RAPID SITUATION ANALYSIS REPORT

BHOTEKOSHI–TRISHULI CATASTROPHIC FLOOD

Jointly Prepared by: Youth Alliance for Environment (YAE); Himalayan Cryosphere, Climate and Disaster Research Center (HiCCDRC); Kathmandu University (KU); Society for Conservation Biology Nepal

A view at flood-impacted area of the Betrawati Bazzar (Photo Credit: Saroj Adhikari)

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Disclaimer: *This preliminary situation analysis reports on the Rasuwa–Trishuli floods is based on field observations, satellite imagery, and other available information. All reported loss, damage, and impact figures are indicative and subject to change as further assessments, verification, and updates become available.*

Executive Summary

On the morning of 26 August 2026, a catastrophic flash flood surged down the Bhote Koshi River. This is one of the most severe disaster events to affect Nepal's northern border and mid-hill/Tarai river corridors in recent years. The 26 August catastrophe was likely triggered by a large glacier–rock mass failure in the upper Lhende Khola catchment. The estimated 2.26 km^2 collapse zone and 2.93 km^2 eroded area may have mobilized more than 142 million m^3 of ice, rock, sediment, and debris. The failure likely generated a rapid ice–rock avalanche that entered the Lhende Khola, altered the river channel, and may have temporarily blocked and then released water, producing a high-energy debris-laden flood. The sudden breach of this blockage released a wall of water that swept downstream through Timure, Rasuwagadhi, Syabrubesi and other settlements and continued into Nuwakot, Dhading, Gorkha, Chitwan, Tanahun and Nawalparasi districts.

As of the most recent National Disaster Risk Reduction and Management Authority (NDRRMA), the disaster has had a devastating human impact, with approximately 734 confirmed deaths, around 2,498 people still out of contact, and an estimated 93,000 people affected. Search, rescue, and verification operations are continuing, and the toll is expected to change further.

Initial estimates suggest that the damage to infrastructure is around NPR 200 billion (equivalent US $ 1.3–1.5 billion), and the government has estimated the reconstruction cost to be US$4-5 billion). The disaster caused heavy damage to 14 hydropower projects with a combined capacity of about 748 MW (9 operating plants totaling 354 MW and 5 under construction totaling 394 MW), to transportation (33 suspension bridges and 35 motorable bridges, ~42 km of road), and to the Rasuwagadhi trade corridor, affecting energy supply and cross-border trade. The social, economic, and ecological impacts of this disaster, therefore, are enormous and must be fully assessed and accounted for in future planning to develop a well-informed disaster recovery plan.

Figure 1: Safrubesi After the flash Flood (Photo Credit: Umesh Pathak, KU)

1. How the Catastrophe Happened?

1.1. Cause of Flood

In the beginning of the massive flood that struck Rasuwagadhi at around 8:40 am on 26 August 2026, we speculated that a glacial lake may have breached or a supra-glacial pond/lake released a huge volume of water that caused the massive flood downstream. However, after gradually analyzing the available satellite images, it has become clear to us that the underlying cause of the massive flood was a huge ice avalanche from the glacier on the Nepal side or the northern side of the Langtang-Lirung Himal (Figure 2). The avalanche started falling down by 1400m (5200m-3800m) above sea level (asl), bringing together the huge mass of ice with some snow and rocks-within route. This huge mass also entrained another large amount of ice, debris, and water from the lower ablation area of that glacier at 3800m and rapidly rushed toward the Lhende River at elevation of about 2900m with vertical drop of 1100m.

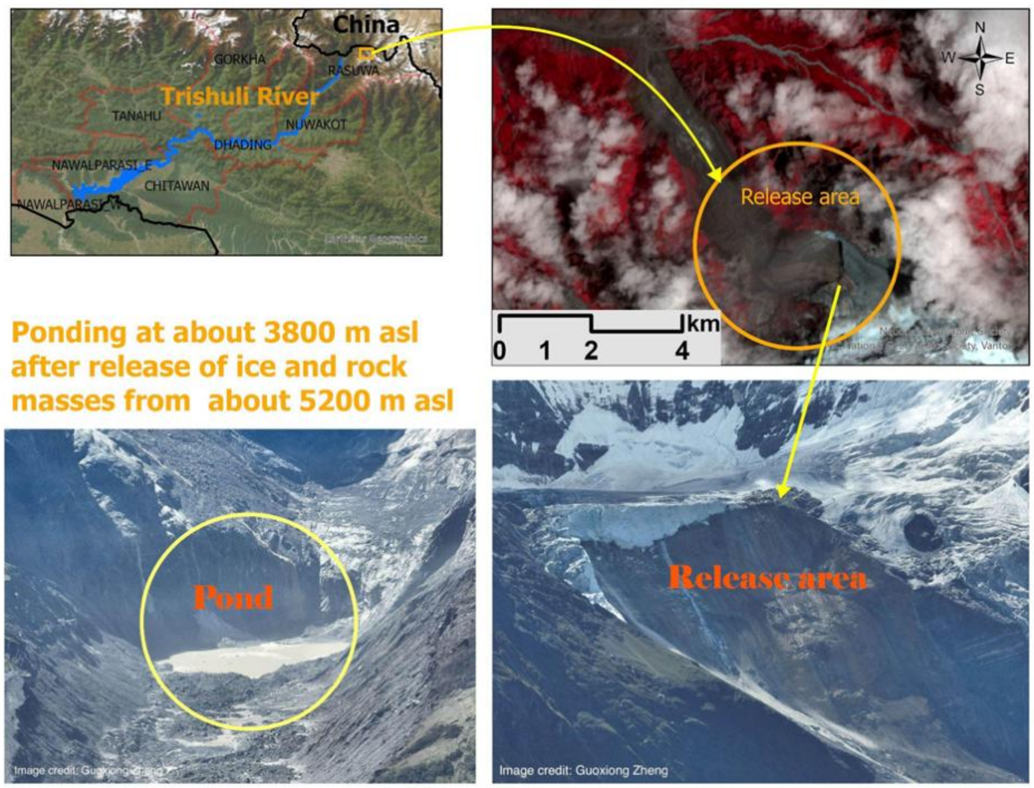

Figure 2: Source area of the flood (Gosaikunda Rural Municipality, Ward No. 2) and part of Langtang National Park.

