Journal of Tourism & Hospitality Research
Islamic Azad University, Garmsar Branch
Vol. 2, No. 2, Autumn 2012, Pp.19-29

Optimized positioning for accommodation centers in GIS using AHP techniques; a case study: Hamedan city

Majid Shams*
Associate prof. Dept. of Geography, Islamic Azad University, Malayer Branch, Malayer, Iran
Javad Negahdari
Ph.D. student in Urban Planning, Islamic Azad University, Malayer Branch, Malayer, Iran

Abstract
Nowadays, tourism is found more attractive as an economic source in countries with cultural and travel destination background. One of the most important factors in attraction of international and domestic tourists is the required tourism facilities. Accommodation centers are more important destinations through mentioned facilities. Therefore, correct positioning of these centers can make an extension in tourism industry. In this study, Hamedan city was selected as a case study because of several tourist centers and one of the distinguished tourism hubs. Then, GIS was used to analyze the effective factors in positioning of tourist centers, and a layer was defined for each effective factor followed by weight determination for any created layer. Finally, all layers were analyzed and the results were merged using Analytical Hierarchy Process (AHP), and appropriate places for construction of accommodation centers were defined. Results were created in different degrees for Hamedan city, which means that regions with degree of 10 from 10 are the ones that have the most priority for constructing accommodation centers and vice versa.

Keywords: Hamedan, accommodation centers, tourism, GIS, AHP.

*Corresponding author: fazelman362@yahoo.com
Received Date: 7 December 2014 *Accepted Date: 31 January 2015*
Date of Print: Winter 2015

1. Introduction

In twenty first century, tourism forms the main part of global economic and is one of the biggest industries around the world and is rated first according to its dispersal. It has been predicted that global tourism will grow to a rate of 1.6 billion which will lead to more than two thousand billion dollars.

Considerable growth of abroad tourists to Middle East and exploring the touristic attractions made this region as the fourth biggest visiting countries. According to national tourism organization report, Iran stands the fifth place comparing natural (eco-tourism) and historical attractions. Economic of Iran is uniaxial and is based on incomes from oil. Oil is a fossil energy which is faced to an end. Nowadays, oil industries do not have the ability to compete industries of developed countries. Thus, tourism industry needs more attention.

Tourism industry is a regular system which its components have inner and outer interactions. In other words, touristic attraction cannot prosper this industry on its own, so, a variety of options for accommodation of tourists must be prepared.

Accommodation centers have a very high importance according to above. Positioning of accommodation centers in closed city areas can decrease or increase supportive areas and change the tourist treatment patterns due to the scattering and distribution. For example, a large distance between accommodation centers and touristic attractions will cost tourists much money. For this reason, optimized positioning plays a critical role in touristic industry prosperity and to increase satisfaction level of tourists.

2. Problem declaration

A lot of parameters are involved in accurate and precise positioning of accommodation centers. Using traditional ways for analyzing the whole parameters involved in the problem is very difficult and expensive. The only way to solve these problems which consists a very big amount of information is to use computer systems. The well-known computational system in processing of geo-spatial data is GIS. GIS is a very powerful tool in development, assessment and analyzing different problems in urban issues.

3. Methodology

In this section, first, location of the study area is provided followed by a brief discussion about the study area. Hamedan city is the center of Hamedan province located in west Iran (Fig. 1). This city is located in the east hillside of Alvand Mountain and is selected as one of the fifth historical-cultural cities of Iran. Hamedan city is located in 360 kilometers south-west Tehran (capital city of Iran), and has a 1800 meters height from mean sea level. Hamedan city has an area of about 4118 square kilo-meters and is drawn from Alvand ridge to eastern borders of the province. Eastern and western borders of the city are located in 49 degree and 27 minutes and 48 degrees and 20 minutes from the Greenwich meridian, respectively. Southern and northern borders of the city are also located in 34 degree and 35 minutes and 35 degrees, respectively. Northern, neighbors of Hamadan city are Razan and Kabudarahang, and southern neighbors are Tuyserkan and Malayer. Western and eastern neighbors of Hamadan city are Bahar and Famenin, respectively. Alvand high grounds are placed in south of Hamadan and the ridge of Alvand mount makes the natural border between Hamadan, Ghahavand, Nashr flat and a part of Razan-Famenin flat. Highest point in Hamadan city locates in heights near Alvand high grounds with a height of 3584 meters and the lowest point is located in Omar-abad village with a height of 1600 meters, which is the exit of Gharachay River. Average height from mean sea level is about 1820 meters. Hamedan County consists of five cities named Hamedan, Maryanaj, Famenin, Joraghan and Ghahavand and three capitulum and twelve townships.

