From Tragedy to Resilience

An Open Call for Global Action and Technical Collaboration in Nepal

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In the immediate aftermath of Nepal's tragic August 26th flooding, we issue this open call to action to our global community of engineers, scientists, policy experts, and the Nepalese diaspora. This catastrophic flash flood is a global crisis demanding an immediate, coordinated technical and humanitarian response. We must share feedback, drive evidence-based discussions, and mobilize collective expertise for disaster management, energy resilience, and climate-adapted infrastructure. Rebuilding Nepal's mountain corridors requires forward-thinking engineering capable of withstanding the compounding risks of geological hazards, hydro-meteorological threats, and climate change. Simultaneously, we urge the international community, major economic powers, and global research institutions to recognize their accountability and partner with us for knowledge-sharing in regards to stabilizing vulnerable mountain ecosystems. This open letter intends to reinforce the need for global collaboration and accountability in order to safeguarding our homeland's future.

Over the years, ASNEngr has driven several impactful initiatives including Nepal's flood preparedness, disaster recovery, and resilient infrastructure. The society publishes critical policy frameworks including its official position paper, "*Flood Preparedness, Mitigation, and Disaster Recovery in Nepal*" and hosts conventions and webinars on early warning systems, landslide mitigation, and floodplain assessments. Beyond technical exchange, ASNEngr mobilizes international diaspora fundraising campaigns to support the Prime Minister's Disaster Relief Fund in restoring vital infrastructure. To empower ground teams, the society also co-developed and trail-tested the crowdsourced Himalayan Disaster Response Portal for real-time hazard mapping. Through these efforts, ASNEngr bridges global diaspora collaboration and professional knowledge to address Nepal's critical environmental, infrastructural, and economic challenges.

Background

In the morning of August 26th, 20206, a 600-meter-wide slab of glacier and bedrock detached near the Nepal–China border, plunging over a kilometer into the upper Lhende Khola valley. The massive impact generated shockwaves recorded globally and was initially mistaken for a tectonic earthquake before being identified as a devastating debris flow driven by ice and a warming mountain. Millions of tons of ice and stone pulverizing on contact, and in doing so, generating enough frictional heat to instantly melt the ice around it. Within minutes it was a river possessed accelerating to nearly 180 kilometers an hour, tearing through the Gyirong Port border complex, crossing into Nepal's Rasuwa district, and roaring down the narrow throats of the Bhote Koshi and Trishuli valleys. At Galchhi, the river rose nine meters in half an hour. At Malekhu, seven meters. There was, for the people living along those banks, almost no warning at all.

The scale of what was lost

Numbers feel cold next to grief, but they're the only way to grasp what happened here. More than a thousand people are confirmed dead, and thousands other remain missing across Nepal. Debris and remains have reportedly been found as far as 240 kilometers downstream, into Nawalparasi district and across the border into India's Uttar Pradesh. Hundreds of foreign nationals are among the missing including the pilgrims and travelers from India, the United States, Ukraine, Australia, and the United Kingdom, many en-route to Mount Kailash. The physical toll is just as staggering. Damage to Nepal's economy is estimated above $2 billion. The Gyirong Port complex is destroyed, four hydropower stations are damaged, and the Friendship Bridge, a literal and symbolic link between two nations has been swept away. In the worst-hit areas, homes and highways lie buried under more than a meter and a half of mud, silt, and boulders.

From Peru to Rasuwa: The Accelerating Rhythm of Mountain Outbursts

If this story sounds familiar, that's because it is. Rasuwa is not a freak accident it's the latest, and deadliest, entry in a growing ledger of high-altitude disasters that stretches back generations. In 1941, a glacial lake outburst above Huaraz, Peru, killed over 4,000 people and wiped out a third of the city. In 2002, Russia's Kolka Glacier detached without warning, sending a surge at 150 km/h down 33 kilometers of valley, killing 125. In 2013, Kedarnath in India suffered a cloudburst and glacial lake breach that killed more than 6,000 pilgrims. In 2021, a rock-ice avalanche off Nanda Devi destroyed the Tapovan Vishnugad hydropower project and left over 200 dead or missing. And just last year, in 2025, a glacial lake outburst on the Bhote Koshi, the very river now swollen with grief again knocked out 8% of Nepal's power grid and destroyed the same Friendship Bridge that has now been lost a second time. Each of these events happened in a different country, a different decade, a different mountain range. What connects them is a single, uncomfortable pattern: glaciers have been losing ice at roughly twice the rate since 2000 as they did in the two decades before it.