Figure 3 shows the upper and lower stages of the glacier. We have tentatively estimated that 120.96 million m^3 of ice, snow, and rock fell through a vertical distance of 1100m and eroded the ablation area of the debris-cover glacier in the lower part. We have estimated that about 67 million m^3 of ice under the debris from that area mixed in the Lhende River. We suppose all snow, ice, and rock brought down to the confluence of the Lhende River and the river were temporal blocked for certain times before it rushed down. The huge devastation downstream is mainly due to huge amounts of snow, ice, and rock, along with some water, brought down, from around 5200m asl (the upper part of the glacier from where it collapsed) along the steep gradient, striking the lower ablation area of the debris-covered part at around 3,800 m and finally reaching the Lhende River at around 2,900 m (Figure 4). Although there is no clear indication that the Lhende River was blocked, it must have been blocked by snow, ice, water, and debris for a few minutes before flowing downstream at high speed.

The HEC-RAS analysis with 120.96 million m³ (Figure 3) of water shows that the maximum velocity was 15 m/s (Figure 4) from the Lhende River, where snow, ice, and water with debris struck the river to about 15 km downstream, maximum depth of 15 m (Figure 5), and maximum discharge of 23,000 m³/s at Syafrubesi (Figure 6).

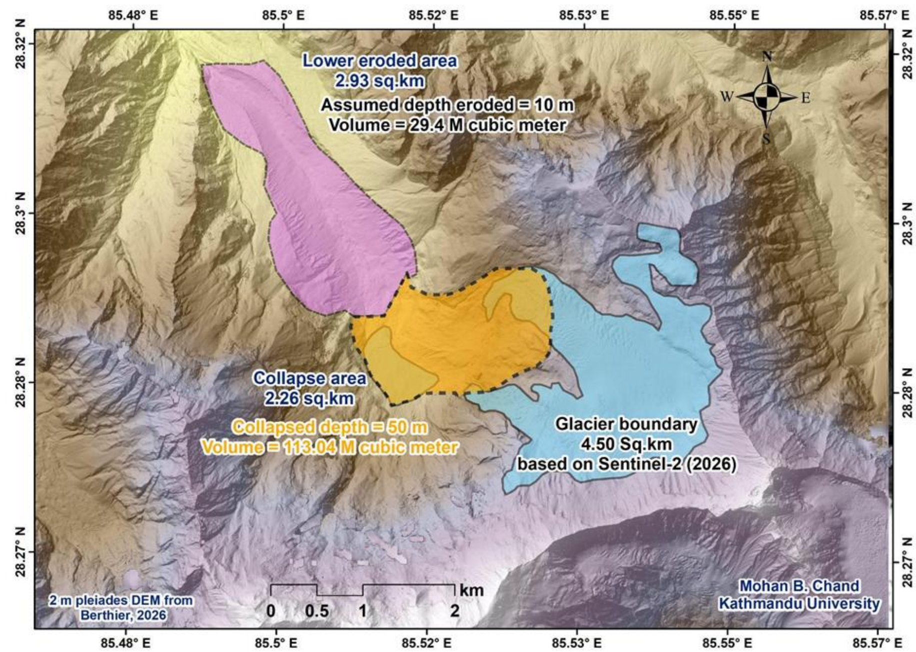

Figure 3: Area and volume of mass collapsed from the glacier, rock, and debris-covered area.

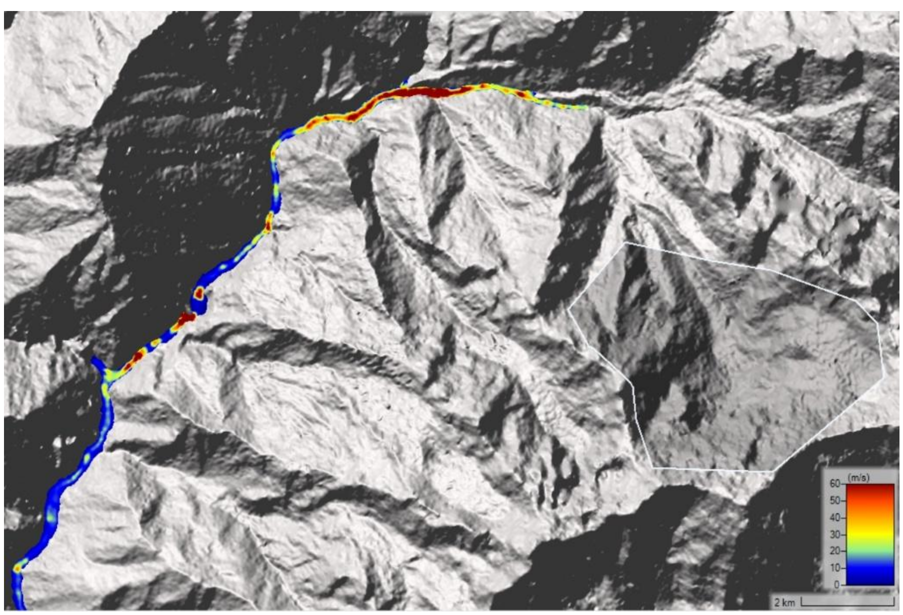

Figure 4: Velocity distribution map of flood water.

Figure 5: Water depth distribution map of the flood water.

