Middle-East Journal of Scientific Research 14 (3): 432-442, 2013
ISSN 1990-9233

DOI: 10.5829/idosi.mejsr.2013.14.3.317

The Multi-Criteria Topsis Model Approach in Optimized and Sustainable Location Selection Lands Housing Development (Case Study: Bahar City in Hamedan Province)

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Abstract: Planning for supply of housing development land in suitable conditions in small cities and optimal and sustainable selection with considering the space culture and stable residential population of this cities among the important factors that are known to stabilize the population and the increase in weight of small towns in final, the balance of the settlement in the province is very significant role. Hamedan as one of the metropolises of Iran, according to the Master Plan for Housing Studies with 27 cities,more than 40 percent is allocated to the province's housing needs, this situation because of the concentration of population and Services from the first to the last Census in 2006, that has been transformed Hamedan into a first urban area, that one of the ways out of this phenomenon,that is due to a long break in the settlement system of state, is Prevention-oriented focus and small town population migration to capital, especially in the midsection province. In this study, a survey research through direct and indirect observation of land in the city, to document information on housing needs, taking into account demographic developments, In a 20-year horizon in the Bahar of satellite cities of Hamedan and by determining the criteria for the selection of land for housing development with TOPSIS method as a method of multiple criteria, the selection of optimum and sustainable location for housing development in terms of location and area of land required about this city, thus, this study shows the physical development of the city's central interest in the context of decentralization and greater tendency to develop in the West and access to main road.

Key words: Conservation and sustainable site selection · Bahar city · TOPSIS multi-criteria model · Lands development housing

INTRODUCTION

Land as a nonrenewable wealth in the city, in the most different user, it provides various services to residents and citizens, Under urban land use, according to city population size, has a certain standard, It is learned that as per capita, increasing urbanization and growing demand for housing, according to most officials and planners to address the housing needs of citizens draws, But according to the needs of future generations, while the current needs of the most essential TOPSIS that will be great emphasis on the scientific community, But the formation of each residential unit and create a suitable environment for human life must include the various stages of planning, design and construction is over, The lack of attention to their principles or even a failure to perform properly, can cause various problems [1], The residential user, the most original and largest city is to provide the most basic needs of people, With different dimensions and different that people in urban space, a sense of belonging for more public space, social and economic dimensions of the transfer. Meaning of urban space and time to meet all aspects of their environment, which is becoming the place. Private space to house citizens can be considered [2], Most land in the occupied territories and in different cultures have their own space is limited to situations in which geographic factors have also played a role unmatched, However, one of the most important principles in this section, the words that go beyond the concept of living and housing and households for the collection of biological activity lies in the social relations [3], The values of every community in the form of a culture that emanated from the social aspirations of the community, Defines crystallized and

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their surroundings, so these features shows. Land for housing in the horizontal distance must be selected in place the necessary features for the enjoyment of other services in the appropriate space according to different criteria is, The results confirm that the populations and prevent population displacement, especially in villages towns and satellite cities is, Because today, one of the problems, lack of appropriate links in the network environment and urban systems in the urban settlements, Often a lack of regional balance and weight, the main conditions for the development of rural towns, satellite cities and towns, is very hard. And while the concept of sustainability is an important part of city, village city, lies in the word. Forming units of urban development that will shape the structure of this concept is a strategy for sustainable development approach. This strategy focuses on the development of future activity centers and thus prevents the growth of dispersed and identity [4]. This study measures the determinations effectively Location selection housing, Using th TOPSIS model as a multi-criteria approach to Location selection and prioritization Optimal and sustainable the lands of housing development land in Bahar cities is studied.

Research Methodology: This study is an applied research that in which the researcher has studied the physical and structural development of the city in different direction by employing field methods, as well as identifying the development capacities, the limitations and barriers. In this walk, the researcher has studied the distribution of uses with suitable location criteria in various dimensions in order to determine suitable direction, place and amount of land needed in a 20-year horizon Using the model TOPSIS to prioritize and Location selection land for housing development in Bahar cities, As one of the Metropolis towns of Hamedan satellite deals.. In this study, the researcher has been dealing to study and investigate some available documents and information in relevant organizations such as municipality, housing and urban development and statistics centers in order to obtain necessary information to predict the population and housing needs in the scope.

Research Goals:

- To study environmental, natural and human conditions and existing status.
- To study the urban growth and development status in the residential system of.
- To study housing situation and its needs in the Hamedan province.
- To determine the location, amount and suitable directions of land development and priorities by using TOPSIS model.

Volume of Sample: Bahar in the middle zone of the province was selected as a sample from the six cities of Maryanaj, Joreghan, Salehabad, Lalejin and Asadabad cities.

Research Questions:

- Are environmental, natural and geographic conditions effective in urban land development location?
- Are social factors effective in Location selection Optimal and sustainable of housing lands in satellite cities?
- What criteria could be effective in location selection for housing development lands in the satellite cities?
- Is it different standards, land development, housing choice and prioritized in satellite cities?

