

## **Delphi technique for generating criteria and indicators in monitoring ecotourism sustainability in Northern forests of Iran: Case study on Dohezar and Sehezar Watersheds**

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### **ABSTRACT**

Ecotourism is widely accepted as the most effective type of sustainable development. For monitoring ecotourism sustainability in the Northern forest of Iran, a study was designed to help identifying criteria and indicators (C&I) with the principle goal to ensure the objectives of forest management, and at the same time – maintain processes in a sustainable manner. Indicators act as an instrument which can be used for monitoring sustainability. Hence indicators should be multidisciplinary, and cover all aspect of social, ecological, cultural, economic and institutional factors affecting sustainability of ecotourism. In this study, C&I were identified by using the Delphi approach through multidisciplinary panel team. Three rounds of meetings were held for discussions and dissemination of research to a panel of local experts. At the end of the second round we reached a consensus on 9 criteria and 61 indicators, which include 21 indicators related to ecological aspects, 8 to economic aspects, 21 to social aspects, 6 to cultural aspects and 5 to institutional aspects. The selected indicators would be applied by the Iranian Cultural, Heritage, Handicrafts and Tourism Organization for monitoring ecotourism sustainability in the Northern forest of Iran.

### **KEY WORDS**

ecotourism, sustainability, ecological indicators, Delphi method, evaluation, watershed

### **INTRODUCTION**

The Northern forest of Iran is blessed with very rich biological diversity, endemic and endangered species, spectacular panorama and landscape scenery and its masterpieces the natural, creative form of ancient forests (ICHHTO 2007). In recent years, ecotourism, which has received a great deal of attention worldwide,

has been promoted in the area as a means for sustainable development. There is no doubt that ecotourism represents more friendly alternatives for economic use of natural resources, when compared to other consumptive economic uses, such as mining, logging, farming, and others (Li 2003). However, some activities can degrade natural resources, especially when confronted with poor management (Mieczkowski 1995). Therefore,

for natural resources managers, ecotourism is not only an opportunity but also is a challenge. It is well known that natural habitat degradation arises gradually, and usually it is difficult to revive environment after degradation has reached a critical level. Hence, establishing a set of warning indicators is necessary for ecotourism management. Because of lack of warning indicators, revival attempts are mostly made after environment has been seriously impacted upon and fragile ecosystems are lost (Li 2003).

The use of criteria and indicators (C&I) for sustainable development has been acknowledged and recommended by the United Nation Commission of Sustainable Development (UNCSD) as important tools for the use in measuring the status of management of sustainable development. In order to evaluate the past, guide the action of the present, and plan for the future, we need to know what to monitor, what data to collect and what to measure. In other words, C&I are useful to track changes in social, natural, cultural, economic, and political arenas of ecotourism destinations. We need several sets of sustainability-oriented ecotourism indicators based on their relevance, analytical soundness and measurability (Sirakaya et al. 2001).

This set of C&I is intended as the standard measurement of sustainability, and for broad applications in various areas and disciplines throughout the world. Characteristics of indicators are to illustrate whether destination tourism development has deviated from sustainability (Tsaur and Lin 2006). Therefore, it is important to develop a set of indicators that are rigorous, credible, efficient, holistic, and useful for decision makers. They should also be flexible so as they can be adapted to different ecotourism destinations and their specific contexts (Sirakaya et al. 2001).

In Iran, during the past decade we have witnessed fast growing tourism industry, especially the ecotourism sector. The number of ecotourists entering the Northern forest of Iran annually has increased significantly. It is contended that sustainable ecotourism depends on successful environmental management. It is vital to identify a set of warning indicators for monitoring environmental change at tourism destination. Limits of ecotourism sustainable management are determined by sets of operational C&I in a variety of points. Regarding local specific needs, C&I are defined for every monitoring (Gousheger et al. 2009).

C&I can be useful tools to determine parameters of sustainable management (Gough et al. 2008; Raison et al. 2001). In reality C&I must try to simplify complexities of the world through providing manageable information to help understanding decisions and management of activities in the field (Peng et al. 2002). Development of C&I for monitoring has been the most popular method. In a relatively short period of time, about 150 countries adopted certain C&I (Hickey and Innes 2008). In fact, these C&I are well-known because 150 countries that possess 75.5% of forests by area are involved in nine processes of formulating regional and international C&I (Wijewardana 2008).

