



## **The use of open data in the micro-scale urban flood risk assessment and mapping: two case studies in historic cities in Italy**

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The concept of open data commonly indicates a piece of information which anyone is free to use, reuse, and redistribute. The assessment of flood risk in urban areas can significantly take advantage of the recent availability of open data, allowing users to create risk maps with the joint use of hazard and damage models and Geographic Information Systems. The estimation of hazard, vulnerability and exposure requires to merge data from different sources such as flood depth maps, socio-economic data, topographic maps. Thus a suitable scale of analysis is needed to aggregate such data. Moreover the urban fabric of historic cities poses some problems in choosing an adequate approach for flood modelling in the built environment. In this work the risk assessment procedure is applied to the main cities located along the Arno river, Florence and Pisa (Italy) that are usually considered of broad interest for the importance of urban and cultural heritage. The risk is estimated accounting for structures, household contents, commercial and tertiary sectors which are the most representative of the studied areas. The spatial scale of analysis here adopted is the census section polygon, which usually coincides with the building block in dense urban areas and is considered as a good compromise between spatial detail and availability of open data. Different return period are analyzed with a particular attention to severe scenarios. It results that, for a flood event of similar magnitude as the one of 1966 which is estimated to have 200 years of recurrence interval, the total damage for the city of Florence is about 6 billion euros without considering the damage to cultural heritage. This value is larger than the annual income of the whole municipality. The average flood risk per unit surface of territory is about 10 €/m<sup>2</sup>/year for the historic centre in Florence and 4 €/m<sup>2</sup>/year for Pisa. A critical discussion on the micro-scale maps and on the advantages of the proposed methodology is also presented.