



Understanding three decades of land use changes and a cloudburst in Phewa Lake Watershed, Western Nepal

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This paper details an extreme rainfall event, or cloudburst (315 mm/ 24 hours) which occurred on July 29-30, 2015 in the Phewa Lake Watershed, Western Nepal, three months after the April 25, 2015 Gorkha Earthquake. The event triggered over 170 landslides and debris flows, caused 8 deaths and considerable damage to livelihoods. The fatal debris flow started from one of the numerous rural roads, which have proliferated exponentially over the past decades. In addition to mapping landslides due to this extreme rainfall event, our study sought to document and analyze underlying natural and human land use factors that may have impacted the occurrence of landsliding (Vulliez et al submitted).

To do so, our study analyzed land cover/ land use changes for the period 1979-2016 based on an interpretation of aerial photos and satellite images, combined with ground truthing. We studied how land use / land cover changes have resulted in a shift of active erosion zones from overgrazing around streams and forests to an exponential number of small failures along unplanned earthen rural roads, or “bulldozer roads”. With several hundred small failures documented along roadsides (Leibundgut et al., 2016) as compared to only 14 landslides prior to 2015 extreme rainfall event - and none triggered by the 2015 earthquake - roads are thus a major driver of active erosion zones and small failures in the watershed.

More effective management of the current unsustainable mode of rural road construction is required to reduce further environmental and economic impacts on vulnerable populations in Nepal.

Leibundgut, G., Sudmeier-Rieux, K. Devkota, S., Jaboyedoff, M., Derron, M-H., Penna, I. Nguyen, L. (2016). Rural earthen roads impact assessment in Phewa watershed, Western region, Nepal. *Geoenvironmental Disasters* (2016) 3:13. DOI 10.1186/s40677-016-0047-8

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