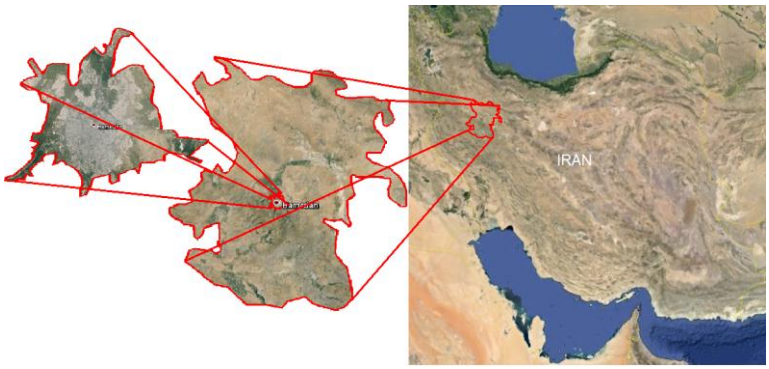

Fig.1 Position of Hamedan city according to the location in Hamadan province and Iran country

The first phase to start the process is to gather, update or to take the needed spatial information in the study area. A variety of different layers were taken into account which will be introduced hereafter.

3-1- Road networks

Roads are connectors of the different urban foundations and are important due to this point of view. The more the accommodation centers are near to road networks, the better choice they are. To create this layer, after recognition and enter main roads in GIS environment as an input, a buffer zone was produced due to the inverse Euclidean distance. In other words, the more far the road network means the lower the weight. Weights are given in Table1 and results are plotted in Fig. 2.

