STUDY NOTES · BASIC CONCEPT

What Is a Flash Flood? What Is a Glacial Lake Outburst Flood (GLOF)? Know Related concepts

Geography

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A. What Is a Flash Flood?

A flash flood is a rapid and often unexpected flood that develops within a short period following intense rainfall, rapid snowmelt, dam or barrier failure, or other sudden water releases.

Characteristics:

1. Rapid rise in water levels.
2. High flow velocity and destructive force.
3. Limited time for evacuation.
4. Transport of rocks, sediment, trees and debris.
5. Mountainous regions are particularly vulnerable because steep slopes accelerate runoff towards river channels.

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B. Why Are Himalayan Rivers Prone to Floods?

1. The Himalayas have complex geological and climatic conditions that can increase flood vulnerability.
2. Steep slopes: Encourage rapid surface runoff.
3. Intense monsoon rainfall: Can quickly increase river discharge.
4. Unstable geology: Makes many slopes susceptible to landslides.
5. Sediment transport: Can change river channels and obstruct drainage.
6. Glacial environments: Certain locations are vulnerable to glacial lake outburst floods.
7. Infrastructure exposure: Bridges, roads and settlements may lie close to active river channels.
8. The degree of risk varies across river basins and depends on local topography, rainfall, geology and human activity.

C. What Is a Glacial Lake Outburst Flood (GLOF)?

A GLOF occurs when water stored in a glacial lake is suddenly released, often because the natural dam containing the lake fails.

Possible triggers include:

1. Failure of a moraine dam.
2. Avalanches or landslides entering a lake.
3. Ice or rock falls generating displacement waves.
4. Other processes that destabilise a natural barrier.
5. GLOFs can send destructive flood waves downstream, carrying sediment and debris.
6. UPSC distinction: Not every Himalayan flood is a GLOF. The cause of a particular flood must be established from the available evidence.

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D. What Is a Transboundary River?

A transboundary river flows across or forms part of the boundary between two or more countries.

The Budhi Gandaki is a tributary of the Gandak river system within Nepal. The wider Gandak basin forms part of the Ganga river system shared by Nepal and India.

Transboundary flood management may require:

1. Sharing rainfall and river-flow data.
2. Coordinating flood forecasts and warnings.
3. Joint disaster-preparedness exercises.
4. Sharing information about relevant reservoirs and infrastructure.
5. Coordinating rescue operations and post-disaster recovery.

E. What Is Disaster Risk Reduction?

Disaster risk reduction involves preventing new disaster risks, reducing existing risks and managing residual risks to strengthen resilience.

It includes four broad elements:

1. Prevention and mitigation: Reduce exposure and vulnerability.
2. Preparedness: Develop early-warning systems, evacuation plans and emergency supplies.
3. Response: Conduct rescue, evacuation, medical assistance and relief.
4. Recovery: Rebuild infrastructure and livelihoods while reducing future risks.

The objective is not only to respond to floods but also to reduce the likelihood that a hazard will become a major disaster.

F. What Is the Sendai Framework for Disaster Risk Reduction?

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The Sendai Framework for Disaster Risk Reduction 2015–2030 is a United Nations framework for reducing disaster risks and losses.

Its four priorities are:

1. Understanding disaster risk.
2. Strengthening disaster-risk governance.
3. Investing in disaster-risk reduction for resilience.
4. Enhancing disaster preparedness for effective response and to “Build Back Better” during recovery.

It emphasises that disasters result from the interaction of hazards with exposure, vulnerability and capacity.

G. Why Is Resilient Infrastructure Important?

Bridges and roads are essential for transportation, emergency evacuation, healthcare access and economic activity.

Resilient infrastructure planning should consider:

1. Historical and projected flood levels.
2. River-channel changes and erosion.

3. Scour around bridge foundations.
4. Landslide and debris-flow hazards.
5. Safe bridge clearance and hydraulic capacity.
6. Inspection, maintenance and emergency access.
7. Reconstruction should incorporate lessons from the disaster rather than simply replacing damaged structures with identical designs.

Relevance for UPSC

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- GS Paper I: Himalayan geography, drainage systems, monsoons and geomorphology.
- GS Paper III: Disaster management, climate risks, infrastructure resilience and environmental degradation.
- GS Paper II: India–Nepal relations and transboundary cooperation.
- Essay: Sustainable development in fragile mountain ecosystems.

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