

**Recreational Evaluation by Analytical Hierarchy Process (AHP)
and Geographical Information System (GIS)
Case: Forest Park of Martyr Zare, Mazandaran**

Dr. Hamid Jalilvand

Associate of Forestry
Sari Agricultural and Natural Resources
University

Omid Karami

Ph.D Student of Forestry
Sari Agricultural and Natural Resources
University

Annahita Shahnazary

MS.c of Forestry
Sari Agricultural and Natural Resources
University

Morteza Shabani

Ph. D Student of Urban Planning Geography
University of Tarbiat Modarres

Introduction

Tourism which today is one of the most successful industries in the world has an extensive approach in ecotourism. Recreational planning in this type of tourism not only is considered as a tool for promoting social and economic levels of local people, but also due to protective functions as an experienced managerial strategy in the natural resources, provides the situation for dynamic protection. Green space is one of the most important systems of the human life and is important not only for economic reasons but also for environmental reasons as well. Urban Forest Park as a major green space has a positive effect on the urban environmental characteristics and by response to the needs of recreational and entertainment requirements can have an important effect on the urban structure and servicing. Analytical Hierarchy Process (AHP) is one of the most important techniques of Multi Criteria Decision Making (MCDM) that was introduced for allocation of scarce resources and planning requirements. Also integrating GIS and AHP have many advantages for the localization and classification of human facilities, different kinds of activities and environmental evaluations and it can be a good way for determining the Suitable and unsuitable areas for the establishment of different types of activities in the fields of agriculture, natural resources, environment, assessment of land capability, land evaluation and... which have spatial dimensions.

Research Methodology

The study area is Forest Park of Martyr Zare with an area of over 70 ha in geographical position of 53° 07' 09" up to 53° 07' 57" east longitudes and 36° 32' 57" up to 36° 32' 34" north latitudes. In this study,

for evaluating the recreational capability of the under study park, the method of combining AHP and GIS environment was used. For this purpose, firstly the vegetation layers, soil, topography, geology and facilities of the study area were obtained from the Department of Natural Resources of Mazandaran province. The layers were digitized in GIS environment and the necessary modifications were made on them. Layers of slope, direction and landscape were obtained from topographic maps with 1:25000 scale with line spacing of 10 meter. The slope layers in 5 layers, direction in five classes and landscape in five classes were classified. For classification of the tree coverage and facilities of the park, the recreational demands in the park were evaluated and the most favorable coverage was identified using tourist's idea. Finally, weights of each layer was obtained for each of the layers with AHP and by combining these weights with layers in GIS environment, the recreational capability map of the study area was obtained. In continue, in order to evaluate the recreational demand, a questionnaire about the characteristics of age and social and economical status of tourists and their demands from the park was prepared. 500 questionnaires were distributed among tourists of the study area in different seasons and different days of the week and their opinions and needs were investigated using Clawson method.

Discussion and Results

The results of evaluating recreational capability:

After preparation and classification of the slope layers, direction, landscape, geology, soil, tree cover and density of facilities in the park by using preferential judgments of experts, weight of each layer and rate of consistency of the made of judgments were calculated. Finally, maximum and minimum weights were allocated to slope and geology layers respectively. After assigning weights to each of the layers, layers were integrated in GIS environment. Finally, the potential recreational map for the study area was obtained which the results of recreational capabilities showed that from the total area of the Park, 10.2% of the area has a recreational degree of 1 (excellent), 28.9% of grade 2(good) , 41.02% of grade 3 (medium) and 19.96% of grade 4(weak).

The results of evaluating recreational demand:

The results showed that 61 percent of demands for recreational users of the park were men and 66 percent were married. Also, in case of increasing the facilities, 62 percent of Tourists willing to pay 1000 up to 5000 toman for entry fee .

Conclusion

In order to evaluate the recreational demand of the study area, firstly the effective criteria and sub criteria in this evaluation were identified. Then these criteria and sub-criteria were weighted which the results showed that the slope layer has assigned maximum weight to itself. The slope element has a great importance in measuring the recreation capability. The most important layer in recreational evaluation process in this area from the view point of experts is the slope layer. Slope plays an important role in recreational capability. The best slope for recreation is placed at the layers lower than 15 % and in Dr. Makhdoom model, is the most important factor in determining the recreational

capability. In the study area, after the slope layer, the landscape, tree coverage, soil, slope direction and geology layers were the most important in the evaluation process respectively. In this study, the tree coverage factor was used as an important factor in the evaluation of recreational capability. For this purpose, the views of tourists were used for determining the suitability of the tree coverage, the tourists who were more willing to engage in recreational activities and the vegetation map was classified on this basis. The majority of the soils in the study area, although they are different in terms of depth, but are of clay loam type. In the study area, there are four main directions and one flat class that will show that the study area is appropriate for summer and winter recreation. After determining the weights, the final map of recreational potential were prepared using GIS that according to the results, 10.2 % of the park has a high quality for recreational capability. These areas are generally flat and have a slope between 0 - 5 % and the park facilities in these areas are more concentrated. Also 28.9 % of the park area has a good recreational potential and 41.09 % has an average capability. But, since the facilities layer has a high weight in the evaluation process, therefore it is possible to increase the recreational capability of the park by increasing the facilities in the under study park.

In this study, for evaluating the capability of recreational Zare forest park, a combination of AHP and GIS were used. AHP has the capability to use the expert's knowledge in evaluation process. Furthermore, it is flexible and it is possible to use any number of criteria and sub-criteria in it.