This study intends to identify all relevant C&I which are effective for monitoring ecotourism sustainability, using the Delphi method. These C&I should be multidisciplinary, covering all aspect of social, environmental, ecological, cultural, economic and institutional factors which affect sustainable ecotourism in protected areas (Hammond 1995). Finally, findings from this research will help providing a standard method which can track changes in ecological, social, cultural, economic and political arenas of Northern forest of Iran.

One of representative works on indicators for sustainable management of tourism, was developed by the World Tourism Organization (WTO) in 1993. In one study, Abidin 1999 developed the Criteria & Indicators for evaluating sustainable ecotourism development in Taman Negara National Park (TNNP) in Malaysia. The final outcome of this study was identification of 15 criteria and 58 indicators of sustainable ecotourism for its appropriate management. Fresque and Plummer (2006) used the Delphi method to determine social and ecological indicators for assessing changes related to visitor use of protected areas. At the end of third round they reached up to 13 social and 15 ecological indicators.

Choi and Sirakaya (2005) employed the modified Delphi technique for generating indicators for community tourism. After three rounds, panel members reached a consensus on a set of 125 indicators for six dimensions (political 32, social 27, ecological 26, economic 24, technological 3, and 13 cultural dimensions). Viljeon (2007) employed similar technique to identify sustainability indicators for monitoring tourism routes development in Africa. At the end of research he reached

to 28 indicators. Another study by Hai et al. (2009) in Quang tri province in Vietnam concerned a two –round questionnaire and was organized for a team of experts who acted as participants. About 37 indicators were selected, which included 17 related to social aspects, 12 to environmental aspects, 3 to the economic aspects, and 4 to institutional aspects.

Tsaur and Lin (2006) used the Delphi method to identify evaluation indicators for the Taiwanese indigenous site. At the end of the second round they reached up to 47 indicators. Similar study was carried by Bender (2008) using the Delphi technique for development of Criteria & Indicators for evaluating forest-based ecotourism in West Virginia. The survey was conducted through two rounds of the Delphi method. At the end of the second round, the outcome reached up to 7 criteria and 38 indicators for evaluating forest-based ecotourism in West Virginia. In present study, indicators for monitoring ecotourism sustainability in the Northern forest watershed were established based on the Delphi method.

## MATERIALS AND METHODS

### Site description

The study site comprises two neighboring watershed areas in the western part of Mazandaran Province in northern Iran. It is characterized by large tracts of natural ecosystems, especially forests, high mountains, and wild rivers. They form many unique and fascinating landscape sceneries with high potential for nature based tourism. The area is located close to the shortest road connection to Tehran, and for this reason it will have major and increasing importance for recreation and experience of nature. The area is located between 36° 19'22" to 36° 45'25" north latitude and 50° 21' 06" – 50° 23' 30" east longitude.

The whole study area is 77,563 ha including 32,761 ha designated as the core zone and 44,802 ha as the buffer zone. With abundance of biodiversity and attractive natural landscape, the entire region is endowed with natural flora and fauna, being a paradise for nature lovers, conservationists, botanists, zoologists and environmentalists. Its altitude at the lowest point is 100 m and the highest point about 4851 m above sea level. This watershed is a protected area and any utilization like

logging, cutting, and mining is forbidden. Currently the Forest, Range and Watershed Organization (FRWO) is trying to register it as a biosphere reserve with 42% of the area as forest cover and the rest as range land (Amiri 2008).

This area is very attractive and has recreational potential such as beautiful scenery, spectacular landscapes, lush rolling rivers, streams, different plant communities, religious and historical monuments, snow capped mountains, natural icebox and blooming valleys. As such, the area attracts a growing number of tourists and the months of June to September are considered as the peak season. Figure 1 shows the study area.

