NDMA Guidelines to Tackle Glacial Bursts

Why in News

A **Glacial Lake Outburst Flood (GLOF)** is suspected to have **caused the flash floods** in **Chamoli district of Uttarakhand.**

- In October 2020, the **National Disaster Management Authority (NDMA)** had issued detailed guidelines on how to reduce and deal with disasters caused by GLOFs/Glacial Bursts.
- The NDMA guidelines suggest that risk reduction can be done by **identifying and mapping potentially dangerous lakes, taking structural measures to prevent their sudden breach,** and establishing mechanisms to save lives and property in times of a breach.

Key Points

- **Glacial Lake Outburst Flood (GLOF):**
  - **Meaning:**
    - A GLOF refers to the flooding that occurs **when the water dammed by a glacier or a moraine** (accumulations of dirt and rocks fallen onto the glacier surface) **is released suddenly.**

      When glaciers melt, the water in glacial lakes accumulates behind loose, natural “glacial/moraine dams” made of ice, sand, pebbles and ice residue.
    - Unlike earthen dams, the weak structure of the moraine dam **leads to the abrupt breach of the dam on top of the glacial lake** which could cause flash floods in the downstream areas.
  - **Causes:**

    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.**

- **Glacial Lakes:**
  - **About:**
    - Glacial lakes are **typically formed at the foot of a glacier.**
    - As glaciers move and flow, they erode the soil and sediment around them, leaving depressions and grooves on the land. Meltwater from the glacier fills up the hole, making a lake.
  - **Types:**

    Lakes form when meltwater ponds, and this can happen on the ice surface **(supraglacial lakes),** in front of the ice **(proglacial lakes),** or even underneath the ice **(subglacial lakes).**
  - **Impact:**
    - Glacier lakes can **affect ice flow** by reducing friction at the ice-bed interface, encouraging basal sliding.
    - They can **change the albedo of the ice surface,** encouraging more surface melt.
    - Proglacial lakes **cause calving,** which affects mass balance and can decouple mountain glaciers from climate.
    - Glacier lakes can be hazardous; moraine and ice dams can fail, **causing catastrophic glacier lake outburst floods** or jokulhlaups.
  - **Increase in Number of Glacial Lakes:**
    - 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.
    - According to a study sponsored by the **Central Water Commission (CWC)**, conducted during 2011-15, there are 352, 283 and 1,393 glacial lakes and water bodies in the Indus, Ganga and Brahmaputra basins respectively.

- **Guidelines on Risk Reduction:**
  - **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.
    - Methods and protocols could also be developed to **allow remote monitoring of lake bodies from space.**
  - **Channeling Potential Floods:**
    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.
  - **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 **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.
    - **The local teams could also assist in planning** and setting up emergency shelters, distributing relief packages, identifying missing people, and addressing the needs for food, healthcare, water supply etc.
  - **Comprehensive Alarm Systems:**
    Besides classical alarming infrastructure consisting of acoustic alarms by sirens, modern communication technology using cell and smartphones can complement or even replace traditional alarming infrastructure.

Source:IE