

# INDIA

## Floods in Sikkim state

### CRISIS IMPACT OVERVIEW

- On 3 October, a major Glacial Lake Outburst Flood (GLOF) occurred from South Lhonak, in Sikkim state in northeastern India, flowing down the Teesta River towards the Teesta III hydroelectric dam in Chungthang (Sikkim). The dam was inundated and collapsed, resulting in the increase in water levels in Teesta River by up to 15-20ft, which resulted in death and destruction downstream (Mint 09/10/2023; EOS 09/10/2023; BBC 05/10/2023).
- According to Sikkim's State Disaster Management Authority (SSDMA), as at 7 October, the floods had affected more than 25,000 people. There is uncertainty around the exact number of people killed, but several sources report that at least 41 people have died in 27 villages across the four districts of Mangan, Gangtok, Pakyong and Namchi. Additionally, floods have partially or fully damaged 2,516 houses, washed away 13 bridges, and rendered several roads impassable, although the Roads and Bridges department is currently working to restore passage of traffic (Sikkim 07/10/2023; Al Jazeera 06/10/2023; AP 06/10/2023; BBC 05/10/2023). The floods have also rendered several hydropower projects along the river dysfunctional (The Hindu 08/10/2023). This is likely to constrain access to electricity and affect people's livelihoods.
- Additionally, floodwaters from reiver Teesta have extended into the neighbouring state of West Bengal, inundating Darjeeling, Kalimpong, Cooch Behar and Jalpaiguri districts in the northern parts of the state (Al Jazeera 06/10/2023). Damage of the army ammunition depot at Munshithang has also raised concerns of contamination by weapons, ammunition and unexploded ordnances (NET 10/10/2023).
- In 2021, Sikkim's economy relied on three primary sectors: manufacturing (52%); service sectors (32%); and agriculture (10%) (CAG 2021).

### Anticipated scope and scale

- Sikkim which is located in the Himalayas in northeastern India, is prone to floods and natural disasters. According to National Disaster Management Authority (NDMA), Sikkim has 10% of the 7,500 glacial lakes in the Himalayan ranges. In 2022, severe flooding displaced tens of thousands and killed at least 24 people (BBC 05/10/2023; IAS 06/10/2023).The geographical location and conditions of Sikkim indicate that floods are likely to keep occurring.
- Global warming has triggered the formation and expansion of glacial lakes as a result of the melting of glaciers in various regions, including Sikkim. This process is a direct consequence of rising temperatures, which accelerate glacial melt. As a result, these newly formed glacial lakes are at a higher risk of bursting, causing potentially devastating glacial lake outburst floods (GLOFs). In Sikkim, the threat of GLOFs is particularly concerning because of its mountainous terrain and the presence of numerous glacial lakes. The ongoing effects of global warming are likely to exacerbate this problem, as the warming climate continues to drive glacial retreat and the expansion of these lakes (NIH 10/08/2023).

### Humanitarian constraints

- The destruction of roads and bridges in the state will significantly impede access by response authorities to vulnerable populations. This could lead to delays in providing essential aid, medical assistance, and other critical services to those in need. It may also hamper the evacuation of individuals from affected areas, potentially exacerbating the overall impact of the disaster and making it more challenging to effectively respond to the crisis (The Guardian 05/10/2023).
- Floods have washed away bridges and National Highway 10, cutting off Sikkim's capital Gangtok from rescue efforts. However, alternative routes to the state capital are being opened via the East Sikkim district as at 6 October (Al Jazeera 06/10/2023).
- The disruption of mobile coverage in the northern regions of the state is expected to have an impact on rescue operations (BBC 05/10/2023).

### KEY FIGURES

+25,000  
AFFECTED PEOPLE

+2,500  
DAMAGED OR  
DESTROYED HOUSES

High Risk  
OF DISEASE OUTBREAK

5.1  
INFORM CLIMATE  
CHANGE RISK SCORE

### FUNDING AND RESPONSE CAPACITY

- National Army
- Indian Space Research Organization
- Sikkim State Disaster Management Authority (SSDMA)
- National Disaster Management Authority (NDMA)

## CRISIS IMPACT

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### Shelter and Displacement

The floods had damaged more than 2,500 houses in four districts, leaving more than 25,000 people to seek refuge in schools, religious buildings and government buildings. This can lead to overcrowding and strained living conditions (Sikkim 07/10/2023).

