

EVALUATION OF THE EFFECTIVENESS OF RISK REDUCTION MEASURES FOR EARTHQUAKE ASSOCIATED GEO-HAZARDS IN TEHRAN

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Tehran, the capital of Islamic Republic of Iran, is located in a seismic prone zone along the Alpine-Himalayan Orogenic belt. As shown in Figure 1, the city has been surrounded by several active faults and experienced numbers of strong earthquakes in its history. Seismologists believe that a strong earthquake can be occurred in Tehran during the coming years. On the other hand, most of the researches carried out during the recent years; depict the high vulnerability of buildings and infrastructures to potential earthquakes. Therefore, in case of occurrence a strong earthquake, considerable loss and damage can be expected (CEST and JICA, 2000).

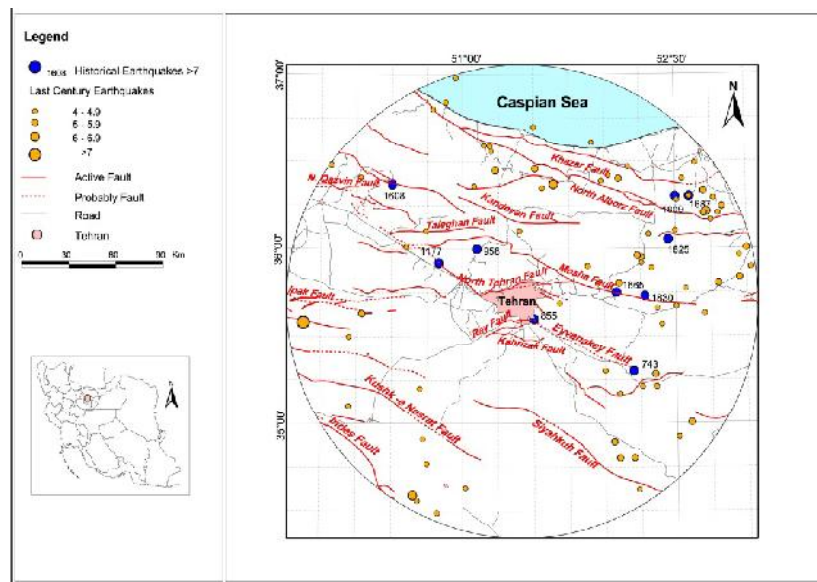


Figure 1. Main faults around Tehran and the location of historical and recent earthquakes around the city in 150 km radius (Amini Hosseini and Hosseini, 2007)

Besides of vulnerability of built environment in Tehran to potential earthquakes, geological hazards such as liquefaction, land subsidence, landslide and rock fall which can be induced or triggered by earthquake motions; may also increase the damages of urban fabrics in the city. Considering the geological setting and topographical condition of Tehran and this fact that many buildings in the city are constructed on unstable ground, and based on what experienced in recent earthquakes in Iran (especially in Manjil, 1990 and Firouz Abad–Kojour, 2004 earthquakes), it seems that the potential impacts of geo-hazards associated with earthquake in Tehran can be destructive. Ground motion amplification due to site effects, slope

instabilities and rock-falls, ground subsidence due to collapse of underground openings and Qanats (underground irrigation tunnels) and even liquefaction are some of the main features of geo-hazards that can be expected at different parts of Tehran (Figure 2).

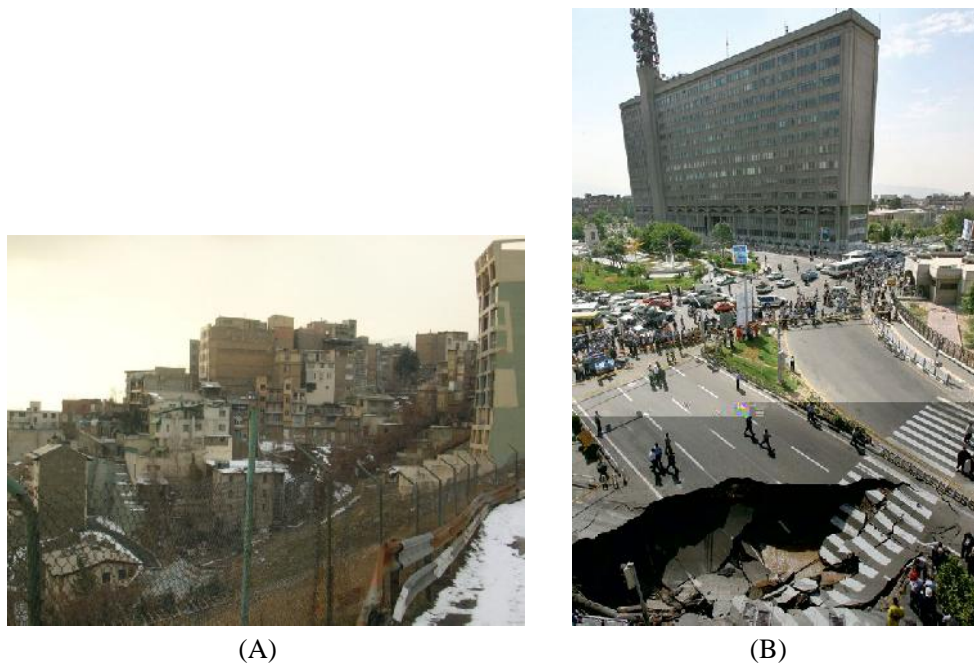


Figure 2. (A) Construction of vulnerable structures on unstable slopes in North of Tehran;
(B) Land subsidence due to collapse of Qanat in Tehran

In order to reduce potential impacts of geo-hazards associated with earthquakes in Tehran, some criteria have been developed by IIEES and approved by Tehran Municipality and Ministry of Road, Housing and Urban Development of Iran (Jafari and Amini Hosseini, 2004). These criteria then were reflected in master and comprehensive plans of the city. A series of guidelines were also provided on how to implement these criteria to prevent and reduce such hazards according to their types and conditions. Furthermore, some applicable methods of remediation or ground improvement were also proposed along with guidelines.

In this paper, having a look on these criteria, the challenges of applying them in practice and their effectiveness in reducing the risk of geo-hazards in the city, after about 8 years from their implementation, will be presented and discussed. In addition, the importance of integrating socio-economic conditions of urban fabrics with the physical aspects as well as potential hazards for formulating any criteria for renovation vulnerable urban fabrics will be shown based on lessons learned from this assessment. It seems the results of this study can be applied in other cities having similar conditions.

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