AMAA
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Rapid Hazard Assessment Report

Location: Lirung massif, Lhende Catchment, Upper Trishuli Watershed

Country: Nepal/China border area

Lat: 28.288708°N - Lon: 85.528159°E - Elevation: ca. 5000 m a.s.l.

Date: 26th of August 2026

Local time: 08:37 am NPT (seismic impact) (10: 52 am CST), 08:44 am NPT flood impact

Hazard type: rock-ice avalanche, flood

Imagery: (Source of imagery consulted for assessment: Landsat 9; Planet, 26 August 2026)

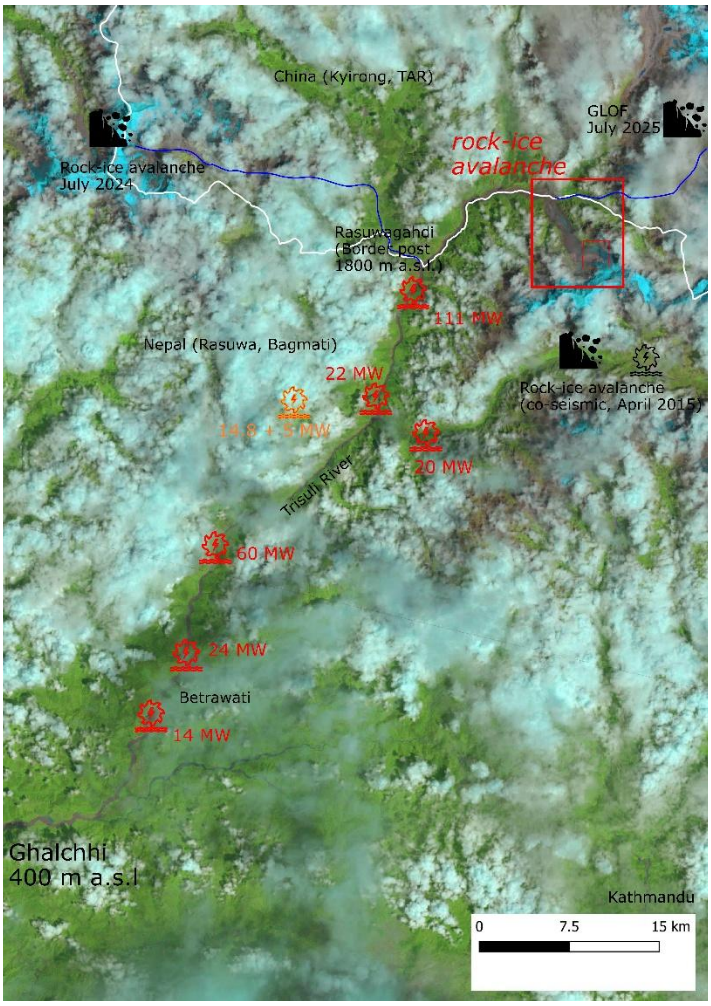

Figure 1: Complete flood path from the source north of the Lirung massif to Ghalchhi, from where the flood still travelled further. Destroyed and damaged (red, orange) and other (black) hydropower plants as well as recent relevant hazard events are also shown.

Preliminary process understanding:

At ca 8:37 am Nepal local time (10:59 am Beijing time) on 26th of August a flood wave hit the Nepal-China border post at Rasuwagadhi, washing away most infrastructure (Figure 1). The flood wave eventually travelled further south reaching Mugling more than 130 km further downstream

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at around 1 pm local time, causing significant damage along the way. Rough estimates of flow velocity reach above 30 m/s in the upper reach.

Satellite imagery (Planet, Landsat 9) just after the event revealed that part of a glacier (RGI2000-v7.0-G-15-05732), as well as the underlying bedrock down to a yet unknown, but apparently significant, depth had detached across a width of approximately 1 to 1.3 kilometers at an elevation of approximately 5200 m a.s.l., mobilising material in the proglacial terrain along its way and reaching the valley floor just below 3000 m a.s.l (Figure 2). Here the mass flow met with deposits from the Purepu GLOF event in 2025 (Zhang et al., 2026) and caused the Lhende Khola to dam, potentially only for a matter of minutes. The eventual failure of the deposit resulted in the flood that impacted large downstream swaths in China and Nepal. Photos from the source area confirm these observations (Figure 2 and 3).

