Implementing sustainable ecotourism in Lafour region, Iran: Applying a clustering method based on SWOT analysis

Abstract
Nowadays, one of the growing and remarkable branches of tourism is ecotourism. Ecotourism has a great impact on the development of a region from different perspectives. Hence, by improving and developing sustainable ecotourism in a region, it will be possible to develop and improve its economic, social, and environmental situation. The Lafour region is one of the potential hubs for ecotourism activities in Iran. Despite the high potential of this region for ecotourism activities, it has not yet achieved its suitable position in this domain. Hence, the main goal of this study is to develop sustainable goals for ecotourism in the region. To meet the target, first, the Strengths, Weaknesses, Opportunities, and Threats (SWOT factors) are identified through interviews with tourists, local residents, and the experts, filed observation, and considering similar works in the literature review. Then, some practical and useful strategies are determined based on SWOT analysis and consulting with the experts. The important point of the study is proposing an applicable heuristic clustering method based on SWOT analysis to classify the strategies into different clusters. To prioritize the strategies in each cluster, the commonly used Multi-Criteria Decision Making (MCDM) method called the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method is applied. This paper concludes and reveals that the three strategies including ST6 "Encouraging investors and entrepreneurs to establish ecotourism centers in the region", ST5 "Establishing and improving the hygiene units and the medical clinics in the region", and ST3 "Improving and diversifying tourism services and products to attract tourists and increase their satisfaction" have the greatest impact on accomplishing sustainable development goals in the region.

Keywords: Sustainable ecotourism; SWOT analysis; Clustering method; TOPSIS; Lafour region

1. Introduction

Nowadays, the tourism industry has attracted much attention in the world and many countries have realized its importance (Chen et al., 2012). The tourism industry is introduced as an important factor for sustainable development in a community that includes the economic, social, and environmental aspects (Sgroi, 2020). Since tourism has a direct relationship with human beings, cultures, and environment, a new and remarkable concept called sustainable tourism has emerged in recent decades in the world (Cucari et al., 2019). Tourism has positive and negative impacts on the environment and the hosting communities (Ehigiamusoe, 2020). Considering the impacts of Tourism Development (TD) without managing them can cause serious damage to the environment, the culture, and the hosting community (Blancas et al., 2011). Thus, the importance of Sustainable Tourism Development (STD) is becoming clearer (Pan et al., 2018). STD improves and develops the existing conditions in any community by emphasizing the need of managing the effects of tourism on the environmental, economic, social, and cultural aspects of the destination community (Toivonen, 2020). Ecotourism is a significant practical concept in tourism to ensure STD in a region (Phelan et al., 2020). The first spark of the concept of ecotourism was formed by the idea of reconciling with real nature (Ceballos-Lascurain, 1996). Ecotourism is a responsible trip to

natural areas that protect the natural environment and enhances the well-being of the local community (Moons et al., 2020). In other words, ecotourism is a type of trip that is performed to study, admire, praise, and enjoy the appearance of nature and observe plants and animals and get acquainted with the cultural characteristics of different past and present local communities (Hosseini and Paydar, 2021b). Due to the significant and positive effects of Ecotourism Development (ED) and the high desire of people to travel to natural and pristine areas, improving and developing ecotourism considering SI is necessary and essential (Gigović et al., 2016). The main positive effects of ecotourism for a region are improving its economic status, cultural exchange, and conservation of its natural resources (Tseng et al., 2019; Omarzadeh et al., 2021). Iran is one of the most important and potential tourism hubs in the world (Ghaderi and Henderson, 2012). Iran has many Ecotourism Potentials (EPs) such as natural, beautiful, and pristine landscapes, different good climates, diverse plants and animal species, and various types of traditional culture (Motlagh et al., 2020). Therefore, among the various types of tourism, there is a higher chance to benefit from the ecotourism field to contribute to the development of the country (Hosseini and Paydar, 2021a). One of the areas with potential for ecotourism activities in Iran is Lafour rural district (Lafour region). Despite having sufficient and appropriate EPs for its development, ecotourism has not been placed in a suitable situation and position in this region (Hosseini et al., 2021). Hence, our main contribution in this paper is to study, for the first time, the ecotourism situation in the Lafour region and to present effective and helpful strategies for its development.

To develop ecotourism in a region, it is first necessary to study its concepts, principles, and goals carefully. Then, the potentials and obstacles of ED should be identified and examined. Subsequently, appropriate strategies and scenarios should be determined. Finally, the identified strategies should be implemented in the right and most appropriate ways (Mosammam et al., 2016). Figure 1 shows the process of carrying out this research. More specifically, the study starts by explaining the concepts, principles, and importance of ecotourism. Then, the strengths, weaknesses, as well as opportunities and threats of ED in the region are identified, considering the similar works in the Literature Review (LR) and through interviews with tourists and local residents and by consulting with the experts. Afterwards, some strategies are determined regarding the identified SWOT factors. Eventually, the strategies are categorized by the proposed clustering method.