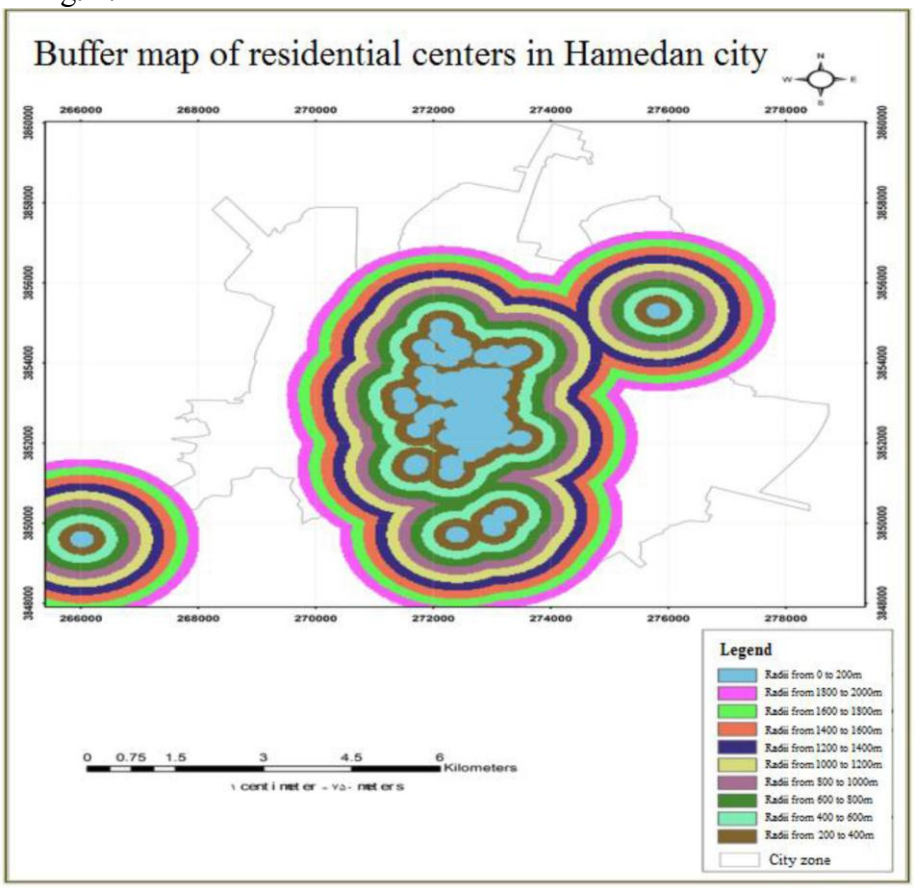

Fig.2 Road network buffer zone and related weights

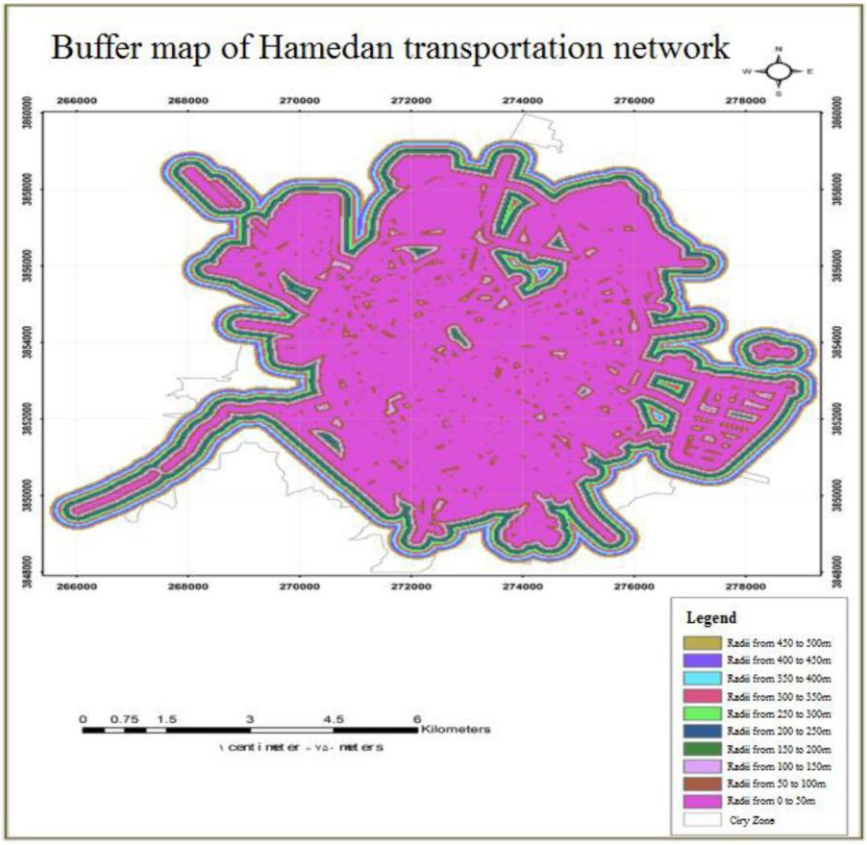

Fig.3 Accommodation centers buffer zone and related weights

3-2- Tourist attraction centers

Since the tourist attraction centers are tourist destinations, therefore, they have to be located in an appropriate distance from the hotels. For this reason, distances between 0 to 200 meters takes the lowest score and distances more than 200 meters and more takes more scores according to their farther distance (Fig. 3).

