable magnets.

Context and Trigger

- China, which dominates the global rare earth magnet market, has imposed **export restrictions on rare earth magnets**.
- This has raised **concerns in India's automobile sector**, particularly EV manufacturers, over potential **supply chain disruptions** and **production delays**.

What are Rare Earth Magnets?

- **Rare earth magnets** are **strong permanent magnets** made using elements from the **lanthanide group** of the periodic table (plus scandium and yttrium).
- The two most commercially important types are:
    - **Neodymium Iron Boron (NdFeB)** magnets: Known for **extremely high magnetic strength**.
    - **Samarium Cobalt (SmCo)** magnets: More **temperature-stable** and corrosion-resistant, used in high-performance applications.
- Despite being called "rare," these elements are **not scarce** but are **dispersed** and **hard to extract economically**.

Importance in Electric Vehicles (EVs)

- Rare earth magnets are vital for **Permanent Magnet Synchronous Motors (PMSMs)** used in EVs.
- They enable:
    - **Higher torque density** – making EVs accelerate faster.
    - **Better energy efficiency** – reducing battery consumption.
    - **Compact motor design** – helps in reducing the overall size and weight of vehicles.
- EV applications include:
    - Main traction motors
    - Battery cooling systems

- Brake systems and power steering

Applications in Conventional (ICE) Vehicles

- Widely used even in **non-electric vehicles**, such as:
    - **Power steering motors**
    - **Windshield wipers and washer motors**
    - **Electric window regulators**
    - **Fuel pump and cooling fans**
    - **Sensor systems and starter motors**

Strategic Importance in Other Sectors

- **Defense**:
    - Used in **radar systems**, **missile guidance actuators**, **military drones**, and **precision weaponry**.
- **Consumer Electronics**:
    - Found in **smartphones**, **loudspeakers**, **headphones**, **hard drives**, and **medical imaging devices**.

China's Dominance

- China **accounts for over 85% of the global rare earth magnet production**.
- It controls the **entire value chain**: from **mining** to **refining**, and **final magnet manufacturing**.
- Export curbs by China can significantly **disrupt global supply chains**, especially in countries dependent on imports like India.

India's Rare Earth Resources: Untapped Potential

- India possesses **rare earth reserves**, especially:
    - **Monazite sands** in **Kerala**, **Tamil Nadu**, and **Odisha**.
- However, India **lags behind** in:
    - **Advanced refining technologies** – which are crucial to separate individual rare earth elements.
    - **Magnet fabrication infrastructure** – essential for producing magnets in desired shapes and grades.
    - **Private sector investment and R&D** in this domain.

- As a result, **India is heavily dependent on imports**, especially from China, for rare earth magnets.

Implications for India

- **Automobile sector**, especially **EV manufacturing**, faces **production risks** due to component shortages.
- **Strategic sectors** like defense and electronics also face **vulnerability** due to import reliance.
- India must consider:
    - **Developing its rare earth supply chain**.
    - **Attracting private sector investments** in magnet manufacturing.
    - **Forming global partnerships** to diversify supply.

Source: **https://www.livemint.com/industry/indias-rare-earth-magnets-crisis-what-s-next-for-the-ev-sector-11749616024940.html**