

Strengthening transboundary collaboration towards disaster risk reduction in the Upper Koshi Basin

The significance of local institutions

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KEY ISSUES

The Upper Koshi Basin region is extremely vulnerable to glacial lake outburst floods, landslides, floods, flood-induced debris flows, and earthquakes. The multi-hazard risks in this region cannot be managed without a proactive, transboundary, and multi-stakeholder collaborative effort between the two riparian countries – China and Nepal.

Since the channels of bilateral cooperation on disaster risk reduction (DRR) between the two countries are not defined and formalised beyond a memorandum of understanding, a key intervention strategy is to utilise available platforms for informal bilateral exchange as entry points for potential collaborations, test them for effectiveness, and formalise them as the opportunity comes.

A community-centric approach that promotes greater collaboration between DRR-related institutions of both countries at the local level can ensure that the interventions are implemented, sustained, and scaled effectively.

The Upper Koshi Basin region and its hazards

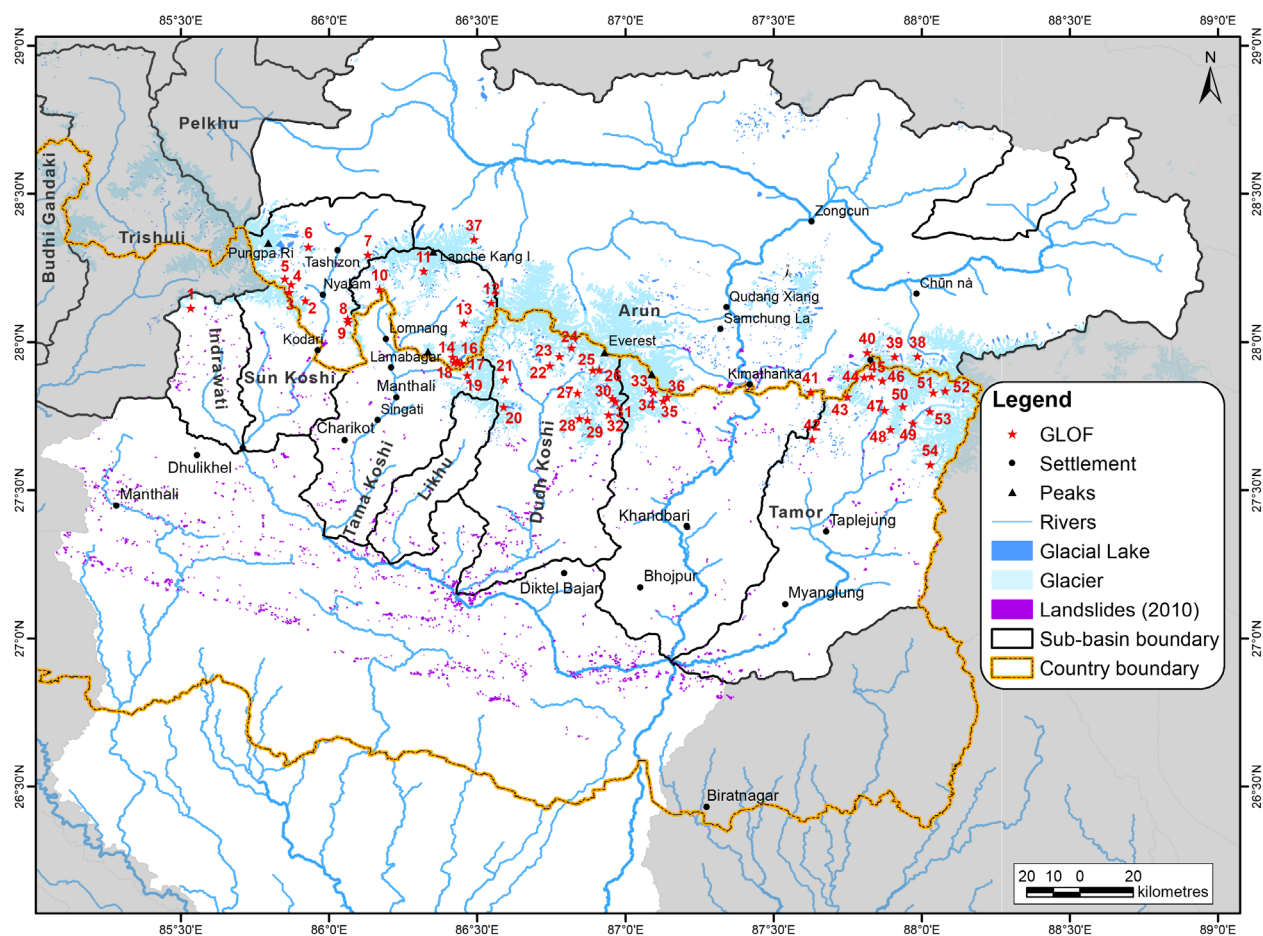
The Upper Koshi Basin (UKB) is a transboundary river basin shared by China and Nepal (Figure 1). Home to Mount Everest, the region includes mountain plateaus north of the Himalaya, the high mountains in the Nepal–China border regions, and the hills of eastern Nepal. The UKB is just over 80 per cent of the entire Koshi Basin in terms of area, but is sparsely populated and holds only 14 per cent of the Koshi Basin population. The geographic spread of the UKB is skewed towards Nepal and so is the population: the population on the Nepal side is approximately 5 million whereas it is just around 100,000 on the China side (in the Tibet Autonomous Region). As the Koshi River enters the plains of Nepal and further south in India, the population density jumps to more than double that of the UKB region. Any major disaster originating in the UKB region thus immediately poses a threat to a significant population (around 40 million) in the Lower Koshi Basin region. The Koshi River, known as ‘Sorrow of Bihar’ in India, is estimated to cause a billion-dollar damage annually¹.

