A cascade, not a flood: testing the competing accounts of the 26 August 2026 Lhende Khola–Bhote Koshi disaster

Type: Case study — post-event characterisation, reporting a null result

Author: Ishfaq Gujree

Affiliation: International Cooperation Center for Mountain Multi-Disasters Prevention and Engineering Safety, Yangtze University, Wuhan, 430100, China

Email: koolishfaq@gmail.com; ishfaqgujree@yangtzeu.edu.cn

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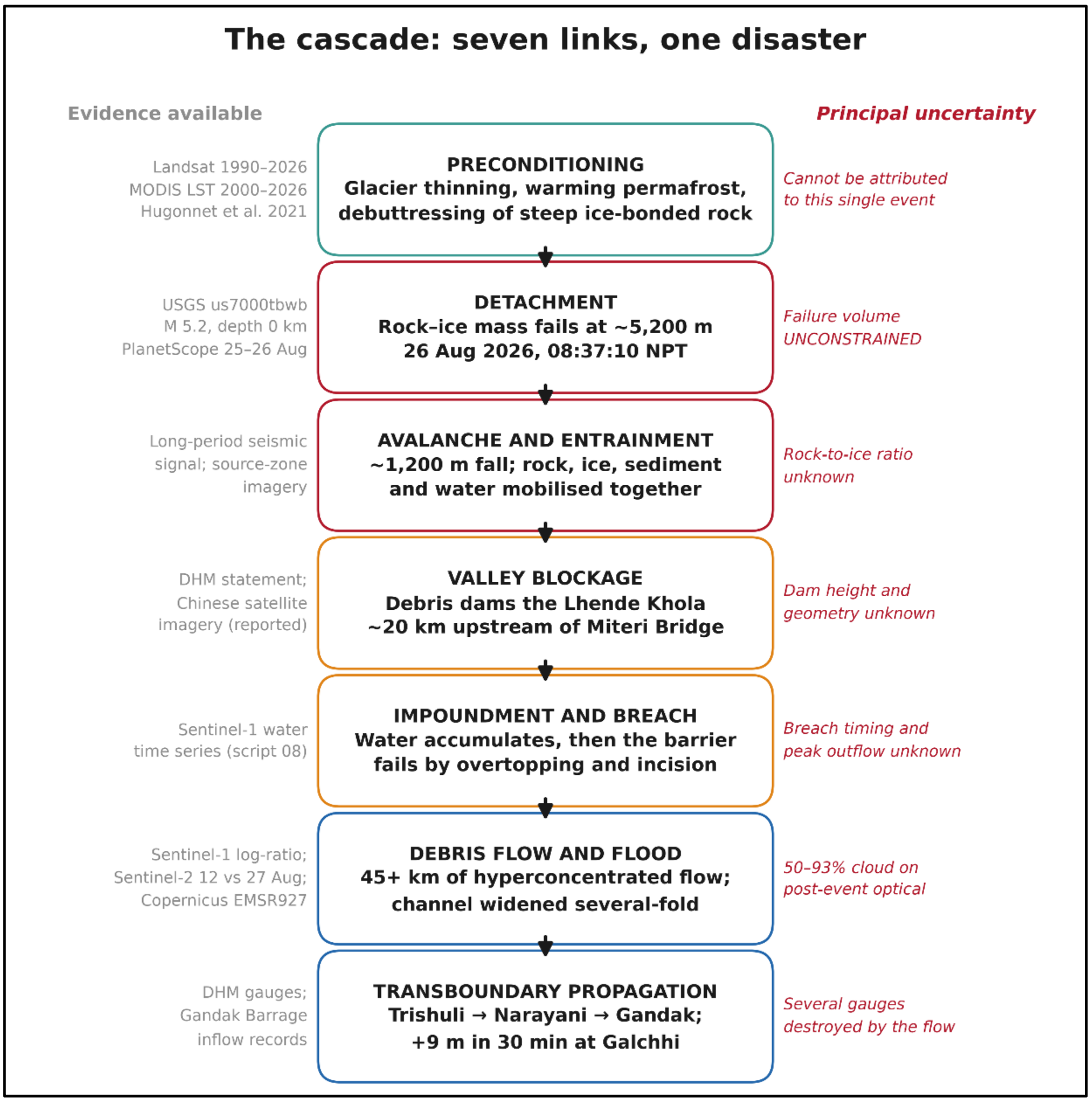
Abstract

On 26 August 2026 a rock–ice mass detached above the Lhende Khola on the China–Nepal border, blocked the channel, and released a flow that travelled about 100 km down the Bhote Koshi and Trishuli, killing hundreds of people and removing about a tenth of Nepal's generating capacity in a single morning. Reporting produced mutually incompatible accounts of the cause, while the agency best placed to judge states the mechanism remains undetermined. Five positions on the trigger are held by credible parties; each makes a prediction, and three can now be tested. Neither the ICIMOD glacial lake inventory nor a seven-year Sentinel-2 water-occurrence record finds a pre-existing surface lake of consequence in the source catchment — two methods agreeing to within 4%, with the detection limit stated. A proposed sequence in which the failure dammed the river for 18–19 hours predict a seismic signal the USGS catalogue does not contain. A stage–area–volume relation from pre-event topography alone, without empirical coefficients, reproduces the reported lake area and identifies which valley is impounded. The catalogue also holds a second failure three hours later, publicly noted but never characterised. Finally, the widely cited figure for capacity lost is only the operational half of a two-part official figure.

Keywords: cascading hazards; rock–ice avalanche; landslide dam; glacial lake outburst flood; Himalaya; Nepal; Bhote Koshi; Rasuwa; disaster risk reduction; transboundary hazard; Sentinel-2; null result.

A cascade, not a flood:

The event of 26 August 2026 entered the record under names the Nepal floods, the Bhote Koshi deluge — that describe the last link of the chain and not the process. What occurred was a cascade: a high-altitude rock–ice mass detached, descended roughly 1,200 vertical metres into the Lhende Khola, blocked the channel, impounded water, and released it when the blockage failed. The resulting flow travelled approximately 100 km along the Lhende and Trishuli channels (USGS, 2026). Only at that point did it become a flood, and by then it carried the



sediment load that made it destructive (Fig. 1).