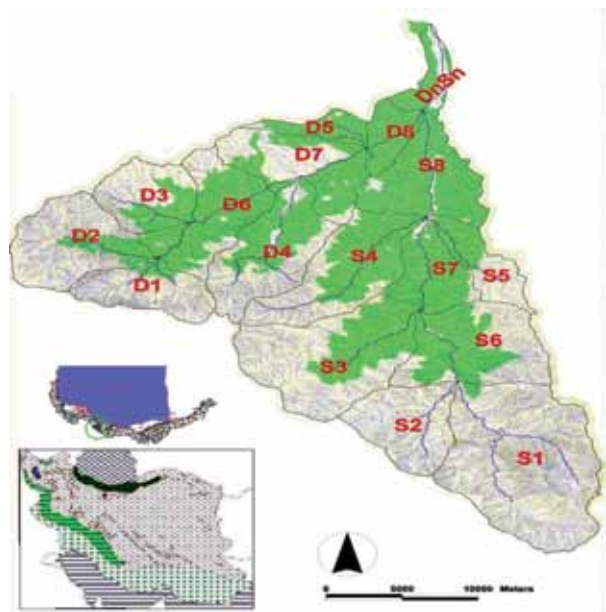


Fig. 1. Study area – Dohezar and Sehezar watersheds in Iran

### Delphi method

The Delphi method is an iterative process which is designed to achieve a consensus among a group of experts on specific topic issue. This method the most effective means for participants to identify criteria and indicators for measuring sustainability of ecotourism. It is an excellent way to generate a consensus of expert opinion when solid scientific data is unavailable. For the Northern forest of Iran this is especially useful in the situation where no standard criteria and indicators exist for evaluation (Goushegir et al. 2009). First we will review information on existing recommendations about

ecotourism sustainable indicators from a wide range of sources.

As we know, it is difficult to elicit and integrate knowledge from a range of experts (Hwang et al. 2006), particularly when they are different and have varying opinions. To cope with this problem there was used, the Delphi approach – knowledge acquisition for multiple experts with time scales (KAMET), which takes time scales into consideration while eliciting expertise from multiple experts, (Chu and Hwang 2007). The method allows systematic collection of expert judgments on a particular topic through a set of sequentially applied feedback questionnaires, interspersed with summary information on options from earlier responses (Delbecq et al. 1975). This method was shown to be a reliable qualitative research approach with potential to solve problems, contribute to decision-making, and reach a group consensus in a wide variety of areas (Cochran 1983). The Delphi method is characterized by four important features (Murry and Hammors 1995):

- Anonymity of Delphi participants.
- Iteration processes occur in round, allowing individuals to change their opinion.
- Controlled feedback: informs the participants about other participants perspectives, and provides an opportunity for Delphi participants to clarify or change their views.
- Statistical group response: allows for a quantitative analysis and interpretation of data.

### Selection of respondents

Selection of respondents is the most important step in the Delphi technique. Wheeler et al. 1990 cited the needs for a balanced panel and accepted that there had to be involved an element of judgment in achieving such a panel across a spread of experts with different background. The person invited to participate must be knowledgeable about an issue. The number of respondents must not be too small to avoid making evaluation too narrowly based or too large – then difficult to coordinate. A sample of experts between 10 to 15 is enough to yield sufficient results (Skulmoski et al. 2007). Twelve ecotourism experts were recommended by Taiwan ecotourism association (Tsaur et al. 2006). Linstone (1978) suggests that a suitable minimum panel size is 7 experts. Dalkey and Helmer (1969) state that a Delphi group possess the largest confidence when the

number of experts at least 10. For this survey we engaged 10 experts from different fields, experienced and professional in their areas of interest.

### First Round

A formal letter with enclosed questionnaire was sent to all panel members. The first round questionnaire was open-ended and designed to select C&I. The questionnaire was presented in a uniform manner to panel members to ensure that they responded to the questions consistently. Each expert identified C&I and returned the questionnaire to the researcher either by e-mail, post or personally. After receiving the first round response, the information was, summarized, collated, categorized and tabulated into the second questionnaire. The second questionnaire which incorporated a feedback report was distributed to the first round respondents.

### Second Round

In this step we distributed the questionnaire as designed, among panel members but this time we provided all the criteria with related indicators which covered all panel member's first round responses and asked the respondents to indicate a degree to which they agreed with a particular criterion and its indicators on the scale of 1 to 5:

- 1 – criteria and indicators are highly irrelevant,
- 2 – criteria and indicators are likely irrelevant,
- 3 – criteria and indicators are more or less relevant,
- 4 – criteria and indicators are likely relevant,
- 5 – criteria and indicators are highly relevant.

The goal of the second round and any other subsequent round using questionnaire was to achieve a consensus or stability of panel members' response. Once the consensus or stability is reached, the Delphi procedure is completed (Murry and Hammors, 1995). The Delphi method ends when all questionnaire items are either accepted or rejected or the rating mean is higher than 3.5.

## RESULTS

### First round

At the end of the first round after summarizing, modifying, merging and deleting of redundant criteria and indicators, the total of 14 criteria and 90 indicators was established. Table 1 shows the list of criteria.

**Tab.1.** The list of criteria

1.	Conservation of natural resources and Biodiversity.
2.	Climate.
3.	Educational affairs and public awareness.
4.	Maintenance of soil and water resources.
5.	Carrying capacity.
6.	Tourists and local people satisfaction.
7.	Promoting economic benefits and poverty alleviation.
8.	Status of public service and infrastructure.
9.	Maintenance of heritage and cultural diversity.
10.	Maintenance of scenery, natural and physical features.
11.	Mixed and dense forests.
12.	Maintenance of hygiene and tourist safety.
13.	Existence of legal, institutional, legislation and policy frameworks.
14.	Local people participation, awareness & involvement.