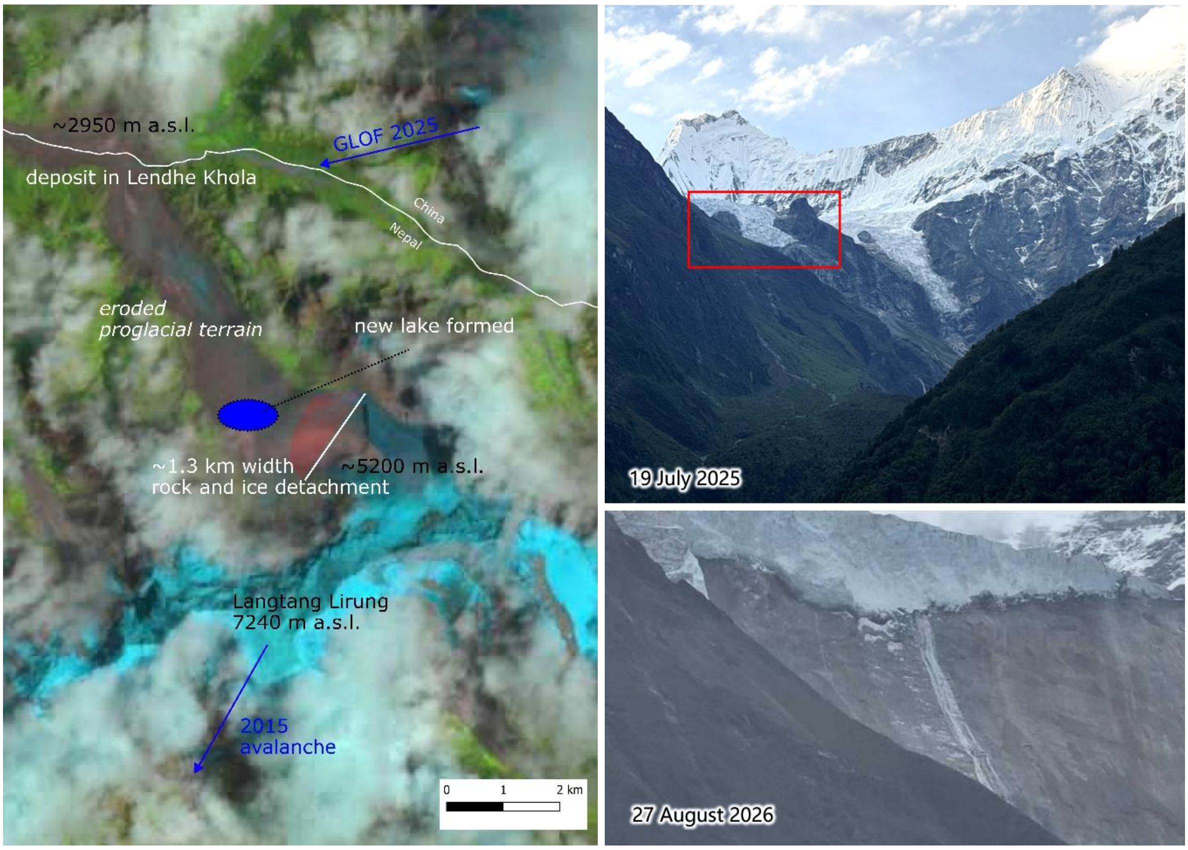

Figure 2: Focus on the source area showing before (2025.07.19) and after (2026.08.27) *the detachment and the location of the lake that formed (and remains till the time of writing). The figure on the lower right shows the failure zone after the event. Figure 3 shows the same area taken from below towards the source area.*

Large new sediment deposits are visible in the ca 100 km stretch between the glacier front and Galchhi in Nuwakot District, where Nepal's Pasang Lhamu Highway, the main trade corridor between Nepal and China meets the highway between Kathmandu and Pokhara (Figure 1).

Figure 3: Photographs of the source area after the event (left) and the eventual deposit (right) after failure. Note that some water remains in the lake.

