



Interactions between the dynamics of a small “landslide catchment” and new infrastructure development: the Ghatte khola, Myagdi District, Nepal Himalaya

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Small river catchments play a major role in the overall denudation of the Himalayas, because they may generate extreme geomorphic events. Their potential impacts on the morphology and dynamics of trunk rivers may also affect new infrastructure and settlements located along the valley floor.

The Ghatte Khola, an intermittent tributary of the Kali Gandaki (Myagdi District, Western Nepal), flows across the Dana village. It is affected by occasional debris flow events, caused by the reactivation of a persistent planar slide zone (dip slope) by pre- or monsoon heavy rainfall on the upper, forested catchment. The narrow channel of the upstream part of the tributary is temporary clogged by landslide masses, until sudden, landslide outburst floods occur. Downstream, where the channel is entrenched across a 5-8 m thick debris fan, the occurrence of successive debris flows has caused bank erosion and stream channel widening. At the junction with the Kali Gandaki, the flows may aggrade debris volumes large enough to impede the Kali Gandaki for a few hours and cause the level of this major river to rise more than 5 m upstream. During the last 40 years, pulsed aggradations transferred erosion point to the opposite (left bank) side of the Kali Gandaki. This ephemeral, yet threatening behavior of the stream, occurs every two or three years, according to field investigations (geomorphic mapping, sediment analysis, repeated photographs), completed by interpretation of satellite images and interviews with villagers.

The Kali Gandaki road, open in 2007, is currently extended to a 2-way tarred road, as an annex of the new “Silk Road” that will cross Mustang down to Lumbini at the Indian border and called “the Kali Gandaki corridor”: it will foster both international and local trading and tourism. In this context, the dynamics of the Ghatte “landslide catchment” represents a direct threat, that should be considered prior to any new settlement and infrastructure design. Yet, at Dana, the ongoing construction of a concrete bridge modifies the natural dynamics of the stream channel. In addition, the creation of a transformer field (in connection with the new Miristi khola hydropower plant) and the subsequent diversion of the canal feeding the water mills (“ghatte”) have induced new disorders at the Kali Gandaki junction, with severe bank erosion. These perturbations of the natural dynamics of the hydro-geomorphic system potentially will create new hazards to infrastructure, hence will increase the functional, social and economic vulnerability in the context of a developing country.