## Second Round

Ratings given by the experts in this round are shown in Tables 2 and 3. Criteria and indicators were selected using the following approach: rated highly irrelevant, anchored at 1 while highly relevant anchored at 5. Indicators scoring 3.5 or higher were treated as the midpoint

**Tab. 2.** Rating criteria in second round

	Criteria	Rating given by each expert										Mean	Status
		1	2	3	4	5	6	7	8	9	10		
1	Conservation of Natural Resources and Biodiversity	5	4	5	5	5	4	5	5	5	5	4.8	Accept
2	Climate	3	3	3	2	3	2	3	3	2	3	2.7	Reject
3	Education affairs and public awareness	5	4	4	4	4	4	5	5	4	4	4.3	Accept
4	Maintenance of soil and Water Resources	4	4	5	5	4	5	5	5	4	4	4.5	Accept
5	Carrying capacity	4	3	2	3	4	3	2	3	3	3	3	Reject
6	Tourists and local people satisfaction	5	4	5	5	5	5	5	4	5	5	4.8	Accept
7	Economic benefits and poverty alleviation	5	4	5	5	4	5	5	5	4	4	4.6	Accept
8	Status of Public service and infrastructure	3	3	2	3	3	3	2	3	4	2	2.8	Reject
9	Maintenance of heritage and cultural diversity	5	4	5	5	4	5	5	4	5	5	4.7	Accept
10	Maintenance of scenery, natural & physical features	5	4	5	5	5	4	5	5	5	4	4.7	Accept
11	Mixing and densely of forest	1	2	1	2	3	2	1	1	2	2	1.7	Reject
12	Maintenance of hygiene and tourists safety	5	4	5	4	4	5	5	4	4	5	4.5	Accept
13	Existence of legal, institution and policy framework	5	4	5	4	5	4	5	4	4	5	4.5	Accept
14	Local people participation, awareness and involvement	4	3	3	4	3	3	3	3	2	4	3.2	Reject

between likely relevant 4 and more or less relevant 3 (Chris and Sirakaya 2006). Criteria and indicators with mean ranks of 3.5 and above are finalized, used and adopted by Delphi studies (for example, see Egan, 1993). As such, the mean 3.5 and above were accepted while mean ratings of below 3.5 were rejected.

Initially, the experts rated all 14 criteria and followed that by rating the indicators related with each criterion. Table 2 shows that among the 14 criteria which experts rated from 'highly irrelevant' to 'highly relevant', nine criteria were accepted (criteria number 1, 3, 4, 6, 7, 9, 10, 12 and 13) while five criteria (2, 5, 8, 11 and 14) were rejected. After determination and recognition of criteria, the procedure continued and all of 90 indicators with related criteria were evaluated and assessed by experts. As the result, 29 indicators were rejected and 61 indicators accepted. Table 3 shows the results.

At the end of the second round, all of the criteria & indicators were collated, based on different aspects of environmental, social, economical, cultural and institutional parameters. Tables 4 and 5 show economic Criterion with 8 Indicators, cultural Criterion with 6 Indicators, institutional Criterion with 5 indicators, 3 environmental criteria with 21 indicators as well as 3 Social criteria with 21 indicators. The total number of indicators reached up

