Modeling the optimal paths of Dalaky–Vahdatiyeh Towns development using AHP, Dematel, and SAW techniques

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Extended Abstract

Introduction

Natural conditions and physical limitations determine the suitability of an area for the development of the city. Therefore, ignoring the effects of these factors and conditions such as the position of the floodplain, steep, existence of bedrock ... on the development can cause serious and complex problems (sarvar, et al., 2014, 96). Urban development is the harmonious and balanced expansion of the surface assigned to the residential buildings in a city, with the surfaces required by other applications at a standard level (ghrekhloo et al, 2011). In many sources, the physical expansion of cities is defined as a dynamic and continuous process in which the physical limits of the city and its physical spaces increase in vertical and horizontal directions in terms of quantity and quality (Pour Ahmad et al, 2014). High population growth and migration caused unplanned constructions and unrestrained expansion of cities and has created a lot of changes in their spatial constructions. The lack of knowledge and awareness of these limitations and the lack of preserving their limits led to the development of the city towards these obstacles and ultimately, urban areas will face serious problems. Therefore, the balanced development of cities requires planning principles. Accordingly, this research tries to determine the optimal areas for the physical development of the Dalaky and Vahdatiyeh towns, while considering the variables affecting the location of these two towns with the help of the Geographic information system (GIS) and mathematical methods of MCDM.

Research Methodology

The research method in this study is descriptive-analytical, based on practical type. In this research, the required information was collected using field and library methods and then, the subject under study was investigated using Excel, AutoCad, ARC GiS and GOOGLE Earth software and SAW, Dematel and AHP methods in two stages. At the first stage, geomorphological maps were prepared as the base maps using 1: 100000 geological and 1: 50000 topographic maps -K753 series, pages 6148 IV and 6248 I, digital elevation model (DEM) and satellite imagery. Then, at the second stage, the AHP method was used to weight the sub-criteria and the SAW, DEMATEL and AHP methods were used to weight the main criteria of the research and ultimately the final map was prepared. In general, AHP helps decision-makers to choose the best option by comparing criteria and sub criteria. In this way, decision-makers compare criteria and sub-criteria in pairs, and there is no need to consider all criteria at one stage.

Results and discussion

The variables and indices in this study are 5 criteria: slope, mother materials, geoform, land surfaces and climatic elements; and 6 sub-criteria: distance from human elements, distance from runoff, distance from the tectonic structure, temperature, precipitation, wind speed; and 10 indices: distance to urban settlements, distance from the road, distance from groves, distance from agricultural lands, distance from the alluvial fans, distance from the river, distance to Galli, distance from alluvial terraces and distance to reverse and strike-slip faults. After evaluating these indices, AHP, Dematel and SAW techniques were used to analyze them.

Conclusion

Urban physical development is one of the main issues of urban growth, and if the physical development is not a desirable location in cities, there will be many negative impacts both from natural and human aspects on the cities. Unauthorized growth of urban areas and the development of these areas in the natural environment regardless of natural hazards, recognizing regional geomorphic conditions, environmental hazards, and urban planning are necessary to determine the safe and sustainable environment for the expansion of cities. In this research, the geomorphological and environmental hazards in the study area have been investigated using the Saw, Dematel and AHP models; the opportunities and constraints have been expanded in different directions of the Dalaki and Vahdatiyeh cities, and finally the best direction for the expansion of these cities in the future was determined.

Although both the DEMATEL and AHP model compare each parameter to other parameters, but, because the AHP model compares the weight of the classes of each criterion based on the preference of one class to all classes of that criterion, it provides better results. The results show that the SAW method also suggests some results by direct determination of the weights. Therefore, with regard to the contradiction of the final results of parameter weighting, the weights have been integrated in this research using the average rating method. Accordingly, the mother material parameter with an average rating of 1.33 is the most preferred parameter, and the slope and land surface parameters with an average rating of 3.67, have the least preference in weighting factors. According to these surveys, the lands of the south-east, north, north-east and the eastern slopes are the most suitable directions for the physical development of two towns of Dalaki and Vahdatyeh.

Keyword: Geomorphology, Physical development, Environmental hazards, MCDM, Dalaki– Vahdatiyeh