



## The SEE-GeoForm WebGIS: a tool for seismic data and hazard analysis

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The SEE-GeoForm project (Site Effects Evaluation - Geological Form) is born to share and make easily accessible via Internet seismic hazard data for Italy at different scales and for different administrative units (regions, provinces, municipalities), from existing database or new dataset carried out in this project. Using a WebGIS (<http://www.seegeoform.it>) a tool to archive, display and elaborate information has been developed. In particular, the website allows the user to query the basic and local seismic hazard values for single municipalities or to calculate those for any single point only by clicking on the maps.

In order to make the WebGIS more flexible, the system has been fully implemented using open source technologies, based on the guidelines expressed by the Open Geospatial Consortium (OGC); in this way, it has been possible to develop some thematic modules for data elaborations and queries as integrated web services such as WMS, following all of the internationally-acknowledged best-practices in this field.

The WebGIS has three frames: the data panel, the display area, the map layers directories. The data panel has several modules concerning respectively: basic and local hazard data for all Italian municipalities calculated by National Institute of Geophysics and Volcanology (INGV) or from other studies, such as horizontal peak ground acceleration values for different return periods (considering the exceedance probability in 50 years), and soil classes with the corresponding lithostratigraphic amplification factors according to the EuroCode8; a regular grid of 16.810 points, with a step equal to  $0.05^\circ$ , used by INGV for the seismic hazard elaborations (<http://zonesismiche.mi.ingv.it/>): values that are necessary to draw the site-dependent response spectra, according to the Italian seismic code, are linked to each point; the calculation on user demand of basic seismic hazard parameters for a site selected by clicking on geographical layers; composite seismogenic sources from DISS (Database of Individual Seismogenic Sources, vers. 3.1.1.: <http://diss.rm.ingv.it/diss/>), with their relative parameters (maximum moment magnitude, strike, dip, etc.). Finally, there are two modules regarding litoseismic classes and subsoil categories: the first one is linked to a map obtained by reclassifying the 46 lithotypes of the Lithological Map of Italy at 100000-scale by Geological Survey of Italy (National Institute for Environmental Protection and Research - ISPRA) into 12 litoseismic classes, considered homogeneous regarding to their seismic behavior; while the second one permits to know the subsoil category, according with Italian seismic provisions (Norme Tecniche per le Costruzioni – NTC 2008), for a single point by clicking on the map. This has been possible by elaborating a subsoil categories map at 100000-scale derived from the litoseismic map at the same scale, by blending different litoseismic classes into 5 categories.

Datasets have been built starting from 2007 within the ReLUIIS Project (<http://www.reluis.it>) and are being improved within the 2009-2012 EUCENTRE project (<http://www.eucentre.it>), that partially financed the WebGIS development, as a result of the strong collaboration between researchers from INGV and ISPRA.

The SEE-GeoForm web-tool aims to become the focal point to display in a simple way many databases containing information on seismic hazard of Italian territory, allowing user-friendly elaborations for researchers and professionals.