Figure 1. The 26 August 2026 event as a process chain. A high-altitude rock–ice mass detached, descended into the Lhende Khola, blocked the channel, impounded water, and released it when the blockage failed. The flow became a flood only at that point, and by then it carried the sediment load that made it destructive. The right-hand column states the principal uncertainty attached to each link.

The distinction is not semantic. Flood warning, flood insurance and flood-return-period statistics all assume a hydrometeorological driver, and none applies to a mass-movement chain initiated in a glaciated cirque. Nepal's Department of Hydrology and Meteorology reported no significant rainfall in Rasuwa on 25 or 26 August: whatever destroyed this corridor, it was not the monsoon. Two independent satellite analyses use the process label this paper argues for. The UN Satellite Centre, mapping the event for the International Charter from CARTOSAT-3 imagery, titles its product an assessment of barrier lakes "following an ice-rock avalanche in Rasuwa District, Nepal" adopting both the mechanism and the location. The mislabelling is not confined to press coverage; it appears inside individual scientific documents. A satellite analysis published on 31 August 2026 by the International Research Center of Big Data for Sustainable Development Goals and the IRDR National Committee of China locates the event's origin at a "rock-ice avalanche source area" the process named correctly, once while describing the event as a mudslide throughout, including in its title. The source mechanism and the event label are being set independently of each other, and only the second is propagating.

My purpose is deliberately narrow–to fix the process description while the event is still being characterised, because a mislabelled event tends to stay mislabelled in the literature that follows.

What the seismic catalogue already settles

Early reporting attributed the disaster to a magnitude 4.4 earthquake. That came from an automatic solution the United States Geological Survey has since superseded. The reviewed entry (us7000tbwb) records a magnitude 5.2 surface-wave event at 02:52:10 UTC on 26 August 2026 (08:37:10 Nepal Standard Time) at 28.271° N, 85.515° E, depth fixed at zero, event type “Landslide”. USGS states that long-period wave analysis showed the energy was generated by a glacial collapse and debris flow. Three catalogue features argue against a tectonic origin independently of that classification (Fig. 2b): depth fixed at the surface, where tectonic ruptures in this belt do not nucleate; a surface-wave rather than moment magnitude; and a location residual of 11.91 s, an order of magnitude larger than a well-located tectonic event would give precisely what an emergent, long-duration mass-movement source produces when forced through a point-source algorithm.

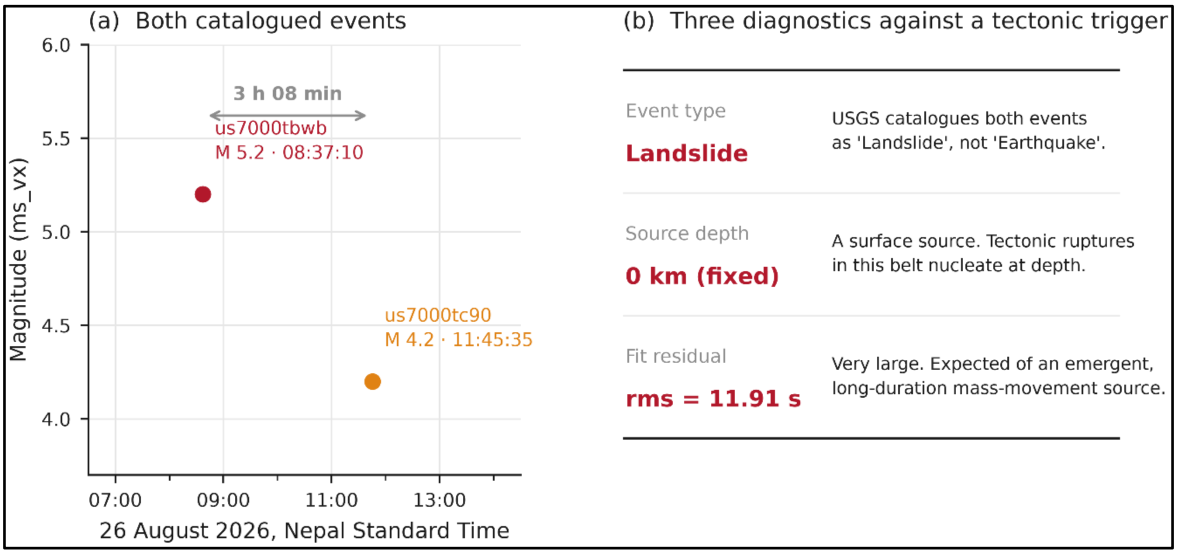


Figure 2: Two catalogued seismic events, both classified as landslides. (a) The only two events catalogued by the USGS between 27–29.5° N and 84–87° E for the whole of August 2026: the main failure (`us7000tbwb`, ms_vx 5.2) at 08:37:10 Nepal Standard Time, and a second (`us7000tc90`, ms_vx 4.2) 3 h 08 min later at the same source area. (b) Three catalogue diagnostics arguing against a tectonic origin independently of the USGS classification: event type, a source depth fixed at the surface, and a location residual of 11.91 s. There is no catalogued background tectonic seismicity in the source region. Retrieved from the USGS FDSN event service 29 August 2026 and re-checked to 1 September. The second event's location is inherited from the first rather than independently determined, and magnitude is not mass.

A fourth line comes from what the catalogue does *not* contain: a query across 27–29.5° N and 84–87° E for the whole of August 2026 returns two events and nothing else, with no catalogued precursory seismicity. This should close the earthquake-trigger question; it has not entirely closed in public discussion, and is worth stating plainly so the superseded figure does not propagate.