Research Variable: Independent variable: Empty lands capable of being used for development inside city.

Dependent Variables: Slope, substructures, topography, communication roads, urban services, natural hazards, river limits.

Research Territory: Hamedan with 19491 square kilometers area includes 2.1 percent of total area of Iran. This province is located between 33 degree and 59 minutes to 35 degree and 44 minutes northern latitude and 47 degree and 47 minutes to 49 degrees and 30 minutes eastern longitude from Greenwich meridian [5]. According to the political divisions, Bahar is the central city (Capital) of Bahar city and is located in the central section (south Bahar) of city. Bahar is between 48 degree and 25 minutes to 48 degree and 27 minutes geographic longitude and 34 degree and 52 minutes to 34 degree and 55 minutes geographic latitude. In terms of general situation, the city is located in 15 Km distance in northwest of Hamedan and the most essential communication road of city with surrounding settlement areas is through Hamedan-Kermanshah Road. Bahar in addition, is connected to Lalejin and other settlement spots in north via the asphalt road in its north zone. The nearest settlement in south around Bahar includes

Yekanabad and Mehriabad, in east, Ghorogh Bahar village, in north, Ganj Tappeh village and in west, Salehabad town.The most important natural characteristics of the city is Ghourichai river in north and west and Alvand mountain chains in south of the city [6].

Theoretical

Land: In terms of starting point of any urban development, including housing, industry, services and … land is of high importance and each plot of urban land is considered valuable as it is exclusive and exceptional than other plots and in general, due to the supply restrictions [7]. Land covers a major part of natural resources and holds various characteristics and specifications, recognizing them are greatly important in land use planning. Those specifications make the land especial and distinguished as well as becoming a core and center and in legal and private ownership viewpoint, land is a consumable property; and, in economic view, it is a capital in its essence. Land, particularly in connection with resources market, is a location position [8]. The urban land polices are affected by laws that controls the method of govern ownership on urban lands.

Housing: In the Second Congress on Mankind Settlement (1996) held in Istanbul, a suitable housing has been defined as follows: "A suitable shelter does not mean having a roof but it means comfort and suitable space, physical access and safety, ownership safety, structural sustainability, suitable light, ventilation and heating systems, suitable primary substructures, suitable environmental quality and suitable place with accessibility to work and primary facilities and all of those factors should be provided with respect to people's affordability [9]. In Iran, the housing policies have been planned based on two factors of demand and supply. Different policies have been taken by the ruling governments to housing development since Islamic Revolution until now. Since several factors have affected on housing in Iran during the few past decades, this sector has been facing with different crisis [10].

Housing Development Lands: The housing industry contributes immensely to national growth, forms part of the productive economic sector and actively contributes to the gross domestic product (GDP) of a country. However, current threats and challenge have built up barriers that slow down the growth of the industry [11]. Governmental housing units play very important roles in both quality and quantity terms in the countries that face to housing shortage; however, as the housing problems gradually become less, the private ownership and housing production has flourished by private sector [12]. In this section, using various criteria, the in-bound or peripheral lands are selected by private or governmental sectors to be used for construction; nonetheless, most often, the housing development lands are forecasted in form of development plans and since those estimations often lack spatial and residential analysis in zone level- lack of that information or neglecting it- makes city a polarized place or causes discretion in urban networks in various levels. The housing development land, also called urban development reserve land- is a complex of city lands that is selected based on natural, physical, demographic, economic… nature in a 10-20 year range to fulfill residential demands of the city in a direction free from natural or artificial barriers and have necessary accessibility to services, including essential substructures [13].

Model of Suitable Places to Housing Function Development: Suitable places for developing residential regions should have 1 to 8 percent land slope, maximum 1600 meters height and southern and eastern geographic directions for semi-hot climate and western position for hot climate, observing the limits of known faults in the zone based on the regulations and laws of geology and the faults width in the zone. In addition, legal distance should be taken from dried riverbeds and floods ways and no residential structure should be allowed to be built in 50 to 300 meters distance of flood canals limits. The legal distance should be observed from energy, water, gas and electricity networks, establishment of green landscape in the zone, maximum wind speed of 15 meters per second, study of water reservoirs, conformity of existing pattern of water sources based on the ecological model of Iran, attention to protecting historical and cultural pieces and spots and highly fertile and fertile soils as well as underground water resources must be protected. Furthermore, especial attention should be paid to the damages causing by any probable flood and determining the flood risk regions are among other measures that should be taken in housing functions development activities [14]. In general state, development takes place in three forms: City-connected development; disconnected development with a distance that would make connection to city possible in a specific time intervals [15]. Of course, one item must be added since there are various and different factors involved in selecting suitable place in developing urban lands; among

them, one may discuss access to substructures and urban services, communication roads and economic and social issues that in turn has extensive elements.

