Home

Search Abstracts

Author Index

Symposia Programmes

Sponsors

Help

GHZ-06 Landslide risks in fluvial systems

Landslide hazard assessment, vulnerability estimation, and risk evaluation

Fausto Guzzetti, *Consiglio Nazionale delle Ricerche (Italy)*
Paola Reichenbach, *Consiglio Nazionale delle Ricerche (Italy)*
Ardizzone Francesca, *Consiglio Nazionale delle Ricerche (Italy)*
Mauro Cardinali, *Consiglio Nazionale delle Ricerche (Italy)*

The ultimate goal of many landslide studies is the determination of the risk posed by existing or future slope failures. To achieve this goal, information on landslide hazard and vulnerability to landslides is required. Assessment of landslide hazard involves determining "where" landslides are expected, "when" or how frequently landslides will occur, and how large or destructive the slope failures will be, i.e. the "magnitude" of the expected landslides. Studies of the vulnerability to landslides, including methods to determine vulnerability and examples of damage assessments, are less abundant. Investigators do not agree on methods and scales for determining landslide damage, and accepted standards for measuring landslide vulnerability are lacking. This is particularly the case where vulnerability has to be determined over large areas. Lack of established methods to assess the damage and of reliable information on vulnerability hampers our ability to properly determine landslide risk.

For a 79 square kilometers study area in central Umbria, landslide hazard was ascertained, landslide vulnerability was determined, and landslide risk was evaluated. To ascertain landslide hazard, a probabilistic model was adopted that predicts where landslides will occur, how frequently they will occur, and how large they will be in a given area. For the purpose, a multi-temporal landslide inventory map prepared through the interpretation of five sets of aerial photographs and field surveys covering the period from 1941 to 2005 was exploited. Using a 10 m 10 m digital representation of the topographic surface, the study area was partitioned into 894 slope units, and the probability of spatial landslide occurrence was obtained through multivariate analysis of a large set of thematic and environmental variables. For each slope unit, the probability of experiencing one or more landslides in different periods was determined adopting a Poisson probability model for the temporal occurrence of landslides. The probability of landslide size was obtained by analyzing the frequency-area statistics of landslides. Assuming independence, landslide hazard was ascertained as the joint probability of landslide size, of landslide temporal occurrence, and of landslide spatial occurrence. For the Umbria region, landslide vulnerability curves exist. The curves were established exploiting information on landslide damage to buildings and roads caused by individual landslides of the slide type. Assuming independence of hazard and vulnerability, and exploiting (i) the multi-temporal landslide inventory map, (ii) the obtained landslide hazard assessment, and (iii) the available landslide vulnerability curves, landslide risk was evaluated. Results indicate that landslide risk can be determined quantitatively over large areas, provided adequate forecasting models are adopted and reliable landslide and thematic information is available.

CD-ROM Produced by X-CD Technologies