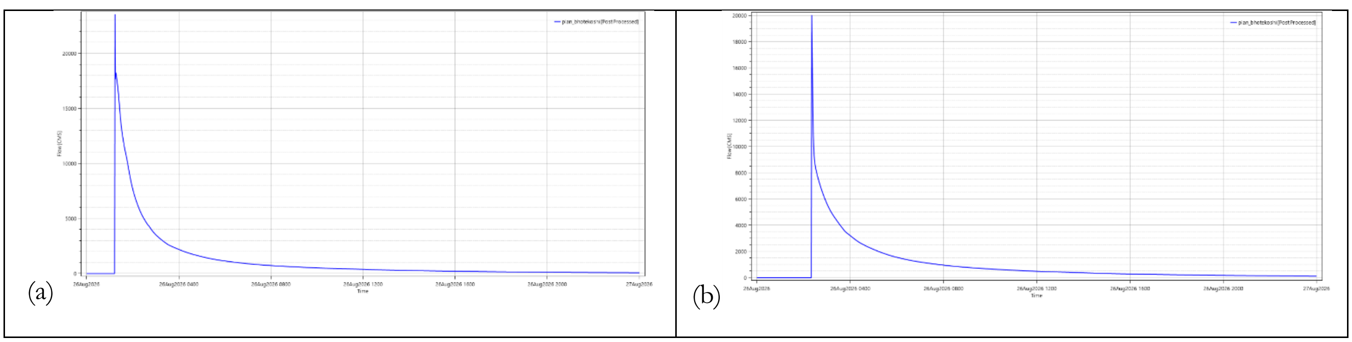

Figure 6: Hydrograph of the flood with the peak discharge of 23,000 m/s at Syafrubesi (a) and Betrawati (b).

We conservatively estimated a total of 2.26 km² collapse zone of glacier on the norther side of the Langtang Lirung massif, assuming an average failure depth of 50 m. This corresponds to approximately 113 million m³ of displaced material. The adjacent 2.93 km² eroded area, with an assumed erosion depth of 10 m, represents an additional ~29.4 million m³ of sediment and debris mobilization. Together, these estimates suggest a potential sediment–ice volume exceeding 142 million m³, although field verification is required. The resulting high-energy debris-laden flood could explain the severe impacts observed downstream toward Timure and along Bhote Koshi–Trishuli corridor. Hydrological observations recorded a rise of approximately 9 m within 30 minutes at Galchhi and 7 m at Malekhu, demonstrating the exceptional speed of the flood wave (see Figure 4).

1.2. Time Series of Flood

A catastrophic flash flood entered Nepal from the Tibetan side and surged through the Bhote Koshi River in northern Rasuwa at approximately 9:00 AM local time.

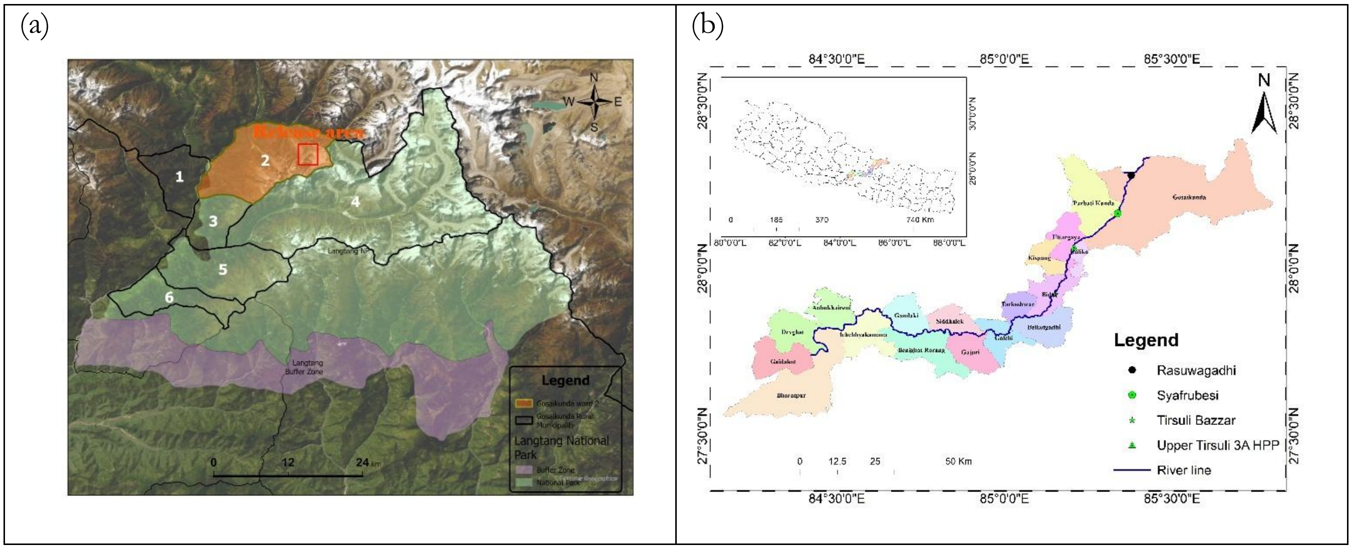

Figure 7: (a) Administrative boundaries of Gosaikunda Rural Municipality and Langtang National Park (b) Most Affected Local Units

The flood moved rapidly downstream, destroying settlements, roads, bridges, vehicles, hydropower infrastructure, and border facilities. Worst-affected areas in Rasuwa include Timure, Rasuwagadhi, Syafrubesi, Hakubesi, Mailung, Shantibazaar, Betrawati, Trisuli Bazar and Debighat. The flood pulse then propagated roughly 60 km down the valley system, affecting Nuwakot, Dhading, Gorkha, Chitwan, Tanahun and Nawalparasi districts, with the Trishuli River corridor placed under high alert in 15 downstream municipalities: Uttargaya Rural Municipality, Gosaikunda Rural Municipality, Kalika Rural Municipality, Aamachhodingmo Rural Municipality, Bidur Municipality, Belkotgadhi Municipality, Kispang Rural Municipality, Tarkeshwar Rural Municipality, Galchhi Rural Municipality, Siddhalekh Rural Municipality, Gajuri Rural Municipality, Benighat Rorang Rural Municipality, Gandaki Rural Municipality, Devghat Rural Municipality, and Aanbukhaireni Rural Municipality.