A second failure, three hours later

The catalogue contains a second entry (us7000tc90) is recorded at 06:00:35 UTC (11:45:35 NPT) the same day, magnitude 4.2, depth fixed at zero, type "Landslide", at the same coordinates as the first. The interval is 3 h 08 min (Fig. 2a, Table 1). Two cautions apply. The second event's coordinates are inherited from the first rather than independently determined: high-frequency energy was too weak for a separate solution. And a catalogue magnitude for a mass-movement source is not a mass estimate. Neither removes the observation. Its existence is not a new observation and I do not present it as one. USGS documents both signals on its event page, and Göran Ekström of the Lamont-Doherty Earth Observatory described the second event in press reporting on 27 August 2026, noting it raised the concern that the first failure had left the slope unstable. What has not happened is any "characterisation": no force-history inversion, no source-time function, no independent location, no mass estimate.

The event is routinely mentioned and nowhere analysed, and most reconstructions in circulation still treat the disaster as a single failure. That matters. It implies the source zone remained unstable for hours after the detachment a rescue-safety question as much as a scientific one. It offers a candidate mechanism for the barrier-lake behaviour, since a second mass arriving in an already-blocked valley would alter both the impoundment geometry and the timing of its failure. And any reconstruction treating this as a single instantaneous event is describing something that did not happen. Resolving it requires the raw broadband waveforms: long-period force-history inversion (Ekström & Stark, 2013) can recover the direction, duration and magnitude of the force the mass exerted on the Earth, and thence a mass estimate.

Table 1. The two catalogued seismic events

Quantity	Event 1	Event 2
USGS event ID	us7000tbwb	us7000tc90
Origin time (UTC)	26/08/2026 02:52	26/08/2026 06:00
Origin time (NPT, UTC+5:45)	08:37:10	11:45:35
Interval after event 1	-	3 h 08 min
Magnitude	ms_vx 5.2	ms_vx 4.2
Depth	0 km (fixed)	0 km (fixed)
USGS event type	Landslide	Landslide
Location residual (rms)	11.91 s	inherited
Location description	55 km NW of Kodari, Nepal	55 km NW of Kodari, Nepal

SOURCE: USGS FDSN event service, retrieved 29 August - 1 September 2026. Raw data: 03_data/seismic/2026-08-29-usgs-seismic-events.

Five positions on the trigger, four of them confident

The public record supports five positions, held by credible parties. Four are confident and mutually exclusive; the fifth is an explicit statement that the question is open (Fig. 3).

Five positions on the trigger — and what the discriminating test returned

Explanation	Held by	What it predicts	The test, and its result
H0 Undetermined **Either a landslide that incorporated glacier ice, or a glacial collapse.**	USGS Landslide Hazards Program (the agency that reclassified the event)	Makes no prediction. This is an explicit statement that the mechanism is not yet resolved — from the agency best placed to resolve it.	The baseline against which the four confident framings below should be judged. Any claim stronger than this needs evidence USGS did not have.
H1 Ice-rock avalanche **No pre-existing lake. Water from melted ice, entrained sediment and the river.**	Petley (Landslide Blog) Shugar (U. Calgary) ICIMOD	No persistent water body in the source catchment in any pre-event image. Impoundment appears only AFTER 26 Aug.	TESTED. ICIMOD inventory: no lake within 6 km. Sentinel-2 2019-2025: 0.013 km² off-channel water. → SUPPORTED
H2 Glacial lake outburst flood **An existing lake drained.**	Copernicus EMS activation text Chinese climate authority (reported)	A water body existed BEFORE 26 Aug and is absent or drained after. It should appear in existing inventories.	The same test, opposite prediction. Neither method finds a pre-event lake of any consequence. → NOT SUPPORTED
H3 Hybrid **Ice avalanche created a short-lived debris lake, which then burst.**	Parajuli, DHM Nepal Flood Forecasting Division	No pre-event lake, but a measurable lag between the collapse and the downstream surge.	Time offset between the 08:37:10 seismic onset and the gauge response. NOT YET RUN — needs the raw DHM records.
H4 Delayed breach **Failure dammed the river for 18-19 h; the 08:37 signal is the BREACH.**	Integrated Research on Disaster Risk (rapid analysis, 28 Aug 2026)	A mass failure on 25 Aug, large enough to dam the Lhende Khola, some 18-19 h before the 08:37 signal.	TESTED. USGS catalogue, all of August 2026: two events, both on 26 Aug. No 25 Aug signal. → NOT SUPPORTED

Figure 3. Five positions on the trigger, and what the discriminating test returned. Four are stated with confidence and are mutually exclusive; H0, that the mechanism is undetermined, is held by the USGS and by ICIMOD. For each position the figure gives the prediction and the observation. H1 and H2 predict opposite states of the source catchment before 26 August. The ICIMOD inventory holds no inventoried lake within 6 km of the detachment, and a seven-year Sentinel-2 water-occurrence record finds 0.043 km² of persistent water, of which 0.013 km² is off-channel in clusters of at least a hectare supporting H1 and not H2. H4's proposed 18–19-hour impoundment predicts a 25 August seismic signal the catalogue does not contain. H3's discriminating observation requires the raw DHM gauge records and has not been run. Optical sensors cannot see subglacial or englacial water, and absence from a catalogue is not proof of absence.

The first holds this was an ice–rock avalanche with no pre-existing lake, the water coming from ice melted by the collapse, from entrained sediment and from the river — the position of Dave Petley, Dan Shugar and ICIMOD. The second holds that an existing glacial lake drained; it appears in the Copernicus EMS activation text for EMSR927 and in reporting of the Chinese climate authority's assessment, and dominated early coverage. It is not unreasonable a priori: two outbursts have been reconstructed in this same basin the Poiqu, which becomes the Bhote Koshi on entering Nepal and ice avalanches from parent glaciers were the dominant trigger of both (Wang et al., 2024). The third, from Nepal's Flood Forecasting Division, is a hybrid: an ice avalanche created a short-lived debris-impounded lake which then burst. Its evidential basis appears to be satellite imagery passed to the Nepali government by China itself an instance of the data sharing discussed below, arriving after the event rather than before it. The fourth is a distinct sequence rather than a distinct trigger. The Integrated Research on Disaster Risk programme, in a rapid analysis of 28 August 2026, proposes the failure dammed the river for 18 to 19 hours before breaching at 08:30–08:37, with tributary inflow masking the blockage — placing the failure on 25 August and making the 08:37 signal the breach rather than the detachment.