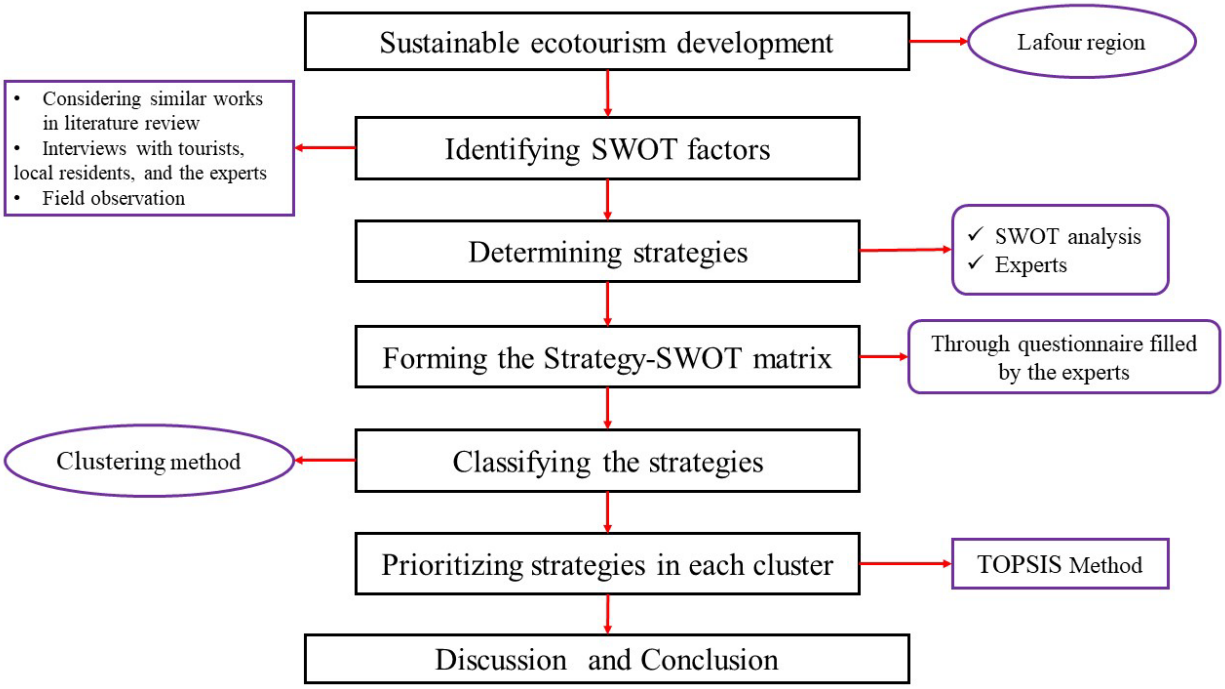

Figure 1: The research steps.

Other sections of the paper are categorized as follows: some associated papers on the topic of the current research are studied and reviewed in Section 2. Section 3 introduces the research area. Section 4 explains the materials and methods used in this study. Section 5 presents the results and findings. Then, Section 6 and Section 7 discusses the results and findings and provides more insights about the proposed strategies and the required actions, respectively. Section 8 is related to the conclusions and the future research developments.

2. Literature review

This section is divided into three sub-sections. In the first one, the papers that studied the ecotourism field using the SWOT analysis and the MCDM methods are reviewed and summarized. In the second part, the papers related to the tourism field and applied clustering methods are reviewed and provided. Finally, the third sub-section presents the novelties of the present study with respect to sub-sections 2.1 and 2.2.

2.1. Application of SWOT and MCDM methods in ecotourism

Regarding our current work, we have studied and reviewed the papers focusing on ED by applying SWOT analysis or SWOT analysis and one or more MCDM method. One of the types of tourism to be considered is rural tourism, and it has an important contribution to the economic and social development of several regions and countries. Therefore, Rahmani Seryasat et al., (2013) applied SWOT analysis to identify weaknesses, strengths, threats, and opportunities of rural tourism in one of the villages in the Tehran province (capital of Iran). They also presented appropriate approaches for TD in the same region. Akbulak and Cengiz, (2014) studied the factors affecting TD in Troia Historical National Park, Turkey. These factors were identified by SWOT analysis and then, the weights of the factors were calculated using the Analytic Hierarchy Process (AHP) method. Also, eight strategies, called A'WOT, were determined and presented using a combination

method including SWOT analysis and AHP methods. Ghorbani et al. (2015) analyzed the conditions of ecotourism in Kaji Namakzar Wetland, Iran. The purpose of their research was to study the sustainability of ecotourism in this region. Factors related to ED were identified with SWOT analysis and interviews with the local people. Also, the Quantitative Strategic Planning Matrix (QSPM) was used to find the proper strategies. Hermon (2016) presented a strategic model for developing coastal tourism in the Mandeh regions, Indonesia. Both the SWOT analysis and the AHP method were conducted to formulate the considered model. Based on the results, it was possible to develop the tourism conditions in this region due to its great strengths. Grošelj et al. (2016) investigated the factors that aid to develop forest management. They also examined the impact of forest improvement on economic, social, and cultural conditions. Forest management includes local regions, public representatives, and conservationists. The required factors were specified by SWOT analysis and some effective scenarios were defined and analyzed based on SWOT analysis results. Nowadays, protecting pristine and natural areas and conserving natural resources has become a significant issue in every community. So, ecotourism ensures a substantial help in researching this issue. Hence, Demir et al. (2016) examined the situation of the ecotourism in a coastal city named Igneada, Turkey. The required criteria and sub-criteria for developing ecotourism were defined by applying SWOT analysis and the AHP method. Arsić et al. (2017) prioritized the strategies that develop the sustainability of ecotourism in the National Park Djerdap (NPDJ), Serbia. In their paper, first, the required factors of SWOT analysis were identified, then the strategies were determined, and finally, they were prioritized by the multi-criteria Analytical Network Process (ANP) and Fuzzy Analytical Network Process (FANP) methods. The results expressed that the determined strategies are useful and feasible for developing ecotourism in that region. Later, Arsić et al. (2018) introduced a new approach called the ANP-SWOT method and they studied and improved the ecosystem management in NPDJ, Serbia. They also specified the necessary scenarios for this realization. Ahmadi et al. (2018) studied the conditions of ecotourism in the protected areas of Iran, named Manesht and Ghelarang. The objective of their study was to provide efficient policies for developing sustainable tourism in these regions. Strengths, weaknesses, threats, and also opportunities were clarified by the SWOT analysis. These factors were then classified using the mapping technique and TOPSIS method. Ecotourism was introduced as an important type of sustainable tourism. Therefore, Hosseinalizadeh et al. (2018) studied the ecotourism status in the Azerbaijan region, Iran. Their study was based on the analytical-descriptive method. The results show that there were some weaknesses like lack of water resources, environmental changes, and cultural differences. These weaknesses caused negative effects on the TD in the region. Protecting ecosystems and preserving natural areas and attractions are mentioned as the main goals of ecotourism. Therefore, Bianco and Marcianò (2018) examined the enveloping conditions of ecotourism in Calabria, Italy. They assessed the strategies by the hybrid A'WOT model. The obtained results clarified that paying more attention to natural resources led to the improvement of the economic condition of the local society. Ecotourism is an important factor in improving the economic conditions of a country as well as preserving the environment and natural resources. Therefore, paying attention to this concept is vital for any society. Demir and Atanur (2019) examined the effective criteria for ED in Iznik, Turkey and determined the required strategies. They also used a priority-ranking approach to improve the strategies. Asadpourian et al. (2020) developed a model for examining and analyzing the sustainability concept for ecotourism in the Lorestan province, Iran. Internal and external factors affecting the ED were determined and prioritized by applying SWOT-AHP-TOWS Analysis. Jamali et al. (2021) studied two aspects of sustainability, including economic and social, for the ED in the Khansar river