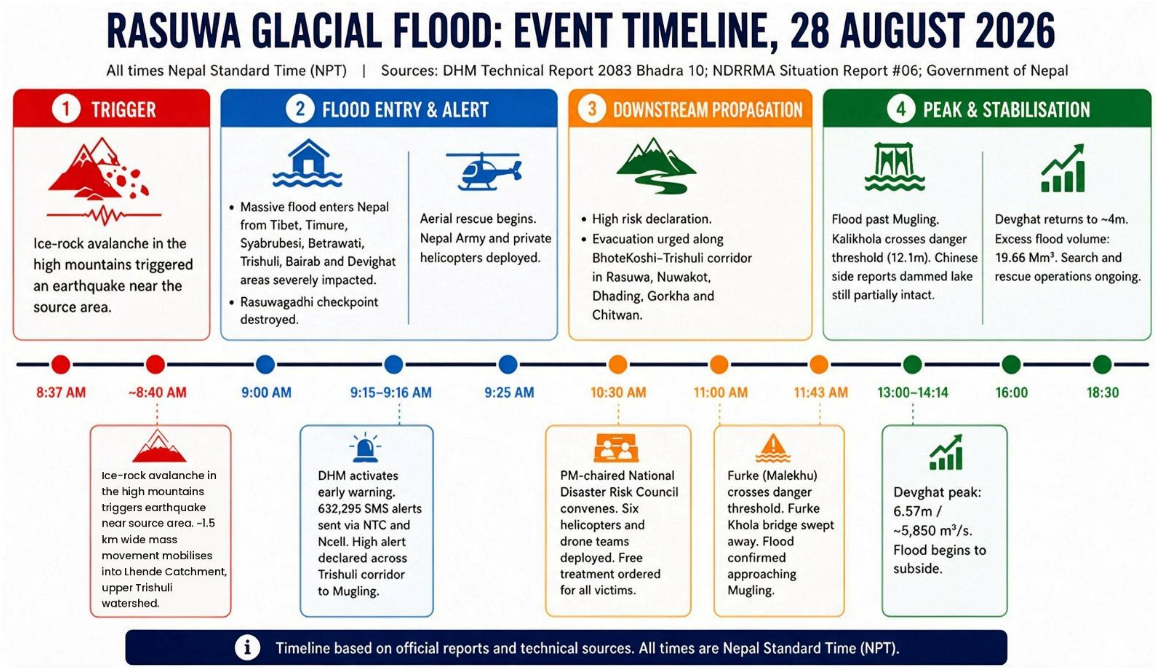

Figure 8: Time series reporting of the flood (RHA Report, Hirisk.org)

A major ice and rock avalanche occurred at around 8:37 AM in the high mountains near the source area, with an estimated wide mass movement entering the Lhende catchment of the upper Trishuli watershed. The resulting seismic signal was described as having triggered an earthquake, likely referring to ground motion generated by the mass movement rather than an earthquake causing the avalanche. At around 8:40 AM, the resulting flood began mobilizing downstream. By 9:00 AM, the Department of Hydrology and Meteorology (DHM) had activated its early-warning system and sent approximately 632,295 SMS alerts through NTC and Ncell, with a high alert issued along the Trishuli corridor down to Mugling. Between 9:15 and 9:25 AM, the flood entered Nepal through Timure, Syabrubesi, Betrawati, Trishuli, Bairab and Devighat, destroying the Rasuwagadhi checkpoint and prompting aerial rescue operations by the Nepal Army and private helicopters. At 10:30 AM, the National Disaster Risk Council, chaired by the Prime Minister, convened, deploying six helicopters and drone teams and ordering free treatment for victims. By 11:00–11:43 AM, Furke (Malekhu) had crossed its danger threshold, the Furke Khola bridge was swept away, and the flood was confirmed to be approaching Mugling. The high-risk situation prompted evacuation alerts along the Bhote Koshi–Trishuli corridor across Rasuwa, Nuwakot, Dhading, Gorkha and Chitwan. Between 1:00 and 2:14 PM, the flood continued propagating downstream toward its peak, while Kalikhola crossed its danger threshold at 12.1 m, and the Chinese side reported that the dammed lake remained partially intact. By 4:00 PM, Devwighat recorded a peak water level of 6.57 m, with discharge reaching approximately 5,850 m^3/s. By 6:30 PM, the flood had begun to subside, with Devwighat returning to around 4 m and an estimated excess flood volume of 19.66 million m^3, while search-and-rescue operations continued.

1.3. Why was this Flood So Destructive?

Nepal's steep and narrow Himalayan valleys can greatly increase the speed and destructive force of sudden flood releases. In this event, the absence of preceding heavy rainfall meant that communities had very little time to receive or respond to warnings. Unlike typical monsoon floods, this type of ice-avalanche-damoutburst event can develop and move downstream very rapidly. The impacts were particularly severe because the flood travelled through major economic, transport, trade, and energy corridors, including areas with hydropower projects, roads, bridges, settlements, and the Rasuwagadhi–Kerung cross-border trade route. As a result, the disaster not only caused loss of life and damage to communities but also disrupted electricity generation, transportation, cross-border trade, tourism, and local livelihoods, increasing its overall economic and social impact.

