Spatial Assessment and Analysis of Flood Risk in Deserts and Desert Areas Based On the Combination of ANP Methods and Pairwise Comparison in GIS Environment Case Study of Khorasan Razavi Province

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1-Introduction

Flood is a natural phenomenon that human societies have accepted as an unavoidable event caused by a number of factors, depending on the climatic and natural conditions of the region. It is believed that the relationship between rainfall and runoff is significantly different from one basin to another. Given that, in order to prevent the occurrence of such harmful phenomena, it is not possible at present to make changes in the factors and elements of the atmosphere. Therefore, any principled and useful solution should be sought on the ground, especially in watersheds. From this point of view, areas with "high potential" for flood production should be identified. Accordingly, the first measure to reduce the risk of floods for the sustainable settlement of the population is to control floods at their source, namely, the watershed sub-basins. Thus, it is essential to identify floodplains within the basin; however, due to the large size and scope of the watersheds, is not possible to carry out modeling, implementation and remediation operations throughout the basin. Thus, it is advised to use various computerized models to prevent floods.

2-Methodology

In this study, it has been attempted to combine GIS and multi-criteria decision-making systems (MCDM) to identify areas with different degrees of flood risk for sustainable settlement of the population in each of the cities of Khorasan Razavi Province, Iran. For this purpose, first the data of 6 effective parameters including Maximum discharge with 2, 3, 5, 10, 25, 50, 100 and 200 year return periods obtained from HEC-HMS software output, drainage density, land use and vegetation, CN, slope and permeability of the

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study area were prepared in GIS software environment. Then, using ANP method and pairwise comparison, the weight of each criterion and the weight of the classes of each layer were calculated in Super Decision software, respectively. Then, using GIS software analysis functions, the whole range was zoned for each of the specified criteria. Ultimately, through combination of the zoned maps and based on the weights of the ANP, the final map was prepared in five classes of low-risk flooding and high-risk flooding areas.

3-Results and Discussion

The results area of the cities exposed to floods with a very high degree as well as flood risk zoning with a return period of 2 years in the entire Khorasan Razavi province show more than 86% of areas with low and very low flooding, 12.2% of medium areas and 1.8% with high. While the results of flood zoning in the 200-year return period show 41.3% low flooding, 31.4% moderate flooding, 13.3% high flooding and 14.1% very high flooding in the entire province.

4-Conclusions

The results of this study were analyzed using field visits and ground control, which indicates that all selection criteria are met revealing the usefulness of combining MCDM methods with GIS in identifying areas with different degrees of flood risk.

Keywords: Flood risk, Population settlement, Couple comparison, Khorasan Razavi