watershed, Iran. They presented socio-economic strategies using SWOT analysis and gathered the required information through a questionnaire. They also evaluated the validity of the questionnaire by assigning a panel of experts. Kaymaz et al. (2021) claimed that developing Sustainability Issues (SI) in each field is extremely important for all countries in the world. They stated that humans and natural resources as two factors in achieving sustainable goals. In this regard, they studied sustainable development in Erzurum province, Turkey. To conduct their research, they used SWOT analysis and the AHP method. Rezagama et al. (2021) focused on developing SI in a sub-section of ecotourism called marine ecotourism in Bedono village, Indonesia. They applied SWOT analysis to determine the strategies in their work. They revealed that the current environmental condition is a big threat against sustainable development of the region. Like some other papers, Swangjang and Kornpiphat (2021) considered various aspects of sustainability in ecotourism development. They focused on developing Sustainable Ecotourism (SE) in the region of Klong Kone, Thailand. They combined SWOT analysis and the Driving forces, Pressures, States, Impacts, and Responses (DPSIR) framework to do their work.

2.2. Application of clustering method in tourism filed

In this section, papers that used clustering method to study tourism are reviewed and summarized. The tourism cluster is defined as a set of related industries and entities that provide necessary products and services for tourists. Two important elements of the tourism clusters are cooperation and complementarity. In this regard, Weidenfeld et al. (2011) studied these two components by applying Jackson and Murphy's (2006) approach. They examined the relationship between these elements by evaluating two tourist attractions in Cornwall, UK. D'Urso et al. (2013) proposed a novel technique based on the bagged clustering method and examined its application to Tourism Market Segmentation (TMS). To show the authenticity of their proposed method, they used two different samples of tourists who visit cultural attractions of the Trentino-South Tyrol region, Italy. The purpose of their study was to cluster the motivations of the tourists to visit the place. D'Urso et al. (2015) presented a novel method for TMS by integrating the BC method and the Fuzzy C-Means clustering method for Fuzzy Data (FCM-FD) method. They examined the validity of their proposed method using a sample of 328 Chinese people who travel to Western Europe as a tourist destination. Dimitrovski and Todorović (2015) clustered the motivations of the tourists interested in spa tourism in Vrnjacka Banja Spa, Serbia. They applied the Clustering Analysis (CA) based on Formann (1984) and Qiu and Joe, (2009)'s works. Additionally, the findings of their study show that the motivations are clustered into six clusters. Amaro et al. (2016) examined the effects of social media on tourists' travel planning. They applied CA to classify tourists based on travel-related characteristics. They claimed that the findings of their research can deeply help the online marketer to adopt the best possible strategy for each cluster. Claveria and Poluzzi (2017) categorized the top tourist destinations from 2000 to 2010 in the world. To achieve this target, they used CA and dimensionality reduction techniques. They clustered the destinations into three main groups including Turkey, China, and other destinations. Using the CA, Laing and Lewis (2017) provided useful strategies for developing tourism destinations. Their main focus was on rural communities in La Brea, Trinidad. The main focus of the Dias-Sardinha et al. (2018) was to propose a new model for CA for better managing the tourism destination based on heritage resources. One of the sectors of the tourism industry that has a significant impact on its development in a country is ecotourism. Considering this fact, Santarém et al. (2018) evaluated EPs to improve tourism sites in Mauritania. They utilized the CA and ordination methods in their research and clustered the sites into different groups based on some features such as demand.

Rodríguez et al. (2018) claimed that all tourism markets seek to identify tourist profiles to better serve tourists. They also declared that traveling patterns and the tourists' behaviors are two important elements for tourism management and transportation system planning. Therefore, they presented a hierarchical clustering approach to do their investigation. Majewska and Truskolaski (2019) studied the spatial agglomeration concept in the tourism field, focusing mainly on economic activities. Thus, they proposed a novel clustering method named the cluster-mapping procedure based on the Geographic Information System (GIS) and fuzzy clustering and geostatistics. Tea Cultural Heritageis (TCHs) are mentioned as one of the potentials for tourism development in China. In this regard, Tang and Xie (2019) analyzed the capabilities of TSHs using the grey clustering approach and AHP method to achieve TD in Huangshan city. Gu et al. (2021) evaluated the roles of the residents settled in an area for the development of nature-based tourism in a protected area near China and North Korea. They categorized the residents considering their discernment about various aspects of tourism, including economic, social, cultural, and environmental aspects. The tool they applied in their research was a factor-cluster approach. They also clustered the residents into four different groups. Duarte-Duarte et al. (2021) evaluated and clustered the tourist's site to achieve sustainability goals. They used the clustering methods, and the required data was gathered from a region in Colombia. They classified the tourist sites into three groups and considered three factors for each group. Like some other papers, Wang et al. (2021) focused on clustering the tourist destination considering the tourists' behavior. They declared that proper identification of the tourist's interests in selecting a destination can help accelerate TD there. They used the Principal Component Analysis (PCA) and the modified affinity propagation clustering methods to conduct their research.

