

RISK FROM GLACIAL LAKE



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Rising temperatures have increased the risk of glacial lake bursts of the kind that devastated the Kedarnath valley in 2013 and parts of Chamoli in 2021. Uttarakhand has commissioned a GLOF risk-assessment.

Context :- The Uttarakhand government has constituted two teams of experts to evaluate the risk posed by five potentially hazardous glacial lakes in the region.

Glacial lakes outburst floods (GLOFs), it is a disaster event caused by the abrupt discharge of water from glacial lakes. The glacial lakes generally found either sit in front or on top or beneath of a melting glacier. Formation Process of the golfs as a glacier withdraws. It leaves behind a depression that gets filled with melt water, thereby forming a lake. The more the glacier recedes, the bigger and more dangerous the lake becomes, such lakes are mostly dammed by unstable ice or

sediment composed of loose rock and debris. Major causes of golfs which related to the glacial dynamics and environmental factors are ice-avalanches or landslides, glacial lake formation, volcanic activity. Understanding these causes is crucial for predicting and mitigating the risks associated with glacier outburst floods, especially in this regions where communities are vulnerable to such events, which are the major cause of GLOFs.

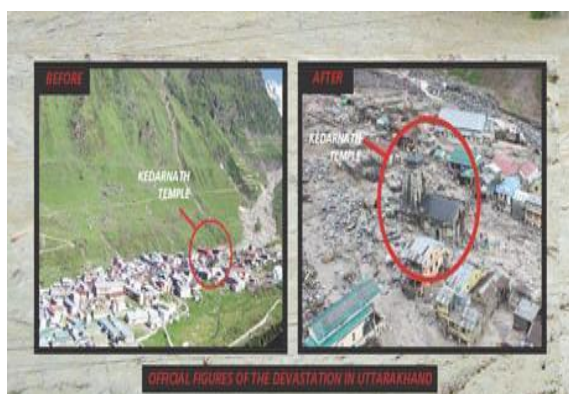


Figure 2 : 2013 DEVASTATING SITUATION OF KEDARNATH



Figure 1: FORMATION OF GLACIAL

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.

Impact – which unleash large volume of water sediment and downstream with formidable force and velocity. Which can be affected in populated area such as the flood water can submerged valleys obliterated infrastructure such as a roads, bridges, and buildings, and results in significant loss of and livelihoods. GLOFs under the spotlight since 1980

in the Himalayan region particularly in southeastern Tibet and the China – Nepal border area, GLOFs have become more frequent^[1].

Rise in recent years GLOFs events in Himalayan region Soaring global temperatures have been increased glacier melting. Due to rapid infrastructure development in vulnerable areas has also contributed to the spike in such incident. As per we target of average global temperature 1.5 degrees Celsius should not be increased from pre-revolution time (globally). According the study of this risk enhanced by the journal nature 2023^[2].

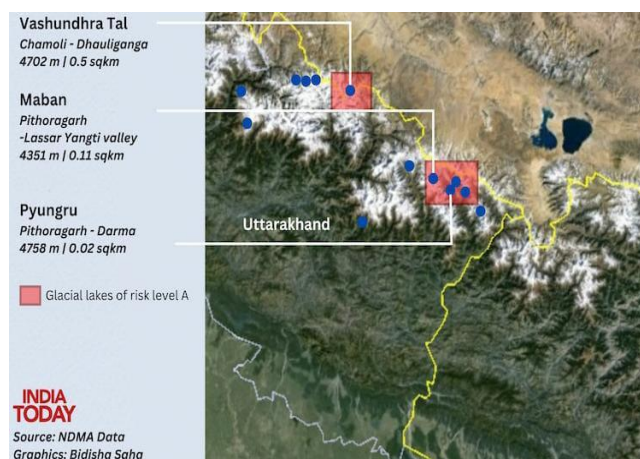


Figure 3: CATEGORY 'A' RIVER HIGHLY SENSITIVE

Quantification of the risk for the glacial lake outburst floods.

Approximately 6,353 sq km of land:-

1. Threats to 55,808 buildings
2. 105 hydropower projects
3. 194sq km of farmland Nearly 5,000 km roads & 4,000 bridges.

3 million people in India & 2 million in Pakistan face the risk of GLOFs^[3]. Number and size of glacial lakes in these areas (India and Pakistan) as large in places like the Pacific

Northwest or Tibet, it's that extremely large population and the fact that they are highly vulnerable that mean Pakistan and India have some of the highest GLOFs danger globally. According to the situation of Uttarakhand, the government of Uttarakhand has formed two teams of experts to conduct a risk assessment and survey of five glacial lakes in the state that are highly vulnerable to "outburst floods"

The situation in Uttarakhand NDMA which operates under the union ministry of home affairs, has identified 188 glacial lakes in Himalayan states, 13 of them are in Uttarakhand. The 13 glacial lakes of Uttarakhand have been categorised as 'A', 'B' and 'C', with 'A' being highly sensitive. Out of the 13 glacial lakes in Uttarakhand, Five fall in category 'A'(highly sensitive), four in category 'B' (sensitive) and four in category 'C'(relatively less sensitive).

Out of the five highly sensitive lakes falls into the 'A' category, including Vasudhara Tal in the Dhauliganga basin (Chamoli district) Maban lake, Pyungru lake and two unclassified lakes in Pithoragarh district. The areas of these five lakes range between 0.02 to 0.50 sq. km and they are situated at elevations ranging from 4,351 meters to 4,868 meters. The hill annual average maximum temperature may increase by 1.6-1.9 degree Celsius between 2021-2050.