The catalogue does not contain the signal that requires: two events, both on 26 August. A mass large enough to dam the Lhende Khola would be expected to register, the network plainly resolves mass movements here, and USGS types the 08:37 event as a "Landslide" at zero depth. Absence from a catalogue is not proof of absence, but the proposed sequence predicts a signal that is not there. The fifth is the most defensible: USGS states it is unclear whether the initial failure was a landslide that incorporated glacier ice or a glacial collapse — an explicit statement of unresolved uncertainty from the agency that performed the reclassification, in sharp contrast to the confident framings elsewhere. These are not stylistic differences. The first and second make opposite, imagery-testable predictions about the source catchment before 26 August. If a lake existed it should be visible in pre-event optical imagery and appear in the ICIMOD inventories; if not, impoundment should appear only after the collapse. That a pre-existing lake is unlikely has already been said in public: Göran Ekström noted on 27 August 2026 that pre-event satellite imagery showed no major lakes forming in the area. That statement is qualitative, and the word major is carrying weight no threshold or detection limit accompanies it. What follows is the same conclusion made measurable, on two independent lines, with its detection limit stated.

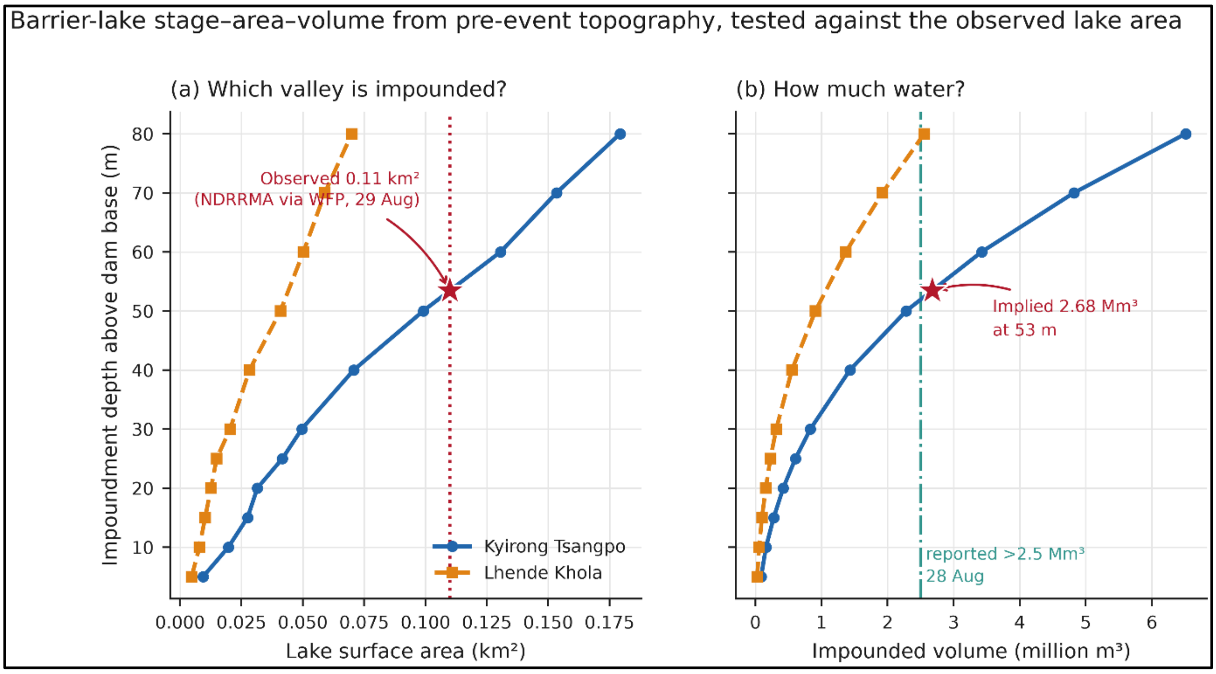
The ICIMOD inventory of glacial lakes in the Koshi, Gandaki and Karnali basins contains no inventoried lake within 6 km of the detachment; the nearest lies 7.3 km away, covers 0.042 km², and sits at 3,988 m, more than a kilometre below the source. This is not a detection limit: the same product maps ponds down to 0.0026 km². Independently, a record of late-ablation-season water occurrence from Sentinel-2, with a terrain constraint suppressing the shadow and wet-snow false positives that dominate high-mountain water mapping, finds 0.043 km² of water present in every one of the seven densely observed pre-event years, 2019–2025. Roughly 40% of that lies on the drainage network and is river. Grouped into connected off-channel clusters of at least a hectare candidate standing water bodies the total is 0.013 km². Two methods a decade apart an expert-revised manual inventory and an automated multi-year frequency analysis agree to within 4%. There was no glacial lake of any consequence in this catchment before 26 August 2026. Three limits attach. At 20 m resolution under seasonal snow a small supraglacial or moraine-dammed pond can be missed, and the smallest detectable lake must be quantified rather than assumed.

Neither method could detect an impoundment that formed and drained between overpasses. And subglacial or englacial water is invisible to any optical sensor: Kääb et al., (2018) showed it can be central to glacier collapses in western Tibet, and the one documented precedent in this basin 8 July 2025 was supraglacial. Some 15 million people worldwide live with exposure to glacial lake outburst flooding (Taylor et al., 2023), and the inventories built to manage that exposure are the ones this event bypassed. On this evidence, the inventories on which regional early-warning planning rests were addressing a hazard class that did not cause this disaster.

