

# State-of-the-art, proposal and application of physical vulnerability models for the built environment

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Within Work Package 3 of the RETURN Spoke TS1 “Urban and metropolitan settlements”, a dedicated deliverable has been produced, compiling state-of-the-art vulnerability models for the built environment under various hazard conditions. These models provide a toolbox that can be used for impact assessment within Returnville, ensuring a comprehensive evaluation of risk propagation mechanisms. A highlight of this research is the development of a novel vulnerability assessment tool, specifically designed within the RETURN project. In fact, a new tool has been developed for estimating the debris produced by infill wall collapse in reinforced concrete buildings under seismic actions. The tool is based on nonlinear dynamic analyses of buildings with various heights, ages, and infill wall types. It aims to quantify, at increasing levels of seismic intensity, the volumes of collapsed material and the distance this material can project onto nearby roads. This information is crucial for assessing the possible obstructions to emergency vehicles and for improving the resilience of urban areas after an earthquake. The proposed tool is applied for the seismic assessment of the case-studies developed within TS1, namely Returnville virtual testbed.

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