# FROM DOCUMENTATION TO RISK ASSESSMENT

## EXPERIENCES BASED ON LANDSLIDE ANALYSES IN THE COMMUNITIES GASEN AND HASLAU (STYRIA)

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Growing concern about public safety and booming tourist areas in the Alps require the development and improvement of methods to estimate present and potential flood, debris flow, avalanche or other mass movement hazards.

A main preventing measure is to keep endangered areas free. In this context, the Austrian Federal Service for Torrent and Avalanche Control (WLV) has identified hazards in so called hazard-zone maps (GZP) starting in the early 1970ies. Nowadays, Austrian land use planning refers to these expertises with legally-binding land use plans. While hazard zoning of floods, debris flows or avalanches are available in particular spatial plans, an urgent need for development remains concerning zoning mass movement hazards.

Series of flood measurements are used for the determination of peak run off and recurrence intervals of rivers, in addition to quite a number of empirical approaches. For mass movements, common methods and guidelines to determine spatial occurrence and frequency of appearance are missing. Another open issue is to determine areas, which are endangered by transportation and deposition of material out of mass movements. Within the presently existing hazard zoning maps the information about mass movement provided is often of a more general nature. However, there is no statutory commitment to identify landslide zones. As a matter of fact they are often not marked maps and cannot be identified for spatial planning disaster prevention.

Operations to pursue proper deduction and evaluation of mass movement disposition as well as the identification of endangered areas with physical based models need comprehensive area and parameter information. Susceptibility of slopes in area region is specified by area inclination and morphology, soil type (grain size, structure, water regime, friction angle) and thickness of loose material. Vegetation, interacting with soil type is also relevant, because of its influence on the water regime. Topographical position of the fracture line, material properties (viscosity) and surface conditions (roughness, gullies,…) are relevant to material transport and deposition.

Except for the initiating factor “precipitation”, none of these coefficients include a time component. For this reason it is hardly possible to determine the frequency of occurrence based on this information. Furthermore, susceptibility of slopes changes with the appearance of mass movements. Other presentments of hazard intensities seem to be more

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functional. An alternative method to the long-time series of measurements is the documentation of landslides. In chronicles only a few details about landslides (time, location and quantity) are written down, other parameters are lacking.
A continuous, homogeny and area-wide documentation of mass movements and their triggering mechanisms is important to predict events in terms of spatial occurrence and probability. Such a data base will allow to asses the susceptibility of landslides by using statistical analyses of parameters and parameter combinations. These analyses have to consider the spatial inhomogeneity of many parameters. An iterative selection of sub areas is necessary. The determined, spatial referenced interrelations between terrain parameters and susceptibility have to be transferred to the area with GIS based modelling. At the moment, this method is limited by the essential area wide available data, which differ in scale and accuracy. Anyhow, modelling results must be evaluated methodically and comprehensibly in view of plausibility. The evaluation results should be re-entered in the modelling process to improve iteratively the results.
The heavy thunderstorms in August 2005, which caused severe property damages, were the starting point for a national, standardized documentation. In this connection, the BFW was charged by the Austrian Ministry for Agriculture, Forestry, Environment and Water Management (BMLFUW) to make a detailed investigation of the disaster in the most affected areas of Styria (the communities of Gasen and Haslau near Birkfeld). Thereby, about 250 single landslides were recorded in detail. The most important conclusion of these documentations can be described with the following statement: „Begin with the end in mind“.

Already at the beginning of the documentation, it is important to define the expected results in terms of spatial extent and scale. Also, the available human and financial resources, methods and basic data have to be considered. Scale and methods of surveys have to be adapt on that. Inputs, which are not collected, can rarely be found in other reports. Conclusions from neither quantified nor standardised collected information can only be drawn to a limited extent. It is crucial to identify the aim of the documentation. Should it concentrate on:

- an overview of losses or a monetary evaluation of disaster?
- the development of better process insights?
- the advancement and developing hazard and risk assessment tools?
- or on the development of an applied disaster management plan?

For the survey of the disaster of Gasen/Haslau in 2005, a newly-developed system to determine spatial and temporal distribution of precipitation was used. The approach is called INCA (Integrated Nowcasting through Comprehensive Analyses). It is operated by the Central Institute for Meteorology and Geodynamics Vienna (ZAMG). This system uses weather radar values which are pre-scaled and actually scaled with ground measuring stations. Furthermore, first steps have been taken to determine susceptibility depending on different soil types using the so called ebod. This is a digital soil map of all Austrian agriculture areas, created by the BFW.
Although everybody talks about risk assessment, approaches as well as interest in the second part of this term (Risk = hazard * vulnerability) are at the initial stage. Emphasis should be given to this task. The example of the communities Gasen and Haslau indicate which basic- and parameter data are required to draw conclusions about landslide hazard affected and adjacent areas. The everlasting conflict between decreasing quality and availability of data by increasing expanse can be met by applying a “top down strategy” with different scales (levels of accuracy), ranging from pan European summary maps and regional land use planning to detailed planning of preventive measures.

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