



## **The impact of landslides on urban areas and infrastructure in Italy**

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Landslide risk in Italy is particularly high since in addition to the geological, geomorphological, seismic and structural settings which render it susceptible to frequent and widespread landslide phenomena, the Italian territory is also densely populated and highly urbanized. In terms of landslide hazard, 485,004 landslides occurred between A.D. 1116 and 2006 within Italy, with a landslide area of 20,721 km<sup>2</sup> equal to 6.9% of the national territory. 5,708 municipal districts are affected by landslides (70.5% of the total), of which 2,940 with extremely high levels of criticality due to landslides affecting urban centres. This data emerges from the IFFI Project (Italian Landslide Inventory) which, set up by ISPRA – Institute for Environmental Protection and Research/Geological Survey of Italy and the Regions and self-governing Provinces, identifies landslide phenomena across Italy in accordance with standardized methods of data collection, recording and mapping. With regard to exposure and vulnerability, urban areas in Italy account for 17,929 km<sup>2</sup>, equal to 5.9% of the national territory. In the past 50 years, urban areas in Italy underwent a dramatic increase, whose surface has more than doubled. Often building areas did not benefit from any form of proper land use planning and management or detailed landslide hazard assessment. Moreover unauthorized building has reached levels as high as 60% in regions of Southern Italy. This study assesses the incidence of landslide phenomena and their impacts within urban areas of Italian provincial capitals in terms of number of landslides, surface area and type of movement. The people exposed to landslide risk at national level and critical points along highways, railways and road network has been also estimated. Landslides have been classified in two main categories: rapid and slow movements. The rapid phenomena are strictly correlated to the people safety, while the slow ones concern mainly losses and usability of buildings and infrastructures. Consequently different strategies for planning and emergency management must be adopted. The assessment has been implemented within a GIS platform by overlapping landslide data derived by the IFFI Project with urban areas, populations census data and main Italian transportation network. More in detail analyses have been performed on some of these urban centres, in reference to which it has been possible to assess the extent of urban expansion from the post war period up until now and the corresponding increase in landslide risk. Related to population, the analysis allowed to estimate the number of people exposed to landslide risk in terms of safety of human life and socio-economic consequences. In order to reduce the impact of landslides within urban areas and along transport infrastructure, different measures should be adopted. In addition to engineering works and delocalization plans, the instrumental monitoring networks and emergency plans assume a fundamental role in landslide risk management. It is within this context that the IFFI Project, due to its highly detailed landslide maps and its complete coverage of the national territory, represents a useful tool for land use planning, emergency planning and mitigations measures.