



GIS-based hazard analysis of torrents and debris flows in Walgau (Vorarlberg/Austria)

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Due to the increasing population density the alpine valleys of Austria become increasingly populated, in particular in touristic seasons. But the beautiful mountain scenery bears risks that are still difficult to assess. Especially debris flows are known for their devastating consequences and enormous damage to infrastructure and population. In the context of the project „Georisikokarte Vorarlberg“ this diploma thesis comprises the development of a GIS-based model with respect to hazardous torrents and debris flows in the Walgau (Vorarlberg/Austria). The main object was to generate geological hazard maps, providing in insight into local exposure of this area with respect to debris flows and torrents. In Summer 2005 the geological and geotechnical input data were obtain in the field. From a geological view the area of interest (ca. 40 km²) lies in the Northern Calcareous Alps (NCA) and the Vorarlberger Flysch Zone. Quaternary sediments are widely spread in the Walgau. Especially these sediments are contributing to the bed loads of the torrents. But also landslides and rock fall can increase the bed loads dangerously. A detailed mapping of the area gave helpful hints, where dangerous processes took place or will be in the future.

The data were integrated and processed in a Geographic Information System (GIS). The data used were raster type (cell size 10m). All models were programmed with AML within ArcInfo 9.1 to ensure easy adaption to changed parameters.

The modelling process was divided in three part-models: a disposition model to locate possible starting points of debris flows within torrents, a trajectory model to distinguish potential paths a debris flow would take and a vulnerability model to estimate the potential hazard of debris flows for the infrastructure and the population.

The considered factors e.g. precipitation and vegetation were weighted according to their relevance for triggering debris flows. In August 2005 intense rainfall resulted in floods and others natural disasters in Vorarlberg. This recent scenarios could be used to calibrate the threshold values for various parameters e.g. slope or catchment's area.

In order to estimate how realistic the modelling results were, a comparison with highly resolved ariel photographs was made. A geological hazard map on the scale of 1 : 25000, the final product of the modelling process, is an ideal accessory to elucidate the hazard of torrents and debris flows because it illustrates clearly the endangerment on a well spotted colour scale (major dangerous – red, minor dangerous – green). This makes it very practical for authorities and their public relations.