2.3. Contributions of the current work

Table 1 provides useful and concise information about previous studies in the field of tourism, especially ecotourism, that are related to the present work. The table highlights the importance of our work since examining the ecotourism conditions and presenting effective and useful strategies for the development of the Lafour region is being done for the first time. The ED in Lafour can improve the economic, social, and environmental conditions of the whole region's population significantly. The main motivation behind choosing this specific region for our research is that despite Lafour having adequate and proper EPs, this area is not currently in a worthy position. Table 1 shows that only Santarém et al. (2018) applied a clustering method in the field of ecotourism, which is completely different from our research and applied a very different context. Therefore, the technique of the clustering method has never been used in the literature in the ecotourism context focusing on providing beneficial strategies for its development. In this regard, this paper proposes, for the first time, a clustering method based on SWOT analysis to solve the specific problem under exam. Appropriate strategies are defined for the development of ecotourism in the region and then the most efficient strategies must be selected and implemented. The important feature about applying the clustering method in this research is its capability to categorize the strategies to different clusters in this method and then to identify the best possible strategy/strategies from each cluster. As a result, the chance of selecting the most appropriate strategies and ensuring balanced ED will increase dramatically (Botha et al., 2016).

Table1: A summary of reviewed articles in the tourism industry especially ecotourism and current work position.

Researchers	Methodology				Research domain		Case study
	SWOT	Clustering	MCDM	Other	Tourism	Ecotourism	
Weidenfeld et al., (2011)	×	✓	×	×	✓	×	✓
Rahmani Seryasat et al., (2013)	✓	×	×	×	×	✓	✓
D'Urso et al., (2013)	×	✓	×	×	✓	×	✓
Akbulak and Cengiz, (2014)	✓	×	✓	✓	×	✓	✓
Ghorbani et al., (2015)	✓	×	×	✓	×	✓	✓
D'Urso et al., (2015)	×	✓	×	✓	✓	×	✓
Dimitrovski and Todorović, (2015)	×	✓	×	×	✓	×	✓
Hermon, (2016)	✓	×	✓	✓	×	✓	✓
Grošelj et al., (2016)	✓	×	×	×	×	✓	✓
Demir et al., (2016)	✓	×	×	×	×	✓	✓
Amaro et al., (2016)	×	✓	×	×	✓	×	✓
Arsić et al., (2017)	✓	×	✓	×	×	✓	✓
Claveria and Poluzzi, (2017)	×	✓	×	✓	✓	×	✓
Laing and Lewis, (2017)	×	✓	×	×	✓	×	✓
Ahmadi et al., (2018)	✓	×	✓	✓	×	✓	✓
Dias-Sardinha et al., (2018)	×	✓	×	×	✓	×	✓
Santarém et al., (2018)	×	✓	×	✓	×	✓	✓
Rodríguez et al., (2018)	×	✓	×	×	✓	×	✓
Hosseinalizadeh et al., (2018)	✓	×	×	×	×	✓	✓
Bianco and Marcianò, (2018)	✓	×	✓	✓	×	✓	✓
Arsić et al., (2018)	✓	×	✓	✓	×	✓	✓
Demir and Atanur, (2019)	✓	×	×	✓	×	✓	✓
Majewska and Truskolaski, (2019)	×	✓	✓	×	✓	×	✓
Asadpourian et al., (2020)	✓	×	×	✓	×	✓	✓
Jamali et al., (2021)	✓	×	×	×	×	✓	✓
Kaymaz et al., (2021)	✓	×	×	×	×	✓	✓
Rezagama et al., (2021)	✓	×	×	×	×	✓	✓
Swangjang and Kornpiphat, (2021)	✓	×	×	✓	×	✓	✓
Gu et al., (2021)	×	✓	×	×	✓	×	✓
Duarte-Duarte et al., (2021)	×	✓	×	×	✓	×	✓
Wang et al., (2021)	×	✓	×	✓	✓	×	✓
The current paper, 2021	✓	✓	✓	×	×	✓	✓

3. Research area

Lafour or Lafoor rural district (also pronounced as Lafur, Lapur or Lapour) is a region located in the North Savadkuh county in Mazandaran province, Iran. Lafour region reaches the forests of Shirgah city from the north, Alborz mountain from the south, the forests of Javaram village from the east, and Babolkenar region (known also as Quran-Talar region) from the west. This region includes 29 villages and the most famous among them are Burkhani, Shah Kola, Naft Chal, Deh Kalan, RaiesKola, KaliKola, Sharqelet, and Esbokola villages. The area of the Lafour region is about 80,000 square meters and, according to the 2016 census, its population is 4,959 people (Statistical center of Iran, 2016). This region is composed of many parts, such as the Lafour Lake, Alborz Dam, and the Lafour Forests. The neighboring cities of Babol, Amirkola, Babolsar, Fereydunkenar, Ghaemshahr, and Joybar rely on the water of Lafour Lake for their drinking water. Lafour forests are another special part of this region, where 80 different plant species including hornbeam, beech, lilac, thymus vulgaris, Rubus fruticose and many other rare species can be found. Due to its attractions and natural resources such as mountains, forests, waterfalls, and lakes, as well as the warm-hearted and hospitable people, the Lafour region is a suitable and significant area for the development of ecotourism. Figure 2 shows the geographical map of the Lafour region and Figure 3 represents some natural tourist attractions of the region.