The UKB region is prone to multiple disaster risks, ranging from high-risk events such as glacial lake outburst floods (GLOFs), landslide lake outburst floods, and earthquakes to relatively lower-risk but frequent events such as landslides, high precipitation or flood-induced debris flows, and forest fires. There are 40 potentially dangerous glacial lakes (PDGLs) in the UKB – 17 in Nepal and 23 in China². Recent increases

¹ Amjath-Babu, T. S., Sharma, B., Brouwer, R., Rasul, G., Wahid, S. M., Neupane, N., Bhattarai, U., & Sieber, S. (2019). Integrated modelling of the impacts of hydropower projects on the water-food-energy nexus in a transboundary Himalayan river basin. *Applied Energy*, 239, 494–503. <https://doi.org/10.1016/j.apenergy.2019.01.147>

² Shijin, W., & Tao, Z. (2014). Spatial change detection of glacial lakes in the Koshi River Basin, the Central Himalayas. *Environmental Earth Sciences*, 72(11), 4381–4391. <http://dx.doi.org/10.1007/s12665-014-3338-y>

FIGURE 1 THE UPPER KOSHI BASIN



in glacier ice melt have made these PDGLs more of a concern³. Twenty-two GLOF events have been reported in the area between 1935 and 2016. There have been 6,872 landslides documented during 1992–2015, about 97 per cent of which occurred in Nepal⁴. In 2014, the debris from the Jure landslide created a natural dam across the Bhotekoshi River in Nepal, creating an artificial lake 2.5 kilometres (km) across and 3 km in length, and generating an emergency alert in areas as far south as northern Bihar in India.

Economy of the UKB region

The high-altitude areas of the UKB region have low population densities, and the communities in the area predominantly depend on subsistence agriculture and pastoral activities for their livelihood. As one goes south to lower altitudes, the population density begins to rise and the economy becomes more diverse.

Transboundary trade features significantly in the livelihood strategies of communities living in the upper reaches of the region. There are an estimated 200 informal trading trails along the Nepal–China border, with at least a fourth of that number in the UKB region. Household food security and livelihoods in the area depend heavily on the operability of these trails; monsoon floods, landslides, and debris flows routinely damage these trails every year and disrupt local economies. Extended disruptions in the local trade during the Covid-19 pandemic resulted in loss of incomes and weakened food security in the region. Trade between China and Nepal also happens through five formally designated custom points, only two of which are connected by national highways on both sides. Of the two, the largest customs point – Tatopani – is in the UKB region, but has still not become fully operable after suffering damage during the Nepal earthquake of 2015 and from landslides that followed the earthquake. Around 40 per cent of the businesses in Tatopani town have closed in the last five years.

³ Confalonieri, U., Menne, B., Akhtar, R., Ebi, K. L., Hauengue, M., Kovats, R. S., Revich, B., & Woodward, A. (2007). Human health. In M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden, & C. E. Hanson (Eds.), *Climate change 2007: Impacts, adaptation and vulnerability. Contribution of working group II to the fourth assessment report of the intergovernmental panel on climate change* (pp. 391–431). Cambridge University Press. <https://www.ipcc.ch/site/assets/uploads/2018/02/ar4-wg2-chapter8-1.pdf>

⁴ Zhang, J. Q., Liu, R. K., Deng, W., Khanal, N. R., Gurung, D. R., Murthy, M. S. R., & Wahid, S. (2016). Characteristics of landslide in Koshi River basin, central Himalaya. *Journal of Mountain Science*, 13(10), 1711–1722. <https://doi.org/10.1007/s11629-016-4017-0>

