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Short Communication

Analysis of suitable zoning of ecotourism landscape using TOPSIS model at Nain - Isfahan

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ABSTRACT:

The present preliminary research intends to examine the feasibility of environmental power and to evaluate the ecological power of Nain, Iran concerning tourism. In this regard, ecological indices and a variety of natural tourism in the county were introduced to achieve sustainable development in this part. The present preliminary research aims to detect capacities of existing ecotourism in Nain via analytical-descriptive method using TOPSIS model. Evaluation of environmental power indicates that the county has the potential for extensive tourism. With regard to the high potential of the region in terms of tourist attraction by means of major attractions, it can hope for the development of this major industry and its role in the development of region. Further, after study on digital maps of the country, ecotourism capabilities of the region were detected including desert climbing, star gazing, mountaineering, hill climbing, nature tour and wildlife. With regard to interview with experts, ecological indices were determined for these tourisms based on which suitable tourism zones were obtained at the country. Ultimately, in this research TOPSIS method was used to rank the tourism landscape of Nain. The first three priorities were given to desert climbing, star gazing, hill climbing among these activities

Keywords:

Development feasibility, Nain, Sustainable development, Tourism, TOPSIS.

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INTRODUCTION

History of ecotourism or environmental tourism dates back to 1965 when the term "ecotourism" was invented from two terms of ecologic and tourism. In general, ecotourism implies a variety of tourism which takes place in the context of nature aimed at exchange between the tourist and environment in which there will be no damage to the environment (Shamaei and Mousivand, 2011). Tourism flourished at the 21st century required specific features which differentiate them from other economic activities. Tourism refers to a multifaceted activity and also one of the most complicated human businesses regarding geographical situation. This is due to the fact that the applicant is in a territory and the product is in another destination, the effort put forward by the tourist gains memorable and attractive experience well suited to his taste during his journey by reaching to the target destination (Zahedi M and Ranjbaran, 2006 a, b). At the 19th century, we witness a new and strong phenomenon which is mass tourism with special international benefits (WTO, 1998). At the late 19th century, Wilhelm started his studies in the context of nature of tourism groups and also contrastive function of cultures and sub-cultures. The first scientific article on global culture of tourism has been written by an Italian (Guglielmo, 2006). Tourism studies have a long tradition but short history. The first notes about experiences of travel date back to ancient civilizations of middle east, Asia and Mediterranean; they spoke out about the art of travel, customs and traditions, languages or various foreign tribes (1939). History of ecotourism or environmental tourism dates back to 1965 when the term "ecotourism" was invented from two terms of ecologic and tourism (Figure 1). In general, ecotourism implies a variety of tourism which takes place in the context of nature aimed at exchange between the tourist and environment in which there will be no damage to environment (Shamaei and Mousivand, 2011). Concerning localization and analysis of suitable zones for ecotourism development as well as development and evaluation of tourism, a variety of studies have been conducted by (Farajzadeh and Panah,

