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Multi-risk analysis, mitigation and resilience in historical cities

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The need for a shift from single to multi-risk analysis is widely recognized in international agreements, however the different multidisciplinary aspects, hazard metrics, data requirements and resolutions make quantitative multi-hazard and multi-vulnerability assessment rarely practiced. This work aims at describing a multi-risk assessment including present and mitigation scenarios and multi-risk resilience for historical art cities where the ability to recovery from a disaster passes through cultural heritage and related economic activities. Earthquakes and floods are considered to introduce a multi-risk workflow for buildings based on common metrics for exposure, vulnerability, and risk and a dynamic resilience model to simulate the post-event recovery. The method is applied to the historical city center of Florence (Italy), which is exposed to low-probability events and renowned for its unique cultural heritage. The application of the method suggests that the estimation of direct physical damages for earthquakes and floods requires a different characterization of vulnerability parameters. The resilience to earthquakes and floods shows significantly different recovery times that are linked to the severity of losses. The results of the application to the historical city center Florence show interesting differences in the spatial distribution of multi-risk, mostly depending on the evolution of the constructive typologies form the Middle-Ages to the XX century but also on the anthropic alteration of terrain morphology. Further research would be needed to finding synergies in multi-risk mitigation and to better understand resilience to cascade risks.

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