**Tab. 3.** Rating Indicators in second round Rating given by each expert

1	Criteria	Rating given by each expert										Mean	Status
		1	2	3	4	5	6	7	8	9	10		
1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Criterion 1: Conservation of Natural Resources and Biodiversity</b>													
1	Extent of protected area	5	4	5	5	5	4	5	5	5	4	4.7	Accept
2	No of protected water resource (rivers, marsh, streams, and so)	4	4	4	5	5	3	2	4	4	5	4	Accept
3	No of rare, threatened, vulnerable & endangered species (plants, animals, aquatic)	4	5	5	5	5	5	5	4	4	5	4.7	Accept
4	Bird diversity & their population	3	3	4	3	2	3	3	4	4	2	3.1	Reject
5	& implementation of Action plan for conservation Existence of natural resources	3	5	4	4	5	3	5	5	5	4	4.3	Accept
6	Fish abundance & diversity	4	3	2	3	3	2	3	4	2	4	3	Reject
7	Existence of different plant type	4	5	5	4	4	4	4	3	3	4	4	Accept
8	Diversity of plants and wildlife	5	5	4	5	4	4	5	4	4	5	4.5	Accept
9	Extent and diversity of habitats	4	3	4	4	2	3	3	2	3	2	3	Reject
10	Existence of zoning and comprehensive management system in watershed	3	4	4	5	4	3	5	5	5	4	4.2	Accept
11	Extent of damaged area duo to human activities	3	4	4	5	4	2	3	4	4	3	3.6	Accept
12	Mammal diversity and their population	3	4	3	2	2	3	4	4	3	1	2.9	Reject
13	Existence and implementation of EIA program in Recreational Zone	4	4	3	5	5	4	2	4	5	4	4	Accept
<b>Criterion 2: Educational affairs and public awareness</b>													
1	No of trained local people in field of local skill	5	4	5	5	5	4	5	4	5	5	4.7	Accept
2	Access to Farsi and English maps	3	4	2	3	4	3	2	4	3	3	3.1	Reject
3	No of educational workshop	4	4	4	4	5	4	5	4	4	3	4.1	Accept
4	No of dissemination information center	3	4	4	3	3	3	4	2	2	3	3.1	Reject
5	No of warning tableaus about waste management	5	3	4	4	5	5	5	4	4	3	4.2	Accept
6	No of brochure for representing attraction areas & biodiversity importance	4	4	4	3	5	4	4	4	4	4	4	Accept
7	Education how to use nature	2	4	4	3	3	2	3	3	4	2	3	Reject
8	No of educated & trained local people for hosting	4	4	5	5	5	4	5	4	5	5	4.6	Accept
9	Education of nature protection in local education center	3	4	4	3	3	2	3	4	4	2	3.2	Reject
10	No of distributed handbill among tourists about pay respect to Local culture and belief	4	4	4	4	5	4	5	4	5	5	4.4	Accept
<b>Criterion 3: Maintenance of soil and water Resources</b>													
1	Amount of erosion & sidement	5	4	5	5	5	5	5	5	5	4	4.8	Accept
2	Warming of water	3	3	2	3	3	2	3	2	3	3	2.7	Reject
3	% of Replanting of depleted forest	3	3	2	2	4	2	2	1	4	4	2.7	Reject
4	Amount of contamination materials in waters (clarity, turbidity, color, odor)	5	4	3	5	5	5	4	5	4	5	4.5	Accept
5	Season) fluctuation water resources (ground and underground in different Amount of	4	3	4	4	5	4	5	4	3	3	4.1	Accept