The quantities nobody has yet constrained

The gap between what is reported and what is measured is wide (Fig. 1, right-hand column). *The failure volume is unconstrained*: mean thickness, rock-to-ice ratio, bulk density and entrained mass are all unknown, and converting the catalogue magnitude to an energy — the widely quoted figure equivalent to several hundred tonnes of TNT — is an arithmetic transformation, not an independent measurement. The detached fraction has been estimated: the Indian Space Research Organisation reported on 27 August 2026, from Sentinel-2, Resourcesat-2A and Landsat-9 imagery, that "almost two-third of the glacier's body detached and collapsed". That is an area-based observation offered as a preliminary analysis, it carries no volume, and ISRO does not identify the glacier. Both candidate source positions fall inside a single mapped outline in the GLIMS database, `G085538E28285N`; the area recorded against that outline derives from 1974 imagery and should not be multiplied by a detachment fraction to manufacture a footprint. The blockage geometry is unknown, including the internal structure that governs whether it fails by overtopping, piping or incision.

The peak discharge is unknown; several gauges in the affected reach were destroyed by the flow. And the detachment elevation and fall height in circulation are journalistic renderings of expert statements, not published measurements. Two things have now been measured. The Chinese satellite analysis cited above reports channel widening along 97.2 km below the source and a rise in river water area from 6.39 km² on 12 August to 30.99 km² on 26 August, a factor of 4.85 an independently measured runout against the approximately 100 km inherited from reporting. It also records some 4.9 km of upstream backflow at Gyirong Port, a process detail unavailable from the Nepali side of the border. And one quantity can be constrained from topography alone, resolving a question of fact. Raising a water level over the pre-event Copernicus digital elevation model, with the fill confined to the upstream catchment of the dam point from MERIT Hydro flow directions, yields stage–area–volume curves for the two candidate blockage positions across the Lhende Khola / Kyirong Tsangpo confluence (Fig. 4, Table 2). No empirical scaling relation is used, and deliberately so: lake area and depth are only



weakly correlated across glacial lakes ($r^2 = 0.38$; Cook & Quincey, 2015), so a relation fitted elsewhere would import an error of unknown size into the one

Figure 4. Barrier-lake stage, area and volume from pre-event topography, tested against the observed lake area. Curves are computed by raising a water level over the Copernicus GLO30_2024_1 digital elevation model, with the fill confined to the upstream catchment of each candidate dam point derived from MERIT Hydro D8 flow directions. No empirical area–volume scaling relation is used. The two candidate positions lie one 90 m cell apart across the Lhende Khola / Kyirong Tsangpo confluence. (a) Lake area against impoundment depth: the observed 0.11 km², reported by NDRRMA via the WFP situation report of 29 August 2026, is reached only on the Kyirong Tsangpo branch. (b) The same curves against volume, implying 53.5 m of impoundment and 2.68×10^6 m³. The model surface is pre-event and contains no landslide deposit. These are volumes of valley drowned at a given water level, not volume held behind the real dam crest; agreement is a consistency check, not a measurement of the dam. A further caveat is owed. Satellite mapping for the International Charter, from CARTOSAT-3 imagery of 28 August, detects two newly formed barrier lakes rather than one approximately 12 ha near the border and approximately 19 ha some 2 km from the source area. The 0.11 km² figure modelled here is closest to the first of those, so the identification of which valley is impounded applies to that impoundment; a second exists upstream of it.

Table 2. Barrier lake stage, area and volume from pre-event topography

Depth above dam base (m)	Lake area (km2)	Volume (10^6 m3)	Note
10	0.02	0.16	
20	0.032	0.42	
30	0.05	0.83	
40	0.071	1.43	
50	0.099	2.28	
53.5	0.11	2.68	observed area; implied depth and volume
60	0.131	3.43	
80	0.179	6.52	

SOURCE: Copernicus DEM GLO30_2024_1 (30 m); fill confined to the D8 upstream catchment of the dam point from MERIT Hydro v1_0_1. Script: 04_code/python/make_barrier_lake_figure.py. Observed area from NDRRMA via the WFP Situation Report of 29 August 2026.

quantity this paper measures. The candidates lie one 90 m cell apart and behave quite differently: the observed area of approximately 0.11 km², reported by NDRRMA via the World Food Programme on 29 August 2026, is reached only on the Kyirong Tsangpo branch, while the Lhende-only branch does not exceed 0.070 km² at any modelled depth.

The observation therefore identifies which valley is impounded. Read at the observed area the curve implies 53.5 m of impoundment and 2.68×10^6 m³, consistent with the ">2.5 × 10^6 m³ and rising" reported a day earlier. The model surface is pre-event and contains no landslide deposit, so these are volumes of valley drowned at a given water level rather than volume held behind the real crest: a consistency check, not a measurement of the dam. Closing the failure-volume question requires differencing a pre-event surface against a post-event one, and the latter does not yet exist publicly. Until it does, failure volume should be reported as unconstrained rather than estimated.

Preconditioning, and what it cannot show

Himalayan ice loss accelerated markedly between the 1975–2000 and 2000–2016 periods (Maurer et al., 2019), and glacier thinning is well documented across High Mountain Asia (Hugonnet et al., 2021). The detachment occurred on a mapped glacier rather than bare rock: both candidate source positions fall inside GLIMS outline `G085538E28285N´, contributed by ICIMOD, in a catchment that is 39% glacierised. That is independent support for the rock–ice framing and does not depend on interpreting the event. Detachments of this kind may also be more frequent than long assumed (Kääb et al., 2021), which bears on how such slopes are treated in hazard assessment.

What cannot be demonstrated is that anthropogenic warming caused this particular collapse: single-event attribution for a slope failure requires a probabilistic framework and a counterfactual climate, and neither is available. The defensible statement is narrower and sufficient land surface temperature at the detachment elevation has risen measurably over the observational record, by about 2 °C across 2000–2025 in both the day and night series (Table 3), and warming acts on precisely the mechanisms governing rock–ice stability. This is warming and not thawing: mean summer night temperature there remains near −5 °C, so the surface has not crossed freezing, and land surface temperature is not air temperature. That is susceptibility, not causation.