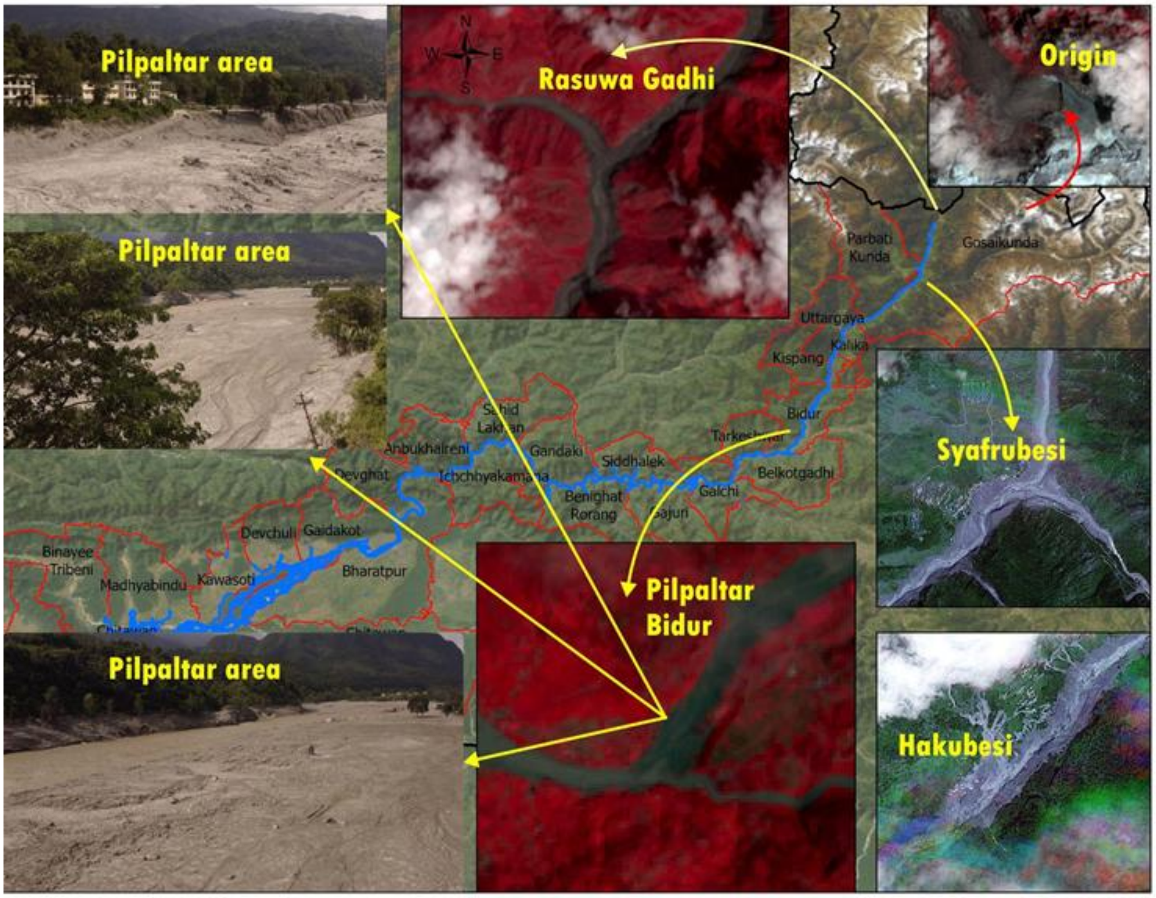

Figure 9: Affected areas by Flash Flood

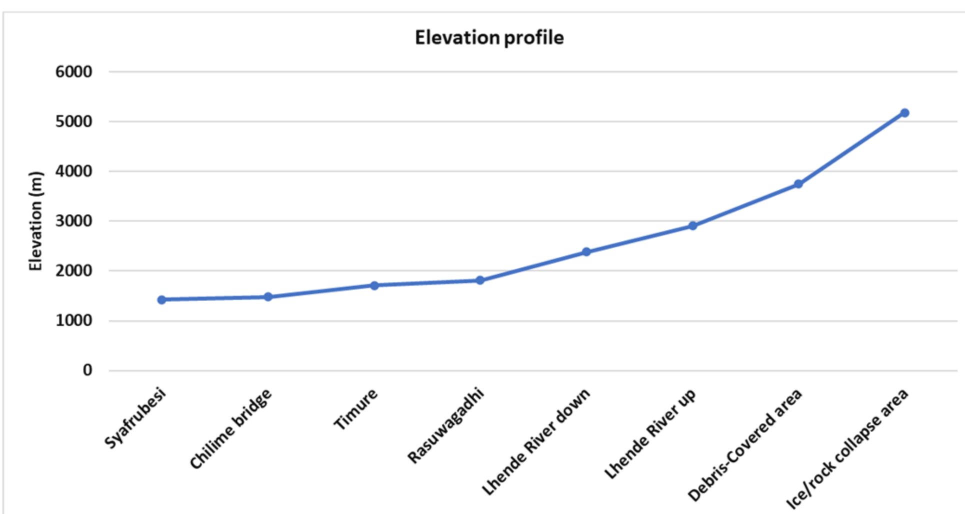

Figure10: Elevation profile from Syafrubesi to the source area.

The elevation profile illustrates how flood velocity changes across Rasuwa according to the different gradients of the river. In the upper reach stretching from the ice/rock collapse area (~5200 m) down to the Lhende River (~2900 m)—the extremely steep slope causes gravity to accelerate debris/water rapidly, generating high kinetic energy and massive debris transport and scouring capacity that has formed depression and a new lake later on (Figure 11). As the river transitions through the midstream area toward Rasuwagadhi (~1800 m), the gradient moderates, slightly reducing the speed but still maintaining enough capacity to carry heavy loads. Finally, from Rasuwagadhi down to Syafrubesi (~1400 m), the profile flattens significantly; this drastic reduction in slope causes debris/water to drop, prompting the water to spread wider horizontally and deposit its carried sediment and debris.

