



Mains Marathon

Day 38: What is glacial lake outburst flood? What are the causes and remedies available to prevent it? (250 Words)

17 Aug 2022 | GS Paper 1 | Geography

Approach / Explanation / Answer

- Give the definition of Glacial Lake outburst flood (GLOF) and give some examples GLOF in India in recent past.
- Write the causes and NDMA guidelines to prevent GLOF.
- Conclude by suggesting some more measures to prevent GLOF.

Answer:

When glaciers melt, the water in glacial lakes accumulates behind loose, natural “glacial/moraine dams” made of ice, sand, pebbles and ice residue. **Glacial Lake Outburst Flood (GLOF)** refers to **the flooding that occurs when the water dammed by a glacier, or a moraine is released suddenly**. According to recent studies, there has been a rapid increase in the number of glacial lakes due to a retreat in the glaciers caused by warming temperatures (due to global warming), and their potential to cause large scale flooding and destruction. The **Kedarnath tragedy in 2013**, for example, had involved a breach in a large glacial lake. **The Chamoli Disaster of 2021** is caused due to a portion of the **Nanda Devi glacier** having broken off, triggering an avalanche and a flood claiming the lives of hundreds.

Causes of GLOF:

Unlike earthen dams, the **weak structure of the moraine dam** leads to the **abrupt failure of the dam on top of the glacial lake**, which holds large volumes of water. **A failure of the dam** has the potential of releasing millions of cubic metres of water in a short period, causing catastrophic flooding downstream. Peak flows as high as 15,000 cubic metre per second have been recorded in such events.

According to NDMA, **glacial retreat due to climate change** occurring in most parts of the Hindu Kush Himalaya has given **rise to the formation of numerous new glacial lakes**, which are the **major cause of GLOFs**. Since glaciers in the Himalayas are in a retreating phase, glacial lakes are growing and pose a potentially large risk to downstream infrastructure and life.

NDMA Guidelines to prevent GLOF:

- The NDMA guidelines say that risk reduction has to begin with **identifying and mapping such lakes, taking structural measures to prevent their sudden breach**, and establishing

mechanism to save lives and property in times of a breach.

- **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.
- NDMA has recommended **the use of Synthetic-Aperture Radar imagery to automatically detect changes in water bodies**, including new lake formations, during the monsoon months. It has said methods and protocols could also be developed to allow remote monitoring of lake bodies from space.
- To manage lakes structurally, the NDMA recommends **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.**
- A landslide occurred along the Phuktal (tributary to Zaskar river) on December 31, 2014 in Kargil district of Ladakh, leading to a potential flood situation on May 7, 2015. The NDMA created an Expert Task Force which, along with the Army, used explosives to channel water from the river using controlled blasting and manual excavation of debris.

Way Forward

- A robust early warning system, and a broad framework for infrastructure development, construction and excavation in vulnerable zones.
- There are **no uniform codes for excavation, construction and grading codes in India.** Restricting constructions and development in GLOF/LLOF prone areas is a very efficient means to reduce risks at no cost.
 - Construction of any habitation should be prohibited in the high hazard zone. New infrastructures in the medium hazard zone have to be accompanied by specific protection measures.

There are no widely accepted procedures or regulation in India for land use planning in the GLOF/LLOF prone areas. Such regulations need to be developed. There should be monitoring systems prior to, during, and after construction of infrastructure and settlements in the downstream area.

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