

POLICY BRIEF

Traditional and local knowledge to disaster risk reduction

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Traditional knowledge of planting vegetation on verges and slopes for slope stabilization needs to be promoted in the local development program

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SUMMARY

Landslides and soil erosion represent two common phenomena in mountainous regions, induced by heavy rainfall, floods, and human activities along the slopes. The practice of using vegetation to enhance slope stability is established in mountainous areas in Nepal and is deeply ingrained in traditional farming management, such as hedgerows, slope site plantation and agroforestry. Such techniques are gradually diminishing within the newer generations due to shifts in livelihood practices and a growing emphasis on engineering-based solutions. We advocate the integration of these practices into local development programs, which predominantly prioritize costly measures like embankments, gabion walls, and roadside canals. This shift not only offsets cost but also provides multiple benefits, including soil protection, the increase of green spaces, and biodiversity. There is a need for guidelines to promote traditional knowledge of planting vegetation on verges and slopes for slope stabilization.

Background

Nepal faces multiple disasters due to its highly steep mountain slope, fragile geological structure and location in seismically active regions (Bhandari et al. 2020). Landslide is the common natural hazards in the hilly region, which is triggered both by natural (e.g., slope, geology, rainfall intensity) and human factors (e.g., deforestation, unplanned infrastructure development). People use various types of knowledge to minimize the risk of soil erosions and landslides, ranging from terrace cultivation in slopes and the development of hedgerows and agroforestry to land use patterns (e.g., too steep areas are often left for forest and grass) (Chaudhary et al. 2021). One of the key practices includes the plantation of vegetation to enhance slope

stability. This approach is cheap, environmentally friendly, sustainable, and enhances ecosystem services, such as biodiversity conservation and carbon sequestration (ADB 2020).

The local community along the Arun River section uses both woody and herbaceous vegetation to stabilize slopes depending on location-specific requirements and species composition. Bamboo and fodder-rich species are planted along river banks and in areas susceptible to erosion and landslides. Herbaceous vegetation is planted in verges and hedgerows, which provide ground protection, and mechanical strength and reduce water travelling time. Thus, they reduce both floods and soil erosion and minimize the risk of the gully erosion.

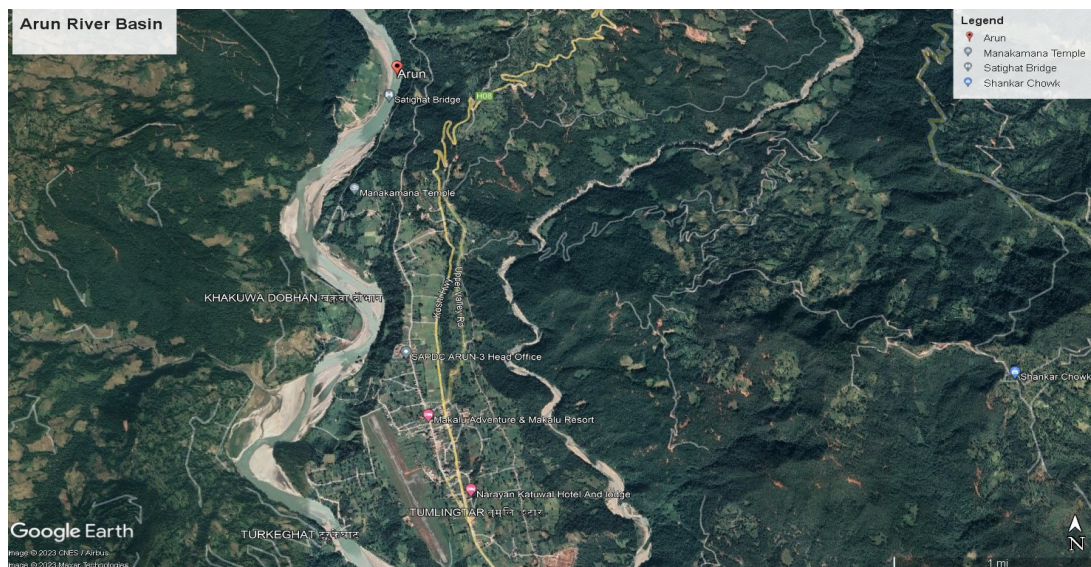


Figure 1. A section of Khadbari Municipality along the Arun River

The policy brief highlights such knowledge documented in the Arun River, Sankhuwasava District (Fig 1).

Challenges

Slope stabilization is a critical aspect of land management

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in mountain areas because mountain slopes are prone to soil erosion and landslides. Local communities have been effectively managing slopes using diverse strategies (Nalau et al. 2018; Rai & Khawas 2019). The terrace with hedgerows is common on mountain slopes. The steep and unstable areas are left for vegetation such as bamboo and fodder species that provide essential livelihood resources. River floodplains are allocated for paddy crops that are limitedly impacted during regular floods. While such traditional knowledge is a time-tested and proven strategy to disaster risk reduction, such knowledge is now confined to older generations due to the high outmigration of young generations and the change in farm-based livelihoods to service-based livelihoods.

Hedgerows and agroforestry for slope stabilization at the community level are observed throughout the Arun River basin in Eastern Nepal (Figure 1). We have noted that this practice is almost forgotten among younger generations. During conversations with local people (Fig. 2) in Dhankuta, an old man in his 80s took us to the field where he planted bamboo about a decade ago, which has been preventing soil erosion. He shared that he learned it from his father and expressed his concerns about the swift negligence of such practices in recent years.

We met an old woman in Tumlingtar who, out of fear of a landslide behind her home, complained, 'I live in constant distress, wondering when my home might be swept away. We used to plant on the slopes and were safe, but now nobody cares.' In another conversation, a woman in her early 30s pointed out her backyard with a steep slope, which was experiencing advancing gully erosion. She shared that planting shrubs and trees like bamboo and other fast-growing plants on the verges effectively controlled erosion and saved her house. She fondly recalled the moments when her parents and grandparents planted particular species in such areas.

The local municipal government, Khadbari Municipality, is adopting an engineering-based approach in slope management (e.g., concrete structures) and drainage construction along the roadside (e.g., concrete drainage, etc.). The Chief Executive Officer of this municipality confirmed the absence of nature-based solutions in the municipal

development plans due to limited information. Instead of making recurrent large investments in engineering solutions, the local government can use a hybrid approach to maintain slopes and greenery. This represents a cost-effective and sustainable alternative.

Policy Recommendations:

Integration of ecosystem-based adaptation into development plans:

Municipalities should incorporate ecosystem-based adaptation for disaster risk reduction into their development programs. This includes the utilization of traditional knowledge-based slope stabilization techniques during road construction, infrastructure development, and land-use planning. Urban green spaces and urban forestry are very limited, and there is a sweeping neglect of local plant species. There is a need for guidelines or protocols and a monitoring and evaluation system to effectively integrate such protocols and guidelines.

Financial Incentives and Support: The government should offer financial incentives and support to encourage the adoption of traditional practices. Establishing nurseries for native plant species and making them accessible to the local community is required.

Capacity Building: Capacity building is a crucial component for effective integration as it helps impart the necessary skills and knowledge to carry out traditional slope stabilization practices effectively.

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Figure 2. Bamboo protects agricultural land from landslides and erosion

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About Us

This policy brief is part of a project titled “*Enhancing ecosystem-based adaptation to disaster risk reduction in the Himalayan river basin: Integrating traditional and local knowledge in disaster management plan in Nepal, India and Bangladesh*” which is funded by Asia Pacific Network for Global Change Research under grant number *CRRP2021-04MY-Paudel*. More information about the project can be found on the [APN](#) and [KIAS](#) websites.

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