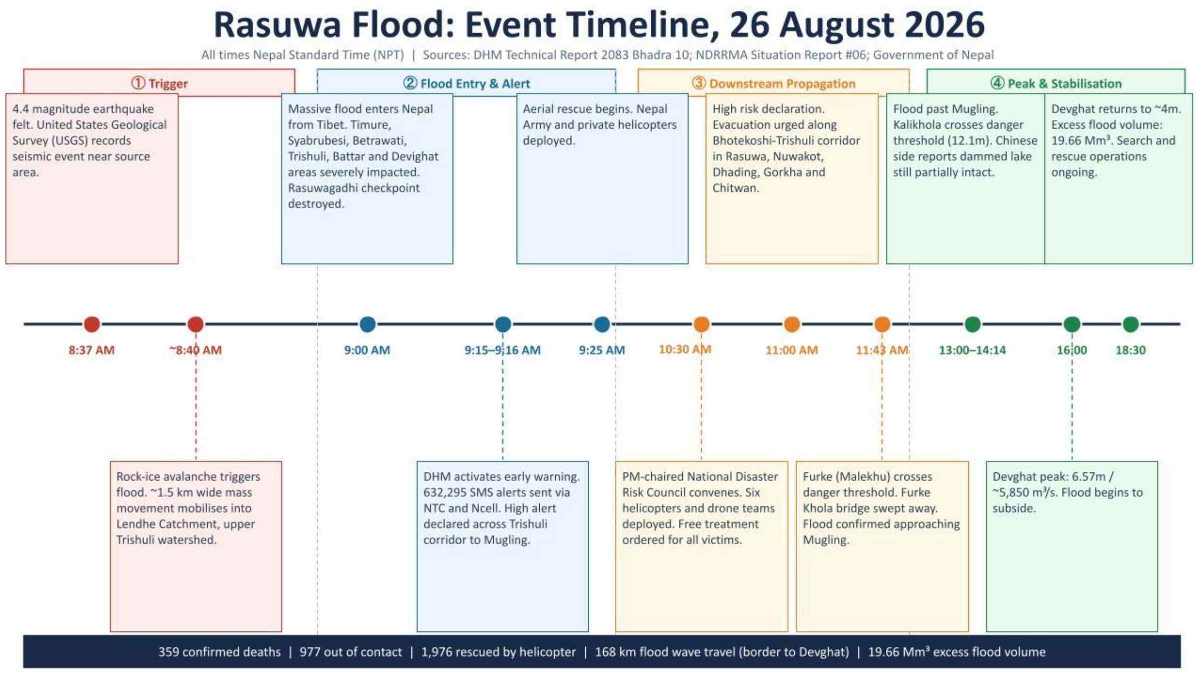

Figure 4: General timeline of events.

<u>Climate change context:</u> The glacier has receded 450 m between 1990 and 2020[1], moving over a *bergschrund* in the process. Over longer time scales, post-Little Ice Age recession of the glacier has likely had a debuttressing effect on the underlying bedrock slope, while permafrost is generally warming and destabilising mountain slopes. More recent rapid glacial recession potentially facilitated eventual failure processes. Temperatures in the area had been

[1] rds.icimod.org/metadata/b80287b9-2978-48c2-b386-bd5f1449d84f

comparable to recent years in previous months but were above average during the last month prior to the event (Figure 5). While this is just a rough approximation for such an extreme location, it could indicate the chance for excessive melt that could have contributed to the failure.

Rock and ice failures have been documented around the world (Baral et al. 2023; Mani et al. 2023; Bashkova et al., 2026), but definitively identifying links to climate change-related trends remains challenging. Climate change impacts on the local cryosphere, however, have been well documented in the adjacent valley (Ragettli et al., 2016).

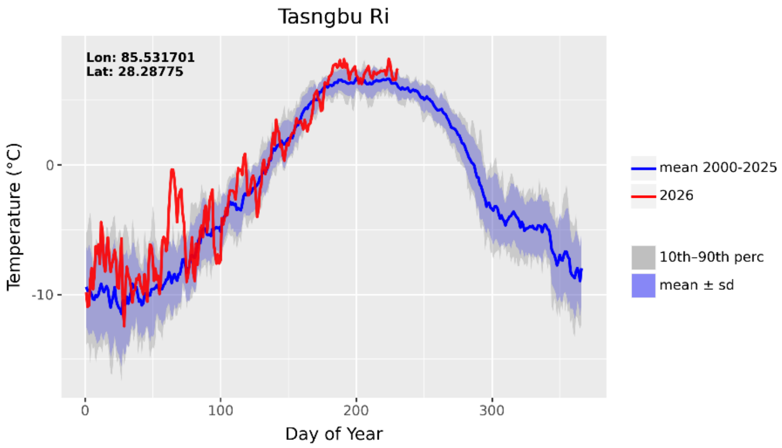

Figure 5: Temperatures from ERA5 at the approximate location of the failure.