3-3- Sport centers

Sport centers are also one of the tourist accretion destinations and their distances to the accommodation centers are important because of their high amount of noise. So that, the distance from 0 to 200 meters to these centers take the lowest score, and the score increases as the distance grows (Fig. 4).

3-4- Education centers

Education centers also attract tourists from other places and therefore an estimation of accommodation centers for the people is necessary. For this reason, a buffer zone for this case has been created again using Euclidean distance. Distances lower than 200 meters takes the lowest score vice versa (Fig. 5).

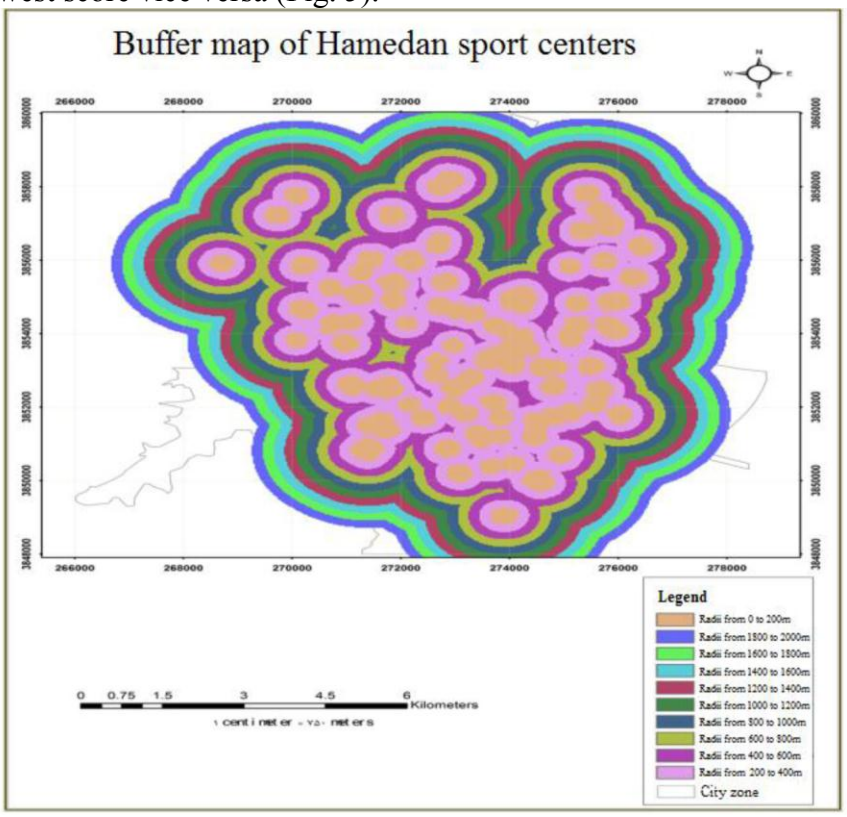

Fig.4 Sport centers buffer zone and related weights

3-5- Parks

For parks layer it is exactly the same as what is it for accommodation centers. The score is decreased as the distance reduced (Fig. 6).

3-6- Land prices

In the process of the positioning of accommodation centers, considering the land price is very important in order to eliminate expensive lands. Therefore, commercial lands and arid lands take the lowest and the highest score, respectively (Fig. 7).

