

Resilience of Vital Landuses against Earthquake Disaster in Tabriz Metropolis

Mohammad Raza Poor Mohammadi^{1*}, Hanyeh Yousefi Shahir², Karim Hoseinzadeh Dalir³

1. Professor of Geography and Urban Planning Tabriz University, TABRIZ, Iran
2. PhD Candidate of Geography and Urban Planning, Marand Branch, Islamic Azad University, Marand, Iran
3. Professor of Geography and Urban Planning, Marand Branch, Islamic Azad University, Marand, Iran

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Extended abstract

Introduction

Nowadays, the process of urbanization is expanding and growing in all the countries of the world. Establishment of more urban districts has increased the main places for possible disasters. Tabriz Metropolis is located in an area prone to earthquake hazard and seismic natural disasters in different return periods. Thus it is required to study resilience of the vital landuses of the city. These vital landuses including water tanks and electricity transmission stations, gas stations, gas pressure reduction centers, hospitals, fire stations, airports, and terminals are necessary to rehabilitate critical circumstances and optimize service. Deficiency of the sensitive and vital sites may disrupt vital performance of the city. Thus, lack of comprehensive plans and rational decision-making models in this area may create irreversible problems.

Methodology

The present study is a descriptive-analytical survey that attempts to evaluate resilience of vital uses in Tabriz Metropolis against earthquake risk in terms of building strength, land resistance, application of regulations in construction of structures, their intelligibility, and emergency storage of fuel and water. The present study detected the effective indices influencing resilience of vital uses. The data were collected through the questionnaire distributed among 30 crisis management experts. We obtained 12 indexes of questionnaire. The collected data were analyzed by T-tests, Friedman, and Chi-square in SPSS software.

Results and discussion

According to the 12 criteria and indexes that influence resilience of vital uses in Tabriz city, the mean score and Friedman score for application and full implementation of building regulations and standards are 3.00 and 7.84; the values are 2.96 and 7.98 for strength and resistance of buildings; and for logical relationship between private vital uses and governmental vital uses they are 2.94 and 6.52, respectively. This reveals that resilience of vital uses in Tabriz city in terms of these indexes are in a relatively desirable condition.

* Corresponding Author: hyousefi.geo@gmail.com

Tel: +989144166892

The results of Chi-square test (375, 397) revealed that there is a significant relationship (0.000) between promotion of the quality of vital uses and resilience of them against earthquake; the insurance level is equal to 99 percent. The results of t-test revealed that three indices examined in resilience of vital uses in Tabriz are not in a desirable condition and their t value is less than 3. The t value of intelligence and the index of installing earthquake forecasting tool in vital applications is -1.25; the t value of people participation in resilience of vital uses index is 0.27; and t value for prediction of emergency fuel and water storage index is 1.56.

The ANP multi-criteria analytical method was used to make pairwise comparison of the criteria. The obtained results were examined by Super Decisions software; the accuracy of the process was ensured by controlling the compatibility coefficient of judgments. A set of calculated coefficients were presented in the form of a matrix. By combining these comments with scores of ANP model, dissimilarities among vital uses in different districts of Tabriz were estimated by 30 crisis management experts in 10 districts of Tabriz city; the data of the questionnaire were analyzed based on VIKOR model.

Conclusion

By combining the findings of the ANP and VIKOR model, it can be concluded that the evaluation of resilience of vital uses in Tabriz city revealed that districts 9 and 4 are in desirable condition, districts 1 and 2 are in relatively desirable condition, district 3 in moderate condition, districts 5, 6, 7, and 10 are in relatively undesirable condition, and finally district 8 is in undesirable condition. Thus, by examining the current condition, the following suggestions are provided for resilience of vital uses in Tabriz: In districts 1 and 2, with relatively desirable resilience, building density around critical uses must be avoided. In district 3, with moderate resilience, it is recommended to maintain the current status and attempt to improve and promote the quality of vital uses and create spatial opening around these uses, and equip these applications to smart systems. In district 5, with relative undesirable condition, it is necessary to increase vital uses by focusing on correct location around open areas, prevent compression of developing areas around vital uses, and avoid creating these uses within the fault line range. In districts 6 and 7 with relatively undesirable condition there are various industrial divisions and intensive constructions, thus it is recommended to have vital uses in accordance with practical and functional activities in order to meet the needs of the areas at the time of crisis with the resilience of these uses. In district 8 as an old part of Tabriz, the resilience condition is undesirable; thus, it is necessary to attend to renovation and improvement, observe regulation and required standards, and participate in increasing the resilience of current vital uses and transferring and moving vital users with trans-regional performance to other areas. District 9 is in desirable condition and it is regarded as new developed areas of the city which is added recently to Tabriz city. Therefore, it is suggested to emphasize on the complete implementation of the approved draft plan without subsequent modifications through Article 5 of the Commission. District 10 is in relatively undesirable condition; it is suggested to balance the spatial organization of the city through the expansion and development of vital applications and avoid creation of these applications in the vicinity of the fault line. It is necessary to monitor the principles and criteria in the preparation of comprehensive urban plans in terms of resiliency, more closely. When using advanced systems, the units of the facility must consider the relevant standards, in addition, they must comply with the relevant standards in order to cut off the electricity and gas through smart grids.

Keywords: resilience, vital land use, earthquake, natural disaster, Tabriz.

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