Soil seismic hazard assessment: two examples

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Although national seismic hazard maps refer to rock or to a very stiff soil, soil hazard estimates are very important in urban planning and become to be considered in seismic zonation as well. Without entering into the details of a complete microzonation study, soil hazard can be assessed on the basis of a good geological information of the study region. The OGS has recently developed two studies aimed at defining the soil hazard for general purposes: revision of the seismic zonation and future urban planning.

For both studies a probabilistic approach for seismic hazard assessment was considered according to the Cornell (1968) approach in the Bender and Perkins (1987) formulation. The PGA hazard estimates refer to a 475-year return period, corresponding to the 10% exceedence probability in 50 years, standard reference in seismic design. The variability of the attenuation model has been taken into account considering one standard deviation in the hazard computation.

The first study area is the Friuli - Venezia Giulia region in N.E. Italy. A detailed geological map is available for this region and several geophysical measurements were done to define the litho-stratigraphic characteristics of six test sites, roughly representative of all the situations in the study region. Rock seismic hazard was assessed according to the most updated methodologies (logic tree approach) and data (tectonic and earthquake data). The site amplification for the six test sites was computed by 1D and 2D modeling and applied to the rock hazard map according to the actual local litho-stratigraphic situations. The final soil hazard map shows clearly the areas where the stronger ground motions are expected and offers a precise view of what can be observed in the case of the occurrence of a violent earthquake.

A similar study was performed also for the Tbilisi broader area in the Caucasus. In this case the local amplification was estimated applying different amplification factors from literature only on the basis of a detailed geological map, because geophysical measurements were not available. The rock hazard map was computed very similarly to that for N.E. Italy: a logic tree consisting of 2 seismogenic zonations, 2 methods for the seismic rate computation, 2 approaches for the maximum magnitude determination, and 2 attenuation models.

References

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