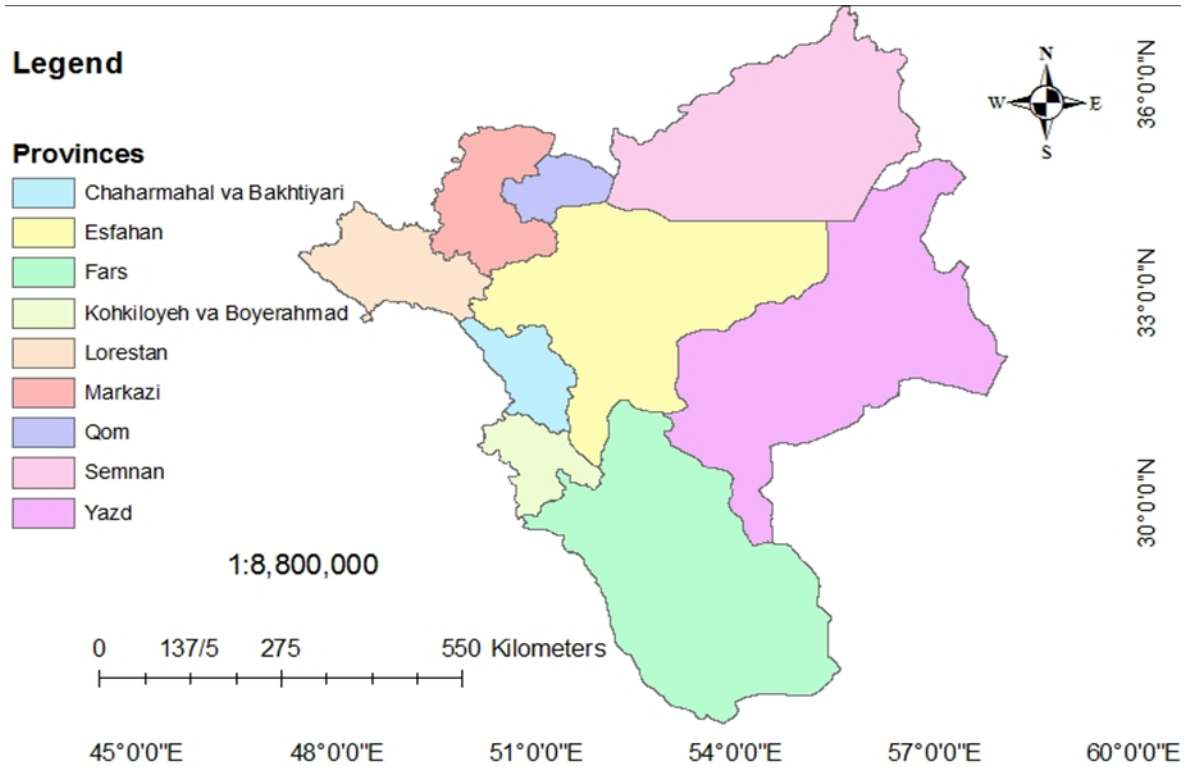

Figure 1. Map showing Nain and other provinces

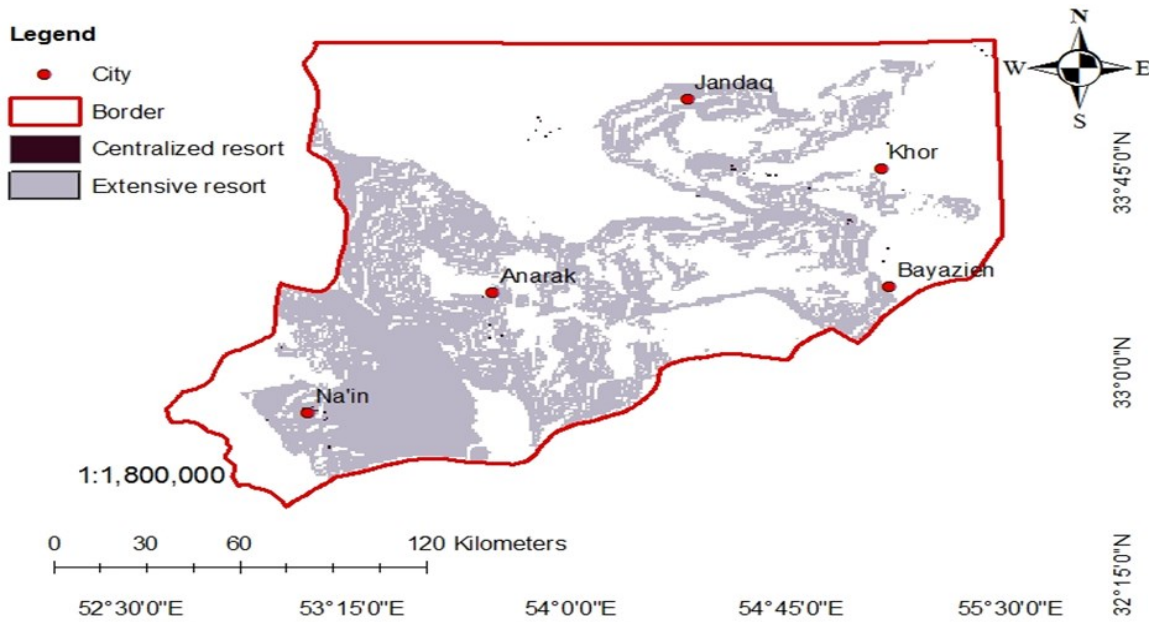

Figure 2. The map of centralized extensive recreation based on storey 1 and 2

2008; Azad, 2012; Nouri *et al.,* 2010; Kalantari *et al.,* 2014; Maghsoudi *et al.,* 2015; Ahmadi and Mozaffari, 2012; Monshizadeh and Falahi, 2008). The present research intends to examine capability of tourism sites of Nain (Figure 2). Nain as one of the most important counties in Isfahan in terms of historical works, natural tourism attractions, handicrafts and customs and traditions has turned to one of the tourism areas as the east tourism in Isfahan (Figure 3). Here, the main research question is whether this region can turn to a tourism area and thereby evaluating the potentials of Nain?