TOPSIS Model: TOPSIS is a widely accepted multi-attribute decision-making technique due to its sound logic [16], simultaneous consideration of the ideal and the anti-ideal solutions and easily programmable computation procedure [17]. TOPSIS for selecting the best system the preferable relative importance of each indicator grade (objective) should be identified [18]. This technique is based on the concept that the ideal alternative has the best level for all attributes, whereas the negative ideal is the one with all the worst attribute values. In fuzzy TOPSIS, attribute values are represented by fuzzy numbers. Using this method, the decision- maker's fuzzy assignments with different rating view points and the trade-offs among different criteria are considered in the aggregation procedure to ensure more accurate decision making [19]. This type of model, the selector to select the most suitable choice from among the m choice is used. In this model, quantitative and qualitative indicators in two formats and they must be converted to a. TOPSIS model best option would be a subjective choice value or desirability of each characteristic provides the most preferred [20], Generally, this method for analyzing complex decision problems in which decision options based on the conflicting and inconsistent assessment is done [21].

Research Findings

Housing Status in Hamedan Province: Study housing indexes is one of the recognized tools and methods on housing characteristics and by its help, effective parameters on housing could be identified and any planning and decision making on housing could be facilitated [22]. Indexes are in fact measurement tools on housing position and the process of changes as well as an assessment tool on measuring success and realization of housing policies. For this reason, in addition to assessing the status, they could be also used in developing the quantitative goals of plans. In general, the housing indexes could be divided in three main groups: A: Quantitative indexes of housing, B: Qualitative indexes of housing, C: Economic indexes of housing [23]. In line with this important issue and based on existing information, according to the census of 1986, the number of residential units of province was 235160 and in the census of 1996; that is 10 years later, that number reached to 292327. In another word, during that period, 57167 residential units were added to the number of previous period units and this increase for one decade shows a growth rate of 2.20. Based on the same information, as taken from Iran Statistics Center, listed in table (1), in the last census, the number of residential units of the province had reached to 369472 units and this 77145 unit's increase somehow shows a growth rate increase from 1996 to 2006, showing 2.40 growth rates for that period [5]. Studies of this research on the process of housing needs, with all increases and the growth rate of the last two decades showed that based on studies of Housing and Urban Development Organization, Hamedan is short of 22908 residential units in 2006 and the highest shortage was for city of Hamedan. Immigration and absorbing population of peripheral cities and villages could be one of the most important reasons of increase in that demand in Hamedan city; therefore, one of the ways to remove that shortage, due to the spatial restrictions and closeness of this city to the satellite cities in midde zone, along with ambiguities and disputes which are usually observed in determining the limits and boundaries of this city and other cities and unfortunately, various barriers in physical development have restricted the residential development. Removing housing problem of satellite towns of Hamedan and directing a part of overflow population to those towns could be achieved through proper location and identifying needs in a long-term horizon. The importance of establishing suitable grounds for establishing housing in cities, aims at preventing migration to capital cities of the province and preventing negative growth of those cities. The table and diagram number 1 list the 41 percent share of Hamedan city of housing demands of province. This shows the centralization of population and services and appearance of a city that in the absence of proper planning for the settlement system of satellite cities; its urban network will face a serious in balance, loss of weight and polarization of the central zone versus weakness of other zones, especially northern and southern zones [6].

Housing Status in Bahar City: In order to have a better understanding of residential spaces, this city is divided into 2 zones and 6 blocks. According to the calculations made from the map, the existing status of the city showed that total land use area of the city is 160.25 hectares. The share of this land use from total gross areas of the city was 20.37 percent and the proportion to the net surfaces (built) was 41.2 percent. The per capita of the land use in existing status is 44.57 square meters per individual. In addition, the net housing density in this city is calculated to be 224 persons per hectare [6].

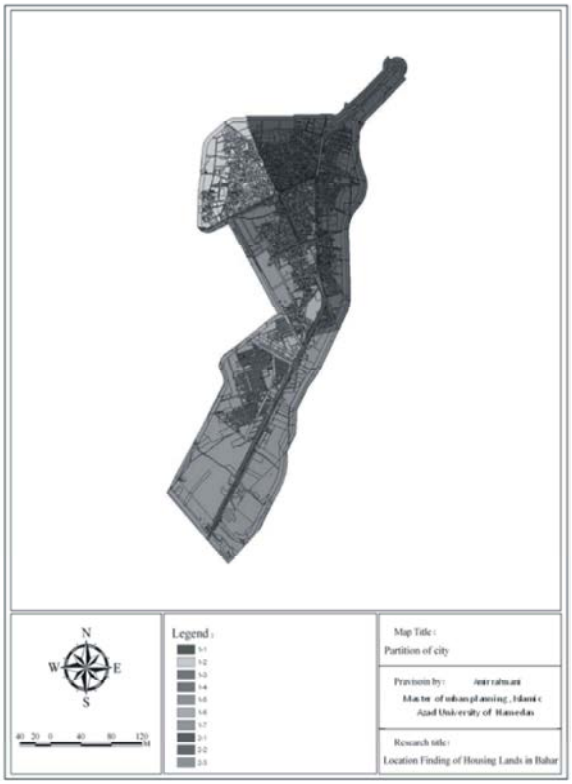
Table 1: Housing status in population and housing census of 1986-2006

