

Landslides, river incision and environmental change: the Ruzizi gorge in the Kivu Rift

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Abstract

The understanding of the interplay between natural and human-induced drivers in the occurrence of landslides remains poorly constrained in many regions, especially in tropical Africa where data-scarcity is common. In these regions where population growth is significant and causes changes in land use/cover, the need for a sustainable management of the land is on the rise. Here, we aim to unravel the occurrence of landslides in the 40 km-long Ruzizi gorge, a relatively young bedrock river in the Kivu Rift in Africa that has seen its landscape disturbed over the last decades by the development of the city of Bukavu (DR Congo). Careful field observations, historical aerial photographs, satellite imagery and archive analysis are combined to produce a multi-temporal inventory of 372 landslides. We show that the lithological context of the gorge and its extremely high incision rate during the Holocene explains the presence of a concentration of large landslides (size up to 2 km²) of undetermined age (well before the first observations of 1959) whose occurrence is purely natural. They are mostly of the slide type and show nor to very little morphologic patterns of recent activity. The landslides that occurred during the last 60 years are flow-like shallower slope failures of smaller size (up to 0.12 km²) and tend to disappear rather quickly (sometimes within a few years) from the landscape as a result of rapid vegetation growth, land reclamation and (human-induced) soil erosion. They are primarily related to threshold slopes and precipitation plays a frequent role in their onset. However, land use/cover changes also affect their occurrence. This study provides useful information for a more accurate evaluation of the landslide hazard in the area, particularly with respect to the growth of the city of Bukavu that has developed without the consideration of naturally instable slopes along the gorge. It also stresses the need and added value of building accurate landslide inventories in data-scarce regions.