

# Istanbul at the Threshold: An Evaluation of the Seismic Risk in Istanbul

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There is no convincing evidence indicating that future ground motion in at least two-thirds of Istanbul, Turkey, shall be less demanding than the ground motions that devastated the city of Düzce, Turkey, in 1999. Comparison of vulnerability indices calibrated for Turkish construction indicates that the structures of the buildings in Istanbul are no better than the structures of buildings in Düzce. On the basis of these arguments, we project that a future earthquake near Istanbul may cause severe damage or collapse approximately quarter of a million buildings. Leaving the vulnerable buildings as they are and organizing for emergency response is not an option for Istanbul.

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## INTRODUCTION

Istanbul, Turkey, has experienced several earthquake disasters.<sup>1</sup> The 1509 earthquake caused the worst recorded disaster. Parsons et al. (2000a) estimate the magnitude and distance between the epicenter and Istanbul were approximately 7.6 and 60 km, respectively. Ambraseys and Finkel (1991) estimate the earthquake caused 5,000 fatalities and collapsed 1,000 houses. At the time, the population of Istanbul was approximately 160,000 (Ambraseys and Finkel 1991).<sup>2</sup> It is estimated that today Istanbul houses approximately 12 million people (DIE 2005) in about one million buildings (DIE 2000). Figure 1 shows Istanbul with its European and Asian districts divided by the Bosphorus Strait. The number of recorded devastating earthquakes for Istanbul is sufficiently large that we accept that there will be another one soon. Therefore, in this note we examine the possible consequences of a devastating earthquake striking Istanbul within the next 10 years.

In 1999, two devastating earthquakes shook Düzce, Turkey—a provincial capital city located about 200 km east of Istanbul. In Düzce, the 1999 earthquakes caused almost 600 fatalities and significantly damaged or collapsed approximately 3,500 buildings out of approximately 12,000 buildings (DPT 2001).<sup>3</sup> The population of Düzce at the time

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<sup>1</sup> The historic structures still found in a state of “tolerable preservation” in the Marmara Sea region should not be interpreted as an indication of lack of seismic activity. Many of these structures have in fact sustained damage during past earthquakes (Ambraseys and Finkel 1991).

<sup>2</sup> The 160,000 estimate in 35,000 households was given for the year 1480.

<sup>3</sup> The Turkish State Planning Organization (DPT) reported in 2001 that in the provincial capital of Düzce the damage distribution among all buildings, i.e., regardless of the construction material and style, cumulative of the two 1999 earthquakes was as follows: collapsed/heavy damage (3,491 buildings), medium damage (3,170 buildings), and light damage (5,366 buildings).