Socioeconomic risk context: As of 28 August 2026, 469 people have been confirmed dead and more than 1000 remain out of contact. Preliminary government estimates put total infrastructure damage above NPR 200 billion (USD 1.3 billion). Separately, 12 hydropower facilities (representing a combined 431 MW of power generation capacity) and a 25 MW solar plant have been shut down - taking approximately 10 % of Nepal's total power generation capacity offline. 15 projects under construction (470 MW) sustained damage. The Trishuli 220 kV 3B Hub Substation, the hub for power in this corridor, was completely destroyed.

The Rasuwagadhi border checkpoint and road corridor connecting Nepal to China - still under reconstruction at the time of this event after a previous disaster - have sustained further damage, compounding fiscal losses on Nepal's primary northern import route. The optics of hundreds of tourists impacted or missing and the access to trekking routes in Langtang National Park will also likely lead to lasting economic impacts. The long-term impacts on Nepali economy of the 2025 GLOF has recently been documented[2] and the scale and intensity of this event is likely to cause far larger massive long-term impacts on infrastructure and economic activity.

A full breakdown of damage across human, infrastructure, energy, trade and social sectors is provided in Table 1.

[2] https://www.stimson.org/2026/climate-risks-to-nepals-energy-transition-loss-and-damage-from-a-glacial-lake-disaster-disrupting-the-trans-himalayan-ev-supply-chain/

Table 1: Overview on impacts.

Category	Indicator	Figure	Notes
Human Toll	Confirmed deaths	469	Dhading 33, Nuwakot 28, Rasuwa 19, Gorkha 32, Chitwan 139, others
	Out of contact	977	Incl. 519 foreign nationals, 85 Nepal Army, 28 Police, 13 APF, 60 HPP workers
	Injured	73	Rasuwa 43, Nuwakot 27, Dhading 3
	Rescued by helicopter	3,253	15 helicopters (6 Nepal Army + 9 private); 13,295 security personnel deployed
Infrastructure	Total damage estimate	NPR 200B (USD 1.31B)	Preliminary; roads and bridges only; excludes HPP damage. Rate: NPR 152.45/USD (28 Aug 2026)
	Bridges destroyed	68	33 suspension bridges and 35 motorable bridges
	Highway damaged	40 km	Betrawati–Rasuwagadhi corridor; road under reconstruction after 2025 GLOF
	Flood wave travel distance	168 km	Tibet-Nepal border to Devghat; peak flow ~5,850 m^3/s; excess volume 19.66 Mm^3
Energy Sector	Operational capacity shut down	431.1 MW (~10%)	12 HPP facilities + 25 MW solar plant; ~10% of Nepal's total installed capacity
	Under-construction capacity damaged	470 MW	15 HPP projects under construction
	Transmission	Destroyed	Trishuli 220 kV 3B Hub Substation completely destroyed; 6 transmission lines blocked
	Emergency response	500 units	Solar power banks deployed via AEPC; 19,000L diesel + 19,000L petrol dispatched
Trade & Finance	Rasuwagadhi corridor	Closed	Nepal's primary northern trade route; second disruption within 13 months (first: July 2025 GLOF)
	Customs office	Suspended	Rasuwa customs office at Timure; 15 staff out of contact
	Banking	9 branches	Commercial bank branches destroyed; 26 staff unaccounted for
	Tourism	519+	Foreign nationals out of contact; Langtang trekking circuit cut off; near-term revenue losses anticipated
	Gyirong Port (China)	Disrupted	Road, communications and electricity cut off on Chinese side of border crossing
Social Infrastructure	Schools damaged/destroyed	38	18 completely destroyed + 20 damaged; Rasuwa, Nuwakot and Dhading districts (UNICEF, 27 Aug 2026)
	Hospitals on standby	5	Trauma Centre, Bir Hospital, TUTH and others; 42 military/police doctors deployed to Nuwakot District Hospital; free treatment ordered
	Telecommunications	Disrupted	MoIC tasked with restoration; 632,295 SMS early warnings issued pre-flood by DHM (NTC: 432,635, NCELL: 243,660)
	Customs infrastructure	Destroyed	300+ vehicles swept away at Rasuwagadhi customs yard including freight trucks and containers