MATERIALS AND METHODS

Position of region under study

Nain is a city, Isfahan Province, Iran. It has an area about 22570 km^2, developed from the two central and Anarak parts with three cities of Nain, Anarak and Baferan (Division of National Mapping 1990).

The present research is a descriptive-analytical

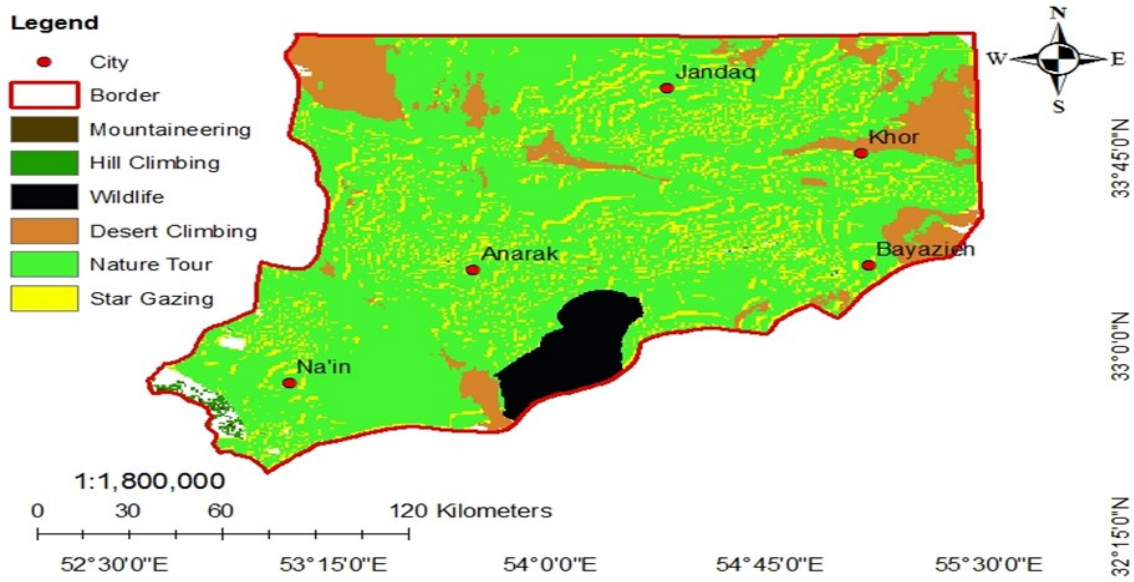

Figure 3. Map of suitable zones for tourism activities

Table 1. Latitude and longitude of Nain (2013)

S. No	Latitude				longitude			
	Maximum		Minimum		Maximum		Minimum	
1	Degree	Minute	Degree	Minute	Degree	Minute	Degree	Minute
	34	16	32	31	54	47	52	36

Table 2. The ecological indices used to combine information layers in each of the tourism activities