Year	Rural	Urban	Province
1986	140,252	94,908	235,160
1996	126,109	166,218	292,327
2006	139,844	229,628	369,472
Increase Rate 1986-1996	-1.10%	5.80%	2.20%
Increase Rate 1996-2006	1.00%	3.30%	2.40%

Table 2: Average distribution of area of residential plots in Bahr city blocks

Block	Residential Surface (Square Meter)	Number (Plot)	Plot Space Average
Block 1-1	247909	834	297
Block 1-2	293375	1147	256
Block 1-3	135723	515	264
Block 1-4	115750	387	299
Block 1-5	124643	491	254
Block 1-6	64982	287	226
Block 1-7	168677	806	209
Block 1-8	154131	556	277
Block 1-9	91990	401	229
Block 1-10	5353	3	1784
Total	1602535	5427	258

During past years, the residential units of Bahar have been affected by cultural and economic actors including various materials and construction techniques. During the last 15 years, using local and traditional materials has been significantly reduced due to homogeneity in producing construction materials in the country. The techniques and materials of residential units in Bahar shows that iron and bricks have been the main construction materials in the units. In such buildings, after foundation, the platform is made; the floor and walls are thus immune from ruins caused by humidity. The load bearing walls are made of bricks and cement mortar and the ceiling is made of iron beams and cross beams. The final coat is bitumen and asphalt or Isograms (insulation brand) to prevent moisture penetration. According to the last studies, in 2006, more than 452 residential units were built with metal or concrete structure and those materials account 8.33 percent of total residential units of the city. Distribution of residential buildings as per construction materials and blocks of the city shows that blocks 1-7, one of the newly constructed parts of the city- with 34.24 percent metal and concrete frame (structure) had highest ratio among blocks in terms of this type of construction materials. Studies show that in central blocks of the city, including blocks 1-2 and 1-4, low durability and poor materials such as cement block, mud, mud and bricks…were used in many buildings. Those blocks are considered as worn out and low blocks of the city [6].



Map. 1: Zoning and blocks of the city

Study of Population Structure in Bahar Cities

Population of City and its Change Process: According to the results of general census of population and housing of 1996, the resident population of Bahar was 25865. The existing studies show that the population was steadily increasing in 30-years period of 1966-1996; although the relative intensity of growth differed in time intervals. Based on the results of general census of population and housing, the population of 1956 was 9615, of 1966 was 11843, while the population reached to 14489 in 1976 and has increased to 21678 in 1986. Therefore, it could be observed that the city population in this time has increased for 2.2 times taking the break even of the total increase coefficient of population for three subsequent decades. In each subsequent decade, the population respectively has grown 1.2 times, 1.5 times and 1.2 times per decade. In another word, in the first two decades of this time, the acceleration of grow population has been increasing. While in the last decade, there has been a considerable reduction in the population grow acceleration, as if the relative intensity of population grow is almost equal in the first and third decades of this time period. The number of city dwellers in 2006 was approximately 27481 that show its grown1.1 times in that

decade. It thus could be observed: First, Bahar is a small and low population town, second: the net break even of impacts of attraction and rejection forces of the population was not significant and the population has increased in a relatively low rate and third: the population increase rate was higher to 1986 and after that, it has been gradually reduced and is becoming lower and lower. Bahar City's population in 2011 to 30490 people [5].

Average Annual Growth of City Population: Based on accessible information, the average annual growth of population of Bahar has been 2.28 percent during 1966-2006 and the break even of similar size of this growth rate in three subsequent decades 1966-1996 is (2.04%, 4.11% and 1.78% respectively) and average size of growth rate per years of this time period 1996-2006 has been almost 1.08 percent. Therefore, spite of its small size and low population, Bahar is one of the main cities of Hamedan Province and its population is only less than the population of the five cities of province (Hamedan, Malayer, Nahavand, Touyserkan and Asadabad) and is more than population of other 11 cities of the province. In this distribution model, the relative share of city of Hamedan is 49.5 percent, Malayer, 17.8 percent, Nahavand, 8.0 percent, Asadabad 6.0 percent and Touyserkan is 4.7 percent, having more than 86 percent of urban population of the province. In any way, based on existing information, due to less acceleration in population growth of Bahar, in compared to the average size for total urban population of province (with respect to the increase in number of cities), the size of relative share of its population is diminishing gradually as far as this size reduced from 5.1 percent in 1966 to 3.2 percent in 1996 and its similar size in 1976 and 1986 was 4.5 percent and 3.8 percent; respectively. According to similar implications, that process has been continuing in recent years as well and the relative size of population of Bahar from total urban population of Hamedan is approximately 2.9 percent [6].

