



## Multihazard Analysis: Istanbul Microzonation Projects

**Sema Kara**, Kemal Duran, Deniz Yılmaz, Evrens Rıza Yapar, Muhammed Emin Karasu, and Betül Ergün Konukcu

Istanbul Metropolitan Municipality, Directorate of Earthquake and Ground Research, İstanbul, Türkiye  
(sema.kara@ibb.gov.tr)

Istanbul is located one of the most seismically active regions of the earth. For this reason the city has suffered damage due to earthquakes in its historical process. Three of them, occurring in 1509, 1766, 1894 respectively, seriously affected Istanbul and caused great losses around the city during the Ottoman period. 1509 Earthquake caused extensive damage to many mosques, buildings and some part of the city walls in Istanbul. 1509 Earthquake caused extensive damage to many mosques, buildings and some part of the city walls in Istanbul. Another destructive earthquake occurred in the east part of the Sea of Marmara in 1766. Not only many houses and public buildings collapsed but also The Ayvad Dam located north of the Istanbul were damaged in Istanbul because of the 1766 Earthquake. Third major earthquakes took place in the Gulf of Izmit in 1894 and had adverse impact on Istanbul. On August 17, 1999 The Kocaeli Earthquake with a magnitude 7.6 was the not only devastating but also deadly earthquake for Istanbul in recent years. Despite the approximately 110 km epicenter distance, 3,073 buildings suffered extensive damage, 11,339 buildings had moderate damage and 454 people died and 1880 people injured in Istanbul. Damages in Istanbul especially Avclar and Büyükçekmece during Kocaeli Earthquake in 1999 raised and improved the awareness on disaster risk management since then several scientific and institutional studies has been conducted for the potential earthquake of Istanbul. Istanbul Metropolitan Municipality (IMM) carried out two major geo-scientific studies called "microzonation studies" covering more than 700 km<sup>2</sup> of Istanbul's urbanized areas between 2006 and 2009. And then IMM has just started new microzonation project in order to complete remainder urbanization area of Istanbul consists of districts of Büyükçekmece, Beylikdüzü, Çatalca, Esenyurt, Küçükçekmece, Beşiktaş, Şişli, Sarıyer covering approximately 257 km<sup>2</sup>. Esenyurt is the most populated district of Istanbul and the other districts host many Istanbulites. This project supports substantial hazard knowledges after the evaluation of geological, geotechnical and geophysical measurements in order comprehend these districts risk against the potential Istanbul earthquake,. In the end "Land Suitability Maps" are derived from the combination of inputs using multi-hazard approach. Microzonation results could be used in land development/use plans, hazard identification in urban transformation, determination of the routes and characteristics of various types of engineering structures for making city resilient.