

## GeoZS – Landslide Issues in Slovenia and Contribution to the SafeLand Project Stože Landslide

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Slovenia is positioned on the complex Adria – Dinaridic – Pannonian structural junction and its general geological structure is well known. As a consequence of an extraordinarily heterogeneous geological setting, Slovenia is very much exposed to slope mass movement processes. Figure 1 shows that almost one quarter of Slovenian territory is subjected to processes of slope mass movements, and based on rough estimations, around 18 % of the population is under threat (KOMAC, 2005).

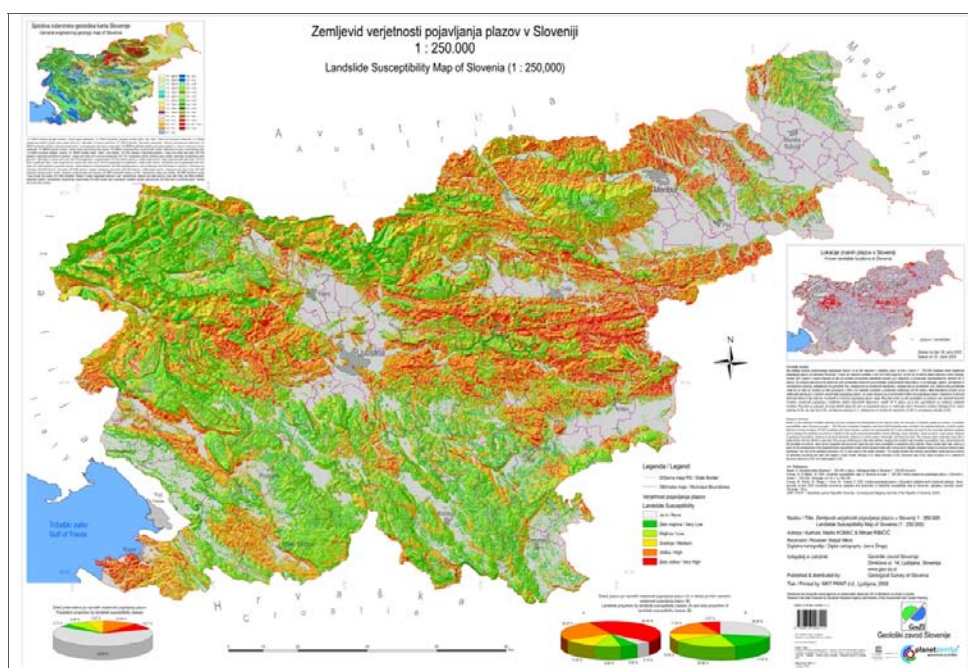


Fig. 1: Landslide susceptibility map of Slovenia (1:250,000) (KOMAC, 2005).

Legislation, planning and prevention measures are not satisfying in the field of landslides in Slovenia and the primary activities are still focused on the remediation instead of the prevention measures. The updated spatial law from 2007 governing natural disasters also discuss problems with mass movements, but a common methodology and procedures to prevent geology-related natural disasters does not yet exist. Local communities, which are currently preparing new planning acts of the municipalities, are committed to include a part on protection from natural hazards. Most important is to ensure the production of good evidence, which will clearly identify risk areas. Unfortunately, there is no statutory methodology for hazard mapping, so it is expected that local communities will have different quality bases.

Effective prevention is based on two equally important components: (1) Capturing and storing data on landslides (GIS\_UJME – a national landslide database containing 6602 landslides, but has not been updated since 2005) and monitoring changes in the existing (active) landslides and (2) Production of risk assessment maps (geo-risk maps for municipalities and probability maps), indicating the threat of certain areas to possible landslide occurrence.

Our contribution to the SafeLand project in the Area 4 will be performed on the Stože landslide, which occurred in November 2000 in the NW of Slovenia, in the Bovec municipality, under the Stože mountain (Figure 2). In the lower part of the slope, at the bottom of a small valley, runs a torrent named Mangartski potok. The first landslide movement (which was triggered by very intense rainfall) dammed up the torrent, resulting in a huge debris flow which flooded the village of Log pod Mangartom 4 km downstream. By its size, this was one of the largest events in Slovene history (materials from an area of over 25 hectares were displaced and deposited over more than 15 hectares). The consequences were catastrophic, with 7 casualties and huge material damage (MAJES, 2001).

A part of the slope debris above the landslide (approx. 1 million m<sup>3</sup>) remained in place, but its stability was reduced to the limit state of equilibrium and continues to pose a threat. That is why we want to apply new techniques and to evaluate and compare the results with already performed researches: geological, engineering geology and hydrogeology mapping, drilling (piezometers, inclinometers – which were destroyed later), ground seismometry and ground radar. Our work will comprehend (1) microtremor measurements (TROMINO portable seismographs for microtremor monitoring on landslides with HVSR – Horizontal to Vertical Spectral Ratio) to determine the depth of landslide thickness and landslide activity stage in time of measurement) and (2) airborne geophysical mapping (will be performed by GSA) to help detect areas susceptible to a high sliding risk.



Fig. 2: Left – municipality Bovec, where landslide Stože is located.  
Right – slope, where landslide Stože was "triggered" (Photo: M. ČARMAN, 2009).

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