Indian Economy · GS - III

“Critical minerals are becoming central to both the global clean energy transition and national economic security.” Discuss the significance of critical minerals for India. Examine the challenges in securing their supply and suggest measures to build a resilient and sustainable mineral supply chain.

EXAM YEAR	PAPER	SUBJECT
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MARKS	WORD LIMIT
10	~150 words

Answer Hint

EV batteries, solar and wind technologies, energy storage, electronics, defence manufacturing, industrial development, energy security, Import dependence, concentration of global processing, geopolitical tensions, price volatility, limited domestic exploration, environmental damage, technological constraints

Model Answer

Introduction

Critical minerals such as lithium, cobalt, nickel and rare earth elements are essential for clean energy technologies, electric vehicles, electronics and modern defence systems. Their strategic importance is increasing as countries pursue energy transition and technological self-reliance.

Significance for India

1. Clean Energy Transition: These minerals support battery manufacturing, energy storage and electric mobility, helping India pursue its renewable energy and decarbonisation goals.

2. Economic and Strategic Security: Reliable mineral supplies can strengthen domestic manufacturing, reduce import vulnerability and improve India's competitiveness in emerging industries.

Major Challenges

India faces limited domestic production of several critical minerals and dependence on international supply chains. Concentrated processing capacity, geopolitical tensions and price volatility create additional risks. Mining can also cause water stress, biodiversity loss and displacement if poorly managed.

Way Forward

India should expand geological exploration, develop overseas mineral partnerships, strengthen recycling and invest in mineral-processing technologies. Research into alternative materials and strict environmental safeguards are equally important. International cooperation can improve access to finance, expertise and responsible mining practices.

Conclusion

A diversified, technologically advanced and sustainable critical mineral supply chain is essential for India's energy security and long-term economic resilience.