



## Mains Practice Question

Q.Examine the factors that increase the Himalayan region's susceptibility to Glacial Lake Outburst Floods (GLOFs) and suggest strategies for mitigating the associated risks. (250 words)

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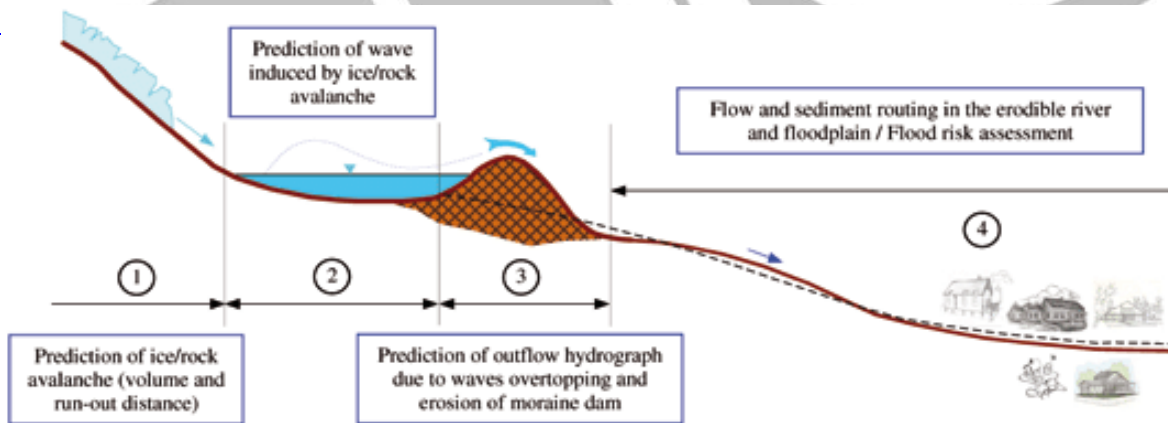
### Approach

- Give a brief introduction to Glacial Lake Outburst Floods (GLOFs).
- Discuss the factors that increase the Himalayan region's susceptibility to Glacial Lake Outburst Floods (GLOFs).
- Suggest strategies for mitigating the associated risks
- Conclude suitably.

### Introduction

Glacial Lake Outburst Flood (GLOFs) refers to a sudden release of water from a glacial lake, typically caused by the breaching or collapse of a natural dam, such as a moraine or ice barrier, that holds back the lake's water. The ISRO's National Remote Sensing Centre (NRSC) released a glacial lake atlas for the Himalayan River Basins which identified over 28,000 glacial lakes in the region.

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### Body

The factors that increase the Himalayan region's susceptibility to Glacial Lake Outburst Floods:

- **Glacier Retreat:** The Himalayan glaciers are rapidly melting due to climate change, leading to the formation of glacial lakes. As glaciers retreat, the volume of meltwater increases, raising the risk of GLOFs.
- **Geological Vulnerability:** The Himalayan region is seismically active, with the potential for earthquakes and landslides. Seismic events can trigger GLOFs by destabilizing moraine dams or causing landslides that block river valleys and create temporary barriers for glacial lakes.
- **Steep Terrain and High Precipitation:** The rugged terrain of the Himalayas, coupled with high

precipitation rates, accelerates the movement of water during GLOFs, amplifying the destructive power of floods downstream.

- **High Vulnerability Quotient:** The embankments of these lakes consist of loose deposits of glacier moraine, rocks, boulders, soil and ice. Since these embankments are not properly compacted, they have a high vulnerability quotient.
- **Human Activities:** Deforestation, infrastructure development, and mining activities in the Himalayan region can exacerbate the risk of GLOFs by destabilizing slopes, altering river courses, and obstructing natural drainage pathway.

### Some measures that can be taken to Mitigate GLOF Disaster:

- **Monitoring and Data Collection:** Intense monitoring of meteorological events near the snout of vulnerable glacier lakes is an urgent necessity. Data should be gathered at observatories and communicated to a centralized office. It should be processed in real-time to forecast the behavior of glacial lakes and alert people.
- **Use of Technology:** A nationwide programme to regularly monitor vulnerable glacier lakes by satellites and drones should be initiated. This technology can complement ground-based observatories and enhance the overall understanding and prediction of GLOFs.
- **Revised Safety Standards:** Given the increased threats from GLOFs, safety standards for infrastructure projects in mountainous areas should be revised. This includes projects like dams, bridges, and highways. Quality control measures should be stringent to ensure the safety of such projects.
- **Regulation of Construction:** Infrastructure projects in mountains — dams, bridges and highways — must be subjected to stringent quality control measures. GLOFs and other floods in mountainous regions have shown that buildings constructed close to rivers were the first and the worst sufferers.
- **Comprehensive Risk Assessment:** The Himalayan region requires a comprehensive risk assessment that accounts for projected temperature rise, changes in precipitation patterns, and land-use/cover changes. This assessment should inform disaster risk-reduction strategies.
- **Reforestation and Watershed Management:** Protecting and restoring natural vegetation cover in the Himalayan region can help stabilize slopes, reduce soil erosion, and regulate water flow, thereby mitigating the risk of GLOFs and enhancing overall watershed resilience
- **Community Engagement and Capacity Building:** Engaging local communities in GLOF risk reduction efforts through awareness campaigns, training programs, and participatory planning initiatives can foster community resilience and empower residents to take proactive measures to protect themselves and their livelihoods.

### Conclusion

By adopting a holistic approach that integrates scientific knowledge, community engagement, and cross-border cooperation, it is possible to reduce the vulnerability of the Himalayan region to GLOFs and enhance its resilience to climate-related hazards.