

## Discussion on the role of level 1 and 3 Liquefaction microzonation studies for improving seismic resilience of urban areas

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Since the 1976 Friuli earthquake, the microzoning studies have been developed and conceived as a profitable strategy to tackle seismic hazard estimation at local scale. Microzoning activity in Italy has recently been promoted and coordinated by the Italian Civil Protection Office at three investigation detail: geological susceptibility, simplified hazard and in-depth hazard analyses.

These three working levels can be seen as providing with complementary knowledge of the territory, although only the third level gives a truly insight into the local differences of seismic response. Concerning the so called "liquefaction instability" according to the Guidelines for Microzoning Studies (ICMS 2008) issued by the Italian Civil protection Office at level 1 they are evidenced as hatched polygons named "liquefaction prone areas" although the point nature of the liquefaction phenomenon needs several point investigations to be correctly characterized. This is particularly true in the case of alluvial deposits whose lateral heterogeneity of soil properties and grain size can affect the liquefaction susceptibility site by site.

The paper presents the case study of the Sulmona intramontane basin located in the Central-Northern sector of the Apennine chain, in the Abruzzi Region. The basin infill consists of a thick lacustrine succession passing to different orders of terraced alluvial deposits with a shallow water table (lower than 15 m under the ground level). No historical evidence of liquefaction have been recorded in the Sulmona plain, although limited local liquefaction phenomena occurred in during the 2009 L'Aquila earthquake, within the Holocene alluvial deposits. Due to the high seismic hazard related to the Sulmona fault system, the first level of Sulmona microzonation limited two liquefaction prone areas (located nearby the railway station and the main access road to the city) where the liquefaction second and third level of microzoning studies must be investigated. To this end the writing authors will undertake geophysical and geotechnical investigations to carry out quantitative estimate of liquefaction potential starting from the liquefaction susceptibility zonation at level 1. In doing this the recently issued Italian guidelines proposed for liquefaction microzonations will be checked in their applicability and effectiveness.