

Integrated multi-risk assessment for resilient cities: The case study of Bologna

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Abstract In recent years, due to the intensification of climate change, unexpected extreme events have affected many urban environments around the world. In order to mitigate the risk and implement climate change adaptation strategies, it is crucial to conduct multi-risk assessments of urban areas. A multi-risk assessment is aimed at evaluating the impacts that multiple natural disasters may have in a specific area, by investigating the vulnerability and exposure, based on physical, social, and economic parameters. To improve multi-risk assessment, in the framework of the RETURN project (Multi-risk science for resilient communities under a changing climate), the storyline methodology is proposed to analyze different possible scenarios, where the occurrence of single- or multiple-hazardous events, interacting with one another, may affect urban environments. Based on these scenarios and through specific models, it is possible to assess the socio-economic impacts of all the exposed urban assets and human factors. To better understand the interrelationships between hazard, exposed assets, vulnerability and/or mitigation measures, a graphical representation of the storyline, i.e., the impact chain, is also developed. In this framework, the objective of this study is to visualize the sequence of different natural events that can occur in a urban area. The city of Bologna is selected as a case study and earthquake, flooding, and heatwaves are considered as hazardous events. Indeed, the city is situated in a seismic region and it has been subjected, in recent years, to increasing temperatures and precipitation due to climate change. Storylines and impact chains, considering one or multiple events, have been developed and will be presented, together with the characterization of the exposed assets of a portion of the city, considering a specific taxonomy, and the evaluation of social vulnerabilities. The main results of the study have been mapped in a GIS environment for the upload on the RETURN web platform, on which the input and output data of multi-risk assessment procedures can be visualized and compared.