Prediction of Future Changes in Population: In general, the noteworthy point in the urban plans in various levels is the close relationship between population and land. Both categories affects to each other and the change in one of them would cause change in the other category. Therefore, the study requires careful population analysis and studies in order to be able to calculate the needed land carefully in plan horizon. On the other existing situation and population elements could be always obtained through census of people and housing as well. In this part, by using tow methods of linear growth and exponential growth model, we will investigate the population of Bahar in the plan horizon by using special analytical relations and prediction methods, (2032) are studied.

Exponential Growth Model: This model is obtained based on the proportion between desirable populations to base population by exponential ratio of growth rate.

$$r = (\sqrt[n]{\frac{P_n}{P_0}} - 1) \times 100 \quad (1)$$

$$P_n = P_0(1+r)^n \quad (2)$$

In this relation, r is equal to growth rate between the origin years (P_0=1956) and horizon year (P_n=2006).

$$r = (\sqrt[50]{\frac{27481}{9615}} - 1) \times 100 = 2.1$$

Since The growth rate between 1956 to 2006 was positive and predicting population of horizon 2032, according to 2012 population and that growth rate, is as follows:

$$P_n = 30.490(1 + \frac{2.1}{100})^{20} = 46203$$

As it could be seen, the population of the city will be 46203 by accounting the growth rate of the previous 50-years period to the horizon of year 2032. After making population studies and suggesting population for the plan horizon, the amount of land should be calculated that are needed for residential units horizon that are going to built in plan. We have predicted to needed land the by making structural, population, economic studies and by considering all aspects and various analysis from the two methods that has mentioned above. The method is explained in details as follows. In first method, we started with taking the three items of suggested population and estimate the number of housing units per family coefficient in the residential unit and average of family size.

$$H = \frac{p}{Ks} \quad (3)$$

In above-relations, H is number of houses needed, P is the population as predicted in plan horizon, K is the coefficient of number of families per residential units and S is the average of size of family.

By placing the numbers of above-mentioned items in the formula for Bahar city, the number is obtained to be 9714 residential units. After obtaining the number of necessary units, divide it into the net residential destiny to obtain area of land needed for housing building

$$H = \frac{46203}{4.1 \times 1.16} = 9714$$

$$A = \frac{H}{D} \quad (4)$$

$$A = \frac{9714}{224} = 29.97$$

With respect to the above calculations, it could be seen that 30 hectares land is needed for this plan with 46203 populations.

In second method, which is a simple method, the population of horizon year of plan is multiplied in the residential per capita to obtain the size of residential land for the year 2032. The number is then subtracted from the current residential land use of city to calculate the size of land needed. According to the above calculation, 45 hectares of land is needed.

$$46203 \times 44.57 = 205.92$$
$$205.92\text{-}160.52 = 45.4$$

With respect to the methods used and considering the two population growth as suggested for 2032 and the two methods of calculating land and considering all aspects, in average, 38 hectares land is needed.

By considering the existing conditions of the lands as located in the city boundaries and connected development form, is considered as first priority and development outside city boundaries- but inside city limits is the second priority.

In this research, by considering the following factor, the TOPSIS multi-criteria model has been used. According to the calculations of previous parts in average, 38 hectares land is needed; therefore, since there are already 54 hectares of uncultivated, deserted and under construction land is available in the city, which are not included in fertilized agricultural lands, gardens, green landscapes and environmental protection and preserved zones, we will face no shortage of land and the priority is to use existing lands.

Research Analysis

Multi-Attribute Decision Making (TOPSIS): These types of models are selector and they have been applied, in order to, select the most appropriate item between M options. In these models, indexes are in the both form of quantitative and qualitative and they must be converted to quantitative form. In TOPSIS model, the best option would be a subjective choice. That provides the most preferred value or desirability of each characteristic [20]. This step by step process in our study are (Bahar city) to prioritize and Locating housing development in is as follows:

Analytical diagram of Location selection and prioritization Optimal and sustainable land for housing development using the TOPSIS model

