ISSUE BRIEF

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THE GLACIAL LAKE OUTBURST FLOODING IN GILGIT BALTISTAN: A GROWING THREAT

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On July 30, 2024, a week-long heat wave in Gilgit Baltistan had increased melting rate of glaciers resulting in flooding which caused destruction to the Naltar Expressway and subsequently damaged electricity power plant in Nomal. A flash flood from Baltoro glacier in Beraldu river eroded agricultural land and the road to Testun village. Major roads in GB like Shahra e Baltistan, Karakoram highway (KKH) faced blockages and damages due to erosion caused by rising water level forcing the locals to displace.[1]

Glacial Formation and the Triggers of Glacial Lake Outburst Flooding (GLOF)

Glacier formation takes decade by accumulation of snowfall at higher altitude or Polar Regions where a cold temperature facilitates the process. The layers of snow are burdened by their own weight that makes a denser form of ice, eventually over the time with extra pressure glacier is form. The melting ice is a source of water which travels through channels towards valleys. The most common way of the formation of glacial lack is glacial damming where a flow of river is blocked when glacier move down a valley.[2]

1 Jamil Nagri, "GB rivers flood as heat wave melts Glacier," Dawn, August 4, 2024. https://www.dawn.com/news/1849999/gb-rivers-flood-as-heatwave-melts-glaciers

2 "What is a Glacier: Types, Formation and Location," Earth Eclipse , August 2, 2023, https://eartheclipse.com/science/geology/glacier-types-formation-and-location.html

Global warming has caused an increase in melting rate and slowed down the accumulation of snow. Particularly in summers, melting rate is higher by 0.5 % as compared to other seasons. Melting ice often breaks a heavy mass of ice leading to blockade of river flow, eventually a glacial lake is formed. Heavy rainfall or an earthquake can rupture the dam leading to a devastating release of water which is known as Glacial Lake Outburst Flooding (GLOF).[3]

GB has more than 2000 glaciers among which 33 are at great risk of GLOF, and is home to globally known glaciers like Siachen, Bultoro, and Hisper. These glaciers are source of water for irrigation and agriculture in Pakistan. These glacial lakes merge into the Indus River which passes through the region, flowing into rivers of Punjab and Sindh before reaching the Arabian Sea. This increases the risk of flooding in the Indus especially in the summer months.[4]

Situation Analysis

Presently glaciers are melting faster than ever due to a global warming. According to a report published in Nature Communications, four countries are at higher risk to GLOF, where approximately 15 million people are vulnerable to damage. Pakistan is included among these vulnerable countries with estimated population of 13 million at risk, from which 7.3 million people are from GB and Khyber Pakhtunkhwa (KP).[5]

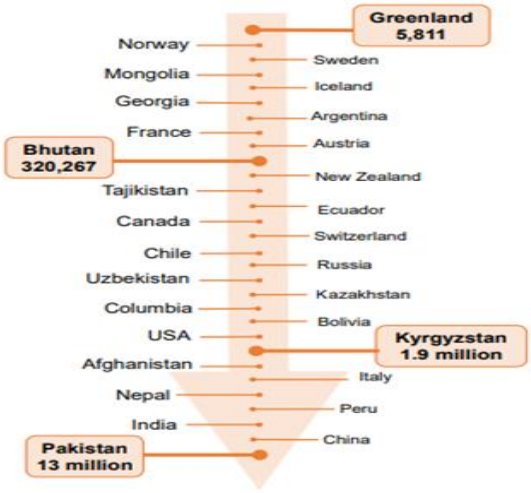

Figure 1: *Four GLOF high risk countries*[6]

3 Waseem Abbas, "Climate Change and Glacial Melting in Gilgit Baltistan," Youlin Magazine, May 18, 2022, https://www.youlinmagazine.com/article/climate-change-and-glacial-melting-in-gilgit-baltistan-(gb)/MjI2MA==#google_vignette

4 ibid

5 Caroline Taylor, Tom R. Robinson, Stuart Dunning, J. Rachel Carr, and Matthew Westoby, "Glacial Lake Outburst Lake threatens millions globally," Nature Communications, 7 February, 2023, https://www.nature.com/articles/s41467-023-36033-x

6 "Increasing risk of Glacial Lake Outburst Floods," Antarctic Glaciers.org, June 10, 2024, , https://www.antarcticglaciers.org/glacier-processes/glacial-lakes/increasing-risk-of-glacial-lake-outburst-floods/

National Disaster Management Authority (NDMA) in a recent press release on July 17, 2024, warned GB and KP regions regarding a potential threat of GLOFs during monsoons in 2024. NDMA had instructed Provincial Disaster Management Authorities (PDMAs) to ensure safety and take precautionary steps to placate any danger. According to NDMA an increase in temperature, heavy rainfall, and overflow of glacial lakes can be the main cause of floods and it could cause an increase in water level of rivers, landslides and flash floods. This can lead to widespread damage like sweeping away infrastructure, damaging crops, and casualties. In response departments had been told to alert local communities and travellers to minimize unnecessary travel. NDMA has also launched an online application to provide timely alerts and give instructions to manage risks.[7]

A glacial outburst on May 7, 2022, from Shispar glacier caused collapse of Hassan Abad Bridge in Hunza, which is permanent trade route between China and Pakistan. This resulted in blockade of KKH and impacted the ecosystem of the area. It destroyed 52 Houses, hundreds of trees, hydro power plants, cultivated land and led to displacement of people. The flood halted the trade between the countries causing economic losses to the region and the country.[8]

