



## Glacial Lake Outburst Flood

**Prelims:** Flood, Himalayas, NDMA, Early Warning System.

**Mains:** Glacial Lake Outburst Flood.

### Why in News?

Recently, a new study has been published on [Glacial Lake Outburst Flood \(GLOF\)](#), which threatens millions of people globally.

- It is the first global **attempt to map potential hotspots for such floods**. The study assessed the conditions of glacial lakes and the number of people living downstream from them, which has also increased significantly.

### What are the Key Highlights of the Report?

- **Vulnerability:**
  - Up to 15 million people face the **risk of catastrophic flooding from glacial lakes** which could burst their natural dams at any moment.
  - Those facing the greatest threat live in mountainous countries in Asia and South America.
    - The **majority of the globally exposed population** - 9.3 million (**62%**) are located in the region of **high mountain Asia (HMA)**.
    - In Asia, around one million people live within just 10 km of a glacial lake.
  - People living in India, Pakistan, Peru and China **account for over half of those at risk** (globally).
- **Most Dangerous Basins:**
  - The most dangerous of Glacial basins are found in Pakistan (Khyber Pakhtunkhwa basin), Peru (Santa basin) and Bolivia (Beni basin) containing 1.2 million, 0.9 million and 0.1 million people respectively **who could be exposed to GLOF impacts**.
  - Glaciers across the [Andes](#) (S America) have **undergone rapid deglaciation over the last 20 years** in response to climate changes.
- **Threat to India:**
  - In the [Himalayas](#), 25 glacial lakes and water bodies have witnessed an increase in water spread area since 2009.
  - There has been a 40% increase in water spread in **India, China and Nepal**, posing a huge threat to **seven Indian states and Union Territories**.
    - Of these, **six are Himalayan states / UTs:** Jammu and Kashmir, Ladakh, Himachal Pradesh, Sikkim, Assam and Arunachal Pradesh.
  - The rapid onset and high discharge of GLOFs means there is often insufficient time to effectively warn downstream populations and for effective action to be taken, particularly for populations located within 10-15 km of the source lake.
- **Impact:**
  - The floods that follow come thick and fast, in many cases being powerful enough to destroy vital infrastructure.

- GLOF has the potential to catastrophically threaten people's lives, livelihoods and regional infrastructure.
- **Suggestions:**
  - Improvements are urgently needed in **designing [Early Warning Systems](#) alongside evacuation drills and other forms of community outreach** to enable more rapid warnings and emergency action in these highly exposed areas.

## What is a GLOF?

- **About:**
  - A glacial lake outburst flood (GLOF) is a type of catastrophic flood that occurs when the **dam containing a glacial lake fails**, releasing a large volume of water.
  - This type of flood is **typically caused by rapid melting of glaciers or the buildup of water** in the lake due to heavy precipitation or the inflow of meltwater.
    - In February 2021, [Chamoli district in Uttarakhand witnessed flash floods](#) which are **suspected to have been caused by GLOFs**.
- **Causes:**
  - These floods can be triggered by a number of factors, including **changes in the volume of the glacier**, changes in the **water level of the lake**, and earthquakes.
  - According to [NDMA \(National Disaster Management Authority\)](#), **glacial retreat due to climate change** occurring in most parts of the [Hindu Kush Himalayas](#) has given rise to the formation of numerous new glacial lakes, which are the major cause of GLOFs.

## What are the NDMA's Guidelines to Tackle Glacial Burst?

- **Identifying Potentially Dangerous Lakes:**
  - Potentially dangerous lakes can be identified **based on field observations, records of past events**, geomorphologic and geotechnical characteristics of the lake/dam and surroundings, and other physical conditions.
- **Use of Technology:**
  - Promoting use of **Synthetic-Aperture Radar imagery** (a form of radar that is used to create two-dimensional images) to automatically detect changes in water bodies, including new lake formations, during the monsoon months.
- **Channeling Potential Floods:**
  - **Reducing the volume of water with methods such as controlled breaching**, pumping or siphoning out water, and making a tunnel through the moraine barrier or under an ice dam.
- **Uniform Codes for Construction Activity:**
  - Developing a broad framework for infrastructure development, construction and excavation in vulnerable zones.
  - There is a need to **accept procedures for land use planning in the GLOF prone areas**.
- **Enhancing Early Warning Systems (EWS):**
  - The number of **implemented and operational GLOF EWS is very small**, even at the global scale.
  - In the Himalayan region, there are at least three reported instances (two in Nepal and one in China) of implementation of sensor- and monitoring-based technical systems for GLOF early warning.
- **Training Local Manpower:**
  - Apart from pressing specialised forces such as [National Disaster Response Force \(NDRF\)](#), [ITBP](#) and the Army, NDMA has emphasised the need for **trained local manpower**.
  - It has been observed that over **80% of search and rescue is carried out by the local community** before the intervention of the state machinery and specialised search and rescue teams.
- **Comprehensive Alarm Systems:**
  - Besides classical alarm infrastructure consisting of acoustic alarms by sirens, **modern communication technology using cell and smartphones can complement** or even replace traditional alarming infrastructure.

[Source: DTE](#)

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