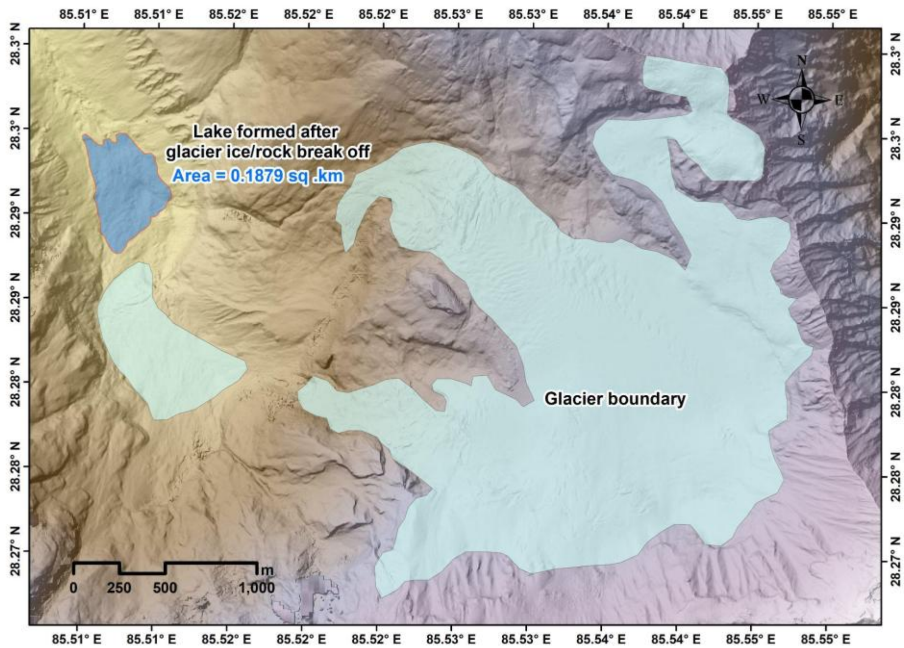

Figure 11: Newly formed lake due to depression created by the force of the break-off mass from 5,200 m asl.

Besides, in 2025, a significant flooding event occurred in the same corridor in Rasuwa, leading to substantial damage. Despite this, reconstruction and settlement mostly occurred in the same high-risk zones, thus leaving communities and infrastructure vulnerable to future hazards and vulnerability. This disaster has to be seen in the wider perspective of the geological and climatic instability in the Himalayas. The Himalayan region is geologically young and tectonically active, with steep slopes, fragile rock formations, and intense monsoon rainfall, making it highly prone to landslides, avalanches, debris flows, and glacial lake outburst floods. Large-scale rock-ice failures are likely at higher elevations due to warming temperatures leading to permafrost thaw and glacier retreat, which is also causing a degradation of natural support for mountain slopes. The harsh environment can have relatively moderate triggering events that interact with glaciers, moraines, and river systems to create disproportionately large and cascading disasters downstream, such as high rainfall, small earthquakes, or slow destabilization of the slopes.

2. Economic and Non-Economic Loss and Damage

The magnitude of the catastrophe has had a tremendous impact on human lives and has claimed many lives, with thousands of people missing, including various groups of people, and many more sufferings from various injuries, psychological trauma, including massive destruction of the infrastructure and economic bases (Figure 12).

