Science & Technology · GS - III

Underground coal gasification offers an alternative route for utilising India's coal resources, but raises concerns regarding environmental sustainability and energy security. Examine its potential, technological challenges and ecological implications.

EXAM YEAR	PAPER	SUBJECT
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MARKS	WORD LIMIT
10	~150 words

Answer Hint

Underground coal gasification, energy security, syngas, coal utilisation, import dependence, technological feasibility, groundwater contamination, greenhouse-gas emissions, carbon capture, environmental safeguards.

Model Answer

Introduction

Underground Coal Gasification (UCG) converts coal deposits into combustible gas without conventional mining. It can potentially unlock otherwise difficult-to-extract coal resources and diversify India's energy options.

Potential Benefits

- **Resource utilisation:** Enables the use of deep and inaccessible coal deposits.
- **Energy security:** Domestic gas production may reduce dependence on imported fuels.
- **Industrial applications:** Syngas can support hydrogen, fertiliser, chemical and synthetic-fuel production.
- **Economic development:** Large projects can attract investment, generate employment and improve regional infrastructure.

Technological and Environmental Challenges

Uncontrolled underground reactions may cause groundwater contamination, land subsidence and gas leakage. The process also involves carbon emissions and requires sophisticated monitoring, geological assessment and gas-purification technologies. Commercial viability and long-term environmental safety remain important considerations.

Way Forward

India should undertake carefully monitored pilot projects, establish stringent environmental impact assessments, protect groundwater resources and explore carbon capture and storage. Independent monitoring and transparent public consultation are essential.

Conclusion

UCG may contribute to India's energy diversification, but its expansion must be guided by technological feasibility, environmental safeguards and a gradual transition towards low-carbon energy.

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