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Building loss estimation for the earthquake peril: Istanbul case study

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As a consequence of the 1999 earthquakes the insurance sector in Turkey felt the need to change their paradigm. Turkish government established the National Earthquake Insurance Program; reinsurance companies responded by reducing their risks by increasing the rates or by leaving the market; and the insurance companies realized the need for regular assessment of the risks associated with their portfolio in order to shape their future market strategies.

The paper describes a generic earthquake loss assessment methodology adopted for Turkey that can be used for portfolio loss estimation. The basic ingredients of the methodology are probabilistic and deterministic regional site dependent earthquake hazard parameters, regional building inventory (and/or portfolio), building vulnerabilities associated with typical construction systems in Turkey and estimations of building replacement costs for different levels of damage. The probable maximum losses and average annualized losses are estimated as a result of analysis. There is a two-level earthquake insurance system in Turkey: the national compulsory earthquake insurance (level 1) and the private earthquake insurance (level 2). To buy private earthquake insurance one has to be covered by the national earthquake insurance system, which has limited coverage. The algorithm considers the risks carried by the national system when finding the portfolio losses. As a demonstration of the methodology we look at the case of Istanbul and directly use its building inventory data instead of a portfolio. A state-of-the-art time dependent earthquake hazard model that correctly portrays the increased earthquake expectancies in Istanbul is used. Intensity and spectral displacement based vulnerability relationships are incorporated in the analysis. In particular

we look at the uncertainties that arise from the use of different types of vulnerabilities and at the effect of the implemented repair cost ratios.