National Glacial Lake Outburst Floods Risk Mitigation Programme

For Prelims: Tawang, Dibang Valley, National Disaster Management Authority (NDMA), Glacial Lake Outburst Flood (GLOFs), South Lhonak Lake, Centre for Development of Advanced Computing (C-DAC), Indian Meteorological Department, Landslides, Yarlung Zangbo River, Lake Lowering, Ground Truthing, Thyanbo Glacial Lake, Flash Floods, International Centre for Integrated Mountain Development (ICIMOD), Hindu Kush Himalayas.

For Mains: Impact of Climate Change on Glacial Lakes and their Consequences.

Source: HT

Why in News?

The **National Disaster Management Authority (NDMA)** has taken up expeditions to glaciers at an altitude of **4500m and above** to map their vulnerability to **Glacial Lake Outburst Flood (GLOF)**.

- Of the nearly **7,500 glacial lakes** in the Indian Himalayas, NDMA has finalised **189 high-risk lakes** that require mitigation measures.

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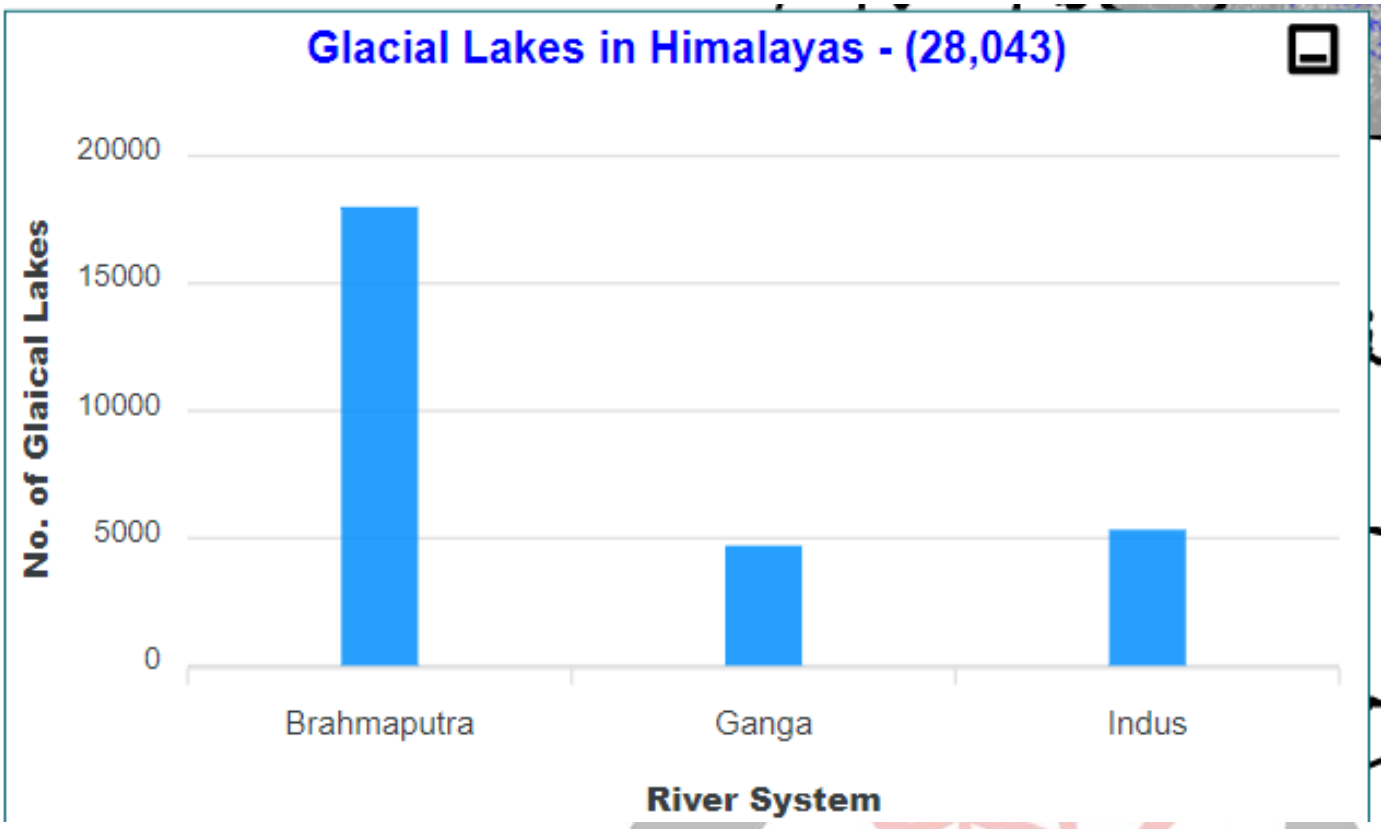


What is the National Glacial Lake Outburst Floods Risk Mitigation Programme (NGRMP)?

