Int. J. Forest, Soil and Erosion, 2014 4 (3): 101-107
ISSN 2251-6387

Research Paper

Solve the problem of road construction of the Abr jungle with use of the Conflict Resolution Theory and Multi Criteria Decision Making (MCDM)

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Abstract: Hirkani jungle is one of most important jungle around the world and has global important because this jungle remain from last ice age, also has little area in the world, actually hirkani jungles are natural museum and have so much value. Abr jungle in the Semnan province, around the Shahrood city is one of the Hirkani jungles in Iran is facing with many problems because in the last years government create road in the Abr jungle. In this research we use of the conflict resolution theory and multiple criteria decision making (MCDM) method to solve the Abr jungle problem. So the Abr jungle problems that related with road development recognized using the MCDM and 20 criteria in the 4 group economical, social, environmental and cultural were extracted. With consideration of the importance of these criteria's and using the pairwise comparison and Expert Choice Software and experts ideas, criteria get weight. In continue the TOPSIS method was used to classification of the options. The results show that with consideration all parameter related with road development in the Abr jungle, the best choice is environmental monitoring of *Iran Department of* Environmental on road construction in the Abr jungle. Also the values and needs of stakeholders should be considered in all steps of decision making about road development.

Keywords: Abr jungle, road construction, Conflict resolution theory, TOPSIS ،Expert Choice.

Introduction

Increasing severity of the effects resulting from human activities has caused the impacts can be observed everywhere. So that, the existence of inconsistent land uses in sensitive and protected regions damage their structure and prevent achievement to their objectives and functions (Zebardast et al, 2011).

Roads are very important among another inconsistent land uses of protected regions. Because, this type of land use is long and thus the scope of influence, impacts and intensive of them will be more (Krami et al, 2012)

Today, the road is an important component and one of the main infrastructures of modern life and the development. Excessive population growth and urban development in different countries have caused developing various sectors such as agriculture and industry that in turn have led to development of read networks which are the link between these sectors (Road and Transportation Ministry, 2007). Road construction has led to structural abnormalities, including fragmentation of lands and nature (Mikaeli and Sadeghi, 2010). The presence of roads in sensitive natural areas has led to decreasing values and effective performance of these areas. Because, in addition to the direct damage caused by the construction and operation, the roads increase access to pristine natural areas and will lead to indirect damage such as land changing, illegal hunting, fires and etc (Zebardast et al, 2011, Nagendra et al, 2003, Fearnside, 2007 and Freitas, 2010).

The roads are serious threat to biodiversity throughout the world because of having various impacts, extensive range of effects and long term operation (Karami et al, 2011, Forman, 1998 and Coffin, 2007). The Abr jungle is a prominent example of such problems that has caused great concern for the environmental authorizes and local people.

Iran has very sensitive ecological features. Therefore, the road construction regardless of environmental considerations can cause irreparable damage to the environment. For example, the road crossing through Uromia Lake is destroying it over time (Iran Department of Environment, 2012). Also the road construction through the Noshahr Botanical Garden in Mazandaran province started in 2009 has caused life-threatening risks for the first ecological garden in Middle East (Mazandaran Department of Environment, 2011).

There is opposition and compliant groups in relation to the road construction through Abr jungle and the final solution and reaching an agreement require the participation of all these groups. Conflict theory is one of the most effective strategies for resolving this problem.

Conflict is a process in which a conscious effort is being carried out by groups or individuals to deal with other individuals or groups (Lee, 2010.) Michael Nicholson defines it as an activity which takes place when conscious beings (individuals or groups) wish to carry out mutually inconsistent acts concerning their wants, needs or obligations (Nicholson, 1992).

The origin of conflict can include different themes such as the lack of agreement on objectives and constraints and resources sharing. In the most cases, disagreement on the objectives is because of different needs and values, but in relation to conflict on resources sharing and constraints, stakeholders are not able to find a practical solution in which the all involved groups are considered.

Conflict management is the process of limiting the negative aspects of conflict while increasing the positive aspects of conflict. The aim of conflict management is to enhance learning and group outcomes, including effectiveness or performance in organizational setting (Ra him, 2002, p. 208). The key point of conflict management is selecting appropriate method after diagnosing the causes of conflict.

