Effect of the detail of exposure data in large-scale seismic risk assessment

Abstract:
The key components for seismic risk assessment studies include hazard characterization, inventory of exposed assets and assessment of their vulnerability. In the recent years, significant research results have been obtained regarding hazard analysis and fragility curves. However, detailed and reliable information on exposed structures to be used for large-scale seismic risk assessment is still not widely available. The aim of this paper is to examine the influence of the level of detail of the datasets of the building stock on the results of large-scale risk assessment studies applied to urban areas in earthquake-prone regions of Europe. Exposure data for seismic risk assessment have been collected for a number of cities around Europe, often at a high level of geographic disaggregation. Information on the building stock has been also collected within the framework of research projects aiming at the assessment of the energy performance of buildings, in this instance, aggregated at much larger areas with similar climatic conditions. Another significant source of information on the building stock, albeit not fully harmonised across countries, are the national housing censuses that may furnish an exhaustive picture of the housing stock in a region. Firstly, the above-mentioned databases are compared in order to investigate their compatibility and to examine the possibility of using them for the seismic risk assessment of large areas in Europe. A case study is then presented in the main part of the paper. A quantitative risk analysis is applied to a specific European country using a dataset of exposed residential buildings, with a high level of geographic detail. This dataset also offers the opportunity to classify buildings using several variables relevant for vulnerability assessment, like structural type, period of construction and number of floors. The same methodology on quantitative risk analysis is applied at a country level, using the more generic dataset of exposed buildings compiled from different sources and for larger regions. The comparison of the results allows examining the accuracy and feasibility of seismic risk assessment of the European urban areas, making use of the information on the exposed buildings that is currently available.

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