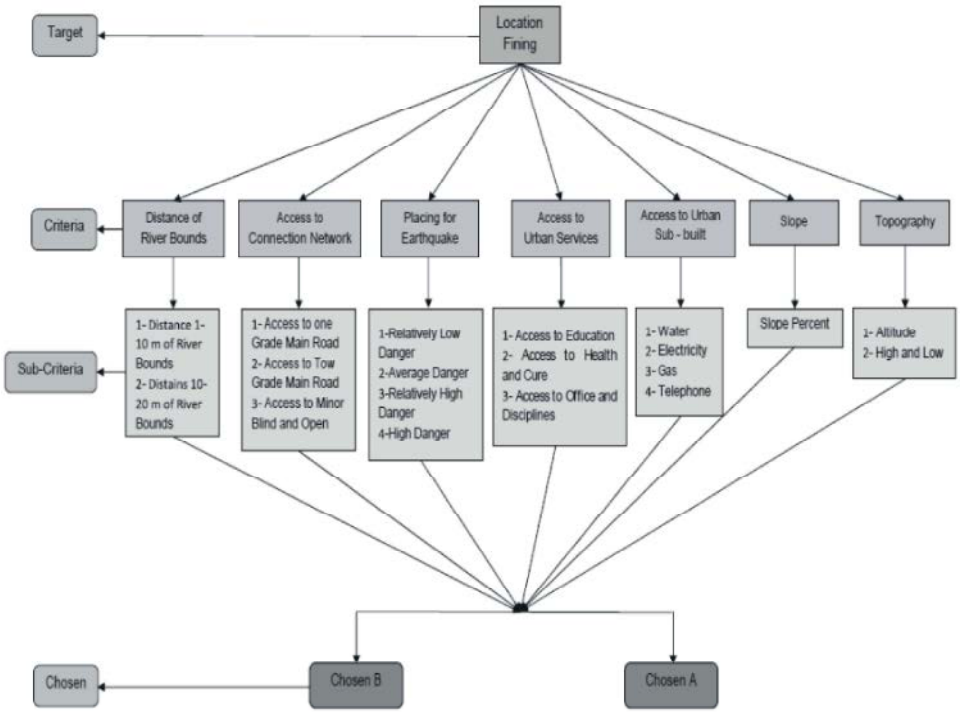
First Part: At first qualitative and quantitative matrix is provided. At this stage, if stated the value, its value will be used. And if the index is a qualitative dimension, it must first be converted to quantify the quality such as Far and closeness to the criteria that have been considered or relatively low and moderate slopes, etc. These quality numbers are usually be divided into 3 level of weak, medium and well. And then we assign it a number and eventually, we will draw standard matrix.

Second Part: In this step, importance of criteria and sub criteria will be determined. And then we use the Saati's 9 quantifies table So in this table 1 points assign to the importance of an equal, 3 will be assigned to more little importance, 5 to more importance, 7 to much more important and at last 9 will assigned to absolute importance. And Numbers 2, 4, 6 and 8 refers to the intermediate mode. Based on these processes, By comparison with the two criteria will be done. Then with geometric mean the indices is obtained and by the way of division the total obtained for each indicator, the important factor is calculated indices.

Third Part (Entropy Technique)

First Step: A decision matrix from MADAM model contains information that entropy can be considered as criteria for its assessment. A decision matrix is considered as follow:

$$D = \begin{array}{c} \\ A \\ B \\ \\ \end{array} \begin{array}{c} \begin{array}{ccccccc} 7 & 6 & 5 & 4 & 3 & 2 & 1 \end{array} \\ \begin{bmatrix} 4 & 2 & 1 & 2 & 2 & 3 & 5 \\ 5 & 1 & 2 & 3 & 3 & 2 & 3 \end{bmatrix} \\ \begin{array}{ccccccc} + & - & + & - & - & + & + \end{array} \end{array}$$



Second Step: At first the information content of the matrix to be normalized are calculated such as following:

$$;\forall i,j \quad P_{ij} = \frac{r_{ij}}{\sum_{i=1}^{m} r_{ij}} \tag{5}$$

$$P = \begin{array}{c} \\ A \\ B \\ \\ \end{array} \begin{array}{c} \begin{array}{ccccccc} 7 & 6 & 5 & 4 & 3 & 2 & 1 \end{array} \\ \begin{bmatrix} 0.4 & 0.6 & 0.3 & 0.4 & 0.4 & 0.6 & 0.625 \\ 0.5 & 0.3 & 0.6 & 0.6 & 0.6 & 0.4 & 0.375 \end{bmatrix} \\ \begin{array}{ccccccc} + & - & + & - & - & + & + \end{array} \end{array}$$

Third Step: For each E_j from the P_{ij} 's complex will be:

$$;\forall j \quad E_j = -k\sum_{i=1}^{m}\left[P_{ij} \times LnP_{ij}\right] \tag{6}$$

So that $k = \frac{1}{Ln(m)}$

	X_7	X_6	X_5	X_4	X_3	X_2	X_1
Ej	0.5775	0.9612	0.9612	0.9688	0.9688	0.9688	0.9525

Fourth Step: Now the uncertainty or the degree of deviation (d_j), information that's created for ***i*** index's is:

$$;\forall j \; dj = 1 - Ej \tag{7}$$

	X_7	X_6	X_5	X_4	X_3	X_2	X_1
dj=1-Ej	0.425	0.0388	0.0388	0.0312	0.0312	0.0312	0.952