The creative decision making is required to conflict management of the groups involved in. this decision making is a knowingly process that is based on creativity and human intelligence, experience and insight. But complexity of the environmental conditions and variety of internal and external factors influencing the decision making has created a complex condition with uncertainty.

Although each manager has different ways for decision making but most of them agree on the following steps in creative decision-making process:

- Problem definition
- Identify solutions
- Data collection
- Decision making

In this research, the above process is used for creative decision making. Therefore, the purpose of this paper is analysis of the conflict about Abr jungle and determines the share of groups involved in this issue using TOPSIS method.

Martial mad Methods

The Case Study

Abr jungle (cloud forest) is one of the oldest forests belongs to the third period of geological. Abr jungle is located in the north of Shahrood city, between Shahrood and Azad shahr with geographic coordinates 57 and 54, 12 and 55 east and 42 and 36 to 50 and 36 is the latitude. Cloud forest area is 35 thousands hectares and in most seasons is overcast and foggy. Plants can be oak tree, maple, hornbeam, milky, alder, hackberry and free pasture plants species Hat Mir Hasan, Choubak, Sainfoin, tail fox, named the thyme and clover. Animals in this area can, brown bear, wolf, leopard, Wild boar, jackal, fox, rabbits, antelope and goat, chamois, and birds, partridges, pigeons forest, quail, forest eagle, vulture, falcon, dove, pheasant Nambrd them. Extent of Abr jungle region and the diameter of more than 13 thousand hectare and type of Caspian forests or is Hyrcanian.

Abr jungle is located at the confluence of three main climatic streams of west and south of Asia, the Siberian high-pressure streams (dry and cool streams, subtropical high pressure and hot sterams) and Atlantic and Mediterranean streams. The confluence of these different climates in a smaller geographic area is unique in the world.

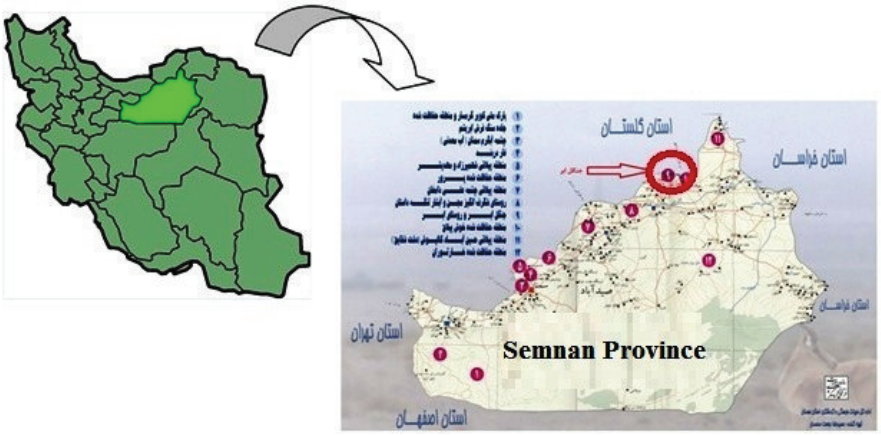

Fig 1. Position of the study area

Methodology

The method of this study is based on field research and literature review. In this way, the problems arising from road construction in Abr jungle were identified. Also the stakeholders and those groups opposed to road construction were determined. In order to consider the view of all of them, primarily the possible options of road construction were identified and then the options were scored with the help of expert opinions and using TOPSIS model and Expert Choice software and finally the best option were selected.

TOPSIS Model

TOPSIS[1] model is a multi-criteria decision analysis method, which was originally developed by Hwang and Yoon in 1981and Hwang. TOPSIS is based on the concept that the chosen alternative should have the shortest geometric distance from the positive ideal solution and the longest geometric distance from the negative ideal solution (Hwang & Yoon, 1981, Nabibidhendi et al, 2012). In this method, a number of alternatives (0, 1, 2,…, m) are measured by a number of indicators (0, 1, 2,…, n) and every problem can be considered as a geometric system including a number of points (0, 1, 2,…, m) in "n" dimensional space(Emami et al, 2012 and Chen, 2000).

