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Seismic microzonation for urban planning and vulnerability assessment

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A microzonation study has been conducted as a part of the Zeytinburnu Pilot Project within the scope of the Earthquake Master Plan for Istanbul. The basic purpose was to produce input for urban planning and to supply site specific ground motion data to be used for the assessment of the vulnerability of the building stock.

A very detailed geological and geotechnical studies were conducted to evaluate the variation of site characterisation within the town of Zeytinburnu. The pilot area was divided into cells by a grid system of 250×250 meters. This approach is adopted for estimating the effects of site conditions by assigning partly hypothetical boreholes at the centre of each cell.

The approach adopted in the assessment of the calculated zonation maps involves the division of the area into three zones as (A, B, and C) without presenting the numerical values for any parameter. The variations of the calculated parameters are considered separately and their frequency distributions were calculated. Thus the zone A shows the most unsuitable 33 percentile, zone B the medium 34 percentile and zone C shows the most favourable 33 percentile.

The basic intention of the site response analysis is to estimate the effect of local site conditions in assessing the site amplification with respect to ground shaking. It is logical to base this decision on all the available results obtained from site identification based on equivalent shear wave velocity and site response analysis conducted in the region. In the case of site response analysis, a suitable parameter is considered to be the average spectral acceleration between 0.1 and 1.0 second periods. Thus, the

variation of the average spectral accelerations was mapped in terms of three zones (A, B and C).

The microzonation map with respect to ground shaking was based on average spectral accelerations and spectral amplifications obtained from equivalent shear wave velocities.

The final stage involved the evaluation of ground motion characteristics to be used for the vulnerability assessment of the building stock. The acceleration response spectra calculated by site response analyzes for each cell were evaluated utilizing two best fitting algorithms to determine the parameters for the NEHRP design spectra.