1	2	3	4	5	6	7	8	9	10	11	12	13	14
6	Extent and percentage of uncovered lands	4	3	4	5	5	5	4	3	3	4	4	Accept
7	(Control of domestic (dairy cattle	5	3	4	5	5	3	5	4	4	3	4.1	Accept
8	usage of pesticide and chemical fertilizer	3	2	2	1	3	4	3	2	2	3	2.5	Reject
9	Extent and percentage of afforested area	5	4	3	4	4	3	5	4	4	3	3.6	Accept
10	prohibition of bush cutting in rangeland	3	2	2	3	4	3	1	2	3	3	2.6	Reject
11	Provision of comprehensive plan and implementation of it	4	3	3	2	3	4	3	2	2	3	2.9	Reject
12	Amount of density for road and pedestrian in watershed	4	3	5	4	4	5	3	3	4	4	3.9	Accept
<b>Criterion 4: Tourists and local people satisfaction</b>													
1	No of tourists visit per year	5	3	5	5	5	5	5	5	5	4	4.7	Accept
2	Duration of tourist stay (increases or reduces of planned staying)	5	3	4	5	5	5	5	4	4	4	4.4	Accept
3	Amount of local production for sale to tourists	4	4	4	4	5	4	5	3	3	4	4	Accept
4	Frequency of local people using area	2	3	1	2	2	3	2	3	4	2	2.3	Reject
5	No of tourists repeat visitation	5	5	5	4	5	5	4	4	5	5	4.7	Accept
6	local people who satisfy with tourism development %	4	5	5	5	5	4	5	5	4	4	4.6	Accept
7	of tourists or no of complaints satisfied %	4	5	4	5	5	4	5	4	4	3	4.3	Accept
8	No of complaints from local or level of satisfaction of them	4	5	4	5	5	5	5	3	3	4	4.3	Accept
9	, burglary, rape, and so) No & list of social disturbance (no of theft	5	3	4	4	5	5	4	4	4	3	4.1	Accept
10	No of conflicts between tourists and local people	4	4	4	4	5	3	5	3	2	2	3.6	Accept
11	No of local people who able to communicate with foreign tourism	4	3	3	2	3	2	2	2	2	3	2.6	Reject
12	No of people who directly or indirectly involve and participate	3	4	4	2	3	2	2	2	3	2	2.7	Reject
<b>Criterion 5: Economic benefits and poverty alleviation</b>													
1	Amount of local revenue from Ecotourism	5	5	5	5	5	5	5	4	5	5	4.9	Accept
2	Value of wood production	3	3	3	3	5	4	5	3	3	4	3.6	Accept
3	Value of non-wood production	5	4	4	3	5	5	5	4	3	3	4.1	Accept
4	Diversity of production in field of associated Agriculture	3	2	2	4	3	3	2	3	4	1	2.7	Reject
5	Enhancement of handicrafts	2	3	2	3	4	3	3	2	3	2	2.7	Reject
6	Amount of investment in ecotourism sector	4	5	5	3	5	5	5	3	4	4	4.6	Accept
7	No of people who are engaged in tourism sector	5	5	5	5	5	5	5	5	5	4	4.9	Accept
8	Existence of vacancy room with service	3	3	4	3	5	3	2	2	3	3	3.1	Reject
9	No of wooden handicraft workshops in region	4	5	4	3	5	5	4	4	3	3	4	Accept
10	Expenditure for access to tourism area	2	3	2	3	4	4	3	4	4	3	3.2	Reject
11	Distance from resident location	3	4	4	3	4	3	3	2	3	4	3.3	Reject
12	No of people (men or women) who are engaged in craft art production	5	5	4	5	5	5	5	3	3	4	4.4	Accept
13	Length of staying of tourists	3	4	2	4	3	4	3	4	4	2	3.3	Reject
14	Promote well-being for residents with providing infrastructure	5	4	5	5	5	4	5	4	4	5	4.6	Accept
<b>Criterion 6: Maintenance of heritage &amp; cultural diversity</b>													
1	Existence of program for protection and development of historical building Religious & sacred places	4	4	3	5	5	4	5	4	5	5	4.4	Accept
2	Measures of protection of diverse traditional agricultural and animal husbandry which are compatible with environment	5	3	4	4	3	3	5	4	5	4	4	Accept

1	2	3	4	5	6	7	8	9	10	11	12	13	14
3	Measures for protection and revival of diverse traditional clothing and music	5	4	4	5	5	5	5	4	5	5	4.7	Accept
4	Maintenance, Revival & implementation of local rituals and festivals (game, dance, horseback riding, local wrestling and so)	5	4	3	5	5	5	5	4	3	3	4.2	Accept
5	Maintenance and management of local architectural buildings	5	5	4	4	5	5	5	3	4	4	4.4	Accept
6	Providing and development of local foods	5	5	4	3	5	4	5	4	4	3	4.2	Accept
<b>Criterion 7: Maintenance of scenery, natural &amp; physical feature</b>													
1	Maintenance of natural plant community	4	3	2	3	2	2	5	4	3	4	3.2	Reject
2	& management plan of protection Existence & implementation for spectacular landscape area in region	5	4	5	5	5	4	5	4	5	5	4.7	Accept
3	Extent and No of specific natural plant communities in region	5	3	2	4	5	3	4	4	4	3	3.7	Accept
4	Diversity of water Resource features	3	4	3	3	3	3	3	4	4	3	3.3	Reject
5	conservation implementation of management plans for Existence & of riparian, Cultivated landscape, streams, and others water resources	5	4	4	5	5	3	5	5	4	4	4	Accept
6	Growth rate of incompatible construction with natural environment in region	5	4	4	4	5	4	4	4	5	5	4.4	Accept
7	Growth rate of incompatible construction with trees covering Extent of land	4	4	3	3	3	2	4	2	2	4	3.1	Reject
8	Existence & implementation of management plans for Protection of topography & geological features in region	5	3	4	5	5	3	5	4	4	3	4.1	Accept
<b>Criterion 8: Maintenance of hygiene and tourists safety</b>													
1	No of active health care center in region	4	4	4	5	5	5	4	4	4	5	4.4	Accept
2	Existence and accessibility to lucid food & water	5	4	5	5	5	5	5	5	5	4	4.8	Accept
3	Existence of Rural treatment system	5	4	5	5	5	5	5	5	4	4	4.7	Accept
4	Hygiene of rural house	3	3	4	3	4	4	3	2	3	3	3.2	Reject
5	Health protection	3	4	4	3	3	4	4	4	3	2	3.4	Reject
6	disease in region No of endemic	4	4	4	4	5	5	4	4	3	3	4	Accept
7	No of incident, accident and other undesired accident	4	3	4	3	5	4	4	3	3	4	3.7	Accept
8	Volume of garbage which collected from nature	5	5	4	5	5	4	1	5	5	4	4.3	Accept
<b>Criterion 9: Existence of legal, institution, legislation and policy</b>													
1	Existence of institutional & policy framework for ecotourism in region	5	5	5	5	5	4	5	4	5	5	4.8	Accept
2	legal obligations, incentives for promoting and Existence of enhancement of ecotourism industries	5	4	5	5	5	4	5	5	5	4	4.7	Accept
3	Existence of legal frameworks for participation of all stakeholders in the planning, development and implementation of Ecotourism projects	5	5	4	5	5	4	5	4	4	5	4.6	Accept
4	Existence of carrying Capacity	3	3	2	2	2	3	3	2	4	2	2.6	Reject
5	(FRWO, DOE, ICHTO) Existence of collaboration among different	5	4	5	4	5	4	5	4	4	4	4.4	Accept
6	Existence of enough fund and human resources	3	3	2	2	3	3	2	1	2	2	2.3	Reject
7	Existence of approved national plan for sustainable tourism development	5	5	5	3	5	4	5	4	5	5	4.6	Accept



