



## **Seismic hazard assessment of Navarre (Northern Spain)**

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The RISNAV project, financed by the Civil Defence Department of Navarre (Northern Spain), aims at assessing seismic risk of the entire region. The final goal of the project is the definition of emergency plans for future earthquakes. With this purpose, four main topics are covered: seismic hazard characterization, geotechnical classification, vulnerability assessment and damage estimation. In this work, the seismic hazard and vulnerability assessment studies are presented.

The focus is then the characterization of the expected ground motion including soil conditions at every site of the region with a 90% probability of non-exceedance in an exposure time of 50 years, as well as the vulnerability assessment of the Navarra building stock. Hence, it is not a scenario-based or deterministic evaluation, but rather a probabilistic estimation in which contributions from different seismogenetic sources, characterized by distinct activity rates and maximum expected magnitudes, are combined. As the low seismic activity of the area makes it practically unviable to establish seismic parameters of active faults, a zoning method is used to characterize the seismicity. A new seismic zonification is proposed taking into account the tectonics and seismicity of the influence region, which includes parts of northern Spain and southern France. A revised seismic catalogue including earthquakes from both areas is used for obtaining recurrence laws for each zone, using moment magnitude as earthquake size parameter. Due to the unavailability of strong-motion models based on local data, different models derived from broad databases are considered. The scant (low-amplitude) local ground-motion records available are used as constraints for selecting the strong-

motion models finally incorporated in the study.

In parallel, a description of building typologies and an estimation of their vulnerability analysis is carried out, following the criteria proposed in the European Macroseismic Scale EMS 98.

Final results are presented in maps of expected peak ground acceleration and spectral accelerations for frequencies of engineering interest (for the prescribed return period) and vulnerability classes. These maps are the inputs to be included in the study of the expected damage in a future stage of the RISNAV project.