In the last 15 years, the UKB region has become a major hub of hydropower development activity. It is estimated that the region has a theoretical potential capacity of 23,000 megawatts (MW) of electricity, of which up to 10,000 MW is technically feasible. Currently, the installed capacity of the region is 650 MW and an additional 3,000 MW is in different stages of construction. At an infrastructure development cost of roughly USD 2 million per MW, the UKB region is expected to see approximately USD 6 billion in investment in the hydropower sector. However, this investment is currently exposed to disaster risks. For instance, the artificial lake created in the Sun Koshi River following the Jure landslide of 2014 damaged two hydropower projects (the Sun Koshi dam and Sanima power house) resulting in millions of dollars in losses.

A third sector of economic significance in the UKB region is tourism. The region is rich in natural beauty and biodiversity, has scenic lakes, rivers, wetlands, protected areas such as Gaurishanker Conservation Area, and sites of cultural and religious significance. On the China side, the Tibet Autonomous Region government is actively promoting domestic tourism to leverage job creation, poverty reduction, and local economic growth⁵. On the Nepal side, the UKB region generates the largest share of mountaineering revenue for the government and has created thousands of jobs in the hospitality, aviation, trekking, white water rafting, and adventure tourism areas. The tourism sector has its own risk exposure to natural disasters and climate change. Tourism infrastructure such as hotels, airports, roads, and local trails are often exposed to the risk of landslides, debris flows, floods, erratic snowfall, and forest fires. Abnormal changes in weather patterns deeply affect adventure tourism and aviation services; the frequent occurrence of extreme weather events can make adventure and nature tourism less attractive and aviation services less reliable.

The state of transboundary collaboration on disaster risk reduction in the UKB

Effective transboundary collaboration on DRR requires, among other things, a reliable data- and information-sharing protocol, tested communication channels between key agencies across borders, periodic opportunities to share knowledge and practices, and some degree of harmonisation of weather, climate, and seismic monitoring, and remote sensing capabilities across borders. Currently, practices and capabilities on all four fronts are weak.

At a regional level, under an existing bilateral arrangement between China and India, China shares hydrological data of the monsoon months (June–October) from the Brahmaputra and Sutlej rivers with India. Similarly, China shares water discharge data from Brahmaputra River with Bangladesh. Nepal and China, however, do not have a formal hydrological data-sharing arrangement⁶. Nonetheless, the lack of a formal data-sharing arrangement between the two countries has not deterred data and information sharing for early warning and disaster response purposes. There are instances when the sharing of time-critical, early warning information has saved lives and protected infrastructure.

During the 2021 monsoon, for instance, information of a lake build-up in Tingri County in China was passed on to Nepali authorities through the Chinese embassy in Kathmandu, triggering an early warning response along the Tama Koshi River. A flood warning system is installed on the Nepal–China border at Tatopani, with two receivers downstream in the Nepal side to protect settlements and hydropower plants along the Bhotekoshi River. The lead time provided by this system, however, is too short (5–7 minutes). A data- and information-sharing protocol between Nepal and China, for instance, could readily increase the lead time if additional transmitters were to be installed upstream in Nyalam County in China.

Scope to leverage Nepal–China bilateral relations for improved transboundary collaboration on DRR

Bilateral diplomatic relations between China and Nepal are now more than six decades old. Traditionally, China's engagement with Nepal had been limited to development cooperation and trade. In the last 10–15 years, bilateral engagements between the two countries have become multi-faceted and cover trade concessions, transit facilities, cultural and educational exchanges, facilitating investment, connectivity infrastructure, tourism, commercial agriculture, and DRR. In 2019, Nepal's Ministry of Home Affairs and China's Ministry of Emergency Management signed a memorandum of understanding (MoU) to enhance bilateral cooperation on DRR. The MoU covers, among other things, sharing data and satellite imagery, official exchanges, training and capacity-building, and early warning systems. The MoU is of particular significance to the design of the DRR programme in the UKB as it provides a formal basis to engage DRR institutions from both countries.

⁵ Ji, Z., Xu, H., & Cui, Q. (2022). Tourism and poverty alleviation in Tibet, China: The role of government in enhancing local linkages. *Asia Pacific Journal of Tourism Research*, 27(2), 173–191.

⁶ Rahman, M., Gurung, G. B., & Ghimire, G. P. (2018). Trans-border flood early warning system in South Asia: Practices, challenges and prospects. Practical Action.