Since the forest park is established for people, therefore without being acquainted with their opinions, we cannot plan for recreation. According to the results obtained from recreational demand assessment in the study area, the facilities should be mainly for meeting the requirements of people especially the young people. Also, given that most tourists have a bachelor's degree; Psychological needs of these groups should be considered in future planning. Most tourists come to the park with own cars. Then, it was trying to provide the facilities for tourists' car parking with sufficient capacity. Also, given that most tourists want to improve facilities at the park area, it is possible to attract more tourists by increasing the park facilities. Results of evaluating the recreational demand showed that most tourists come to the park from short distances and the number of non-native tourists in the park is much lower than native tourists. The reason for this subject can be the lack of familiarity of non-native tourists and lack of guides , signs and sufficient advertisements which has caused these regions and the likes and their beauty not to be introduced properly.

Keywords: Recreation, Eco-tourism, AHP, GIS, Forest park.

References

1. Amino, M (2007). A geographic information system (GIS) and multi-criteria analysis for sustainable tourism planning. A project submitted in fulfillment of the requirements for the award of the degree of Master of Science (Planning-Information Technology). Faculty of Built Environment. University Technology Malaysia.

2. Babaie-Kafaky, S. Mataji, A. and Ahmadi Sani, N (2009). Ecological capability assessment for multiple-use in forest areas using GIS- based multiple criteria decision making approach. *American Journal of Environmental Sciences*, Vol. 5. N. 6
3. Bozorgian, S, Gh (2003). Ecological potential Evaluation of mangrove protected area In order to ecotourism management using GIS. Thesis Submitted for the Degree of M.Sc. in Environment Sciences, Islamic Azad University. Science and Research branch.
4. Bukenya, J, O (2000). Application of GIS in ecotourism development decisions: evidence from the Pearl of Africa. www.rri.wvu.edu/pdf/bukenya2012.pdf. Accessed on 20th September, 2004.
5. Çimren, E. Çatay, B. and Budak, E (2007). Development of a machine tool selection system using AHP, *International Journal of Advanced Manufacturing Technology*, N. 35.
6. Faraji sabokbar, H (2005). Site selection services business units using Analytical Hierarchy Process (AHP). *Geographical Research*, Vol. 37, N. 51.
7. Farajzadeh, M., and Karami, T (2004). Land use planning using remote sensing and geographic information systems (case study: Khorramabad). *Geographical Research*, Vol. 37, N. 47
8. Fennel, D (1999). *Ecotourism and introduction*. First published Routledge is an imprint of the taylor & francis Group.
9. Ghodsipour, SH (2009). *Analytical Hierarchy Process (AHP)*. 7th edition. Amir Kabir University of Technology.
10. Goshtasb Meigoony, H. Shams, B. Cheshme khavar, B (2008). Assasment of Opinions and needs of recreational of visitor's SiSangan Forest Park. *Environmental science*. N. 6.
11. Gul, A, M. Orucu, K. and Oznur, K (2006). An approach for recreation suitability analysis to recreation planning in Golchuk Nature Park. *Journal of Environmental Management*, N. 1.
12. Hibberd, B,G (2001). Ground rule in urban forestry, *Jou of agric and for*, N. 12.
13. Janke, J, R (2010). Multi-criteria GIS modeling of wind and solar farms in Colorado. *Renewable Energy*. Article in Press.
14. Kangas, J. Kangas, A. Leskinen, P. and Pykalainen, J (2001). MCDM methods in strategic planning of forestry on state-owned lands in Finland. *J. Multi-Criteria Dec. Anal*, N. 10.
15. Kumari, S. Behera, M, D. and Tewari, H, R (2010). Identification of potential ecotourism sites in West District, Sikkim using geospatial tools. *Tropical Ecology*, N. 51.
16. Laurance, W. Alonso, M. and Campbell, P (2005). Challenge for forest conservation in Gabon, Central Africa. *Futures*, N. 38.
17. Makhdoom, M (2010). *Fundamental of land use planning*. 9th edition. Tehran University.
18. Malczewski, J (2004). GIS-based land-use suitability analysis: a critical overview. *Journal of Progress in Planning*, N. 62.
19. Moreno-Jimenez, J.M (2005). A spreadsheet module for consistent consensus building in AHP-group decision making. *Group Decision and Negotiation*, N. 14.

20. Rezvanfar, M. (2007). study of Potential of recreational park Chitgar use of GIS and RS technology. Thesis Submitted for the Degree of M.Sc. in Forestry, Natural Resources department of Sari, Mazandaran University.
21. Saaty, T, L (1980). The analytical hierarchy process, planning priority. Resource Allocation. RWS Publication, USA.
22. Shirvani, Z. (1388). Comparative evaluation of recreational forests of Neka-Zalemrood with AHP and Gulz-Dimiril and Makhdoom methods. Thesis Submitted for the Degree of M.Sc. in Forestry, Natural Resources department of Sari, Mazandaran University.
23. Takiekhah, J (2008). Recreational potential Evaluation of Abidar Park using GIS. Thesis Submitted for the Degree of M.Sc. in Forestry, Natural Resources department of Sari, Mazandaran University.
24. Tavary, M. sukhekian, M, A. And Mirnejad, S. A. (2008). Identification and prioritization of factors that affect on Utilization Manpower using the MCDM (Case Study: A jeans cloth manufacturing companies in Yazd province). Industrial Management. No. 1.
25. Ying, x. Guang-Ming, Z. Gui-Qiu, C. Lin, T. Ke-Lin, W. and Dao-You, H (2007). Combining AHP with GIS in synthetic evaluation of eco-environment quality—A case study of Hunan Province, China. Ecological Modeling, N. 209.
26. Zebardast, E (2001). Application of AHP in urban and regional planning. Fine Arts Journal. No. 10.