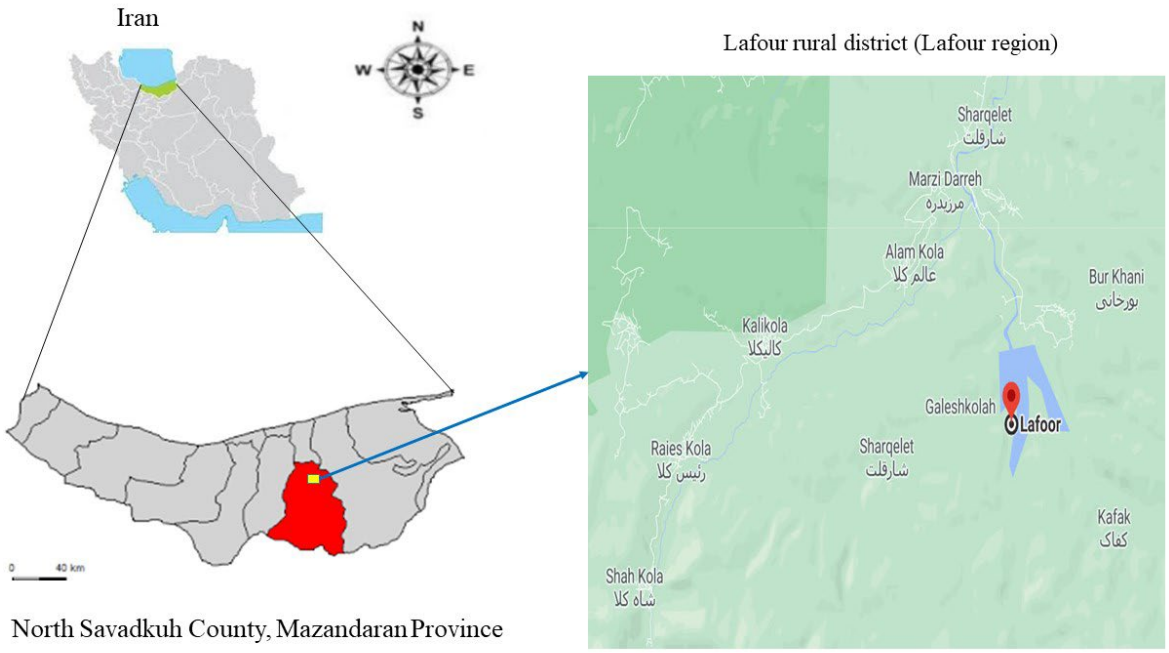

Figure 2: The geographical map of the research area.

Nowadays, ecotourism activists, local people, and the government have a special view on the ED in this region. Their goal consists not only improving the economic, social, and cultural conditions of the region and in increasing peoples' welfare, but also providing the necessary conditions and facilities for tourists.

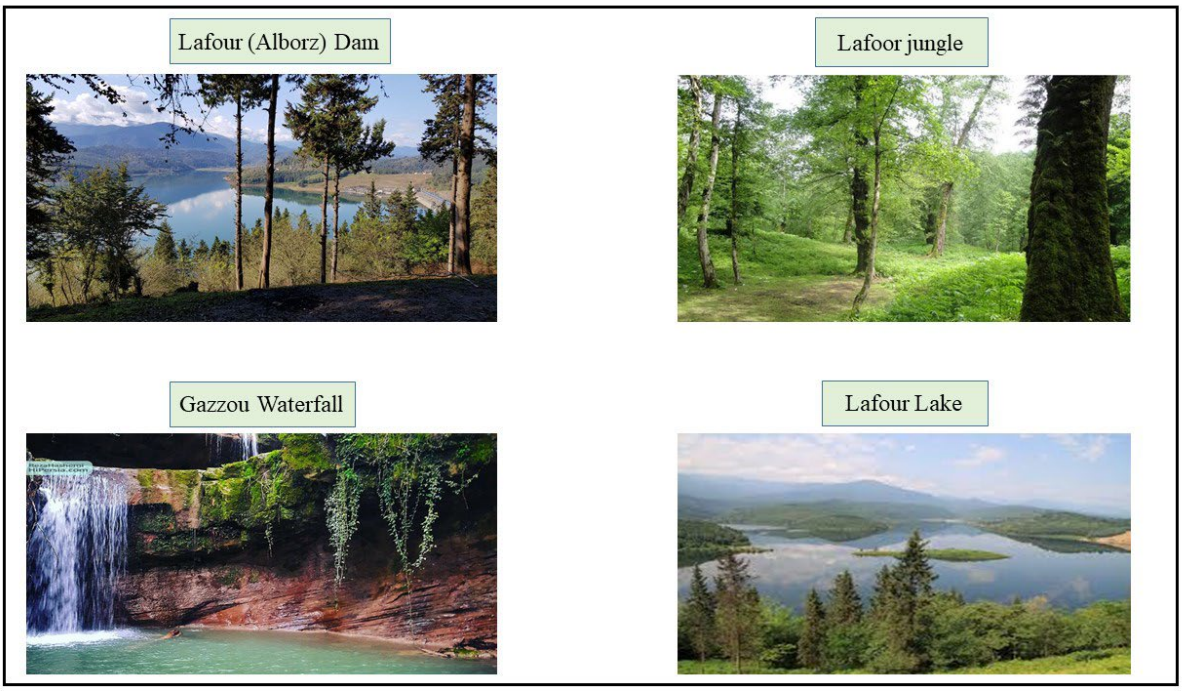

Figure 3: Natural attractions of the Lafour region.