Besides the national-level bilateral cooperation framework, there are informal, local-level avenues for collaboration and pre-existing practices that can be further strengthened for effective DRR in the UKB. There are routine exchanges between border security agencies that cover the exchange of DRR-related information. Counties in China and municipalities in Nepal that share borders have established local communication channels that have proven to be particularly useful in DRR responses. DRR-related institutions at the local level, including those involved in hydrometry and seismic monitoring, can engage under a local communication protocol, particularly during crises, if local information exchange platforms are strengthened. At a more informal level, communities living across the border have economic as well as social relationships that can assist in strengthening community-level resilience in the border regions.

People and policymakers from both countries are acutely aware of the fragility of mountain ecosystems, the challenges in supporting sustainable human habitats in the high mountain areas, and the potential cascading risks that climate change and geological factors have begun to exacerbate. There are compelling reasons to mount a shared response to shared risks. China has made significant progress in understanding and managing disaster risks in the recent years. Disaster-related deaths and damage in China have reduced by 52 per cent and 47 per cent, respectively, compared to five years ago⁷. From the perspective of knowledge and practice, China has a lot to share, and Nepal can potentially benefit from a deeper collaboration with China.

Strategic approaches to designing a DRR programme in the UKB

Convene transboundary forums to establish space for collaboration. The attention and internal priorities of national agencies with wide-ranging mandates, such as the National Disaster Risk Reduction and Management Authority in Nepal or the Ministry of Emergency Management in China, are likely to be spread across a diverse set of issues and geographies. To ensure that DRR in the UKB remains in focus on both sides of the border, periodic transboundary forums designed to promote collaboration among government agencies and other actors from both countries must be prioritised during the first 2–3 years of project intervention. Such forums may, with time, eventually become a platform for routine bilateral exchanges. The entry point for advancing transboundary collaboration

can be issues with pre-existing traction, such as the flood information and communication channel that was activated during the lake build-up in 2021 upstream of the Tama Koshi River.

Localise communication channels and engagement platforms. Within the rubric of the formal bilateral cooperation framework – such as the 2019 MoU between Nepal's Ministry of Home Affairs and China's Ministry of Emergency Management – efforts should be made to promote localisation of collaborative platforms and communication channels to the extent possible. Most disasters tend to have highly localised impacts; communities and institutions in the locality are usually in the frontlines of risk management and recovery efforts and they tend to be more receptive to DRR programmes compared to central-level institutions operating from national capitals. Localised early-warning information sharing has played a positive role in previous disasters, and such community-based early warning systems and response platforms should be further strengthened to reduce mobilisation time and increase the effectiveness of responses. Such systems are inexpensive to set up and more amenable to community engagement and participation.

Mitigate the most critical asymmetries in capacities. There are asymmetries in respective capacities between DRR institutions in China and Nepal. Some aspects of these asymmetries cannot be resolved as the two countries are very different in terms of the size of their respective economies and stages of growth. There are, however, some critical functions in which asymmetries in capacity can immobilise transboundary collaboration, such as data collection and management systems, communication systems and technologies, and response protocols and practices. These should be prioritised for intervention. The capacity development component of the programme should identify the most critical gaps in capacity between the two countries' systems and make prioritised investments in areas that require most urgent interventions.

Leverage private sector interests in protecting key infrastructure installations. The three core sectors of the economy in the UKB – trade, tourism, and hydropower development – are very sensitive to disaster risks and have been significantly disrupted by disasters in the past. The three sectors also engage a wide range of stakeholders and private investors who have an intrinsic interest in DRR. This constituency is politically powerful and well-resourced to support DRR efforts. Their formal and informal engagement is needed to protect these infrastructures, and diversify and reduce

⁷ Amach, O. (2021, May 12). *China cuts disaster mortality by half and calls for strengthening cooperation around risk reduction*. United Nations Office for Disaster Risk Reduction. <https://www.undrr.org/news/china-cuts-disaster-mortality-half-and-calls-strengthening-cooperation-around-risk-reduction>

the related financial risks, and cultivated throughout the intervention period. Private sector resources can become an important factor in sustaining systems and institutional platforms established by the project.

Focus on community perceptions for improved scaling. The eventual beneficiaries of the project interventions are the communities living in the UKB. Government and community support for sustaining and scaling the project interventions will not come forth until communities begin to recognise the value of the interventions in protecting their lives, assets, and livelihoods. Since a project cannot invest in all communities living in the region, it must demonstrate utility, viability, and scalability of the interventions through its pilot locations. In doing so, the pilot programmes must be able to demonstrate a tangible change in the disaster-related threat perceptions in the communities. Success in this effort is likely to generate long-term political support for a strengthened transboundary collaboration on DRR.

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