



## **Regional earthquake loss estimation in the Autonomous Province of Bolzano – South Tyrol (Italy)**

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Beside storm events geophysical events cause a majority of natural hazard losses on a global scale. However, in alpine regions with a moderate earthquake risk potential like in the study area and thereupon connected consequences on the collective memory this source of risk is often neglected in contrast to gravitational and hydrological hazards processes. In this context, the comparative analysis of potential disasters and emergencies on a national level in Switzerland (Katarisk study) has shown that earthquakes are the most serious source of risk in general. In order to estimate the potential losses of earthquake events for different return periods and loss dimensions of extreme events the following study was conducted in the Autonomous Province of Bolzano – South Tyrol (Italy).

The applied methodology follows the generally accepted risk concept based on the risk components hazard, elements at risk and vulnerability, whereby risk is not defined holistically (direct, indirect, tangible and intangible) but with the risk category losses on buildings and inventory as a general risk proxy.

The hazard analysis is based on a regional macroseismic scenario approach. Thereby, the settlement centre of each community (116 communities) is defined as potential epicentre. For each epicentre four different epicentral scenarios (return periods of 98, 475, 975 and 2475 years) are calculated based on the simple but approved and generally accepted attenuation law according to Sponheuer (1960). The relevant input parameters to calculate the epicentral scenarios are (i) the macroseismic intensity and (ii) the focal depth. The considered macroseismic intensities are based on a probabilistic seismic hazard analysis (PSHA) of the Italian earthquake catalogue on a community level (Dipartimento della Protezione Civile). The relevant focal depth are considered as a mean within a defined buffer of the focal depths of the harmonized earthquake catalogues of Italy and Switzerland as well as earthquake data of the US Geological Survey (USGS).

The asset database to identify the elements at risk is developed under consideration of an address dataset, the land-use plan, official building footprints, building heights based on a normalized digital surface model, official construction costs for different building types (buildings cross cubatures), official statistical data concerning households on community level and insurance data based mean inventory values.

To analyse the structural vulnerability and consequently the potential structural losses, community specific mean damage ratios based on the EMS-98 approach and the historic development of the building stock within the individual communities are estimated. Inventory losses are assumed with 30 percent of the structural losses.

Thus, for each epicentre a loss-frequency-relationship can be calculated and the most severe epicentral scenarios can be identified.