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Seismic microzonation in a small municipality: the case study of Sant'Agata Fossili (AL)

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The earthquake of April 11th 2003 (Ml = 4.7), that struck the NW area of Piemonte, caused damages in several municipalities, fortunately without victims.
This event can be considered as representative of the expected seismicity level of the Region and, even if this level can be considered low in comparison to other Regions of Italy, it is necessary to take it into account for an accurate and safety urban planning.
So the government of the Piemonte, in the frame of the European Project RISKNAT, decided to perform the seismic microzonation of the Sant'Agata Fossili (AL).
So a multidisciplinary group has been created, and the fundamental steps of the project have been:
1. geologic and geomorphologic analysis, through survey at scale 1:5,000 on an areas about 0.2 Km2, that has pointed out the presence of silty clay and marl (Gessoso-Solfifera Formation and Sant'Agata Marl);
2. geophysical characterization of the lithologic units and subsequently construction of the lithologic subsoil model: particularly the HVSR survey (15 stations), that pointed out the presence of two sectors characterized by different behavior (the E sector without resonance and the W sector with resonance at 2-5 Hz); 2 Down-Hole (one in each sector); and in a test site different geophysical techniques (MASW, REMI, seismic refraction, passive MASW on 2D array, electrical resistivity tomography;
3. geotechnical characterization through 2 geognostic drillings with SPT tests and collection of undisturbed samples to perform the dynamic and static laboratory tests;
4. individuation of the expected seismic inputs in term of accelerograms: particularly the 5 recorded accelerograms were selected from strong motion record databases, fixing the constraint of the geologic and seismologic characteristics of studied area, the expected magnitude-distance couple, the soil type of the registration station, the expected maximum horizontal acceleration (through the use of scaling) and the spectrum compatibility with the national code target spectrum;
5. numerical analysis, using a one-dimensional model, to point out the expected amplifications in term of amplification factors and elastic acceleration response spectra.
The results have been able to understand the geologic and geophysical differences of the municipality and consequently the different local seismic responses, that permit to better define the level of seismic protection of the buildings taking into account the expected amplification effects. In particular, the results in term of acceleration response spectra, in comparison with the corresponding spectra derived by the National Code, show, in some cases, significant differences, consequently the use of the calculated spectra is necessary during the building design project.
The study shows, in urban contests, that the seismic microzonation analyses are possible and offer a valid instrument of knowledge of the territory, using for the seismic prevention of the buildings, if the seismic vulnerability is known. In fact a realistic evaluation of the expected amplifications is necessary to perform the reduction of the seismic risk and the safety of the buildings.