Fifth Step: Finally for the weight from the existed (d_j) indexes will be

$$;\forall j \quad W_j = \frac{d_j}{\sum_{j=1}^{n} d_j} \tag{8}$$

	X_7	X_6	X_5	X_4	X_3	X_2	X_1
Wj	0.6938	0.0633	0.0633	0.0509	0.0509	0.0509	0.0775

Third Part: Decision taking Matrix Algorithms

First Step: To convert the decision matrix into a matrix ((non Scale)) using the formula:

$$n_{ij} = \frac{r_{ij}}{\sqrt{\sum_{i=1}^{m}(rij^2)}} \tag{9}$$

$$N_D = \begin{array}{c} \\ A \\ B \\ \\ \end{array} \begin{array}{c} \begin{array}{ccccccc} 7 & 6 & 5 & 4 & 3 & 2 & 1 \end{array} \\ \begin{bmatrix} 0.6246 & 0.8944 & 0.4472 & 0.5547 & 0.5547 & 0.8320 & 0.8575 \\ 0.7808 & 0.4472 & 0.8944 & 0.8320 & 0.8320 & 0.5547 & 0.5145 \end{bmatrix} \\ \begin{array}{ccccccc} + & - & + & - & - & + & + \end{array} \end{array}$$

Second Step: To create a ((non Scale)) matrix that suppose a vector weighty as input to the algorithm:

Supposed as

$$W = \{ W_1 , W_2 , W_3 , ... , W_n \} \approx DM \quad (10)$$

None scale weight:

$$V = N_D \times W_{n.n} = \begin{bmatrix} V_{11} & ,..., & V_{1j} & ,..., & V_{1n} \\ \vdots & & \vdots & & \vdots \\ V_{m1} & ,..., & V_{mj} & ,..., & V_{mn} \end{bmatrix} \quad (11)$$

So that N_D is a matrix that index points in it have been done ((none Scale)) and comparable:

$$V = \begin{array}{c} \\ A \\ B \\ \\ \end{array} \begin{array}{c} \begin{array}{ccccccc} 7 & 6 & 5 & 4 & 3 & 2 & 1 \end{array} \\ \begin{bmatrix} 0.4333 & 0.0566 & 0.0283 & 0.0282 & 0.0282 & 0.0423 & 0.0664 \\ 0.5417 & 0.0283 & 0.0566 & 0.0423 & 0.0423 & 0.0282 & 0.0398 \end{bmatrix} \\ \begin{array}{ccccccc} + & - & + & - & - & + & + \end{array} \end{array}$$

Third Step: Determine the ideal solution and ideal negative solution.

We defined for ideal option as (A^+) and for negative ideal option (A^-)

Ideal option =

$$A^+ = \{ (\max V_{ij} \mid j \in J) , (\min V_{ij} \mid j \in J') \mid i = 1,2, ...,m \} = \left\{ V_1^+, V_2^+, ..., V_j^+, ..., V_n^+ \right\} \quad (12)$$

Ideal negative option =

$$A^- = \{ (\min V_{ij} \mid j \in J) , (\max V_{ij} \mid j \in J') \mid i = 1,2, ...,m \} = \left\{ V_1^-, V_2^-, ..., V_j^-, ..., V_n^- \right\} \quad (13)$$

So that:

={ j that related to benefit of j ı = {j = 1,2,…,n
={j that related to expense of} j' ı = { j = 1,2,…,n

$$A^+ = \{ \underset{\max}{0.5417} , \underset{\min}{0.0283} , \underset{\max}{0.0566} , \underset{\min}{0.0282} , \underset{\min}{0.0282}, \underset{\max}{0.0423}, \underset{\max}{0.0664} \}$$

$$A^- = \{ \underset{\min}{0.4333} , \underset{\max}{0.0566} , \underset{\min}{0.0283} , \underset{\max}{0.0423} , \underset{\max}{0.0423}, \underset{\min}{0.0282}, \underset{\min}{0.0398} \}$$

Fourth Step: Calculate the size of the separation (distance):

The distance between options I with ideal option by using Euclidean way is:

$$\begin{cases} di+ = \text{Distance between option i from ideal} = \sqrt{\sum_{j=1}^{n} (V_{ij} - V_j^+)^2} : i = 1,2,...,m & (14) \\ di- = \text{Distance between option i from ideal} \\ \text{negative solution} = \sqrt{\sum_{j=1}^{n} (V_{ij} - V_j^-)^2} \; i = 1,2,...,m & (15) \end{cases}$$

$$\begin{cases} dA+ = \text{Distance between option i from ideal} = \sqrt{\sum_{j=1}^{7} (V_{ij} - V_j^+)^2} = 0.1153 \\ dA- = \text{Distance between option i from ideal} \\ \text{negative solution} = \sqrt{\sum_{j=1}^{7} (V_{ij} - V_j^-)^2} = 0.031 \end{cases}$$

$$\begin{cases} dB+ = \text{Distance between option i from ideal} = \sqrt{\sum_{j=1}^{7} (V_{ij} - V_j^+)^2} = 0.0316 \\ dB- = \text{Distance between option i from} \\ \text{ideal negative solution} = \sqrt{\sum_{j=1}^{7} (V_{ij} - V_j^-)^2} = 0.1153 \end{cases}$$