Global Warming, Geological Hazard and Physics of Mountains

Why are these incidents occurring with such frequency? One must dig into thermodynamics as well as seismology for answers. The Hindu Kush Himalaya experiences elevation-dependent warming, meaning climate impacts arrive amplified at higher altitudes. Mountain permafrost acts as the "glue" holding steep rock faces and hanging glaciers together above 4,000 meters. As temperatures climb, this frozen ground thaws, allowing water to seep into fissures, build pore pressure, and compromise structural stability. Furthermore, under the Clausius-Clapeyron relation, a warmer atmosphere holds 7% more moisture per 1°C of warming. Consequently, high-altitude precipitation increasingly falls as rain rather than snow. Rain penetrates deep crevasses and lubricates the glacial bedrock, priming massive ice formations to destabilize over decades of accumulated thermal stress. Yet, whether this specific incident is purely the result of global warming or a deeper, inner geological hazard such as deep-seated rock displacement or intrinsic faulting within the mountain's structure remains a critical question that must be understood first. A rigorous probe utilizing advanced engineering and scientific knowledge is absolutely necessary before making a definitive, 100% conclusion that this was driven by climate impact alone. While the broader melting of Himalayan snow and permafrost due to global warming is an undeniable reality, the precise mechanics of how this very incident started: whether it was initiated by severe, rapid melting and the formation of a climate-driven crack in the ice, or a purely structural, geological failure far beneath the surface is not yet proven.

Unlike tectonic events like the 2015 Gorkha earthquake deep-seated subduction event beyond human influence, this disaster was triggered by impact, not a slipping fault line. However, if a scientific investigation confirm the climate link, this flash flood will stand as the most devastating direct climate-change impact Nepal has ever witnessed. Claiming above a thousand lives and causing upwards of $2 billion in infrastructure damage, it would serve as a tragic demonstration of what happens when high-altitude thermal stress pushes fragile geology past its absolute physical limit. Furthermore, this potential climate link brings us to a stark paradox of global responsibility. While the mechanical trigger was a physical event, a climate-driven weakening would point directly to a warming atmosphere fueled by nearly 38 billion metric tons of global CO_2 emissions annually. This would further imply a true injustice: Nepal contributes less than 0.05% of global greenhouse gases, with its average citizen producing just 0.6 metric tons of CO_2 per year compared to 14.9 tons in the U.S. and 8.0 tons in China. Yet, Nepal bears the brunt of the devastation. This cross-border catastrophe, originated near Nepal-China border surged through Nepal, and impacted India, proves that the atmosphere checks no passports. Therefore, any upcoming scientific probe must answer a fundamental question: Is this disaster purely an unavoidable, localized internal geological event, or is it a human-made environmental calamity expressing itself through a natural mechanism?

If there's anything to be salvaged from a tragedy of this size, it's the chance to finally act on four fronts:

- **First, build the warning systems that should already exist.** Nepal, China, and India must jointly invest in transboundary seismic monitors, satellite radar, and acoustic networks. These tools should detect glacier collapses instantly, triggering automated SMS alerts and outdoor sirens downstream before the water arrives.
- **Second, invest heavily in advanced scientific research to model complex mountain cascade physics.** Turn this disaster into a definitive case study for how dry avalanches spontaneously transform into high-velocity mud, rock, and water slurries. Researchers need dedicated resources to build predictive models integrating thermodynamics, mass kinetic energy, and non-Newtonian fluid dynamics. This physics must be paired with high-resolution terrain mapping to generate dynamic flood hazard maps for river basins, and vulnerable corridors.
- **Third, stop building for a climate that no longer exists.** 20th-century meteorological data cannot safely guide 21st-century engineering. Bridges, roads, and hydropower projects must be reinforced against weather extremes and built with wide, resilient floodplain buffers.
- **Fourth, assess a direct link with global carbon emissions and climate change.** Only by establishing a direct association between global emissions and this very glacier collapse can Nepal build an undeniable, scientifically backed case. Generic climate arguments are not enough when a reliable international funding mechanism for such catastrophes do not yet exist. Such empirical evidence can provide the leverage Nepal needs to demand climate justice and to unlock climate justice resilience funds and international Loss and Damage frameworks.

The mountain that gave way on August 26 took only minutes to fall, but the thermal stress that broke it was decades in the making. Ultimately, honoring the lives lost in Rasuwa requires more than temporary grief, it demands that the global community accept its shared responsibility. For Nepal, navigating the coming days will require a fundamental shift toward technical rigor: integrating multi-hazard risk modeling into engineering/design, shifting toward decentralized energy generation to safeguard national power grid stability against river-corridor hazards, and establishing climate-adapted floodplain zoning to protect future generations. Above all, this open letter serves as a call for extensive collaboration, knowledge-sharing, and active volunteering across engineering disciplines and international platforms, building a global handshake to uplift the country's resilience and safeguard its future.

Note: *The primary author of this open letter is Dr. Sajag Poudel, a U.S.-based Energy Scientist who serves as a Member of the Board of Directors and Technical Committee Chair for ASNEngr. His research focuses on energy systems, thermodynamics, energy infrastructure, and decarbonization. The views expressed in this document reflect his personal perspectives and represent an independent, voluntary effort outside of his professional workplace and any organizational affiliations.*