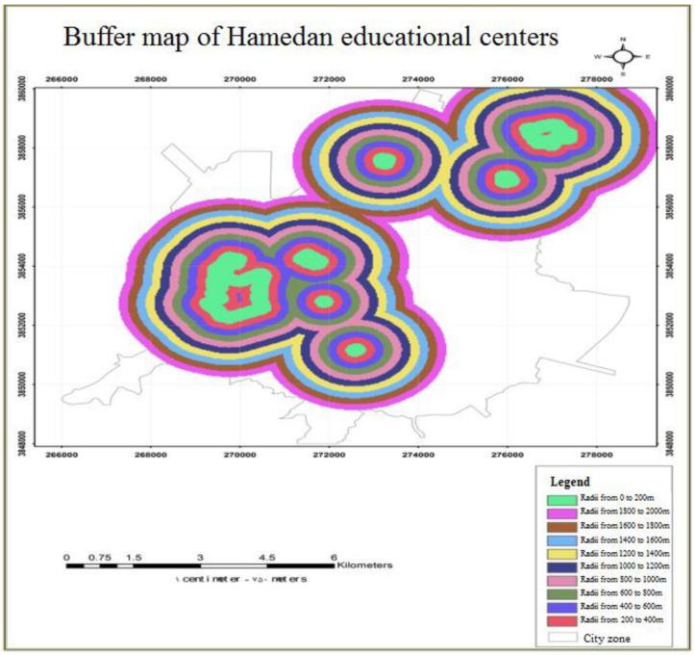

Fig.5 Graduation centers buffer zone and related weights

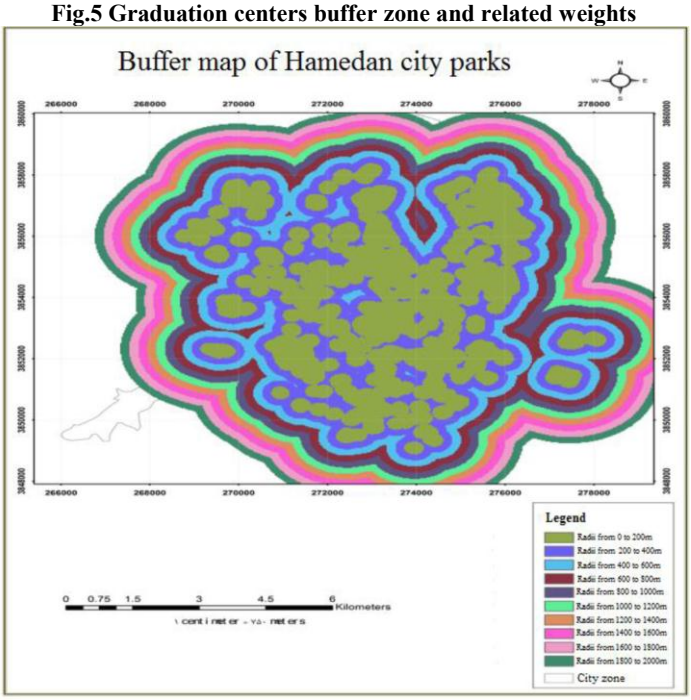

Fig.6 Parks buffer zone and related weights

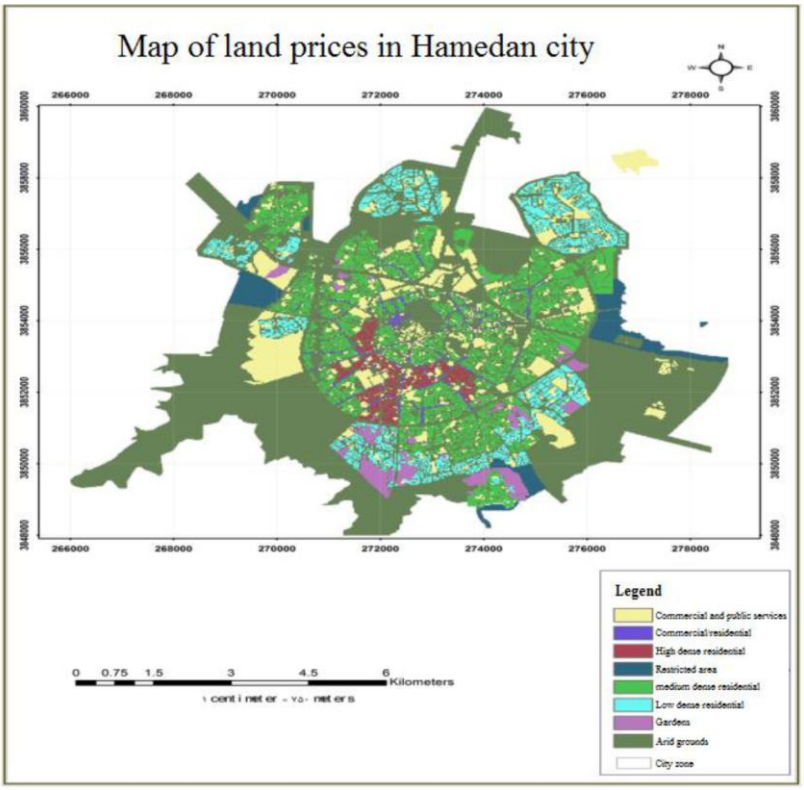

Fig.7 Land price buffer zone and related weights

4. Results and discussion

4-1- AHP

Analytical Hierarchy Process is consist of a pairwise weighting process and is presented in 1980 by Saaty. Analytical Hierarchy Process is one of the most important techniques in multi-decision problems. In pairwise weighting method, criterions are compared one against one and the importance is determined based on one other. Thus, a matrix will be created based on the determined weights as the input and related weights of the criterions as the output. The process starts after determination of elements and making decisions to initialization.

First stage: assign weights to the features

Second stage: assign weights to the alternatives

Third stage: weight combination

Forth stage: check the compatibility

4-2- layer combination

Finally, AHP was used for layer combination. After pairwise comparison between information layers and creation of compatibility matrix, a weight matrix was then assigned to the layers (Table2). By applying these weights to the layers, the best position for construction of accommodation center is determined (Fig. 8).

Table1. The process of assigning weights to the layers

Information layers	Road networks	Tourist attraction centers	Parks	Sport centers	Education centers	Land prices
Road networks	1	2	3	2	2	2
Tourist attraction centers	0.5	1	3	2	2	2
Parks	0.3	0.3	1	0.25	0.25	0.2
Sport centers	0.5	0.5	4	1	1	0.5
Education centers	0.5	0.5	4	1	1	0.5
Land prices	0.5	0.5	5	2	2	1
Total	**3.333**	**4.833**	**20**	**8.25**	**8.25**	**6.2**

Table2. Normalized pairwise comparison matrix

Information layers	Road networks	Tourist attraction centers	Park	Sport centers	Education centers	Land prices	Mean