It is assumed that the utility of each indicator is uniformly increasing or decreasing, or in other words, indicators have positive or negative nature. The positive one is benefit index and the negative one is cost index (Karami et al, 2013). So the ideal solution can be easily identified. That is, the best and worst present value of an index, respectively represent it`s positive and negative ideal (Azar & Rajabzadeh, 2003). The problem solving through this method involves the following steps:

First of all the criteria should be defined. In this study 20 criteria in four different groups presented in Fig 1 are used to identify and solve the problem.

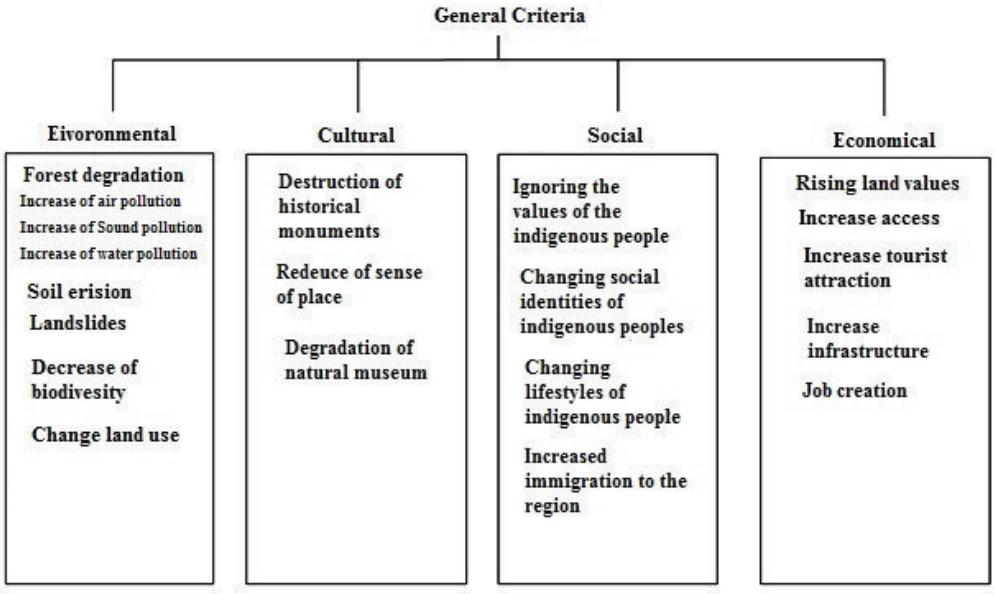

Figure 2. The criteria and sub-criteria

If the value of criteria be different, the criteria are scored relative to objective and the sub-criteria also are scored relative to criteria. Then the criteria weights are obtained (Karami, et al, 2013). The Expert Choice software is used if the number of criteria be high. In this method, pairwise comparisons are performed using Saati pairwise comparison matrix (Nabibidhendi et al, 2012).

Expert Choice: is decision-making software that is based on multi-criteria decision making. Expert Choice implements the Analytic Hierarchy Process and has been used in fields such as manufacturing, environmental management and agriculture (McGinley, 2012). In principle, the pairwise comparisons import into the software and then the weight of criteria relative to objective, the weight of sub-criteria relative to criteria and the total weight of options are calculated in analytic hierarchy process (Ghodsipoor, 2003).

Evaluation of criteria shows that some of criteria are more important to assess the effects of road construction. For example, the criteria in the environmental group are more important than the criteria in the other groups. So at this stage of the research, the criteria weights are determined. For this purpose, pairwise comparisons were performed using different expert opinions in the field of environment, natural resources, forestry, environmental economy and etc. Then the criteria and the pairwise comparison were imported into Expert Choice software. The weights of criteria are shown in Figure 3.

