



UNIVERSITI PUTRA MALAYSIA

**DEVELOPMENT OF A SEISMIC VULNERABILITY
ASSESSMENT RISK MAP**

SARA AMIRI

ITMA 2011 11

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MAP**

By

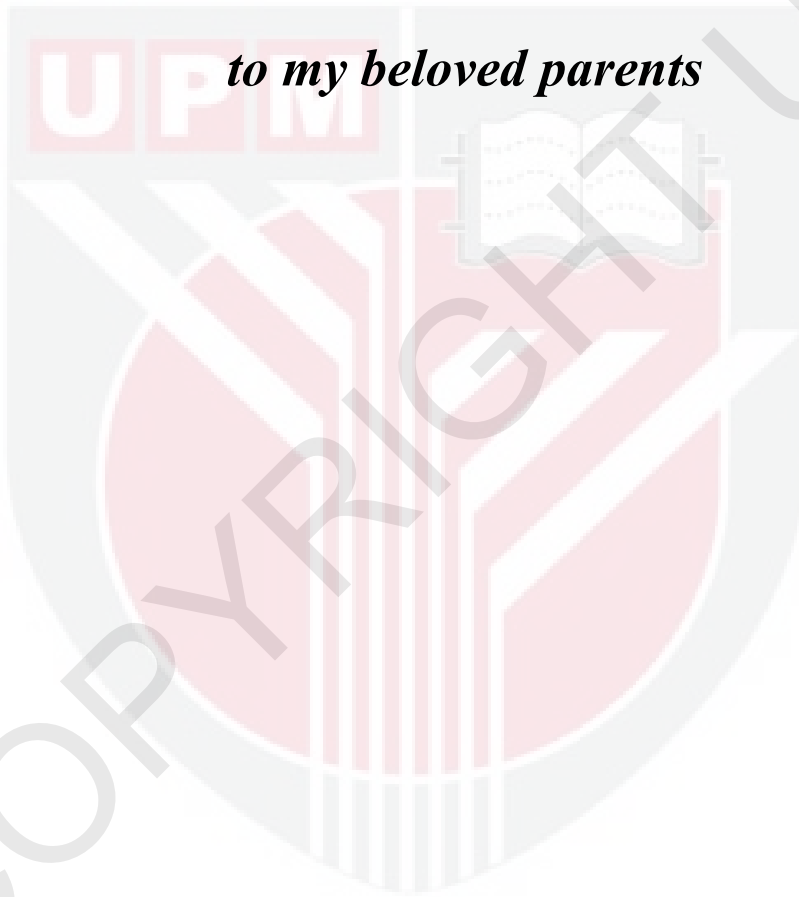
SARA AMIRI

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in
Fulfilment of the Requirement for the Degree of Master of Science**

2011

I would like to dedicate my thesis

to my beloved parents



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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

**DEVELOPMENT OF A SEISMIC VULNERABILITY ASSESSMENT RISK
MAP**

BY

SARA AMIRI

July 2011

Chair: Assoc. Prof. Ahmad Rodzi b. Mahmud, PhD

Faculty: Institute of Advanced Technology

Earthquake is one of the disasters which can cause problems to the economy and the society. Based on historical seismic data, Tehran has suffered from several strong earthquakes with a return period of 150 years. The local seismologists are considering the possibility of a large earthquake in Tehran in the near future because there have not been any large earthquakes in the past 170 years. Since most data related to earthquake have spatial properties, GIS can be used as an effective tool for managing and decision making in disaster time. In some countries such as Iran, disaster experiences show that managing and making decisions right before the occurrence of an earthquake are more effective than doing something after it has taken place. Therefore, planning an action in pre-disaster phases in the disaster management cycle is much more important. Hence, one of the crucial phases in disaster management cycle, known as mitigation, is

specifically meant for creating a resistant city against earthquake. In this study, three steps were used to evaluate vulnerable urban fabrics. The first step was adapted using seismic, geological criteria and suitability matrix to identify buildings that are exposed to danger. Meanwhile, a simplified index was used in the second step for the identification of buildings that would block roads when earthquakes took place. The third step was developed to evaluate recovery areas on the basis of division of city framework for escape and relief people. The results illustrate almost 80% of the total residential buildings are located in high risk site and unsuitable locations. The high amount of building demolition which could cause road blockage and delays in rescues and relief operation had been detected. Some problem caused by shortage of land or space for evacuation and emergency response. The findings of this study reveals that effective risk maps for management and reduction seismic disaster are necessary. In addition, the issues of preparedness, emergency response activities, seismic retrofit and recovery actions and policies shall also be taken into consideration.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