Table 3. Land surface temperature trend at the detachment zone

Series	Trend (C/yr)	Change over 25 yr (C)	Mann-Kendall tau	p
Daytime	0.091	2.27	0.277	0.047 (marginal)
Night-time	0.08	2	0.407	0.0036

A corridor built into the flow path

The Bhote Koshi Trishuli corridor carries an unusual concentration of energy infrastructure. Compiled reporting lists fourteen projects damaged along the approximately 45 km reach that took the worst of the flow, spanning stations commissioned as long ago as 1967 and projects still under construction. The widely repeated figure is incomplete rather than wrong. Nepal Electricity Authority reported, on 26 August 2026, twelve operational projects totalling 431.1 MW removed from the grid; the Ministry of Energy, Water Resources and Irrigation reported the same day that fifteen under-construction projects totalling 470 MW were damaged. Almost all secondary coverage repeats only the first, so total affected capacity is roughly double the number in circulation — 901.1 MW rather than 430 MW (Table 4a, b & c). Two points of precision are owed. *The 431.1 MW is generating capacity, not hydropower*: it comprises 406.1 MW of hydropower reproducing exactly from the eleven projects NEA named and a 25 MW solar plant. And the share of national capacity is habitually misstated: the responsible minister put the loss at 10 percent of national generating capacity on the day, implying a baseline near 4,300 MW, while the widely repeated "one-eighth" requires the smaller end-FY-2024/25 baseline of 3,591 MW.

Three totals now circulate for the same event: 754 MW from the Ministry of Energy's district breakdown of 26 August, approximately 748 MW in the IRDR analysis of 28 August, and 901.1

MW from NEA whose eleven named projects reproduce that total exactly (Table 4b). The share of national capacity is stated three different ways in circulation (Table 4 c).

This is the same pattern as the casualty figures, in a second domain. The concentration itself is the point. This is the second severe flood on this river system in fourteen months; the 2021 Chamoli disaster destroyed two hydropower projects through an almost identical process chain (Shugar et al., 2021), and the 2023 South Lhonak Tso outburst destroyed the 1,200 MW Teesta-III scheme. A rock–ice avalanche terminating in a hydropower corridor is a recurrent Himalayan failure mode rather than an anomaly, and siting practice has not caught up with it.

Table 4a. Generating capacity affected - three official figures

Source	Date	Operational (MW)	Under construction (MW)	Total (MW)
Ministry of Energy - Rasuwa district	26-Aug-26	236	342.4	578.4
Ministry of Energy - Nuwakot district	26-Aug-26	123	52.6	175.6
Ministry of Energy - total	26-Aug-26	359	395	754
IRDR Rapid Analysis Report	28-Aug-26			~748
Nepal Electricity Authority	26-Aug-26	431.1 (12 projects)	470 (15 projects)	901.1

SOURCE: Nepal Electricity Authority, via NEA Spokesperson Rajan Dhakal, 26 August 2026; Ministry of Energy, Water Resources and Irrigation, 26 August 2026, via Minister Biraj Bhakta.

Table 4b. The eleven hydropower projects NEA named, and the arithmetic check

Project	Capacity (MW)	Type
Rasuwagadhi	111	hydropower
Salasungi	78	hydropower
Upper Trisuli 3A	60	hydropower
Sanjen	42.5	hydropower
Trisuli	24	hydropower
Chilime	22	hydropower
Langtang	20	hydropower
Upper Sanjen	14.8	hydropower
Upper Mailung	14.8	hydropower
Devighat	14	hydropower
Mailung	5	hydropower
HYDROPOWER SUBTOTAL	406.1	computed
Solar plant	25	solar
TOTAL (matches NEA's published 431.1 MW)	431.1	computed

SOURCE: Nepal Electricity Authority via NEA Spokesperson Rajan Dhakal, 26 August 2026.

Table 4c. Share of national installed capacity - three framings in circulation

Framing	Implied national baseline (MW)	Source	431.1 MW as a share
"one-eighth"	3591 (end FY 2081/82, 2024/25)	secondary reporting	12.00%
"10 percent"	~4311	Minister Shrestha, 26 Aug 2026	10.00%
"one-tenth"	4296 (date not established)	secondary reporting	10.00%

SOURCE: Minister Biraj Bhakta Shrestha, 26 August 2026, for the 10 percent framing; secondary reporting for the others.

Twenty minutes, and the arrangements that existed

Instrumental records report a stage rise of approximately 9 m within 30 minutes at Galchhi on the Trishuli and 7 m at Malekhu. ICIMOD reports the Bhote Koshi began to rise around 09:00 NPT roughly twenty minutes after the seismic onset. That is not much, but the signal was generated at the moment of detachment and recorded on the global network, while downstream settlements lie tens to hundreds of kilometres along the channel with correspondingly longer travel times. Establishing the usable lead time at each location requires the raw DHM stage records. The figures describing what that flow cost are themselves unsettled. Between 28 and 31 August the reported death toll roughly doubled 469, 616, 734, 903,987 while the missing rose from 937 to a peak of 4,247 and then fell back towards 4,000 as people were found (Table 5). The falling missing count is worth keeping, not smoothing: your argument is that these figures move, and this moves in the direction a reader does not expect

Table 5. Reported impact figures by source and date

Source	As of	Dead	Missing / unaccounted	Injured	Category wording used
IFRC Emergency Appeal MDRNP022	27-Aug-26	165	"thousands"		bodies had been recovered
Government of Nepal (via Japan MOFA)	28-Aug-26	469	937		died / missing
The Watchers	28-Aug-26	489	2381		bodies recovered / unaccounted for
GDACS summary field	28 Aug 2026 08:29 UTC	527			deaths - a false sum, see note
WFP Nepal Situation Report	29-Aug-26	616	1924		deaths / missing or out of contact
Press aggregators	29-Aug-26	669	2362	466	dead / missing
WFP Nepal Situation Report	30-Aug-26	734	2448	242	deaths / missing
Press (Al Jazeera)	30/08/2026 14:00	768	2715		dead / missing
NDRRMA bulletin via OCHA Flash Update #4	31/08/2026 09:00	903	4247	267	death toll / reported missing
Compiled reporting, Nepal	31-Aug-26	939	3925	1473	deaths / missing
Compiled reporting, Tibet (China)	31-Aug-26	16	546		deaths / missing
WFP Rasuwa Flood Response Situation Report	01-Sep-26	987	~4000		death toll / still missing; 11,000+ rescued

SOURCE: ReliefWeb v2 API retrieved 1 September 2026 - OCHA Nepal Rasuwa Flood Flash Update #4 (node 4227820), WFP Situation Reports 29 and 30 August, IFRC Emergency Appeal.

