

## **Flood damage in Italy: towards an assessment model of reconstruction costs**

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Recent decades in Italy have seen a very rapid expansion of urbanisation in terms of physical assets, while demographics have remained stable. Both the characteristics of Italian soil and anthropic development, along with repeated global climatic stress, have made the country vulnerable to floods, the intensity of which is increasingly alarming. The combination of these trends will contribute to large financial losses due to property damage in the absence of specific mitigation strategies.

The present study focuses on the province of Sondrio in Northern Italy (area of about 3,200 km<sup>2</sup>), which is home to more than 180,000 inhabitants and the population is growing slightly. It is clearly a hot spot for flood exposure, as it is primarily a mountainous area where floods and flash floods hit frequently. The model we use for assessing potential flood damage determines risk scenarios by overlaying flood hazard maps and economic asset data. In Italy, hazard maps are provided by Regional Authorities through the Hydrogeological System Management Plan (PAI) based on EU Flood Directive guidelines. The PAI in the study area includes both the large plain and the secondary river system and considers three hazard scenarios of Low, Medium and High Frequency associated with return periods of 20, 200 and 500 years and related water levels.

By an overlay of PAI maps and residential areas, visualized on a GIS, we determine which existing built-up areas are at risk for flood according to each scenario. Then we investigate the value of physical assets potentially affected by floods in terms of market values, using the database of the Italian Property Market Observatory (OMI), and in terms of reconstruction costs, by considering synthetic cost indexes of predominant building types (from census information) and PAI water height.

This study illustrates a methodology to assess flood damage in urban settlements and aims to determine general guidelines that can be extended throughout Italy. The final objective will be to analyse how the loss prospective can change when mitigation measures, including actions to reduce the flood hazard and strategies to prevent potential consequences, are implemented. Flood impacts and the corresponding value of mitigation measures will be assessed by means of a cost–benefit analysis in accordance with the EU Floods Directive.