Preliminary flood assessments utilizing satellite indicate high exposure risks to at least 68 bridges were hit, including 33 suspension bridges and 35 motorable bridges and 40 km of highway were washed away. Open-access datasets indicate that 12,944 buildings are located within the floodplain, with structural heights up to 9 meters. The spatial overlap of satellite-detected inundation with critical transport connections and high-density multi-story buildings highlights the potential for substantial economic losses.

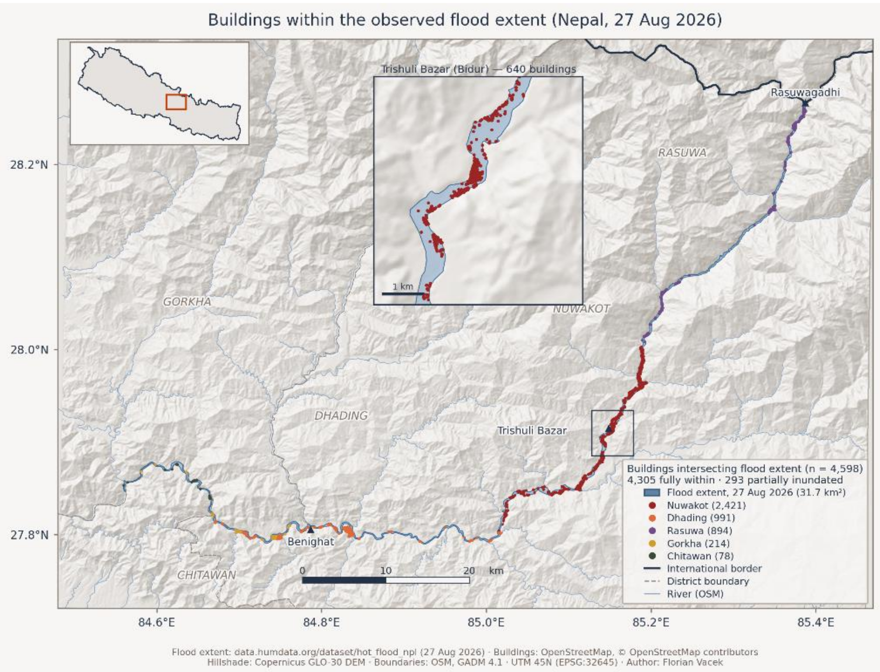

Figure 6: Preliminary exposure assessment (OSM HOT data, compiled by Florian Vacek)

Early warning: Early Warning Systems had been just set up recently in this region, focusing on several glacial lakes in China, but no operational EWS was set up in this place for glacier-related hazards. Given the rapid speed of the initial avalanche, warning time from conventional in-channel systems would have been minimal and likely insufficient for successful evacuation at the Nepal-China border check point at Rasuwagadhi. Further downstream, with warning times of 10 minutes or more, comprehensive and well-capacitated systems could have saved a significant number of lives.

In hindsight, there were some pre-event indications that the ice surface sped up just prior to the event towards the eventual failure location and melt water had turned visibly brown by the 24th of August. There is also some indication of a crack propagating into the surrounding bedrock slope in the days before the event. Additionally, the mass movement caused a seismic signal at a magnitude larger than 4, suggesting that such seismological systems could be used in future in seismic-based early warning setups across large scales.

Potential for recurring events: The Langtang Lirung massif has seen multiple large avalanches, especially following the 2015 earthquake, which are well documented (Zhuang et al., 2024). An additional rock-ice avalanche happened in July 2024 on the other side of Rasuwagadhi (Figure 1). At the moment, potentially unstable masses of rock and ice remain on the glacier, and lakes have so far not disappeared at the base of the valley, suggesting that – likely smaller – follow on events are possible. Particular concerns would be any heavy rainfall events, or rapid enlargement (and drainage) of glacial lakes further upstream. Many slopes downstream will now be undercut and destabilised, and an abundance of loose sediment will heighten the threat from any future flash flood events in the valley for months or years to come.

Literature:

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