Q6

How will the melting of Himalayan glaciers have a far- reaching impact on the water resources of India?

UPSC Civil Services Mains 2020 · GS I · 10 marks · Natural Resources and Industries

Distribution of key natural resources across the world (including South Asia and the Indian sub-continent); factors responsible for the location of primary, secondary, and tertiary sector industries in various parts of the world (including India).

Core demand of the question

- How will the melting of Himalayan glaciers have a far-reaching impact on the water resources of India?
- Keep the answer within a 10-mark length

Revision summary

Himalayan ice buffers the Indus, Ganga, and Brahmaputra in the dry season.

Early melt raises floods and glacial-lake outbursts.

Later mass loss cuts late-summer river flow.

Irrigation, hydropower, cities, and groundwater then take the shock.

Shared basins make the impact diplomatic as well as hydrological.

Introduction

The Hindu Kush-Himalaya stores winter snow and glacier ice that feed the **Indus**, **Ganga**, and **Brahmaputra**. Melt is not a local trekking problem. It rewrites India's river calendar, irrigation, cities, and power.

Body

Near-term water pulse, long-term deficit

- Initial decades can raise summer melt and flood peaks. Debris flows and glacial lake outburst floods already hit Uttarakhand and Sikkim.
- After peak water, glacier mass loss cuts late-summer baseflow when monsoon rain is also uncertain. The far-reaching impact is a less reliable lean-season river.

Basin-wise reach

- **Indus:** high glacier contribution. Punjab-Haryana canal agriculture and Pakistan's shared waters become more political as snowmelt timing shifts.
- **Ganga:** mountains supply the dry-season spine for the plains' cities, ghats, and tube-well recharge. Less glacier support means harder summers from Uttarakhand to Bengal.
- **Brahmaputra:** ice plus monsoon already flood Assam; more melt variability raises both flood and sediment load, then a later lean-season stress.

Far-reaching couplings

- Hydropower in the Himalaya depends on a predictable hydrograph; silt and flood pulses damage dams.
- Food security of the Green Revolution belt is canal-timed. A changed melt season is a crop-calendar shock.
- Groundwater will be pumped harder if rivers fail in late summer, deepening the alluvial crisis.
- Transboundary politics on the Indus and Brahmaputra tighten when the ice buffer thins.

Flow diagram

Glacier melt -> Floods GLOF

Glacier melt -> Later lean-season loss

Later lean-season loss -> Indus canals

Later lean-season loss -> Ganga plains

Later lean-season loss -> Brahmaputra

Conclusion

Himalayan melt first floods, then starves the lean season of the Indus, Ganga, and Brahmaputra. India's water resources feel it as irrigation, cities, power, groundwater, and diplomacy, not as a single mountain stream.

Facts & figures

Indus

Western Himalayan system with a high share of snow and glacier melt in its water budget.

Ganga

Plains river whose mountain tributaries supply crucial pre-monsoon and lean flows.

Brahmaputra

Eastern system where ice, monsoon, and sediment already couple flood and lean-season risk.

GLOF

Glacial lake outburst flood, a near-term hazard of accelerated melt.

IPCC Hindu Kush-Himalaya

Assessments that project substantial glacier loss this century under high warming.