Road networks	0.30	0.41	0.15	0.24	0.24	0.32	0.28
Tourist attraction centers	0.15	0.21	0.15	0.24	0.24	0.32	0.22
Parks	0.10	0.07	0.05	0.03	0.03	0.03	0.05
Sport centers	0.15	0.10	0.20	0.12	0.12	0.08	0.13
Education centers	0.15	0.10	0.20	0.12	0.12	0.08	0.13
Land prices	0.15	0.10	0.25	0.24	0.24	0.16	0.19

Table3. Weights applied to each layer

Road networks	Tourist attraction centers	Park	Sport centers	Education centers	Land prices
0.28	0.22	0.05	0.13	0.13	0.19

5- Conclusion

History shows that unknown scientific and technical criterions for positioning of accommodation centers are the most important parameters that lead to a lot of problems for construction of accommodation centers in most of cities. According to the variety of parameters involve in selection of appropriate position, solving this problem using traditional methods is very difficult or may be impossible. But, using GIS systems confirm the ability to create the final results with the highest quality and reliability. It is important for urban planners to use the ability of GIS experts in positioning of accommodation centers. In this research, after selection of appropriate

criterions associated with positioning of accommodation centers followed by weighting the criterions based on AHP using ArcGIS software, appropriate places for constructing new accommodation centers were determined. Finally, 10 appropriate places were selected as the region with the weight of 10 has the maximum score for being selected by proposed method and vice versa. In this model, as the number of selected criterions increase, the precision of positioning will be increased as well. This will help urban planners to make the best decision upon the use of tools in GIS software. According to the lots of benefits mentioned for AHP, it can be used for positioning for establishment of civilization facilities and other occasions.