### Livelihood

The recent floods are likely to have an adverse impact on the service industry, which is a major component of Sikkim's economy since it is a popular tourist destination, which. This is especially concerning as the main tourist season typically falls between October and December. Disruptions caused by the floods may affect the region's ability to cater to tourists during this crucial period (Bharat Online accessed 10/10/2023). The pharmaceutical industry is another key sector for Sikkim's economy, and the floods have caused substantial damage to the power infrastructure, which is expected to disrupt the operations of drug manufacturing companies. Additionally, the road damage may have ripple effects, impacting the movement of goods and potentially disrupting the supply chains of these firms. Moreover, it could hinder access to markets for local farmers, creating additional challenges for agricultural producers in the region (CNBC 04/10/2023; BBC 06/10/2023; Money Control 06/10/2023).

### WASH and Health

As at 2021, 77% of all households in Sikkim had access to tapped water (Mint 11/04/2023). The floods are likely to compromise clean drinking water sources, elevating the risk of waterborne diseases spreading within the affected areas. Furthermore, the inundation of water can cause damage to sewage systems and sanitation infrastructure, further intensifying the potential for environmental pollution.

### Impact on critical infrastructure

According to the SSDMA, 13 bridges had been washed away including in eight in Mangan, three in Gangtok and two in Namchi districts as at 7 October. Additionally several roads have been blocked by debris (Sikkim 07/10/2023; Al Jazeera 06/10/2023).

The floods have also damaged the army ammunition depot at Munshithang, situated near Chungthang, North Sikkim (Kalimpong Online News 10/10/2023).

The floods have destroyed the Chungthang dam, which is critical to the Teesta 3 hydropower project, and rendered several hydropower projects along the river dysfunctional. The Teesta 3 dam holds water using an imposing 60 m high rock-filled concrete dam to feed its generators. The floods broke the Teesta 3 dam completely, and severely damaged another smaller Teesta V dam, which is located downstream (The Hindu 08/10/2023; The Quint 06/10/2023). Sikkim province has five existing hydropower projects along the Teesta basin, 15 that are upcoming and 27 more in the pipeline. At least three suffered damage in the October 4 flooding (Scroll 09/10/2023).

## DRIVERS OF THE CRISIS

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### Glacier Lake Outburst Flood (GLOF)

The floods were caused by heavy rainfall, which triggered the bursting of South Lhonak glacier lake in north Sikkim. Although meteorological records do not show any heavy rainfall in the area, rainfall at such heights are normally not monitored or recorded (The Hindu 08/10/2023). Glacier lake outburst floods occur when large lakes that form from melting glaciers burst through their natural dams (formed of rock, sediment, and debris). The South Lhonak glacier is one of the fastest retreating glaciers. Sikkim has roughly 80 glaciers and almost 700 glacial lakes that climatologists have warned could be responsible for further lake outbursts as glaciers continue to recede because of climate change. Experts have warned that the dams built on the Teesta river were under threat from the South Lhonak lake (Scroll 09/10/2023; The Hindu 08/10/2023).

## COMPOUNDING/AGGRAVATING FACTORS

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### Political tension

There has been recent political tension between the local government of Sikkim and the national government. Sikkim joined India in 1961 under a document that states exclusive rights for Sikkimese and their descendants to own land, and occupy local governmental jobs, however, this has recently changed. The local government has reported feeling neglected by the national government, unemployment has increased, the condition of roads is bad, and some areas lack full access to electricity and water. The tension between local and national authorities could hamper a coordinated humanitarian response and affect the communities in a longer term (Outlook India 20/09/2023; The Hindu 09/04/2023). Assembly elections in Sikkim are due in late 2023 or early 2024, and the division between local leaders and national authorities could create civil unrest.

## Dams construction and vulnerable housing

Since 2021 experts have warned that the dams were under threat because of glacier melting and earthquakes. In 2011 the Teesta III hydroproject suffered damage due to an earthquake measuring 6.9 on the Richter scale. The quake had triggered 1,196 new landslides. In addition, there is a higher risk of floods and damaged of the remaining dams because of rising global temperatures, which glacial melt in the Himalayas (Scroll 09/10/2023; ECLIM 12/2020). People in this region are at high risk of being affected by future environmental hazards, especially because many have settled along the river beds further obstructing the flow of water.

## FUNDING AND RESPONSE CAPACITY

According to the state government, the affected population is currently sheltered in 22 government camps across the affected districts of Mangan (5), Gangtok (4), Pakyong (5) and Namchi (8). Additionally, more than 2,700 people had been rescued as at 7 October (Sikkim 07/10/2023).

The Indian army has launched a massive search operation to find and rescue those missing (BBC 05/10/2023).

## Map of flood development in Sikkim state as at 8 October



Source: The Hindu (08/10/2023)