S. No	Types of tourism activity	Index
1	Star gazing	The height is about 2100 meter- 6 km distance from the center of the city- the humidity is less than 38%-the dust less than 41%
2	Nature tour	The temperature above '0', slope between 2% to 50%, the height from 800 to 2100 meter, all types of use except for urban and industrial use in any climate
3	Mountaineering	The slope is above 20%, the height is above 1800 meter
4	Hill climbing	The slope between 20% to 70%, the height from 1800 meter to 2500 meter, all types of land is used except for rock
5	Desert climbing	Land use: Desert, Salt lake
6	Wildlife	Protected areas

research. In this research, both library and field methods are used to collect the data. To detect environmental powers, all the geology maps, land capability, land use, land form, climate characterization, height surfaces, slope, geographical directions and so forth are prepared and analyzed to evaluate the ecological model at the Arc GIS environment (Makhdoom, 2013). To examine ecological power of Nain, ecological tourism model proposed by Mcuphy (1983) was used. In this regard, the suitable zones for extensive resorts at the country were obtained. With regard to the extensive and centralized resorts, the potentials below can be mentioned as the tourism landscape of county: desert climbing, star gazing, mountaineering, hill climbing, nature tour and wildlife. In this research, TOPSIS method has been used to rank tourism landscape. Use of TOPSIS method is based on 'm' criteria and 'n' items. In this study, tourism landscape was selected as a criterion and a slope, direction, height, vegetation, water resources, temperature and dust were selected as indices (Table 1-6). Further, dust and slope have been considered as the negative indices (Table 8).

FINDINGS OF THE PRELIMINARY RESEARCH

Evaluation of ecological power of Nain

Ecological power implies evaluation of each of homogenous spots of the land for different uses (Sante-Riveira *et al.,* 2008). A variety of common recreations in

Table 2. Matrix to score indices

S. No	Index / Regions	Slope	Direction	Height	Vegetation	Water	Temperature	Dust
1	Mountaineering	9	9	9	9	5	5	3
2	Nature tour	3	2	2	9	9	9	7
3	Hill climbing	5	5	7	7	3	5	7
4	Wildlife	3	3	5	8	9	3	3
5	Desert climbing	2	5	3	3	5	7	7
6	Star gazing	2	3	9	2	5	5	9
	Sum	**132**	**153**	**249**	**288**	**246**	**214**	**246**

Table 3. Normalized matrix on the indices

S. No	Regions \ Index	Slope	Direction	Height	Vegetation	Water	Temperature	Dust
1	Mountaineering	0.783	0.728	0.570	0.530	0.319	0.342	0.191
2	Nature tour	0.261	0.162	0.127	0.530	0.574	0.615	0.446
3	Hill climbing	0.435	0.404	0.444	0.412	0.191	0.342	0.446
4	Wildlife	0.261	0.243	0.317	0.471	0.574	0.205	0.191
5	Desert climbing	0.174	0.404	0.190	0.177	0.319	0.479	0.446
6	Star gazing	0.174077656	0.242535625	0.570351825	0.11785113	0.318788357	0.341792964	0.573819042

Table 4. Diagonal matrix of the indices

S. No	Regions \ Index	Slope	Direction	Height	Vegetation	Water	Temperature	Dust
1	Mountaineering	2.666666667	0.3333	0.2571	0.2368	0.1389	0.1471	12
2	Nature tour	8	0.0741	0.0571	0.2368	0.2500	0.2647	5.142857143
3	Hill climbing	4.8	0.1852	0.2000	0.1842	0.0833	0.1471	5.142857143
4	Wildlife	8	0.1111	0.1429	0.2105	0.2500	0.0882	12
5	Desert climbing	12	0.1852	0.0857	0.0789	0.1389	0.2059	5.142857143
6	Star gazing	12	0.1111	0.2571	0.0526	0.1389	0.1471	4

Iran and/or world in terms of development rate to perform recreation in environment or open land are classified to two groups:

Centralized recreation: This includes those recreations which require development such as swimming, skiing, picnic, camping, bike racing, and visiting cultural monuments.

Extensive recreation: This includes those recreations which do not require development such as hunting or require little development such as fishing, horse riding and watching animals in the nature. In this regard, ecological potential of Nain to develop centralized and extensive recreations were obtained based on ecological model of Mcuphy (1983) in first and second narrations.

