

Cloudburst in Sikkim

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The recent cloudburst over Lhonak Lake in North Sikkim once again proved that we are so helpless to the nature. The cloudburst ultimately resulted in a flash flood in the Teesta River in Lachen Valley on 4 October 2023. About 14 people died on spot and 102 went missing in the tiny hilly state. The flood in Sikkim that started around 1.30 am was made worse by the release of water from Chungthang dam. Several towns, including Dikchu, Singtam, and Rangpo located in the Teesta basin, have also been flooded with the upsurge in the river. Over 3,000 tourists are reported to be stranded in different parts of Sikkim while some 166 people have so far been rescued, including the army man.

Experts say erratic rainfall patterns and dry periods have replaced regular snowfall, leading to glacial melt, further exacerbating such events. On Wednesday, the South Lhonak Lake, a glacial lake in the upper reaches of Sikkim, burst its banks following a cloudburst in the area. While water initially breached the Chungthang dam, it resulted in flash floods in multiple areas of the tiny hilly state.

Meteorologists said that while the weather conditions were conducive for heavy to very heavy precipitation over the region on account of a low-pressure area in the nearby region, this time's flash flood wasn't just a result of another extreme weather event alone. Climate change has played a significant role in making this weather event more extreme.

Back in 2021, the study Future Glacial Lake Outburst Flood (GLOF) hazard of the South Lhonak Lake, Sikkim, Himalaya warned about a probable outburst and brought forth information about the increasing length of Lhonak glacial lake, which was sensitive to extreme weather events such as cloudbursts. Since it cannot be predicted when Glacier-related floods, including floods from lake outbursts (GLOFs) would burst, the only option is being prepared with proper disaster planning and mitigation.

"It was already predicted in 2021 that this lake would breach and impact the dam. There has been a substantial increase in the number of glacial lakes as the glaciers are melting due to global warming. When the glaciers advance, they erode the riverbed, leading to the deepening of the river. Also, climate change has resulted in erratic precipitation, including events like cloudbursts, as we saw in Sikkim, leading to the partial breach of the moraine dam. When glaciers are eroding, they put pressure on the bedrock, producing more silt. Whenever there is flash flooding, you would witness more silt and debris flowing downhill, aggravating the destruction caused by floods and landslides," said Farooq Azam, glaciologist, Indian Institute of Technology, Indore.

Under the influence of climate change - explaining further how altering weather patterns because of climate change are adding to the crisis, Azam said, "Eastern Himalayas are dominated by monsoon,

which has over the period become more erratic and unpredictable. Snowfall is food for glaciers but it is now replaced by rainfall that is too erratic. There are more days of heavy rains and dry periods are also increasing. Rise in global warming has led to rise in glacial melt."

South Lhonak glacier is one of the fastest retreating glaciers, and the associated proglacial lake has become the largest and fastest-growing in the state. According to the study, the glacier receded ~2 km in 46 years from 1962 to 2008. It further retreated by ~400 m from 2008 to 2019. There has been a growing concern now about the hazard potential of this lake, as the downstream valley is heavily populated with numerous settlements and infrastructure.

A glacier is a moving mass of ice, soil and rocks and thus, it consists of lots of loose sediments. According to geologists, the retreating glaciers have left behind unlimited sediments, which consist of an unstable mix of earth and rocks in the higher reaches of Himalayas. In such cases, even less rainfall is good enough to move the boulders and debris downstream. Hence, the higher Himalayan region is very unsuitable for dams and tunnels due to higher concentration of sediments. GLOFs can also be triggered by extreme meteorological conditions, especially heavy rainfall events that cause degradation of the damming moraine and lead to overfilling of the lake.

While these glacial lakes are mostly located in remote and unsettled mountain valleys, GLOFs have the potential to impact several kilometers downstream. Due to rampant development and building choices within the mountainous regions of the Himalayas, the existence of glacial lakes in the high altitude of the Himalayas has become a major concern to the downstream communities.

Scientists have called for the need for focussed scientific research mechanisms that include high resolution monitoring networks. Roxy Mathew Koll, climate scientist at Indian Institute of Tropical Meteorology, said, "We all know that in the warming world, the potential of cloudbursts, extreme rains, GLOF has gone up. Ocean warming has already increased moisture levels over the region. The low-pressure area near the region further increased the moisture, paving a conducive environment for torrential rains. Moreover, we do not have high-resolution monitoring systems that could tell us what happened, how it happened, and to what extent climate change aggravated the scenario. We know the Himalayan region is prone to cloudbursts, but we cannot identify the hotspot. Thus, a proper monitoring network is the need of the hour."

The flash flood in the Teesta River, triggered by the cloud burst in Lhonak Lake, caused accumulation of huge quantity of water, which turned towards Chungthang Dam destroying the power infrastructure before moving downstream in spite flooding towns and villages.