Assessment of the detectability of geo-hazards using Google Earth applied to the Three Parallel Rivers Area, Yunnan province of China

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Anthropogenic activities such as hydropower, mining and road construction in mountainous areas can induce and intensify mass wasting geo-hazards (e.g. landslides, gullies, rockslides). This represses local safety and socio-economic development, and endangers biodiversity at larger scale. Until today, data and knowledge to construct geo-hazard databases for further assessments are lacking. This applies in particular to countries with a recently emerged rapid economic growth, where there are no previous hazard documentations and where means to gain data from e.g. intensive fieldwork or VHR satellite imagery and DEM processing are lacking. Google Earth (GE, https://www.google.com/earth/) is a freely available and relatively simple virtual globe, map and geographical information program, which is potentially useful in detecting geo-hazards. This research aimed at (i) testing the capability of Google Earth to detect locations of geo-hazards and (ii) identifying factors affecting the diagnosing quality of the detection, including effects of geo-hazard dimensions, environs setting and professional background and effort of GE users.

This was tested on nine geo-hazard sites following road segments in the Three Parallel Rivers Area in the Yunnan province of China, where geo-hazards are frequently occurring. Along each road site, the position and size of each geo-hazard was measured in situ. Next, independent diagnosers with varying professional experience (students, researchers, engineers etc.) were invited to detect geo-hazard occurrence along each of the eight sites via GE. Finally, the inventory and diagnostic data were compared to validate the objectives.

Rates of detected geo-hazards from 30 diagnosers ranged from 10% to 48%. No strong correlations were found between the type and size of the geo-hazards and their detection rates. Also the years of expertise of the diagnosers proved not to make a difference, opposite to what may be expected. Meanwhile the amount of time spent by the diagnoser proved to be positively influencing the detectability.

GE showed to be a useful tool in detecting mainly larger geo-hazards if diligently applied, and is therefore applicable to identify geo-hazard hotspots. The usability for further assessments such as sediment delivery estimations is questionable and further research should be carried out to give insight to its full potential.