**Tab. 4.** Construction of Economy, Cultural and Institutional Criteria & Indicators for sustainable Ecotourism

Element	Criteria	Indicators
Economy	Economic benefits and poverty alleviation	<ol style="list-style-type: none"> <li>1. Amount of local revenue from Ecotourism</li> <li>2. Value of wood production</li> <li>3. Value of non-wood production</li> <li>4. Amount of investment in ecotourism sector</li> <li>5. No of people who are engaged in tourism sector (permanent, seasonal...)</li> <li>6. No of wooden &amp; handicraft workshops in region</li> <li>7. No of people (men or women) who are engaged in craft art production</li> <li>8. Promoting well-being for residents with providing infrastructure</li> </ol>
Cultural	Maintenance of heritage & cultural diversity	<ol style="list-style-type: none"> <li>9. Existence of program for protection and development of historic building &amp; sacred places</li> <li>10. Measures for protection of diverse traditional agriculture and animal husbandry which are compatible with environment</li> <li>11. Measures for protection and revival of diverse traditional clothing and music</li> <li>12. Maintenance, revival &amp; implementation of local rituals and festivals (game, dance, horseback riding, local wrestling and so...)</li> <li>13. Maintenance and management of local architectural buildings</li> <li>14. Providing and development of local foods</li> </ol>
Institutional	Legal, institution, legislation and policy frameworks	<ol style="list-style-type: none"> <li>15. Existence of institutional &amp; policy framework for ecotourism in region</li> <li>16. Existence of legal obligations, incentives for promoting and enhancement of ecotourism industries</li> <li>17. Existence of legal frameworks for participation of all stakeholders in the planning, development and implementation of Ecotourism projects in watershed</li> <li>18. Existence of collaboration among different organization (FRWO, I CHTO &amp; DOE)</li> <li>19. Existence of approved national plan for sustainable tourism development</li> </ol>

to 61. Tables 4 and 5 show the construction of different aspects of indicators for measuring ecotourism sustainability in the Northern forest of Iran.

## DISCUSSION

Sustainable tourism is a holistic approach, therefore it should be ecologically responsible, socially compatible, culturally appropriate, politically equitable and economically viable for host community (Choi and Sirakaya, 2006). In order to realize this concept, an effective set of indicators for monitoring ecotourism sustainability is indispensable. The aim of this study was to investigate the use of the Delphi approach to design a set of C&I potentially useful for monitoring ecotourism sustainability in Northern watersheds of Iran. It was an iterative process for identifying and generating C&I and involving the interdisciplinary panel of 10 professional and experienced Iranian local experts.

Two rounds of Delphi process were used for identifying C&I for sustainable management of ecotourism in the protected watershed. Initially, the experts

provided a large number of criteria which needed to be grouped into the cognate areas in order to make them manageable for the purpose of the study. In the first round, 30 criteria were identified. After merging and omitting redundancy, the number of criteria was 14 with altogether 124 indicators. In the second round the experts were asked to indicate a degree to which they agreed with particular criteria and indicators on the scale of 1 to 5 – from highly irrelevant to highly relevant. At the end of the second round the consensus of 9 criteria and 61 indicators was reached. All indicators covered six dimensions which are: 21 indicators related to ecological aspects, 8 indicators to economic aspects, 21 indicators to social aspects, 6 indicators to the cultural aspects and 5 of them related to institutional aspects.

