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Evaluation of the effectiveness of the second level microzonation abacuses for the municipalities located in the Friuli Venezia Giulia (Italy) plain

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The local geological conditions have a significant influence on seismic waves; these differences are referred to as the "local site effect," and they must be taken in consideration when estimating the seismic effects on buildings and urban planning. In fact, local conditions could affect the seismic shaking of an area and modify the seismic wave in terms of amplitude, frequency and duration.

In a very simplified approach to account for the influence of local conditions on ground shacking, according to the Eurocode 8 (EN-1998 2004), five ground types (from A to E) can be identified and used. According to this approach, an outcrop seismic bedrock is a layer characterized by Vs ≥ 800 m/s and correspond to the class A. The thickness and the shear waves velocity of the layer covering the seismic bedrock are the two factors that influence the amplification of a harmonic horizontal motion from the seismic bedrock to the surface. Thus, the equivalent/weighted average shear-wave velocity from the ground to the seismic bedrock depth H is used as a proxy for the seismic soil characteristics to design the appropriate site-dependent elastic response spectrum for structures. In a less simplified approach, the Seismic Microzonation (SM) studies aims at identifying and mapping at the urban scale the ground amplification in order to identify zones with homogeneous seismic behaviour and to assign to different areas a numerical value of expected shaking useful for the seismic design of structures. The Italian second level SM aims at quantifying the seismic amplification factor (AF) by means of abacuses for areas that can be schematised thanks to a 1D subsoil model (alluvial plain).

In this work the study area is the Friuli Venezia Giulia plain municipalities and the response spectra derived applying the AF values (both from abacuses and numerical simulations) have been compared to those obtained by the Italian Building regulation that apply the Eurocode 8 approach. In general, the smoothed seismic response spectra obtained by the numerical simulations are the highest (in the 82,5% of the total sites). In other minor cases, the spectra from abacuses are higher than the numerical simulation and only in 2 sites the spectra from the Italian regulation are higher than the abacuses and the seismic response ones. Moreover, the Tc values obtained by the by Italian regulation simplified approach underestimate the amplification for short periods of time and overestimate it for longer periods. This is highlighted especially in the soil category E.