4. Materials and methods

In this section, we have developed the sub-sections 4.1 and 4.2 to explain the data gathering process of this work in detail. Afterwards, three methods, including SWOT analysis, a heuristic clustering method, and the TOPSIS technique were used. First, SWOT analysis and opinions of experts are applied to identify the strengths, weaknesses, opportunities, and threats to ED in the research area. The considerable point about our work is that it presents a heuristic clustering method based on SWOT analysis to help classify the strategies. Our proposed method is not limited just to tourism and its related domains but can be applicable in a wide range of fields, especially those presenting development strategies based on SWOT analysis. Finally, the strategies within each cluster are prioritized by the TOPSIS technique.

4.1. Experts

To conduct the present study, we have selected five different groups of people as a team of experts. Two criteria were considered to adopt the experts, and the first one was based on similar research in the LR. The next and major criterion to choose these people as experts was that all people had to be directly or indirectly involved in ecotourism activities in our specific destination.
The team of experts includes:

1) Tourism experts, especially in the field of ecotourism,
2) Local ecotourism activists,
3) Local government officials,
4) Tourism specialists who work for the governmental organizations,
5) Academic experts (University professors whose field of work is tourism and related domains).

Table 2 provides detailed information on the 17 members that have been selected as a team of experts.

Table2: Detailed information of Expert team

Number	Expert group	Position	Organization	Gender	Years of experience
1	Tourism experts, especially ecotourism experts	-	-	Female	7
2		-	-	Male	5
3	Local ecotourism activists	Manager of the ecotourism center	EcoBarak center	Male	6
4		Manager of the ecotourism center	Esperez center	Female	5
5		Manager of the ecotourism center	Behesht Gomshodeh cenetr	Male	7
6	Local government official	Tourism manager	Lafoor (Alborz) Dam	Male	5
7		Village chief	Shah Kola village	Male	4
8		Village chief	Sharqelet village	Male	3
9		Village chief	Burkhani village	Male	5
10		Village chief	Raeis Kola village	Male	4
11		Village chief	KaliKola village	Male	4
12		Village chief	AlamKola village	Male	3
13	Tourism specialists of governmental organization	Deputy of Tourism	Mazandaran Cultural Heritage, Handicraft and Tourism Organization	Male	5
14		Ecotourism Expert		Male	7
15		Director	Savadkuh Cultural Heritage, Handicraft and Tourism Organization	Male	3
16	Academic experts	University professor	University of Mazandaran	Male	7
17		University professor	University of Mazandaran	Male	9

4.2. Data

The data and information required to conduct this research consist of three phases that include identifying each element of the SWOT analysis, determining the strategies, and completing the Strategy-SWOT matrix, respectively.

Phase1: Identifying SWOT factors: First, a set of SWOT factors are identified according to similar works in the literature through face-to-face interviews with tourists, local residents, and field observations. Finally, with the help of the experts, the most appropriate ones are selected.

Phase 2: Determining the strategies: The strategies are identified and determined based on SWOT analysis and by holding some in-person and virtual meetings with the experts.

Phase 3: Forming the Strategy-SWOT matrix: An online questionnaire is applied to complete the Strategy-SWOT matrix. The Questionnaires are completed by the experts and the average of their opinions is considered the final value for each element of the matrix. For more details, an integer number from 0 to 10 is used to score each element of this matrix in the questionnaire. In fact, the score (value) of each element indicates the impact of each strategy on each SWOT factor, so the

value 0 indicates that the strategy does not affect the factor, and the value 10 indicates the maximum level of effectiveness. It is noteworthy that sometimes to score the elements of the strategy-SWOT matrix, the average of the proposed scores given by the experts is used. So, in this case, the score of each element may be either a decimal number or an integer number.

4.3. SWOT analysis

Given that most articles focusing on strategic planning provide strategies to improve the situations using SWOT analysis (Mazloum Vajari et al., 2019), this is true for similar studies in the field of tourism. Therefore, the benefits of this analysis have been utilized in this study. Each letter of SWOT analysis expresses strengths (S), weaknesses (W), opportunities (O), and threats (T), respectively and they are called SWOT factors. The SWOT analysis technique, also known as the SWOT matrix, is a marketing and management strategy that helps businesses identify their strengths and weaknesses, as well as opportunities and threats to adopt suitable strategies for success (Gao and Peng, 2011). The SWOT analysis consists of four parts, among which strengths and weaknesses are internal factors and opportunities and threats are external factors (Karimi et al., 2019). The strengths are the resources and capabilities that the organization has and can employ to differentiate itself from its competitors. Identifying strengths of the organization is an important step to deal with threats and challenges. A threat is an unpleasant situation in the external environment of the organization that can cause trouble and danger for the organization (Pai et al., 2013). The SWOT analysis is also one of the most important and common tools of strategic planning for organizations (Basset et al., 2018). Strategic planning is a managerial activity in organizations that includes strategies and approaches to deal with environmental changes inside and outside the organization. In other words, this type of planning is a roadmap that shows what the organization must do to achieve its long-term goals (George et al., 2019).

4.4. The proposed heuristic clustering method based on SWOT analysis

Our main reason to apply the clustering method in this research, as mentioned in section 2.3, is that strategies are classified in different clusters and then the best possible strategy/strategies are selected from each cluster. In this regard, we applied this method to enhance the chance of selecting the most appropriate strategies and ensuring balanced development of ecotourism. Based on section 2.2, some papers proposed in tourism and related domains applied a clustering method. The most popular clustering algorithms do not apply to our work. Also, to the best of our knowledge, no research has been done on strategic planning in tourism contexts that used clustering methods. Moreover, our work is based on a Strategy-SWOT matrix and none of the clustering methods match or can be applied for this matrix. Also, it should be mentioned that we claim our method as a heuristic method because we could not find a similar method in the literature that performs like the proposed method. The substantial advantage of our proposed method is that it is very general and can be applicable for works that present development strategies based on SWOT analysis in different fields, and it is not limited only to tourism contexts.

