Deterministic landslide susceptibility analysis using SINMAP - a case study in the Swabian Alb

B. Thiebes (1), R. Bell (1), T. Glade (2)

(1) Department of Geography, University of Bonn, Germany, (2) Department of Geography and Regional Studies, University of Vienna, Austria
(benni@giub.uni-bonn.de/+49-228-739099)

Landslides cause enormous economic damage and fatalities worldwide. To reduce further damage by those hazardous events, landslide susceptibility and hazard maps are one way to be prepared. In this study, the process-based model SINMAP (Stability Index Mapping) was applied to calculate landslide susceptibility at regional scale. The aim of the research project was to test the reliability of the deterministic model and to analyse the sensitivity to different input data sets and parameter values.

SINMAP is based on the infinite-slope stability model and can be executed in a geographical information system (GIS). Slope stability is calculated using topographic parameters like slope and topographic wetness as well as information concerning the physical properties of the materials involved. Computation was conducted with different base maps (lithology, soils) and a spatial resolution of input data ranging from 1m to 100m. Resulting susceptibility maps were validated using a landslide inventory map derived from interpretation of a high resolution DEM and field mapping. For sensitivity analysis geotechnical parameters were varied between 50% and 150% of standard values.

The study area covers approx. 8.5 km^2 and is located in the Swabian Alb, southwestern Germany, east of the city of Reutlingen. The Swabian Alb consists of Jurassic sedimentary rocks (clay, marls, limestones) which form a cuesta with steep slopes in the upper parts. The most common landslide processes in the study area are rotational and translational slides commonly triggered by rainfall, snowmelt and to a lesser extent by earthquakes.

Results show that 70-80% of the shallow landslides mapped occurred within the three

highest susceptibility classes. Sensitivity analysis displays a strongly varying influence of the different geotechnical parameters on slope stability calculation. The method presented proved to be a reasonable technique for regional landslide susceptibility analysis and could easily be extended to larger areas.