**PERKEMBANGAN PETA RISIKO PENILAIAN KETIDAKTEGUHAN
SEISMOS**

Oleh

SARA AMIRI

July 2011

Pengerusi: Prof. Madya. Ahmad Rodzi b. Mahmud, PhD

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Gempa bumi merupakan salah satu bencana alam yang membawa masalah kepada ekonomi dan masyarakat. Berdasarkan data sejarah seismos, Tehran mengalami beberapa gempa bumi yang kuat bagi tempoh berulang 150 tahun. Ahli seismologis tempatan mempertimbangkan kemungkinan terjadinya gempa bumi yang besar pada masa hadapan kerana tiadanya gempa bumi yang besar sejak 170 tahun lalu. Memandangkan kebanyakan data yang berkaitan dengan gempa bumi mempunyai ciri spasial, GIS dapat digunakan sebagai alat yang berkesan untuk mengurus dan membuat keputusan tentang masa gempa bumi.. Di sesetengah negara, seperti Iran, pengalaman gempa bumi menunjukkan bahawa mengurus dan membuat keputusan yang tepat sebelum berlakunya sesuatu gempa bumi didapati lebih berkesan daripada membuat sesuatu selepas bencana terjadi. Oleh itu, perancangan tindakan pada fasa sebelum bencana dalam kitaran pengurusan bencana adalah penting. Salah satu fasa penting

dalam kitaran pengurusan bencana dikenali sebagai mitigasi, khususnya bermaksud sebagai membina bandar yang tahan gempa bumi. Dalam kajian ini, tiga langkah telah digunakan untuk menilai ketidakteguhan fabrik bandar. Langkah pertama telah disesuaikan menggunakan seismos, kriteria geologikal dan matrik kesesuaian untuk mengenal pasti bangunan yang terdedah pada bahaya. Di samping itu, index yang dipernudahkan telah digunakan dalam langkah kedua ini untuk mengenal pasti bangunan yang menghalang jalan raya ketika berlakunya gempa bumi. Langkah ketiga dibangunkan untuk menilai kawasan pemulihan berdasarkan pembahagian rangka kerja bandar bagi bantuan kecemasan malapetaka. Hasil dapatan kajian mendapati bahawa hampir 80% keseluruhan bangunan kediaman terletak di kawasan yang berisiko tinggi dan di lokasi yang tidak sesuai. Jumlah bangunan tinggi yang dimusnahkan yang menyebabkan sekatan jalan raya dan kelewatan ekskavasi dan operasi relief telah dikesan. Sesetengah masalah disebabkan oleh kekurangan tanah atau ruang untuk evakuasi dan respon kecemasan. Hasil dapatan menunjukkan bahawa peta risiko yang berkesan untuk pengurusan dan pengurangan bencana seismos diperlukan. Tambahan pula, isu kesediaan, aktiviti respon kecemasan, retrofit seismos dan tindakan dan polisi pemulihan harus diambil kira dan dipertimbangkan.

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I certify that a Thesis Examination Committee has met on 4th of July 2011 to conduct the final examination of Sara Amiri on her thesis entitle "Development of A Seismic Vulnerability Assessment Risk Map" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

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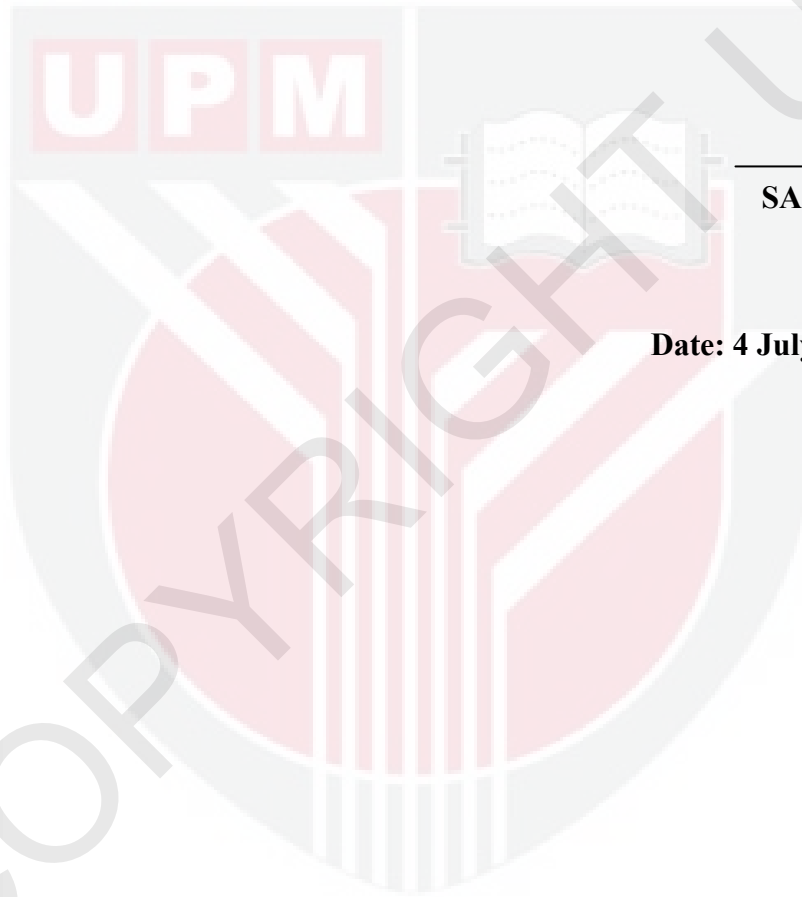
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DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.



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Date: 4 July 2011

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