1 - Technique for Order of Preference by Similarity to Ideal Solution

Table 1: Saati scale for priority
(Ghodsipoor, 2003)

Importance	Score
Equal importance	1
Mid-importance	3
Strong importance	5
Very strong importance	7
Decisive importance	9
Middle values	2,4,6,8

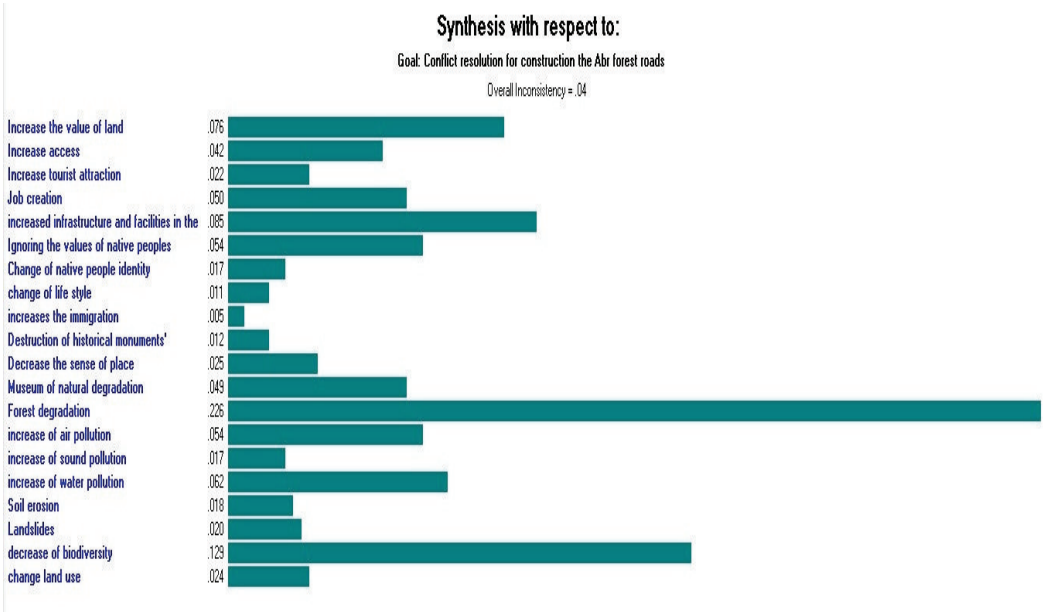

Fig 3. The weight for each criterion

The options of conflict resolution of road construction in the Abr Jungle

There are three different views and three groups supporting these views in the case of road construction in Abr Jungle. The first group supports the rapid road construction without special considerations includes Ministry of Roads and Urban Development and the large landowners that looking for their maximum benefit. The second group includes Iran Department of Environment and environmental advocates. This group is looking for the aims of sustainable development and therefore they are demanding road construction with regard to environmental aspects. The third group also includes indigenous people and some of environment advocates opposed to road construction in this untapped region. The options proposed are present in Figure 4.

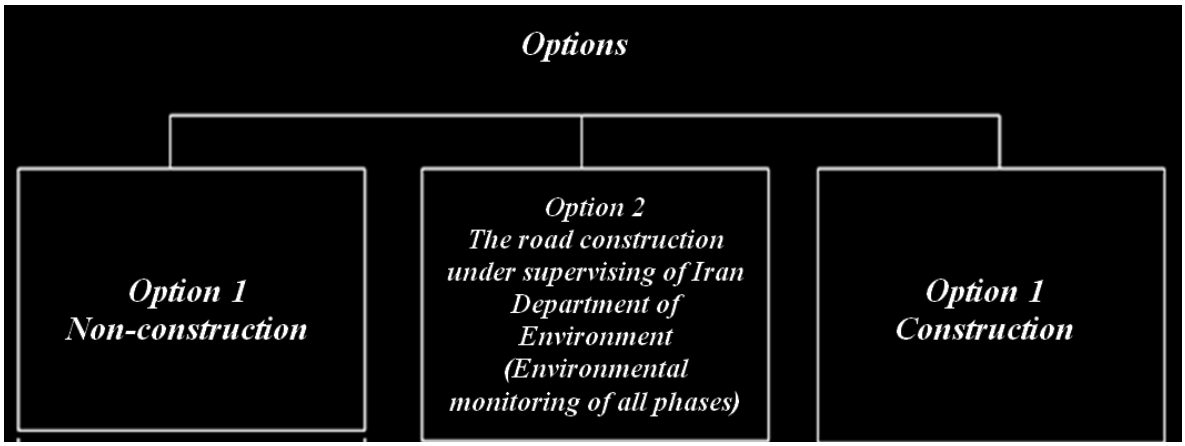

Fig 4: the options for resolution of conflict

Results

Determine the final weight of road construction in Abr Jungle

In this step, the weighted and decision matrix are imported in TOPSIS software. This software performs the stages of TOPSIS implementation and then provides the output (Statistics Analysis Site, 2012). The options were scored with the help of expert opinions. The range of 1 to 10 has also been used to for scoring the options (Fig 5).

