Evaluation of the Road Network at Emergency Evacuation Times in Possible Earthquakes: A Case Study of Samen Area in Mashhad

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Extended Abstract
1. Introduction

Factors such as global warming, environmental degradation and increasing urbanization expose a greater number of people to the threat of natural disasters. These natural disasters require the immediate mobilization and action of multiple stakeholders due to the unexpected nature and amplitude of the event, and the diversity and the quantity of supplies and services needed by the victims. In countries like Iran, natural hazards experience shows that management and decision-making before the earthquake and after that is important. The occurrence of natural and non-natural disasters creates conditions that make some regions be rapidly evacuated.

2. Theoretical Framework

Usually after the occurrence of great events, destruction of bridges and roads, collapse of nearby buildings, faults, landslides, liquefaction, land subsidence, and abandoned or influx of cars cause transportation networks to become disrupted and this makes difficulties in the access of the rescue forces to the affected areas. Evacuation is a complex process that consists of several consecutive phases. After the detection of an incident, decision makers evaluate the potential threats for specific areas and then issue an evacuation order for these areas if the risk is significant and there are no shelters to provide adequate in-place protection. The type of disaster will dictate total or partial evacuation to distant or near-by relief location and if it is long term or temporary process.

3. Methodology

Based on objective, this study is an applied research and from the viewpoint of nature and methodology, it is a descriptive case study carried out based on the descriptive information of Samen Municipality of Mashhad in -2011-. In general,

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in this study we explored the modeling and analysis of the relationship between various parameters in emergency evacuation routing for Samen area in Mashhad. In the first step, based on library studies, important factors to be considered were identified. According to the results of the previous studies and the use of expert opinions, the criteria and sub-criteria for evaluating the performance of the road networks in emergency evacuation were selected. By using survey research, vulnerable routes were modeled by using Arc GIS software capabilities and by combining the information layer, optimized routes in relief and emergency evacuation at the times of disaster, such as an , were identified.

4. Results and Discussion

Planning for evacuation is a major and important part of emergency plans in vulnerable areas at the time of disasters. In fact, the best route in relief and sheltering is one that faces with minimum damage. The purpose of this study was to determine the effectiveness of the network at the time of earthquake disaster in regional levels that have been done with the case study of Samen area in Mashhad. With considering the importance of emergency evacuation issues during a disaster, the selected plan should be better than the other options and be able to save the greatest number of people in the event of a disaster. Thus, the present study aimed at examining the most vulnerable parts of the transportation network according to the mentioned criteria in Samen area and designing suitable models for evacuation and relief based on the results.

5. Conclusion and Suggestions

The purpose of this study was to determine the effectiveness of the network at the time of earthquake disaster in regional levels done based on the case study of Samen area in Mashhad. In this context, according to the opinions and views of the experts in this field, a general form of analyzing for the vulnerability of various routes in this region were presented and four major criteria (access factors, geometric characteristics of the network, construction of land, features of edge buildings) were specified. Furthermore, the effective sub-criteria were divided into 5 zoning as the very low vulnerability, low vulnerability, moderate vulnerability, high and very high vulnerability. In addition, the use of AHP indicated that among the proposed indicators, features of edge buildings criteria in comparison to the other three factors have the highest impact; and distance from fault, distance from the center of the risk, the ratio of width to height, and the type of materials, respectively, would have the most impact on the performance of the network during the earthquake crisis. Finally, combining the criteria with GIS capabilities showed that routes in the north of the area (sector 2) have the most vulnerability compared to the other sectors. South of this area have routes with enough width, more resistant buildings with less age and better access for relief.

Therefore, we must first develop plans to improve the roads, especially in lane width indicators, and take into consideration the vulnerability of buildings. In this way routes with a width of less than 8 meters in this region are widening and

other routes should also be close to their proper width according to the urban regulations design. Also, the modernization and reconstruction of streets, especially around the main and crowded routes, should be placed in priority. In addition, as far as possible, the creation of large construction blocks which reduces the permeability of the tissue should be prevented.

Key words: Road network, Vulnerability, Emergency evacuation, Samen area in Mashhad

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