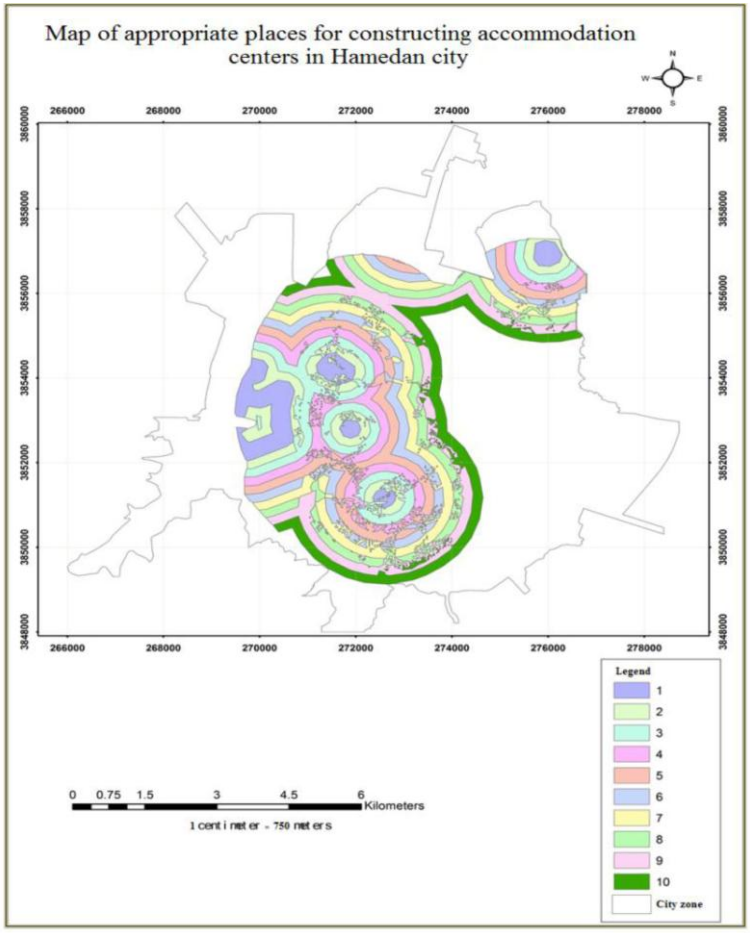

Fig.8 Appropriate places to construct new accommodation centers in Hamedan city

References

1. Ghodsi Pour, S.H. (1384). Analytical Hierarchy Process (AHP), AmirKabir university Press, 4th Edition,
2. Negahdari, J. (1391). Routing based on biological environmental geology principles using remote sensing and GIS, MSc thesis, pp. 10-21,
3. Varesi, H., Rezaei, M. (1391). Spatial analysis and positioning of residential centers in historical cities, Environmental Preparation Journal, Vol. 19,
4. Taghvaei, M., Abdollah Zade, M. (1392). Analysis of the positioning of residential centers in Tabriz city using Analytical Hierarchy Process (AHP), Geographical Space Journal, Vol. 43,
5. Saberi, A., Rangzan, K., Nagahdari, J., Dehghanian, A. (1390). Evaluation and positioning of guidance schools using GIS with AHP, Geomatics Conference,
6. Shahbakjti Rostami, F. (1391). Positioning of tourism applications using GIS, Geography and Urban Preparation, Vol. 5,
7. Zangi Abadi,A., Abolhasani, F. (1387). Spatial analysis, Leveling and planning for residential centers using TID, Center of Humanity science Researches,

Ebrahim Zadeh, A., Reza Zadeh, H., Daraei, M. (1393). Optimized planning and positioning of the facilities and infrastructures of tourism using GIS, Geography and Development, Vol. 35,

9. Saaty, T. L. (1980). The analytical hierarchy process, planning, priority, recourses allocation, RWS publication, USA,
10. Aronof., S. (1389). Geographic Information System: A Management Perspective, Ottawa, Canada: WDL Publications,