The final weight of each option is determined in the output shown in Figure 5. These weights indicate the acceptability of project by expert and if the numbers are larger, the solution to implement the project will be more important. As shown in Figure 5, after investigating economic, social, cultural and environmental aspects, the second option that is the road construction in Abr Joungle was preferred under supervision of Iran Department of Environment.

					Options					
					1	2	3			
			Units	Importance	Construction	Construction under supervising of Iran Environment department	Non Construction	Goal	- Ideal	+ Ideal
Criteria	1	Incersea the value of land		0.076	7	9	0	maximize	0	9
	2	Increase access		0.042	6	8	0	maximize	0	8
	3	Increase tourist attraction		0.022	4	9	1	maximize	1	9
	4	Job creation		0.05	6	6	1	maximize	1	6
	5	Increase infrastracture		0.085	5	5	0	maximize	0	5
	6	Ignoring the values of native peoples		0.054	7	5	1	minimize	7	1
	7	Change of native peoples identity		0.017	4	4	2	minimize	4	2
	8	Change of life style		0.011	2	2	1	minimize	2	1
	9	Increase the immgrations		0.005	3	3	1	maximize	1	3
	10	Destruction of historical monuments		0.012	7	3	1	minimize	7	1
	11	Decrease the sense of place		0.025	4	3	1	minimize	4	1
	12	Museum of natural degradation		0.049	5	3	1	minimize	5	1
	13	Forest degradation		0.226	9	3	1	minimize	9	1
	14	Increase of air pollution		0.054	4	3	1	minimize	4	1
	15	Increase of sound pollution		0.017	5	3	1	minimize	5	1
	16	Increase of water pollution		0.062	7	3	1	minimize	7	1
	17	Soil erosion		0.018	7	3	2	minimize	7	2
	18	Landslide		0.02	6	3	1	minimize	6	1
	19	Decrease of biodiversity		0.129	4	2	1	minimize	4	1
	20	Change of land use		0.024	4	3	2	minimize	4	2
				Score	0.28	0.73	0.70			

Fig 5: The final weight of the options in road construction project

Conclusion

Growth of urbanization and development of urban and suburban transportation systems led to people welfare and roads as well as plays an important role in transfer goods, energy and people. Although road development leads to enhancing the quality of life in recent decades, but also has disadvantages such as damage of environment.

Forests are our surrounding environment that can provide social, economic and environmental services for human. Road construction in jungle may cause irreparable damages to the forest environment that take year to repair if it is not along with environmental principle and monitoring. Abr jungle in the Semnan province, around the Shahrood city is one of the Hirkani jungles in Iran that face with many problems because it is facing with the issue of road construction. Each of the options for construction or non-constructing will strength or weaken the interests of a special group. Therefore, in this study after reviewing issues of road construction in Abr Jungle and considering all respective issues, the 20 criteria were determined and then were categorized in four groups: environment, social, economy and cultural. In the next step, these criteria were weighted by experts and then the options also were scored in TOPSIS software.

Finally, the option of road construction in Abr Joungle under supervision of Iran Department of Environment was preferred with little different than the non-construction. In this regard, Iran Department of Environment should monitor all phases of planning, design and implementation of the road construction which in minimal damage be imposed on this jungle. It should be noted that the road construction regardless of indigenous people, has concerned them. So considering the public needs is very important in terms of environmental planning.

The planner decisions are influenced by his or her adjudication and value judgment, because the nature of decision making is based on prioritizing of one option compared to other options that is the same kind of value judgment and also has a value background (Fainstein and Campbell, 2012). On the other hand, the planning as a communication science and influenced by social values requires determining goals based on norms and values of society.

Therefore, the logic of planning along with the social aspects is the approach that is able to solve the problem of road construction in Abr Jungle. This approach states that in addition to environmental issues, the social and economic aspects also should be considered in planning. In fact, this approach seeks to establish social-environment justice, because it is hard for people to understand the environmental goods and social– environmental justice helps to listening to the 'voice of stakeholder'. The environmental planning can be used to achieve such justice, because its main goal is the productive use of lands and natural resources.