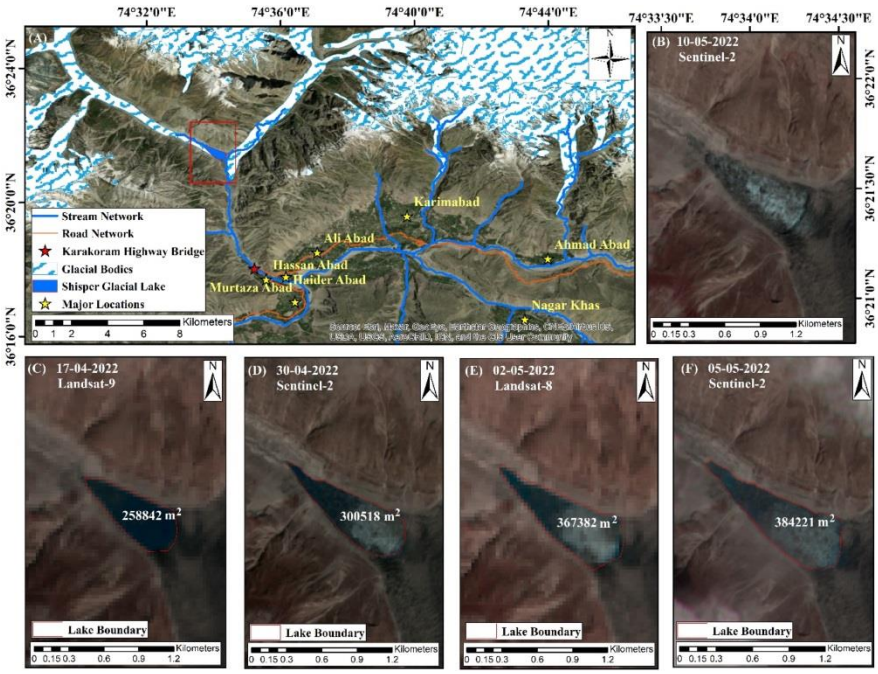

Figure 2: *GLOF Event from Shispar Glacier*[9]

7 "NDMA issues GLOF alert for KP and GB," The News, July 17, 2024, https://www.thenews.com.pk/latest/1210688-ndma-issues-golf-alert-for-kp-gilgit-baltistan

8 Sana Jamal, "Temporary structure to be built as Glacial Outburst destroys Hunza bridge in Pakistan," Gulf News, May 9,2022, https://gulfnews.com/world/asia/pakistan/temporary-structure-to-be-built-as-glacial-outburst-destroys-hunza-bridge-in-pakistan-1.87739942

9 Sandeep Kumar Mondala , Vatsal D. Patela , Rishikesh Bhartia andRamesh P. Singh, "Causes and effects of Shispar GLOF event in Karakarom in 2022," Geomatics, Natural Hazards and Risk, October 3, 2023, https://www.tandfonline.com/doi/full/10.1080/19475705.2023.2264460

Furthermore, in July 2018 due to melting of glacier and heavy rainfall GLOF caused flooding in Ghizar valley and debris from it blocked Kurumbar River. The flooding destroyed roads, bridges, crops, 30 houses and forced people to evacuate their house.[10]

The UNDP in its newsletter in June 2021, highlighted concerns about fund management provided by it for different projects to deal with GLOFs (GLOF I and GLOF II). On June 17, 2021, an Automated Weather Station (AWS) was set up on Shisper Glacier with funding from the Green Climate Fund. By offering real-time data on climate-induced incidents, this AWS, which is a component of the UNDP's GLOF II project, seeks to enhance the disaster management capabilities of the Pakistan Meteorological Department. But due to governance issues these projects have not been operating efficiently and this issue needs attention of the Government as highlighted by UNDP

Impacts on Local Communities

- Flooding caused by GLOFs damages crops and disturbs soil fertility by removing necessary nutrients responsible for a plant growth.
- Infrastructure along the riverside in GB receives damage due to soil erosion caused by excessive water mass in the river.
- Occurrence of devastating flooding causes distress in community by damaging infrastructure, livestock, and crops leading to food insecurity.
- Flooding leads to displacement of local community which faces adaptability challenges to survive, long term non-functional of education system and physiological trauma.
- GB is known for tourism which is a seasonal source of income for people of Skardu, Hunza and Nagar. Destruction caused by GLOFs to roads and bridges creates difficulties for tourists to access these regions causing financial losses for the locals.

Mitigation and Adaptation Strategies

- Installation of advanced early warning system is essential to predict danger. Local training camps need to be established for preparedness and risk management.

10 "Residents of Ishkoman Valley live in fear, after GLOF blocks Kurumbar river," Pamir Times, July 21, 2018, https://pamirtimes.net/2018/07/21/residents-of-ishkoman-valley-live-in-fear-after-glof-blocks-kurumbar-river/

- There is a need for construction of flood resilient infrastructure, strengthening riverbanks to stop water level from overflowing onto the land.

- Tourism is a major source of income in GB therefore, diversification in economy of the region is needed so that people have alternative options to generate income with increasing GLOFs.

- Government should increase its budgetary and moral support to help the people to deal with economic and psychological damage caused by GLOFs

Conclusion

Glaciers are melting at faster rate due to an increase in temperature and climate change. Communities are vulnerable to threats by flooding. Past GLOF events have caused significant damage to ecosystem, agriculture, economy and local community. Tourism generates income for many households, any damage to infrastructure leads to economic loss and least visitors. Economic diversification is very essential to unlock income opportunities. Tourism is seasonal profession and is easily affected by climate change. Effective management strategies like community preparedness, early warning system and resilient infrastructure is needed to mitigate risks.