Landslide susceptibility map: from research to application

Federica Fiorucci (1), Paola Reichenbach (1), Francesca Ardizzone (1), Mauro Rossi (1,2), Giulia Felicioni (3), and Guendalina Antonini (4)

(1) Consiglio Nazionale delle Ricerche, Istituto di Ricerca per la Protezione Idrogeologica. Via della Madonna Alta 126. 06128. PERUGIA, ITALY, (2) Dip scienze della terra, Università degli Studi di Perugia, Piazza dell'Università, I-06123 PERUGIA, ITALY, (3) Regione dell'Umbria, Servizio geologico e sismico , Piazza Partigiani, 06100. PERUGIA, ITALY, (4) Comune di Perugia, Settore Ambiente e Governo del Territorio, Corso Vannucci 19, 06100. PERUGIA, ITALY

Susceptibility map is an important and essential tool in environmental planning, to evaluate landslide hazard and risk and for a correct and responsible management of the territory. Landslide susceptibility is the likelihood of a landslide occurring in an area on the basis of local terrain conditions. Can be expressed as the probability that any given region will be affected by landslides, i.e. an estimate of "where" landslides are likely to occur. In this work we present two examples of landslide susceptibility map prepared for the Umbria Region and for the Perugia Municipality. These two maps were realized following official request from the Regional and Municipal government to the Research Institute for the Hydrogeological Protection (CNR-IRPI). The susceptibility map prepared for the Umbria Region represents the development of previous agreements focused to prepare: i) a landslide inventory map that was included in the Urban Territorial Planning (PUT) and ii) a series of maps for the Regional Plan for Multi-risk Prevention. The activities carried out for the Umbria Region were focused to define and apply methods and techniques for landslide susceptibility zonation. Susceptibility maps were prepared exploiting a multivariate statistical model (linear discriminant analysis) for the five Civil Protection Alert Zones defined in the regional territory. The five resulting maps were tested and validated using the spatial distribution of recent landslide events that occurred in the region. The susceptibility map for the Perugia Municipality was prepared to be integrated as one of the cartographic product in the Municipal development plan (PRG - Piano Regolatore Generale) as required by the existing legislation. At strategic level, one of the main objectives of the PRG, is to establish a framework of knowledge and legal aspects for the management of geo-hydrological risk. At national level most of the susceptibility maps prepared for the PRG, were and still are obtained qualitatively classifying the territory according to slope classes. For the Perugia Municipality the susceptibility map was obtained combining results of statistical multivariate models and landslide density map. In particular, in the first phase a susceptibility zonation was prepared using different single and combined probability statistical multivariate techniques. The zonation was then combined and compared with the landslide density map in order to reclassify the false negative (portion of the territory classified by the model as stable affected by slope failures). The semi-quantitative resulting map was classified in five susceptibility classes. For each class a set of technical regulation was established to manage the territory.