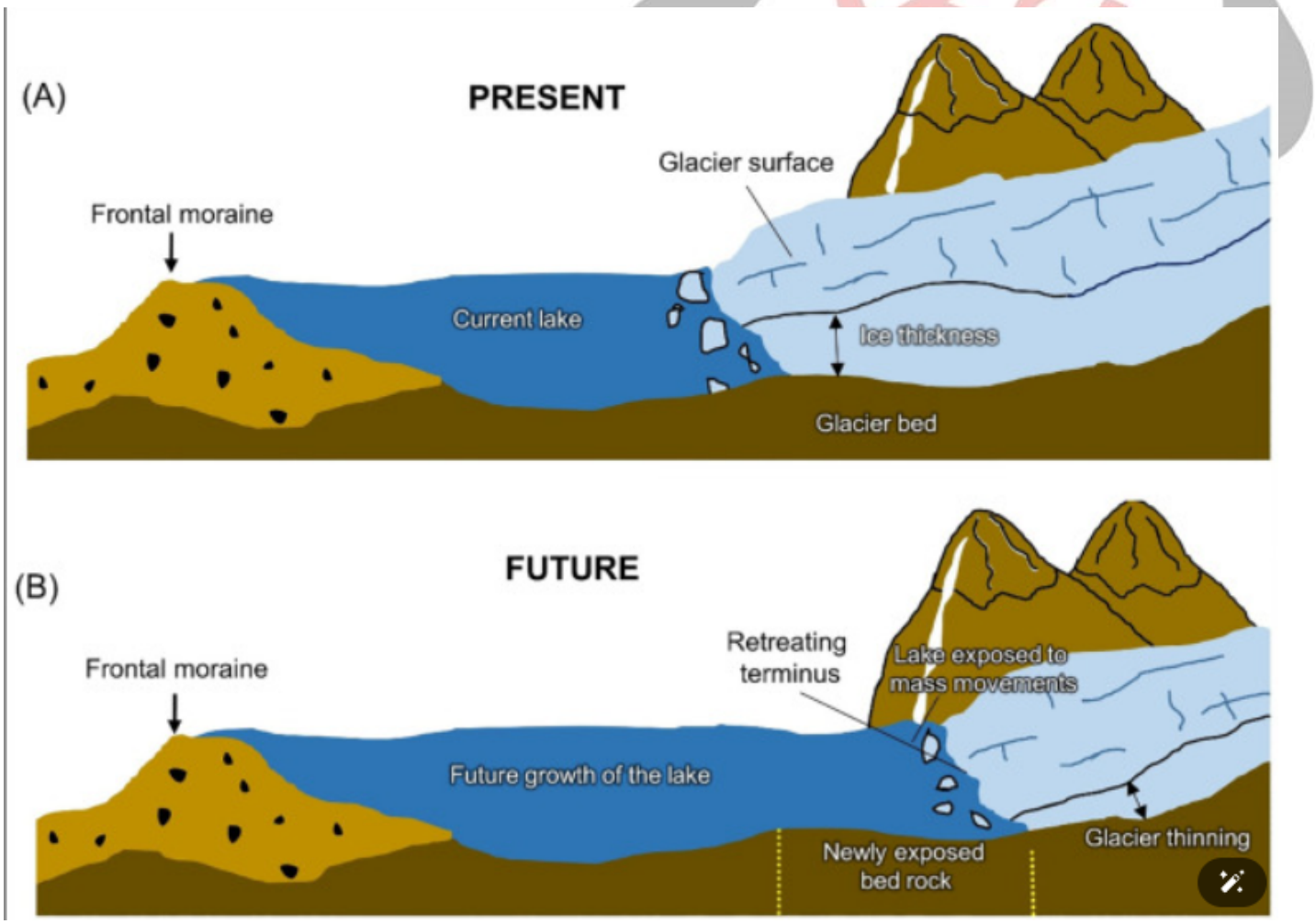
- **About:** It is an initiative launched by the Government of India to address the risks posed by **GLOFs**.
    - **16 teams went out for expedition** out of which 15 teams completed their expedition. Another **seven expeditions are underway.**
        - Of the 15 expeditions completed, **6 were in Sikkim, 6 in Ladakh, 1 in Himachal Pradesh**, and **2 in Jammu and Kashmir**.
    - Teams on expeditions assess the **structural stability** and **potential breach points** of glacial lakes, gathering relevant **hydrological and geological samples and data**, measuring water quality and flow rates, identifying risk zones and making downstream communities aware.
- **Objective:**
    - To **assess hazards**, install automated monitoring and **early warning systems**, and implement **lake-lowering** **measures** to mitigate glacial lake outburst flood (GLOF) risks.
        - **Lake-lowering measures** are techniques used to **reduce the volume of water** in a glacial lake to mitigate the risk of a GLOF.
    - NDMA is focussing on **ground-truthing** of selected 189 “high-risk” glacial lakes.
        - **Ground-truthing** is the process of **validating and verifying data** collected through **remote sensing** or other indirect methods by comparing it with **direct observations** made on-site.
- **Methodology to Prevent GLOF: Three activities** are planned to be executed **simultaneously.**
    - Placement of **automated weather and water level monitoring stations** and early warning systems
    - **Digital elevation modelling** and **bathymetry**.
    - Assessing best means to **reduce the risk of that lake** including by **lake-lowering**.
- **Need of the Study:**
    - **ICIMOD Findings:** As per the **International Centre for Integrated Mountain Development (ICIMOD)**, **Hindu Kush Himalayas** are experiencing rapid, **irreversible**