Some studies create indicators for ecotourism sustainability, however because of their failure to incorporate all dimensions of sustainable development, these studies are incomplete (McCool et al. 2001; Miller, 2001). The present study extended the spectrum by including social, ecological, cultural, economical and institutional dimensions. Thus this survey created a com-

**Tab. 5.** Construction of Environmental and social Criteria & Indicators for sustainable Ecotourism

Element	Criteria	Indicators
Environmental	Conservation of Natural resources and Biodiversity	20. Extent of protected area 21. No of protected water resource (rivers, marsh, streams, and so... 22. No of rare, threatened, vulnerable & endangered species (plants, animals, aquatic) 23. Existence & implementation of Action plan for conservation of natural resources 24. Existence of different plant types (forest and range) 25. Diversity of plants and animals 26. Existence of zoning and comprehensive management system in watershed 27. Extent of damaged area duo to human activities (encroachment, road foundation, mining,, poaching) 28. Existence & implementation of EIA program in recreational zones
	Maintenance of soil & water Resources	29. Amount of erosion & sediment 30. Amount of contamination materials in waters (clarity, turbidity, color and odor) 31. Amount of fluctuation water resources (ground & underground) 32. Extent and percentage of uncovered lands 33. Control of domestic(dairy cattle) animal in range & forest 34. Extent and percentage of afforested area 35. Amount of density for road and pedestrian in watershed
	Maintenance of scenery, natural & physical features	36. Existence & implementation of protection & management plan for spectacular landscape area in region 37. Extent and no of specific natural plant communities in region (forest & range) 38. Existence & implementation of management plans for conservation of riparian, streams, and cultivated landscape 39. Growth rate of incompatible construction with natural environment in region 40. Existence & implementation of management plans for protection of topography & geological features in region
Social	Educational affairs and Public awareness	41. No of trained local people in field of local skills 42. No of educational workshop 43. No of warning tableaus about waste management 44. No of brochure for representing attraction areas & biodiversity importance 45. No of educated & trained local people for hosting 46. No of distributed handbill among tourists about pay respect to local beliefs & culture
	Tourists & local people satisfaction	47. No of tourists visit per year (annually) 48. Duration of tourist stay (increase or reduce of planned staying) 49. Amount of local production for sale to tourists 50. No of tourists repeat visitation 51. % of local people who satisfy with tourism development 52. No of complaints from local or level of satisfaction of them 53. No & list of social disturbance (no of theft, burglary, rape, conflict, injury...) 54. No of conflicts between tourists and local people 55. % of satisfied tourists or no of complaints
	Maintenance of hygiene& tourist safety	56. No of active health care center in region 57. Existence and accessibility to lucid water & food 58. Existence of rural sewage treatment system 59. No of endemic disease in region 60. No of incident, accident and other undesired accident 61. Volume of garbage which collected from nature

prehensive set of indicators which cover all dimensions of sustainable development for monitoring ecotourism sustainability in protected forest areas.

## CONCLUSIONS

Iranian Caspian (northern) forests have high ecological, economics, social and cultural values, but no definite criteria and indicators have been developed for monitoring these forests (Goushegir et al. 2009). One of the most important and effective factor that can play a pivotal role in sustainable management in the Northern forest of Iran is development and sustainable management of ecotourism, for which monitoring and evaluating we need a clear, correct and precise criteria and indicators. The absence of these factors has prevented us from understanding whether forest is experiencing sustainability or not. Consequently, there is no access to required information on ecotourism sustainability, hence the criteria and indicators are indispensable requirements for monitoring.

Previous studies like Kotwal et al. 2008, point out that ecological indicators need to be covered by social and economic indicators. The Delphi approach is one of better methods to select indicators (Hai et al. 2009). The results obtained indicate that the Delphi technique with participation of Iranian local experts was the effective tool for soliciting and selecting sets of criteria and indicators. The study shows that it is possible to define a set of indicators for monitoring ecotourism sustainability in Northern forest of Iran. This can be done using the method that makes the selection process more objective and transparent. The study identified 61 indicators on environmental (ecological), social, economic, cultural and institutional aspects. Among all indicators, 21 relate to environmental aspects (ecological), 8 indicators to economic, 21 indicators to social, 6 indicators to cultural and 5 indicators to institutional aspects.

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