Reference

Azar, A; Rajabzadeh, A. (2003). Functional decision making of MADM approach. 1th Edition. Negah danesh Publisher. Tehran.

Chen, C.T. (2000). Extensions of the TOPSIS for group decision-making under fuzzy environment, Fuzzy Sets and Systems, 114, 1–9.

Coffin,A.W. 2007. From Road kill to Road Ecology: A Review of the Ecological Effects of Roads. Journal of Transport Geography (15): 396-406.

Department of Transportation. (2008). Environmental Assessment Guidelines road transport projects. Transportation Research Institute. Tehran.

Emami, M., Nazari, k., Fardmanesh, H., (2012), Application of Fuzzy TOPSIS Technique for Strategic Management Decision, Journal of Basic and Applied Scientific Research, no2(1)685-689.

Fainstein Susan S. Campbell, Scott, the structure and debates of planning theory in Campbell, Scott and Fainstein, Susan S. (3rd Eds). (2012). Readings in Planning Theory, New York. Blackwell Publishers

Fearnside,P.M. 2007. Brazil's Cuiaba´ -Santare´m (BR-163) highway: the environmental cost of paving a soybean corridor through the Amazon. Environmental Management (39): 601–614.

Freitas,S.R., et al.2010. Effects of roads, topography, and land use on forest cover dynamics in the Brazilian Atlantic Forest. Forest Ecology and Management (259): 410–417.

Forman,R.T.T., E.A.,Lauren.1998. Roads and their Major Ecological Effects. Annu. Rev. Ecol. Syst. (29): 207-231.

Ghodsipoor, H. (2003). Hierarchy analysis possessing. 3th Edition. Amir kabir University press.

Hwang, C.L., Yoon, k.(1981). Multiple Attribute Decision Making: Methods and Applications, Berlin, Springer –Verlag.

Iran department of environment. 2014. www.doe.ir .

Karami, S; Yavari, A; Hashemi, M; Amini, A. (2013). Ecology of asphalt roads (Case study: GHzavin-Alamoot-Tonekabon Road). The 12th International Conference on Transportation and Traffic Engineering. Tehran Municipality. Tehran.

Karami, S; Nabi bid hendi, G; Jafari, H; Vahidi, H. (2013). Design decision support system for chemicals management using Multi Criteria Decision (MCD) (Case study: Petrochemical Aarak). Environmental Studies magazine. (63) 53-62.

Lee, jaewook, 2010, conflict resolution in multi-agent based intelligent environments, building and environment, vol45, pp574-585.

Mazandaran province department of environment. 2014. www.mazandaran.doe.ir.

McGinley, P. (2012), "Decision analysis software survey", OR/MS Today.

Mikaili, A; Sadeghi benis, M. (2011). Ecological network of Tabriz and Recommended strategies to maintain and develop its. Research Environment magazine. (2), 43-52.

Nagendra,H., J.,Southworth, C.,Tucker .2003. Accessibility as a determinant of landscape transformation in western Honduras: linking pattern and process. Landscape Ecology (18): 141–158.

Nicholson, M., 1992. Rationality and the Analysis of International Conflict. Cambridge University Press. pp. 12–13. ISBN 978-0-521-39810-7. Retrieved 11 October 2012

Nabi Bid Hendi, G; Amiri, M,J; Karami, S. (2012). Application of Multi Criteria Decision Making Approach on Environment. 1th Edition, Kiajoor Publisher. Tehran.

Rahim, M., Antonioni, D., & Psenicka, C, 2001. A structureal equations model of leader power, subordinates' styles of handling conflict, and job performance. International Journal Of Conflict Management, 12(3), 191.

Zebardast, L; Yavari, A; Salehi, E; Makhdom, M. (2012). Investigate the structural changes by Golestan national park road between 1988-2011 using landscape ecology metrics. Environmental research magazine. (4) 11-20.

Zebardast, L; Yavari, A; Salehi, E; Makhdom, M. (2012). Use the effective net metric measurement in analysis of jungle land cover disruption in the road work area in Golestan national park. Environmental Studies magazine. (58) 15-20.