



Data management with a landslide inventory of the Franconian Alb (Germany) using a spatial database and GIS tools

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The area of the Swabian-Franconian cuesta landscape (Southern Germany) is highly prone to landslides. This was apparent in the late spring of 2013, when numerous landslides occurred as a consequence of heavy and long-lasting rainfalls. The specific climatic situation caused numerous damages with serious impact on settlements and infrastructure. Knowledge on spatial distribution of landslides, processes and characteristics are important to evaluate the potential risk that can occur from mass movements in those areas.

In the frame of two projects about 400 landslides were mapped and detailed data sets were compiled during years 2011 to 2014 at the Franconian Alb. The studies are related to the project "Slope stability and hazard zones in the northern Bavarian cuesta" (DFG, German Research Foundation) as well as to the LfU (The Bavarian Environment Agency) within the project "Georisks and climate change – hazard indication map Jura".

The central goal of the present study is to create a spatial database for landslides. The database should contain all fundamental parameters to characterize the mass movements and should provide the potential for secure data storage and data management, as well as statistical evaluations.

The spatial database was created with PostgreSQL, an object-relational database management system and PostGIS, a spatial database extender for PostgreSQL, which provides the possibility to store spatial and geographic objects and to connect to several GIS applications, like GRASS GIS, SAGA GIS, QGIS and GDAL, a geospatial library (Obe et al. 2011). Database access for querying, importing, and exporting spatial and non-spatial data is ensured by using GUI or non-GUI connections. The database allows the use of procedural languages for writing advanced functions in the R, Python or Perl programming languages. It is possible to work directly with the (spatial) data entirety of the database in R.

The inventory of the database includes (amongst others), informations on location, landslide types and causes, geomorphological positions, geometries, hazards and damages, as well as assessments related to the activity of landslides. Furthermore, there are stored spatial objects, which represent the components of a landslide, in particular the scarps and the accumulation areas. Besides, waterways, map sheets, contour lines, detailed infrastructure data, digital elevation models, aspect and slope data are included.

Examples of spatial queries to the database are intersections of raster and vector data for calculating values for slope gradients or aspects of landslide areas and for creating multiple, overlaying sections for the comparison of slopes, as well as distances to the infrastructure or to the next receiving drainage. Furthermore, getting informations on landslide magnitudes, distribution and clustering, as well as potential correlations concerning geomorphological or geological conditions.

The data management concept in this study can be implemented for any academic, public or private use, because it is independent from any obligatory licenses. The created spatial database offers a platform for interdisciplinary research and socio-economic questions, as well as for landslide susceptibility and hazard indication mapping.