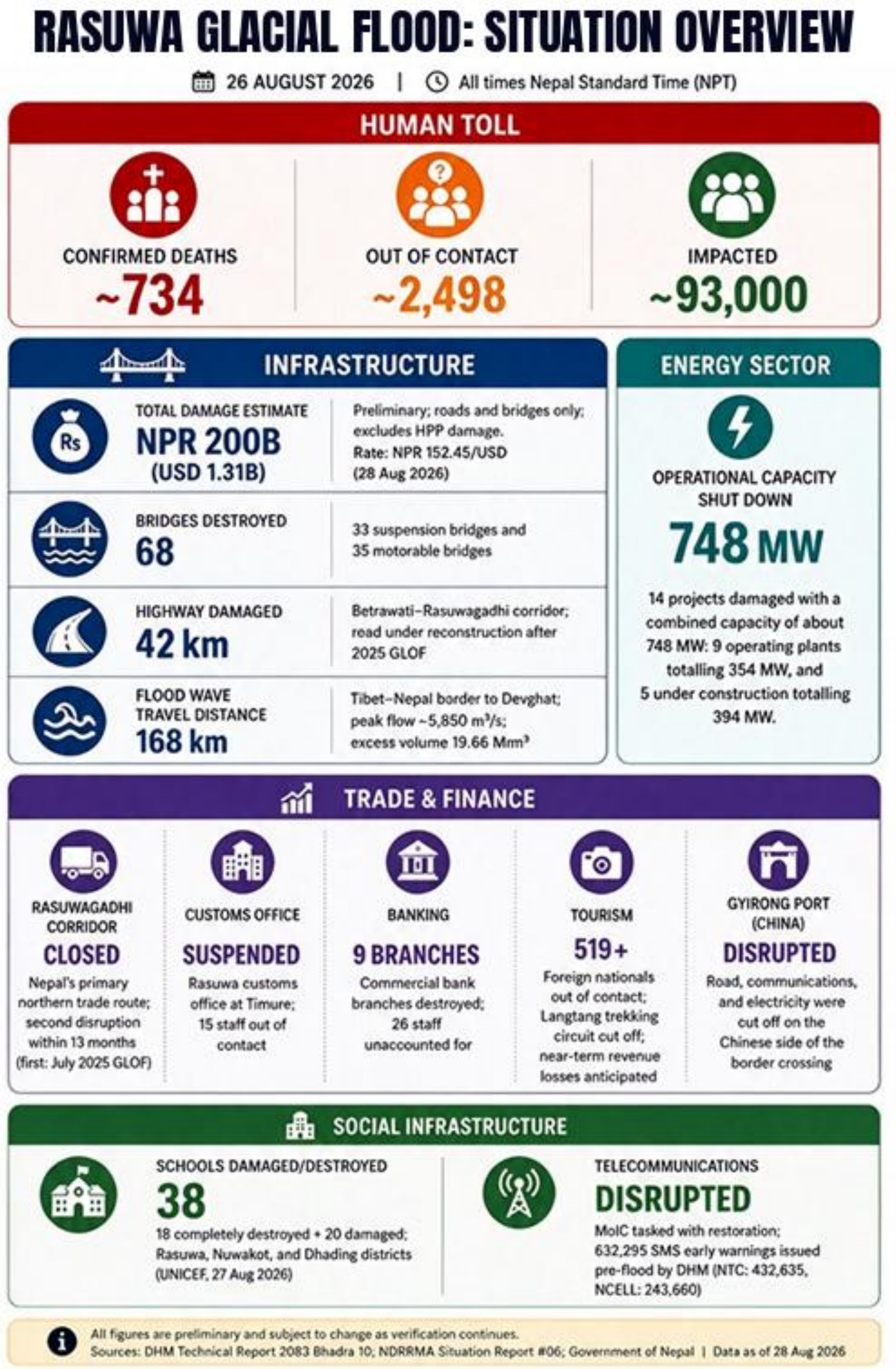

Figure 12: Info graphs of the impacts known by far 30th August, 2026

2.1. Economic Loss and Damage

The catastrophe has resulted in a significant disruption of critical infrastructure, livelihoods, public services, and economic activities. The disaster resulted in very significant direct physical damages on bridges, roads and buildings (approximately NPR 200 billion (~USD 1.31 billion and hydropower projects (approximately 0.97 billion)), and the government has estimated the reconstruction cost to be US$4-5 billion which left the infrastructure, energy generation and cross border trading in the region paralyzed. The loss and damage to agricultural land, cropland, irrigation canals, and other agricultural and livelihood assets are yet to be fully calculated, and their assessment is essential for understanding the total economic impact of the catastrophe. Transport connectivity suffered with 40-45 km of the key Betrawati-Rasuwagadhi Road being damaged or washed away, and 68 bridges (35 motorable and 33 suspension bridges) were completely destroyed and approximately 864 households suffered severe damages in Timure, Syabrubesi, Rasuwagadhi and Betrawati.

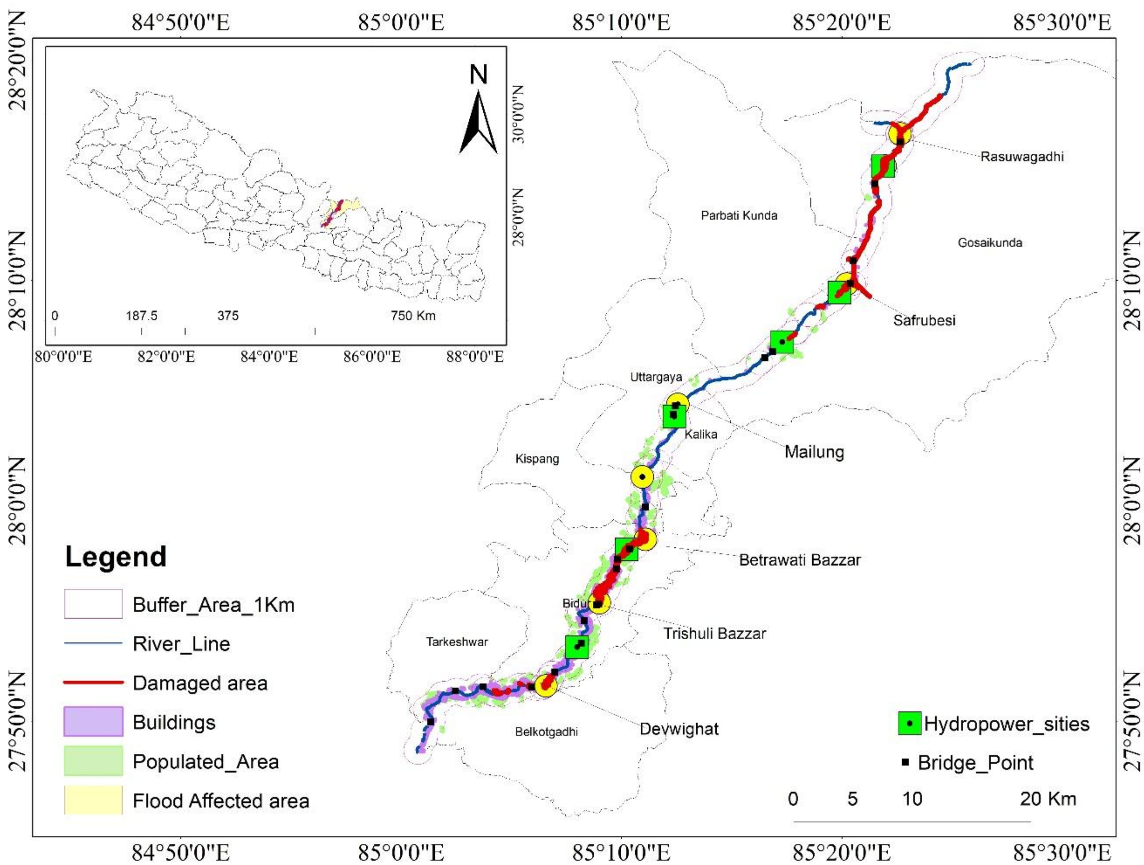

Figure 9: Flood affected area showing damaged area, hydro power sites within the 1KM of Buffer zone

