Environment & Ecology · GS - III

Discuss in detail the photochemical smog emphasizing its formation, effects and mitigation. Explain the 1999 Gothenburg Protocol.

EXAM YEAR	PAPER	SUBJECT
2022	GS - III	Environment & Ecology

MARKS	WORD LIMIT
10	~150 words

Answer Hint

Photochemical smog forms when nitrogen oxides and volatile organic compounds react in sunlight, producing ground-level ozone and other oxidants. It harms health, vegetation and visibility. Emission control, cleaner transport and industrial regulation are essential; the Gothenburg Protocol addresses transboundary air pollution through emission-reduction commitments.

Model Answer

Introduction

Photochemical smog is a brownish haze formed when nitrogen oxides (NOx) and volatile organic compounds (VOCs) react under sunlight.

Formation and Effects

Sunlight initiates chemical reactions that generate ground-level ozone and secondary pollutants. Vehicle exhaust, industries and fuel combustion are major sources. Smog causes eye irritation, respiratory illness, reduced visibility, crop damage and deterioration of materials.

Mitigation

Cleaner fuels, public transport, electric mobility, industrial emission controls, VOC management and strict vehicle-emission standards can reduce its formation. Monitoring and regional coordination are also important.

Gothenburg Protocol, 1999

Adopted under the UNECE Convention on Long-range Transboundary Air Pollution, the protocol aims to reduce acidification, eutrophication and ground-level ozone through national emission ceilings for pollutants such as sulphur dioxide, nitrogen oxides, ammonia and VOCs. It was revised in 2012 to strengthen commitments and address fine particulate matter.

Conclusion

Photochemical smog requires coordinated control of precursor emissions. The Gothenburg Protocol provides an international framework for reducing major air pollutants, though it is not a global treaty applicable to every country.

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