That much is a recovery operation proceeding. But sources also disagree for the same day: on 31 August NDRRMA through OCHA gives 903 dead and 4,247 missing, while compiled reporting gives 939 dead in Nepal and 4,471 missing across both countries, and the injured count differs by a factor of five. Part of the spread is definitional "bodies recovered", "died", "missing", "unaccounted for" and "out of contact" are not the same quantity, and at least one source merges two without saying so. Part is derivation error: the Global Disaster Alert and Coordination System publishes 527 deaths, the arithmetic sum of its own three fatality records, 359 + 165 + 3 (Fig. 5).

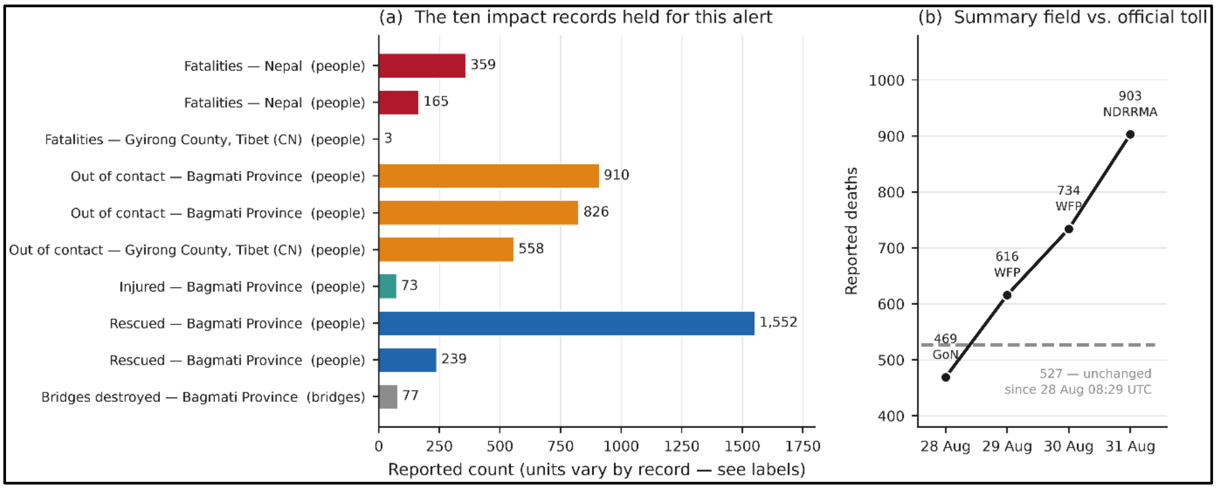


Figure 5. An automated alerting system's casualty figure against the official toll. (a) The ten Sendai-framework impact records GDACS holds for alert FL1104124, coloured by category; units differ by record and are stated on each label. (b) Reported deaths from 28 to 31 August 2026 — Government of Nepal, the WFP situation reports of 29 and 30 August, and the NDRRMA bulletin of 31 August reported through OCHA — against the value GDACS publishes as its summary field. That value, 527, is the arithmetic sum of its own three fatality records (359 + 165 + 3). Two are successive reports of the same Nepali fatalities, as the IFRC appeal independently confirms for the 165, and the third is in Tibet, so the sum is not a death toll. It has not changed since 28 August while the official toll roughly doubled.

Two are successive reports of the same Nepali fatalities the IFRC appeal independently confirms the 165 and the third is in Tibet, so the sum is not a death toll. Those records have not changed since 28 August while the alert itself was modified on 31 August: actively maintained without being updated. Automated alerting systems feed decisions taken in the first hours, and a figure wrong by construction is worse than one merely late.

On warning, the arrangements that existed were not designed for this class of event. The detachment occurred in Rasuwa District, Nepal, some 6 km inside the border; the flow crossed the boundary four times within its first 14 km before continuing into Nepal, and caused deaths on both sides. It would be wrong to call this an absence of cooperation. China and Nepal jointly monitor the transboundary lake Cirenmaco; Chinese authorities routinely share heavy-precipitation forecasts with Nepal's Department of Hydrology and Meteorology, and twelve days beforehand China's World Meteorological Centre warned of a monsoon depression with *"secondary and cascading hazards, including but not limited to landslides and flash floods"*. Officials met in Kathmandu on 27 May 2026 three months before the event — to discuss flood, weather and glacier hazard monitoring, with an agenda including joint glacial lake inventories. ICIMOD, serving both states, had assessed these basins in 2025 and identified 28 lakes as highly susceptible. In the response, Chinese teams worked alongside Nepali and Indian teams. What those arrangements were built for is worth stating plainly, because on the evidence they worked as designed. The joint monitoring covers slowly forming moraine-dammed lakes, where the hazard develops over seasons and an inventory is the appropriate instrument. The downstream gauges are configured for monsoon and perennial flooding, which is the dominant flood risk in this basin in most years. Neither was designed for a sudden rock–ice detachment in a valley holding no inventoried lake, and that is what occurred on 26 August. The source glacier had not been closely watched by anyone: Alton Byers, a mountain geographer with long Himalayan field experience, observed that it "had not been heavily studied or closely watched". The instrumentation that might have registered the wave lay in its path — four stations transmitted nothing after 08:40, and the public alert followed at 09:13