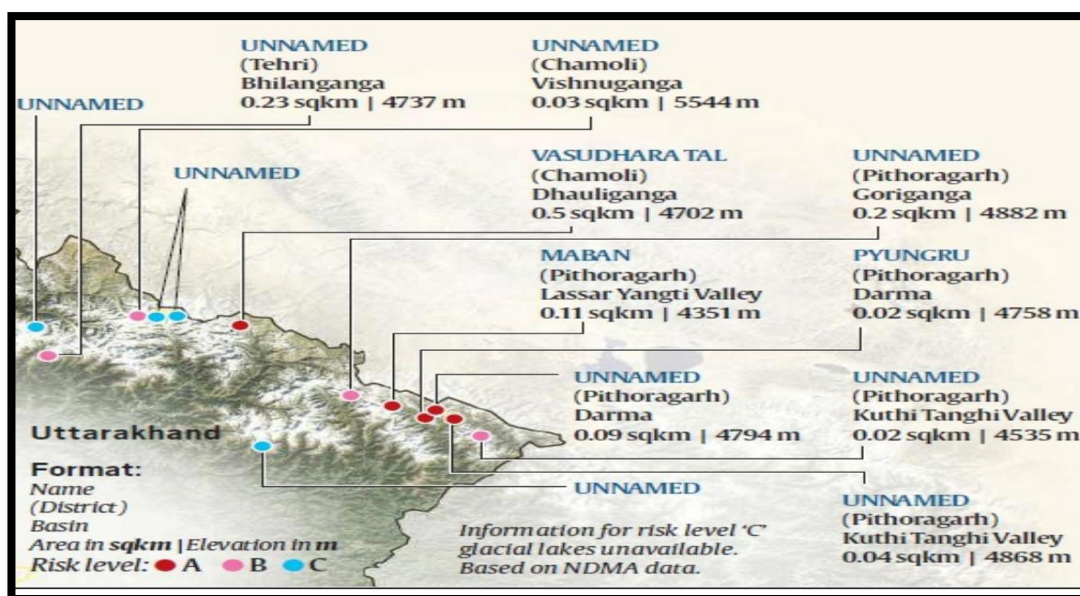


Figure 4:13 MOST VULNERABLE LAKE

As we can see that Uttarakhand has witnessed of two major GLOF event in past few years. First took place in June 2013, affected large part of the state Kedarnath valley, where thousand of people died. Second occurred in February 2021 in Chamoli district, due to the bursting of glacial lake.

Therefore rising on surface temperature could worsen the situation in Uttarakhand. Many studies have been done in on GLOFs

and on lakes prone to outburst, but there is a lack of systematic analysis of GLOF events and glacial lakes for their potential of hazard. It is imperative to study the complex processes interacting in GLOF disaster. The hill annual average maximum temperature may increase 1.6-1.9 degree Celsius between 2021-2025. According to the study on the state in the middle of the Himalayan range by the Germany-based Potsdam Institute for Climate Impact Research

and The Energy and Resources Institute in New Delhi has forecast the

worst impacts will be in higher elevations^[4]

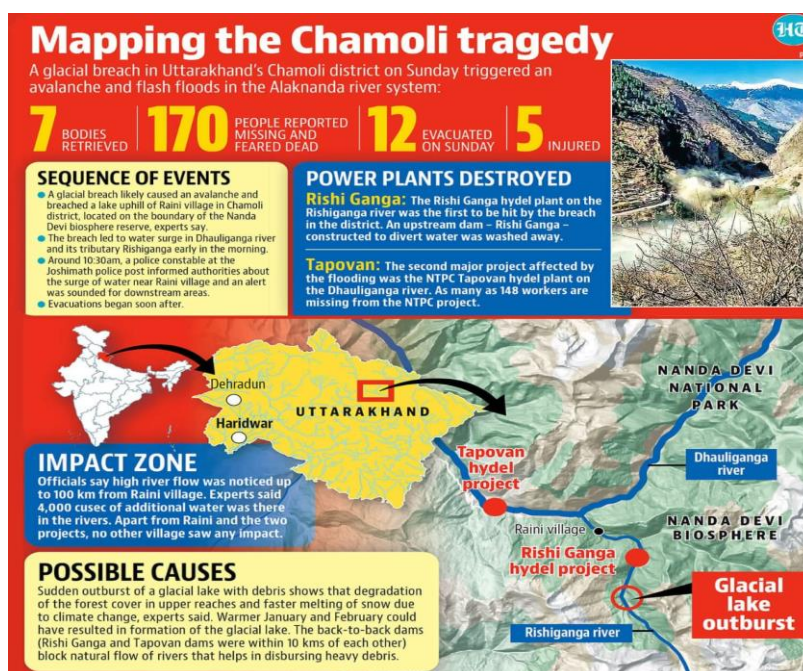


Figure 5: TRAGEDY OF CHAMOLI DISTRICT

References

- Enhanced glacial lakes activity threatens numerous communities and infrastructure in the pole published in the journal Nature in 2023
- 'Glacial lakes outburst floods threatens millions globally', published in the journal Nature in February 2023.
- Study and lecture in disaster risk and resilience at the university of Canterbury, told the Indian express in February last year.
- According to the Germany-based Potsdam Institute for Climate Impact Research and The Energy and Resources Institute in New Delhi.