

Societal Impacts and Risk Perception of Landslides in Sino-Nepal Road Corridor

Susmita Dhakal, Peng Cui, Chandra P. Rijal, Lijun Su

Abstract

Out of six routes that connect Nepal to China, Araniko highway in the North-east and Kathmandu – Kyirong highway in the North -west of capital city are only major motorways. After the massive damage due to co-seismic landslides triggered by Gorkha earthquake 2015 (M_w 7.8), Kathmandu-Kyirong is the only route that is in operation as a transboundary connection, the grade of it is still a feeder road type though. Mulkharka landslides that killed 5 people and obstructed road for many years, Ramche debris flow (2003) which took 45 lives including 22 army personnel and Timure debris flow (2018) claimed 9 lives are recent examples of mass movements caused by monsoonal rain. Similarly, 89 co-seismic mass movements induced by Gorkha Earthquake 2015 with 1.47 million m^3 exposed materials with the complete burial of 2,925 m of highway is an instance of damage caused by co-seismic hillslope failure.

Landsliding is a common and frequent phenomenon along the highway corridor because the terrain is situated on active tectonic boundary of Eurasian and Indian plates with the annual movement rate of 1.8 to 2 cm. The earthquake events either small or large are very obvious in the area. The incision rate of Trishuli river is also remarkable i.e. 90-100 mm/yr. The geology itself is very weak basically including sedimentary, low grade metamorphic rocks and Himalyan crystallines with massive deformations. Additionally, one of the major Himalayan thrust named ‘main central thrust’-MCT along with many other faults is stretched in the area. Besides, extreme seasonal weather and climate system further triggers mass failures.

These mass movements have great societal impacts but most of the time it is not highlighted especially the effects of common seasonal mass failures to the society. In this article, we have considered the impact of mass movement to the life of mountain residents, when the road was blocked by the damages of two bridges due to debris flows taking the case of Dhunche town – district headquarter of Rasuwa. Besides, risk perception of locals to the

mass failures in their neighborhood was also assessed considering rural villages – Ramche, Grang-Milkharka, Thade and Timure along the Kathmandu Kyirong highway.

The method applied were ‘focus group discussion’- FGD (mainly including victims of past disaster events), ‘key informant interview’- KII and a ‘household survey’- HHS. According to HH survey in Dhunche town four different sectors were impacted the most during five weeks blockage of the road by damages of Ghattekhola and Gerkhukhola bridges because of debris flow events viz. (1) movement of people within and/or outside of the district, (2) health treatment especially during emergency (helicopter lifting needed for couple of sick people, ambulances were at Thade village several kilometers south from Dhunche), (3) price hike of stuffs especially of fruits and vegetables, and (4) Tourists flow. However, people were resilient to short term blockage since intermittent obstruction for one or few days is common to this area during monsoon each year.

Based on FGD and KII, perception of risk of nearby landslides to locals was made. Community people also have involved to assess relative risk with the help of ‘hazard and vulnerability assessment’ tool for natural hazards developed by ‘hospital association of southern California’. All ratings were kept solely based on public perception, any judgement by researcher was avoided. For the probability of landslides occurrence, people have considered the activation of landslides in the past (from their childhood), changes on hillslope before and after the road construction, heavy rainfall pattern in the location compare to the neighboring area and hillslope drainage, and few elder people have also included the undercutting by Trishuli River for the risk estimation of nearby landsliding. For impact rating to the property they always consider their agricultural land and houses, and vehicles running onto the road if they feel can be impacted. They have been living on the gentler mountain slope for generations without knowing the fact that their villages are located on the deposits of large historic landslides. Except residents of Ramche village, people have perceived that probability of mass failure is low in their neighborhood. But they perceived the impacts on life and property would go high, if landslide events happen. The relative risk that was estimated by aforementioned method were 24, 28, 30 and 83 percent for Thade, Grang-Mulkharka, Timure and Ramche villages respectively.

This is the part of ongoing research and the future advancement will include not only the impacts to residents and the accommodation providers in local towns but also tour operators in Kathmandu who operate tourism business in this corridor. Furthermore, comparison of perceived risk and scientifically assessed risk will also make.