Science & Technology · GS - III

Secure and resilient semiconductor supply chains have become essential for technological sovereignty and national security. Examine the significance of international partnerships in strengthening India's semiconductor ecosystem.

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MARKS	WORD LIMIT
10	~150 words

Answer Hint

Semiconductor ecosystem, technological sovereignty, critical minerals, supply-chain diversification, geopolitical risks, manufacturing incentives, research and development, skilled workforce, international cooperation, strategic autonomy.

Model Answer

Introduction

Semiconductors are fundamental to artificial intelligence, telecommunications, defence systems and modern industries. Concentration of manufacturing and critical resources in limited geographical regions creates strategic vulnerabilities.

Significance of International Partnerships

- **Supply-chain resilience:** Partnerships diversify sourcing of semiconductor components, equipment and critical minerals.
- **Technology transfer:** Collaboration improves access to advanced manufacturing technologies and research capabilities.

- **Economic security:** Reliable supply chains reduce disruptions to domestic industries and strategic sectors.
- **Geopolitical cooperation:** Trusted partnerships strengthen India's position in emerging technology governance.
- **Investment:** International collaboration can attract capital and support semiconductor manufacturing.

Challenges for India

High capital requirements, technological dependence, limited fabrication capabilities, skilled workforce shortages and vulnerability to geopolitical disruptions remain major concerns.

Way Forward

India should strengthen domestic manufacturing through semiconductor programmes, expand research and development, develop specialised skills and diversify critical mineral sources. Initiatives such as international technology partnerships should complement domestic capacity-building while preserving strategic autonomy.

Conclusion

Building resilient semiconductor supply chains is essential for India's technological sovereignty. A balanced approach combining domestic capabilities and trusted international partnerships can strengthen economic and national security.

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