Natural tourism of region

With regard to the estimation of ecological power of Nain, extensive resort has displayed the highest expansion in the county. In this regards, there is a significant relationship between information layers (height surfaces, slope, land use, temperature,

Table 5. Weight matrix of the indices

S. No	Regions \ Index	Slope	Direction	Height	Vegetation	Water	Temperature	Dust
1	Mountaineering	2.6155	-0.3662	-0.3492	-0.3411	-0.2742	-0.2819	29.8188798
2	Nature tour	16.6355	-0.1928	-0.1636	-0.3411	-0.3466	-0.3518	8.42198806
3	Hill climbing	7.5294	-0.3123	-0.3219	-0.3116	-0.2071	-0.2819	8.42198806
4	Wildlife	16.6355	-0.2441	-0.2780	-0.3280	-0.3466	-0.2142	29.8188798
5	Desert climbing	29.8189	-0.3123	-0.2106	-0.2004	-0.2742	-0.3254	8.42198806
6	Star gazing	29.8189	-0.2441	-0.3492	-0.1550	-0.2742	-0.2819	5.545177444
7	*Ej*	-40.8731	0.7968	0.7385	0.8497	0.8085	0.8122	-47.38567047
8	*dj=1-Ej*	41.8731	0.2032	0.2615	0.1503	0.1915	0.1878	48.38567047
9	$w = \frac{d_j}{\sum d_j}$	0.9890	00048	0.0062	0.2445	0.3174	0.3546	0.992220795

Table 6. Determine the solution for ideals

S. No	Region \ Index	Slope	Direction	Height	Vegetation	Water	Temperature	Dust
1	Mountaineering	0.7748	0.0035	0.00352	0.1296	0.1012	0.1212	0.1898
2	Nature tour	0.2583	0.0008	0.00078	0.1296	0.1822	0.2181	0.4428
3	Hill climbing	0.4304	0.0019	0.00274	0.1008	0.0607	0.1212	0.4428
4	Wildlife	0.2583	0.0012	0.00196	0.1152	0.1822	0.0727	0.1898
5	Desert climbing	0.1722	0.0019	0.00117	0.0432	0.1012	0.1697	0.4428
6	Star gazing	0.1722	0.0012	0.00352	0.0288	0.1012	0.1212	0.5694

geographical direction, protected areas, water resources and abrasion) and type of tourism activity (desert climbing, star gazing, mountaineering, hill climbing, nature tour and wildlife), whereby the natural tourism of region was determined. In general, the land form and height affects the type of ecotourism activity.

Ranking tourism landscape using TOPSIS model

Step 0: obtain decision matrix

In this method, decision matrix is evaluated which includes 'm' items and 'n' indices.

Step 1: Normalizing decision matrix

In this step, existing scales in decision matrix are descaled, in such a way that each of the values is divided to the size of vector relating to that index. As a result, each r_{ij} array is obtained through the equation given below:

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^{2}}}$$

Step 2: Giving weight to the normalized matrix

Decision matrix refers to a parameter which is required to be quantized; for this, the decision maker specifies a weight for each index. Sum of weights (w) are multiplied by the normalized matrix (R).

$$W = \left(w_1 و w_2 و \ldots و w_j و \ldots و w_n \right)$$

$$\sum_{j=1}^{n} w_j = 1$$

Since Wn*1 matrix cannot be multiplied by the normalized decision matrix (n*n), the weight matrix should convert to a diagonal matrix (Wn*n) before multiplication.

Step 1:

$$P_{ij} = \frac{r_v}{\sum_{i=1}^{m} r_v}$$

Step 2:

$$E_j = -k \sum_{i=1}^{m} \left[P_{ij} * \ln P_{ij} \right]$$

m = 5

$$k = \frac{1}{\ln(m)} = 0.62$$

Step 3: Determine an ideal solution and a negative ideal solution

Two virtual items A* and A- are defined as follows:

$$A^{*} = \left\{ \left(\max_i v_{ij} | j \in J \right) و \left(\min_i v_{ij} | j \in J' \right) | i = 1 و 2 و \ldots و m \right\} = \left\{ v_1^{*} و v_2^{*} و \ldots و v_j^{*} و \ldots و v_n^{*} \right\}$$

$$A^{-} = \left\{ \left(\min_i v_{ij} | j \in J \right) و \left(\max_i v_{ij} | j \in J' \right) | i = 1 و 2 و \ldots و m \right\} = \left\{ v_1^{-} و v_2^{-} و \ldots و v_j^{-} و \ldots و v_n^{-} \right\}$$