A cluster is a set of data/items whose elements are similar to each other. In clustering, the purpose is to divide the data into groups such that the similarity among them is high and the similarity between the data of different clusters is low (Kang et al., 2016).

The most important phase of the clustering method is calculating the Similarity Coefficient between factors. Selecting and applying a suitable and efficient method for calculating the similarity coefficient has a great effect on improving the clustering performance (Yin and Yasuda,

2006; Thong, 2016). There are different methods for calculating the similarity coefficient and the proposed approach is described in the following.

4.4.1. The proposed similarity coefficient

Consider the $M \times N$ matrix (strategy-SWOT matrix) in which *M* and *N* represent the number of strategies and the number of SWOT factors, respectively. An integer number from zero to 10 is assigned to each element of the SWOT-Strategy matrix. The number zero indicates the lack of relationship between the SWOT factors and the strategy. In other words, the value of zero clarifies that the strategy does not affect the SWOT factor. In contrast, the number 10 indicates the highest impact of strategy on the SWOT factor. The Strategy-SWOT matrix, as the initial matrix, will be converted to a $M \times M$ matrix (strategy-strategy matrix). The values of elements related to the strategy-strategy matrix are the number of commonalities of the strategies on the SWOT factors. The elements of each two rows for a certain column where both of them have a number except 0 simultaneously are called Common Elements (CE). In other words, even if the value of one of the two considered rows for a certain column is 0, the elements of the two rows are not a CE. The value of each CE is equal to the sum of values of the related elements in the considered rows. For example, to calculate the similarity coefficient for strategies one and two (strategy one and two means rows one and two of the Strategy-SWOT matrix). The sum of the values for all CEs in rows one and two are equal to the similarity coefficient of strategies one and two. In general, the similarity coefficient for every two strategies is a number equal to the sum of values of all CEs in the related rows for all SWOT-factors.

4.4.2. Steps to perform the proposed heuristic method

The proposed heuristic method includes the following steps, as shown also in Figure 4 for a better view.

- **Step 1: Forming Strategy-SWOT matrix**: As explained in the previous subsection, the strategy-SWOT matrix is a $M \times N$ matrix with *M* and *N* representing the number of strategies and SWOT factors, respectively. In other words, in this matrix, the number of rows and columns are equal to the number of strategies and SWOT factors, respectively.
- **Step 2: Converting the strategy-SWOT matrix to the strategy-strategy matrix:** In this step, the strategy-SWOT matrix is converted to the strategy-strategy matrix. The strategy-strategy matrix is an upper triangular one. The elements of this matrix are the similarity coefficient numbers that were described in section 4.4.1.
- **Step 3: Creating a new cluster.**
- **Step 4: Selecting the first threshold value:** In the strategy-strategy matrix, the largest non-zero number is chosen and called the First Threshold value (FTH value). If there is more than one number, select one of them randomly. It should be noted that from the second iteration onwards, this value is called the New First Threshold value (NFTH value).
- **Step 5: Allocating the strategies to the cluster created in step 3 based on the threshold value:** The FTH value (or the NFTH value after the first iteration) is in the position of row *j* and column *k* (strategy *j* and strategy *k*)**.** Therefore, these two strategies (*j* and *k*) are assigned to the created cluster. After this assignment, the threshold value should be removed from this matrix.
- **Step 6: Finding a new threshold value and assigning strategies to the created cluster:** Find the next largest non-zero number in the corresponding row and column of the FTH value or

the NFTH value which is equal to or greater than 50% of them. It is called the New Threshold value Corresponding to Row and Column (NTHCRC value). The NTHCRC value is either in the position of row j' and column k or in the position of row j and column k'. This means that one of the two strategies j' or k' are chosen and should be examined to be assigned. To assign the selected strategy (strategy j' or k') to the previously created cluster, a selection condition must be considered. The condition adopted here is named Competence of Assigning (CA) condition where, the Corresponding Number (CN) of strategy j' or k' and the strategies existing in the cluster (strategy j and k) in the strategy-strategy matrix must also be equal to or greater than 50% of FTH value (or NFTH value). Also, all CNs related to each of the two assigned strategies should be removed from the strategy-strategy matrix before going to the next step.

- **Step 7: Checking a condition related to strategies**: The repetition of the proposed method finishes if all the strategists are assigned to a certain cluster according to steps 5 and 6, and otherwise, go to the next step.
- **Step 8**: **Checking a condition related to the NTHCRC value:** Go to step 9 if all of the NTHCRC are found and applied in step 6, otherwise repeat step 6**.**
- **Step 9: Creating a new cluster.**
- **Step 10: Selecting the new threshold value:** To find the NFTH value in this step, the largest non-zero number is selected from the remaining numbers of the strategy-strategy matrix after implementing steps 5 and 6. If there is more than one number, one of them is selected randomly. After finding the NFTH value, go to step 5.

4.5. TOPSIS method

The TOPSIS method expresses "Technique for Order Preference by Similarity to Ideal Solution". TOPSIS technique is one of the common methods for MCDM (Dymova et al., 2013). This technique is used to rank and compare different alternatives and to select the best one according to some criteria. The TOPSIS method is based on the use of the decision matrix. This matrix is a $M \times N$ matrix in which M and N represent the number of alternatives and the number of criteria, respectively. The general approach of the TOPSIS method is finding two sets of solutions. These sets are called the Positive Ideal Solution (PIS) and Negative Ideal Solution (NIS) (Hashemi et al., 2020). PIS and NIS contain the best and worst values for each of the alternatives in the decision matrix, respectively. TOPSIS is based on the concept that the selected alternative (best alternative) should have the shortest distance to the PIS and the maximum distance to NIS (Dymova et al., 2015). The steps of the TOPSIS technique are shown and described, for example, in the research by Bhutia and Phipon (2012). In this study, the TOPSIS method is used to prioritize the strategies within each cluster.