The lake test points the same way, from a different direction. The inventories, the joint monitoring and the bilateral data arrangement were all built around glacial lake outburst floods, and the evidence set out above is that this was not one. The gap is therefore one of scope, and it is narrow enough to name: what is not yet covered is movement in the source region itself glacier and slope displacement, at a cadence useful for warning. Nepali hydrologists have already identified this as their priority, which suggests an extension of the existing arrangement would meet a need both sides recognise rather than create a new obligation. It would also be a smaller step than building something new, since the channel, the institutional relationship and the technical contact are all in place. Transboundary data-sharing arrangements that lag the hazards they are meant to cover are a recognised problem across the region's river basins (Gujree et al., 2026). None of this depends on where the boundary lines. The line in this sector is undemarcated, and source-region mass movement is a hazard class for which no operational monitoring exists on either side — as is true of most such terrain across the range

What should happen next

Monitor the impoundment: Post-event cloud cover reached 93%, making optical monitoring unreliable — but a pre-event control test shows spaceborne C-band radar at 20 m cannot reliably resolve a water body of this size in this terrain, so the stage–volume curve read against a reported area is more defensible until higher-resolution radar is tasked. Anything with operational value while the lake remains impounded belongs with ICIMOD and NDRRMA now, not in a manuscript queue.

Recover the waveforms: The second failure is the most interesting unexplained feature of this event, and only the broadband records can characterise it.

Task a post-event DEM: Every volume, energy and mobility statement about this disaster is currently unconstrained and will remain so until a post-event surface exists.

Re-examine what the lake inventories are for: The lake test returns a null result, which means early-warning planning built on inventories of moraine-dammed lakes was addressing a hazard class that did not cause this disaster. Detecting a hanging glacier prone to detachment is a different problem requiring different instruments, and it is not currently anyone's operational responsibility in this basin. None of this requires waiting for peer review to begin.

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Data availability

USGS FDSN event service (events us7000tbwb, us7000tc90), retrieved 29 August 2026 and re-checked daily to 1 September 2026. USGS Landslide Hazards Program, "2026 Nepal Debris Avalanche and Flash Flood". Copernicus Emergency Management Service Rapid Mapping activation EMSR927. Copernicus Sentinel-1 and Sentinel-2 data, 2026. Copernicus DEM GLO30_2024_1; MERIT Hydro v1_0_1; MODIS MOD11A2; GPM IMERG V07, all accessed through Google Earth Engine. Glacier outlines from the GLIMS database. Glacial lake inventories for the Koshi, Gandaki and Karnali basins from ICIMOD. Administrative boundaries from the ICIMOD Nepal administrative boundary service. Impact figures from the NDRRMA bulletin of 31 August 2026 as reported in OCHA Nepal Rasuwa Flood Flash Update #4; the WFP Nepal Situation Reports of 29 and 30 August 2026; and IFRC Emergency Appeal MDRNP022 — retrieved through the ReliefWeb API on 1 September 2026. Bilateral cooperation and warning chronology from Reuters reporting of 30 August 2026.

The glacier detachment fraction is from the Indian Space Research Organisation's preliminary analysis released 27 August 2026. Statements by Göran Ekström and Alton Byers are quoted from Nature news reporting of 27 August 2026 (doi:10.1038/d41586-026-02716-w), which is journalism rather than peer-reviewed literature and is cited as such. Two further third-party analyses are cited and both are archived with their retrieval timestamps and SHA-256 checksums at `03_data/published_analyses/`. The alternative event sequence tested in the trigger section is from the IRDR Rapid Analysis Report — Scientific Anatomy of the 26 August 2026 Bhotekoshi Flash Flood, 28 August 2026. The channel-widening and backflow measurements, and the terminology observation, are from Rapid Disaster Impact Report: Satellite Remote Sensing Reveals Severe Mudslide Impacts along the China–Nepal Border, 31 August 2026, by the International Research Center of Big Data for Sustainable. Development Goals and the IRDR National Committee of China. These are two distinct products and are cited separately; they are not consistent with one another on the event sequence. Barrier-lake detections from the International Charter: Space and Major Disasters and the UN Satellite Centre, CARTOSAT-3 imagery of 28 August 2026. Barrier-lake stage–area–volume curves, the derived channel centreline and the analysis code are archived at doi:10.5281/zenodo.22242079, under CC BY 4.0 with the code additionally under the MIT Licence. That deposit is scoped to this paper: it holds the code producing the results reported here, the derived quantities the claims rest on, the five figures, and the provenance records with checksums for the third-party analyses cited. No third-party dataset is redistributed; each is named in the deposit's README with the identifier needed to obtain it.

The detachment position used here is 28.271° N, 85.515° E (USGS seismic solution); an image-based position at 28.2765° N, 85.5194° E gives the same district assignment. Both fall within GLIMS glacier `G085538E28285N` and, per the ICIMOD Nepal administrative boundary service, some 5.9 km inside Nepal in Gosaikunda Rural Municipality, Rasuwa District.

Sources cited as expert commentary rather than peer-reviewed literature:

Petley, D., The Landslide Blog; ICIMOD statements by *Qianggong Zhang* and *Mohd. Farooq Azam*; the *USGS Landslide Hazards Program event page*; *Reuters reporting of 30 August 2026*; Nature news reporting of 27 August 2026, quoting Göran Ekström (Lamont-Doherty Earth Observatory) and Alton Byers (University of Colorado Boulder), doi:10.1038/d41586-026-02716. The *WFP Nepal Situation Reports*; and two rapid analyses issued through *ReliefWeb Integrated Research on Disaster Risk* (2026). *IRDR Rapid Analysis Report* Scientific Anatomy of the 26 August 2026 Bhotekoshi Flash Flood, 28 August 2026. https://reliefweb.int/node/4227546- International Research Center of Big Data for Sustainable Development Goals and IRDR National Committee of China (2026). *Rapid Disaster Impact Report*: Satellite Remote Sensing Reveals Severe Mudslide Impacts along the China–Nepal Border, 31 August 2026. https://reliefweb.int/node/4227748. Neither is peer reviewed, and both are labelled as rapid analyses by their authors.

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