Two virtual items are the worst and best solutions

Step 4: Obtain size of distances

Distance between each n-dimensional item is measured *via.,* Euclidean method, *i.e.,* distance of item 'i' is found from positive and negative ideal items (Table 7).

$$d_i^{+} = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_{j\,max})^2}$$

Table 7. Distance from positive ideal solution

S. No	d + / Regions	Slope	Direction	Height	Vegetation	Water	Temperature	Dust	Sum
1	Mountaineering	0363109.	0000000.	0000000.	0000000.	0006554.	0009400.	0000000.	0379063.
2	Nature tour	0007410.	0000007.	0000008.	0000000.	0000000.	0000000.	0064033.	0007425.
3	Hill climbing	0066693.	0000002.	0000001.	0000830.	0014747.	0009400.	0064033.	0091673.
4	Wildlife	0007410.	0000005.	0000002.	0000208.	0000000.	0021150.	0000000.	0028776.
5	Desert climbing	0000000.	0000002.	0000006.	0007470.	0006554.	0002350.	0064033.	0016382.
6	Star gazing	0000000.	0000005.	0000000.	0010168.	0006554.	0009400.	0144073.	0026127.

Table 8. Distance from the negative ideal solution

S. No	d - / Regions	Slope	Direction	Height	Vegetation	Water	Temperature	Dust	Sum
1	Mountaineering	0.00000	0.00001	0.00001	0.00747	0.00164	0.00235	0.06403	0.01147
2	Nature tour	0.26677	0.00000	0.00000	0.00747	0.01475	0.02115	0.00000	0.31014
3	Hill climbing	0.11857	0.00000	0.00000	0.00332	0.00000	0.00235	0.00000	0.12424
4	Wildlife	0.26677	0.00000	0.00000	0.00519	0.01475	0.00000	0.06403	0.28671
5	Desert climbing	0.36311	0.00000	0.00000	0.00000	0.00164	0.00940	0.00000	0.37415
6	Star gazing	0.36311	0.00000	0.00001	0.00021	0.00164	0.00235	0.01601	0.36731

Table 9. Relative distance to the solution of ideals

S. No	d Value / Regions	d +	d -
1	Mountaineering	0.61	0.10
2	Nature tour	0.08	0.55
3	Hill climbing	0.30	0.35
4	Wildlife	0.17	0.53
5	Desert climbing	0.12	0.61
6	Star gazing	0.16	0.60

Table 10. Ranking items

S. No	d Value / Regions	CLi value
1	Mountaineering	0.14
2	Nature tour	0.86
3	Hill climbing	0.53
4	Wildlife	0.76
5	Desert climbing	0.82
6	Star gazing	0.79

Step 5: Calculate the relative closeness to the ideal solution

This criterion is obtained through the formula given below:

$$CL_i = \frac{d_i^-}{d_i^- + d_i^+}$$

Step 6: Rank items

Each item with greater CL is a better choice.

CONCLUSION

Tourism has a close bond with environment, thus if environmental potential is evaluated properly, it will modify the projects and prevent from failure in a sustainable development of tourism and avoid unpredicted destruction of the environment (Qadri, 2004); further it can lead to improvement in the quality of environment, increase in living standards at local communities and decrease in cost prices. The present research intends to measure feasibility of environmental potential and evaluate ecological power of Damavand county concerning tourism. In this regards, to raise sustainable development, ecological indices have been introduced for county based on which a variety of natural tourism at county were introduced. Evaluation of environmental potential indicated that such county has extensive tourism potential. In this regards, evaluation of environmental potential indicates that this county has the

tourism potential, so that a variety of natural tourism includes desert climbing, star gazing, mountaineering, hill climbing, nature tour and wildlife. With regard to interview with experts, ecological indices were determined for these tourisms based on which suitable tourism zones were obtained at the country. Ultimately, in this research TOPSIS method was used to rank tourism landscape of Nain. The first three priorities were given to desert climbing, nature tour and star gazing among these activities (Table 9 and 10). The results from TOPSIS analysis indicated that nature tour with score (0.86) has the highest potential in tourism planning. With regard to desert at this country, this form of tourism can be ranked at the second with score (0.82); further star gazing is among the attractions which has been preoccupied the individuals' mind from the long lost past to which the third rank with score (0.79) has been given.

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