Fifth Step: To calculate the relative closeness Ai to the ideal solution. This relative proximity is defined as follow:

$$\begin{aligned} & 0 \le cl_{i+} \le 1 : i = 1,2,...,m \\ & cl_{i^+} = \frac{d_{A^-}}{(d_{A^+} + d_{A^-})} \\ & cl_{A^+} = \frac{0.0316}{(0.1153 + 0.0316)} = 0.7848 \\ & cl_{B^+} = \frac{0.1153}{(0.1153 + 0.0316)} = 0.2151 \end{aligned} \quad (16)$$

As u see; if Ai=A^+ then, di^+ =0 and we will have: $cl_{i^+} = 1$ and if Ai=A^- then di^-=0 and $cl_{i^+} = 0$. So whatever A_i option is closer to the ideal solution (A^+), the value of cl_{i^+} would be closer to the unit.

Sixth Step: In this step we were ranked to the option. Based on, Descending order cl_{i^+} , can be given the ranking of the options.

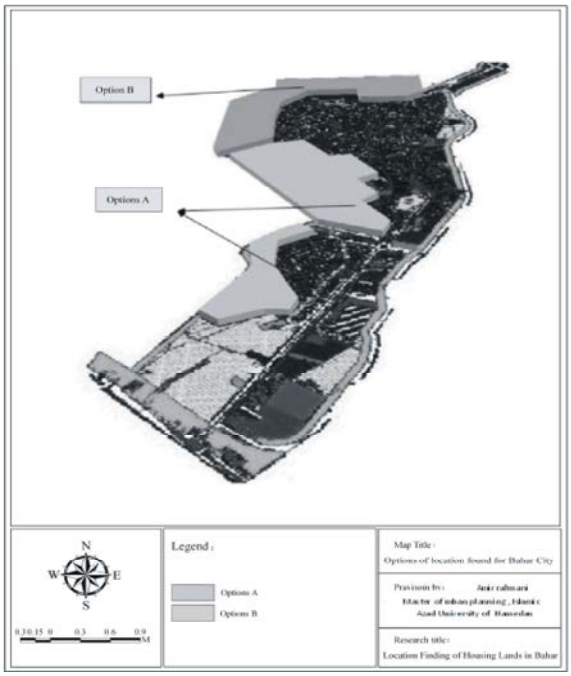
Table 3: Rated Final Options

Priority	TOPSIS point	Option
First	0.7848	A
Second	0.2151	B

CONCLUSION

One of the fund a mental problems that happened in the cities, lack of proper orientation and the development of their physical, Different effects in different sectors have been followed. Failure or inability to observance the principles of urbanism principles apply to all lack of profit counselors powerful tools for environmental analysis And social, economic and legal factors in this field is important. What the results of this analysis show that, in the location selection and prioritization Optimal and sustainable of areas where housing development in the town is a very impressive important point, One to maintain the social fabric of rural - urban ethnic neighborhood and family in the neighborhood And other single-unit homes often connected with the growth and development of the city according to the traditional conditions relying on ethnic affiliation. However, environmental factors and natural and non-natural elements particularly the access and communicative situation the city, As the focal point Iran connecting to West gate of Hamedan the provincial capital, which is the capital and the center connection point of the area is, Has very important and crucial.

Accordingly suggestion for year 2032 taking into account two growth rates and land calculation two methods And consideration all aspects of an average 38 hectares land in the form of the town housing development is required, Considering present situation, the Locating of lands the form of developed primarily within the town and connects the second expansion outside town boundary but is intended. Since the range town about 54 acres of lands in arid, desolate and abandoned of lands under construction and there is a fertile agricultural lands, gardens, green areas and environmentally protected areas is not, Priority and thus will not face a shortage of lands, the of lands is available. The required In this regard of lands, according to the indicators of social, economic, environmental and physical environment, in the form of objective criteria and sub-criteria associated with the research, connected with two different choices (A,B), assessed and analyzed using a multi-criteria model of TOPSIS, In order to develop housing of lands meet the in Bahar cities (deficiency of status quo and coming needs Original research town the horizon), Parallel to urban sustainable development and



Map 2: Options of locations found for Bahar City

protection of forest and farms, fruitful and gardens town privacy, inevitably low the value and irrigated agricultural lands been located, So that ultimately analysis results indicate that located in land Options A with a score of 0.7848 has more priority than other options, In other words, land located in the western part of town was affected by all the factors, criteria and sub-criteria considered and effective in the process of prioritizes and housing development land located in Bahar cities, was determined as the ideal and proper Options.

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