Science & Technology · GS - III

Examine the strategic significance of critical mineral discoveries for India's electric vehicle and clean-energy sectors. What challenges must be addressed to translate mineral discoveries into secure domestic supply chains?

EXAM YEAR	PAPER	SUBJECT
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MARKS	WORD LIMIT
10	~150 words

Answer Hint

Critical minerals; nickel and copper; platinum group elements; electric vehicle manufacturing; clean-energy technologies; import dependence; mineral exploration; processing capacity; environmental sustainability; supply-chain resilience

Model Answer

Introduction

Critical minerals are essential inputs for several advanced manufacturing and clean-energy technologies. The reported preliminary discovery of over four million tonnes of mineral deposits in Chhattisgarh, including nickel, copper and platinum group elements, could have strategic significance for India’s industrial development.

Strategic Significance

Nickel supports certain battery chemistries, while copper is vital for electrical equipment and power infrastructure. Platinum group elements are used in catalysts and selected clean-energy applications. Viable domestic resources could diversify India's mineral supply and reduce vulnerability to external disruptions.

Major Challenges

A preliminary discovery does not necessarily represent economically recoverable reserves. Detailed exploration, mineral-grade assessment, feasibility studies, financing and infrastructure development are required. India must also strengthen mineral processing and refining capacity. Mining can create environmental and social pressures, requiring responsible extraction and community consultation.

Way Forward

The government should promote scientific exploration, transparent mineral governance, sustainable mining and investment in domestic processing technologies. Recycling, material efficiency and diversified international partnerships can complement domestic production.

Conclusion

The strategic value of a mineral discovery depends on its commercial viability and sustainable development. Integrating exploration, processing, recycling and environmental safeguards can strengthen India's critical mineral security.

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