changes due to climate change, increasing the risk of **floods and landslides.**

- **Climate Change:** Due to climate change, India faces **hazards like** extreme **altered FDI (frequency, duration and intensity) of precipitation** and **extreme heat**. It may lead to an increased number of **flash floods.**
- **Previous Incidents of GLOFs:**
  - **Nepal Incident:** Recently, flash floods struck Thame, a village in the **Khumbu region** of Nepal which was due to an outburst flood from **Thyanbo glacial lake**.
  - **Sikkim Flash Flood:** A catastrophic GLOF occured in **South Lhonak Lake, Sikkim**, in October 2023.
  - **Uttarakhand Flash Floods:** A **glacier breach-induced flood** in February 2021 in Rishi Ganga valley resulted in over 200 deaths and significant damage to hydropower plants and **Raini village.**

GLOF

- A GLOF is a type of **flood** occurring when **water dammed** by a **glacier or a moraine** is **released** suddenly.
- When glaciers melt, the **water** in these glacial lakes **accumulates** behind loose naturally formed **'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 failure** of the moraine dam on top of the **glacial lake**, which holds a large volume of water.
- A catastrophic failure of the dam can release the water over periods of minutes to days causing **extreme downstream flooding**.



What are the Recent Developments in NGRMP?

- **About:** The **Arunachal Pradesh State Disaster Management Authority (APSDMA)** to carry out a survey of high-risk glacial lakes in the **Tawang** **and** **Dibang Valley** districts of Arunachal Pradesh.
    - It is part of the larger **National Glacial Lake Outburst Flood (GLOF) Mission** of the **NDMA** to map all glacial lakes in the country.
- **High-Risk Glacial Lakes Identified in Arunachal Pradesh:**
    - **Total High-Risk Lakes: 27 high-risk glacial lakes** have been identified across five districts in Arunachal Pradesh.
        - The lakes are located in **Tawang (6 lakes)**, Kurung Kumey (1), Shi Yomi (1), **Dibang Valley (16)**, and Anjaw (3).
    - The current expedition teams will focus on **three high-risk lakes** in each of the Tawang and Dibang Valley districts.
- **Study Objectives:** The team will study the **accessibility, location, size, elevation, nearby habitations, and land use** of the lakes at risk of GLOF.
    - This will help the **Centre for Development of Advanced Computing (C-DAC)** and the **Indian Meteorological Department** install an **Automatic Early Warning System** and an **Automatic Weather Station**.
- **Significance of the Study:**
    - **Strategic Location:** Both Tawang and Dibang Valley districts share borders with China. It will be closely watched given its strategic location.
    - **Fragile Himalayan Ecosystem**: Landslides on the Chinese side, caused by China's interference with Himalayan geology and river systems, could also occur on the Indian side of the border.
    - **Threat of Floods:** In 2018, the Arunachal and Assam governments issued flood alerts after China reported a landslide blockage at the Yarlung Zangbo River.
    - **Heavy Infrastructure:** The **mega dam** being built by China on the Yarlung Tsangpo river in **Medog** near the international border has been a constant worry over fear of adverse impact right from Arunachal to Assam.

Drishti Mains Question:

Q. How Himalayas and glacial lakes are increasingly becoming vulnerable to climate change? What steps are being taken to mitigate risks like Glacial Lake Outburst Flood (GLOF)?

UPSC Civil Services Examination, Previous Year Question (PYQ)

Prelims:

Q. Siachen Glacier is situated to the (2020)

(a) East of Aksai Chin

(b) East of Leh

(c) North of Gilgit

(d) North of Nubra Valley

Ans: (d)

Q. Consider the following pairs (2019)

Glacier - River

1. Bandarpunch : Yamuna
2. Bara Shigri : Chenab
3. Milam : Mandakini
4. Siachen : Nubra
5. Zemu : Manas

Which of the pairs given above are correctly matched?

(a) 1, 2 and 4

(b) 1, 3 and 4

(c) 2 and 5

(d) 3 and 5

Ans: (a)

Q. Consider the following statements: (2010)

1. On the planet Earth, the fresh water available for use amounts to about less than 1% of the total water found.
2. Of the total fresh water found on the planet Earth 95% is bound up in polar ice caps and glaciers.

Which of the statements given above is/are correct?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

Ans: (a)

Mains

Q. With reference to National Disaster Management Authority (NDMA) guidelines, discuss the measures to be adopted to mitigate the impact of the recent incidents of cloudburst in many places of Uttarakhand. **(2016)**