Recent damage at Krishnavir along the Prithvi Highway has further disrupted a critical transport link, cutting an important lifeline to Kathmandu and neighboring cities, affecting the movement of people, goods, and essential supplies. The damage in Rasuwa, Nuwakot and Dhading districts to 9 commercial bank branches and 38 schools further caused disruption in public and financial services. The energy sector saw heavy damages, with 431.1 MW (roughly 10 percent of Nepal's total national grid capacity) shut down and 14 hydropower projects, totaling ~748 MW, including Rasuwagadhi, Chilime and Trishuli-3A, were damaged physically in the direct hit. In addition, 6 blocked transmission lines and the complete destruction of the Trishuli 220kV 3B Hub Substation were reported. Moreover, the full blockade of Rasuwagadhi–Gyirong road cut off the main northern overland trade route to China which destroyed Timure customs facilities, vehicles and goods, and the closure of the Langtang trekking circuit (which left over 519 foreign nationals initially cut off from the rest of the world) had a significant impact on tourism and its associated economic consequences on supply chains, business and household livelihoods.

2.2. Non-Economic Loss and Damage

Non-economic loss refers to loss of life, health, culture, ecosystems, and social fabric. The losses not reflected in the USD 4-5 billion figure above are central to how recovery should be designed and can be longer lasting than physical loss.

2.2.1. Loss of life and family structure

The catastrophe caused a devastating loss of human life across Rasuwa and downstream affected districts. As of 29 August, 626 people had died and 2,426 people remained unaccounted for, according to the NDRRMA, 29th August, 2026. Behind these numbers are ~93,000 individuals impacted, and many families' and communities' lives have permanently changed. The death or disappearance of family members, particularly household heads and main income earners, can leave families facing emotional distress, uncertainty, and serious social and economic challenges for years. For families of those still missing, the lack of information creates prolonged anxiety and prevents them from finding closure.

2.2.2. Loss of origin of place, culture, and social cohesion

The catastrophe has caused significant loss of origin/home, culture, and social cohesion among affected communities. Some communities along the river corridor had already been resettled following the 2015 earthquake, but the recent flood has displaced them again, with one settlement of around 250 households reportedly swept away entirely. Being forced to leave their homes and familiar surroundings has weakened people's sense of safety, belonging, and stability. The disaster has also damaged or destroyed cultural and religious sites, community gathering places, and locations connected to local traditions and knowledge.

2.2.3. Loss of educational continuity

The catastrophe significantly disrupted education in affected communities, with 18 schools destroyed and 20 schools damaged, impacting an estimated 10,000 or more school-age children. For children who have already experienced the trauma of losing homes, family members, or communities, the disruption of education can further affect their emotional well-being and development.

2.2.4. Loss of health, mental wellbeing, and psychosocial security

The catastrophe caused serious impacts on the physical health, mental well-being, and psychosocial security of affected communities. Survivors who witnessed family members, neighbors, or entire settlements being swept away may experience severe trauma, grief, fear, and emotional distress. The effects may continue long after the flood, with heavy rainfall, rising water levels, or weather warnings potentially triggering anxiety, panic, and post-traumatic stress responses. Children are particularly vulnerable, as many have experienced the sudden loss of their homes, families, schools, and communities while also facing disruption to their normal lives. These challenges further increase loss of livelihoods and separation of children from families. Women, girls, older people, migrant workers, and persons with disabilities may face additional difficulties in accessing health, protection, and psychosocial support.

2.2.5. Loss of biodiversity

The catastrophe's impact on biodiversity is largely unknown, but a flood of this scale can seriously affect aquatic and terrestrial ecosystems and the services they provide. Riparian floodplains (shrubs, wetlands, water channels, sandbars, and grasslands) support aquatic and terrestrial species, including the globally endangered Golden Mahseer (*Tor putitora*) and the vulnerable Asala/Snow Trout (*Schizothorax richardsonii*); these may have been severely affected or locally eliminated. These ecosystems also act as natural buffers that reduce flood risk and provide fishing and other livelihood resources. Loss of vegetation and riverbank destabilization may increase the risk of further erosion and landslides.

Figure 10: A section of river bank impacted by the floods

3. The Way Forward

This flood raises some critical questions: Why did we fail to anticipate the risk? Why did our warning system not work? Why were the impacts on lives, livelihoods and infrastructure so severe? And, most importantly, what could we have done differently to reduce such losses? These questions demand a deeper examination of how we understand, communicate and act upon risks in the Himalaya.

Although Nepal and China agreed to share cross-border glacial lake outburst flood (GLOF) risk information after a smaller-scale flood struck the same river system in July 2025, this event reminds us that information sharing alone is not enough. As extreme and cascading events become an increasing concern across the Himalaya, we need to rethink how scientific knowledge is translated into preparedness and action. There is a need to strengthen our understanding of the science behind such events—and, more importantly, to integrate knowledge across disciplines such as climate science, glaciology, geology, hydrology, meteorology and river sciences.

The most critical gap lies in the link between science and action. Preparedness must be grounded in science and supported by appropriate institutions. Early warning systems are only effective when risks are adequately understood, warnings reach the people at risk in time, and institutions and communities know what action to take.

We call upon the Government of Nepal to take the following immediate actions:

- Conduct a comprehensive assessment of losses and impacts.
- Strengthen scientific understanding of the event.
- Strengthen institutional mechanisms for risk anticipation and response.
- Develop infrastructure and river-corridor planning integrating ecosystem-based and risk-informed land-use planning.

Figure 11: Field Observation (Credit: Team)

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