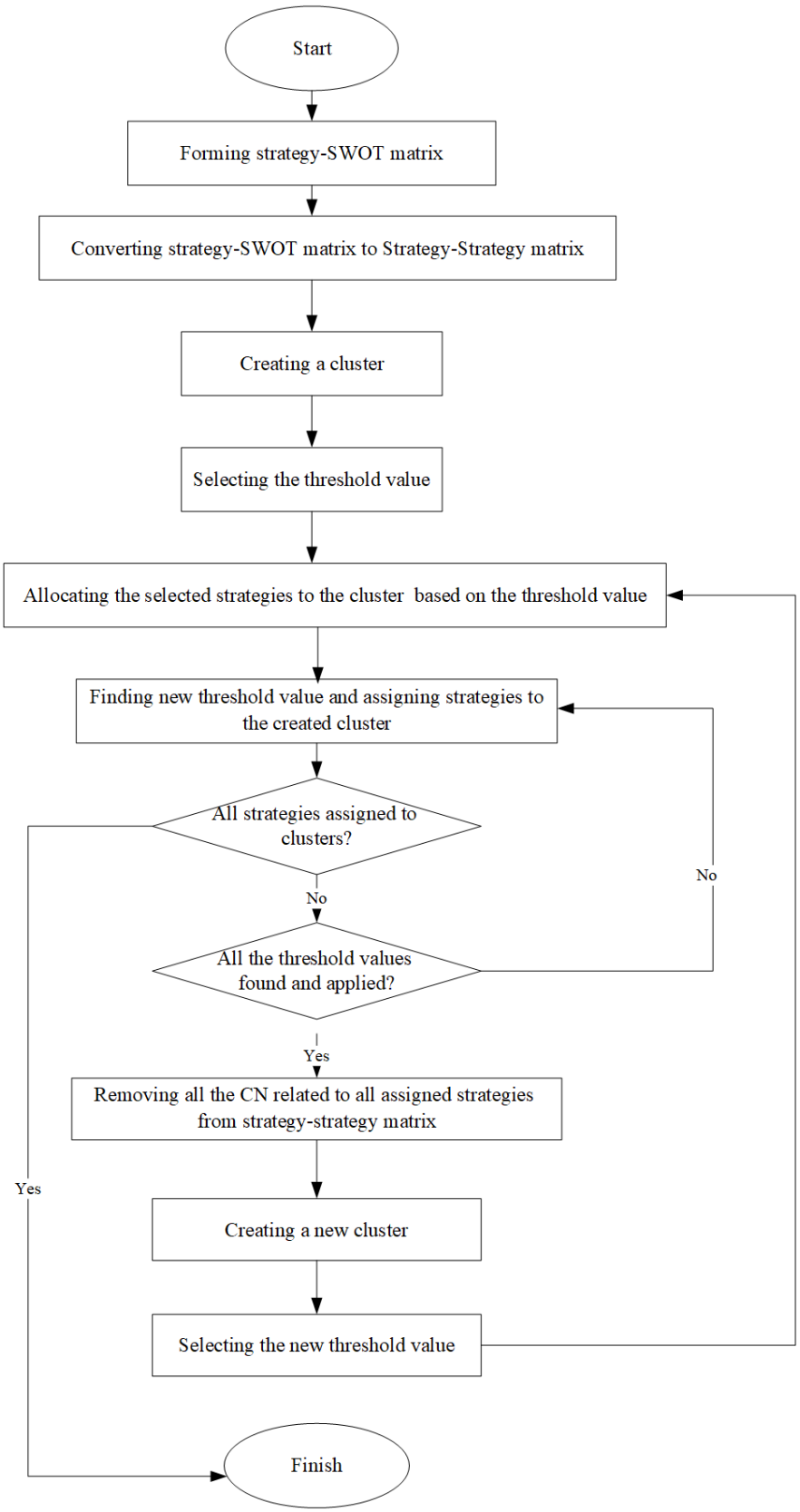

Figure 4: The flowchart of the proposed clustering method.

5. Results and Findings

Based on the methodologies described in section 4, we have implemented the developed approaches, and the results and findings are presented in this section. This section provides three main sub-sections containing the identification of the SWOT factor and the strategies, the implementation of the proposed clustering method, and the TOPSIS method. The notable aspect of this section is to compare and evaluate the effects of using or not using the proposed clustering method in the prioritization of the strategies.

5.1. SWOT factors and strategies

After necessary assessments, the SWOT factors are identified as follows:

Strengths

- **S1**: Convenient communication routes to the area.
- **S2**: Friendly and cheerful residents and their good behavior with tourists.
- **S3**: Existence of natural attractions such as mountains, springs, and forest habitats.
- **S4**: Fresh and unique local products.
- **S5**: Absence of ethnic and tribal differences in the region.
- **S6**: Suitable climate of the region.

Weaknesses

- **W1:** High land prices in the region.
- **W2:** Better facilities and services in competing tourist areas compared to the Lafour region.
- **W3:** Overcrowding in some seasons like spring and summer.
- **W4:** Increase in the social violations rate with the arrival of tourists in the region.
- **W5:** Cultural differences between tourists and residents.

Opportunities

- **O1:** Increased attention to develop tourism conditions in the region to create jobs and prevent migration.
- **O2:** Having the potential to become an important tourism hub in the province and in the country.
- **O3:** High desire of people to spend their leisure time in the pristine natural areas.
- **O4:** Increased consideration of the government to develop tourism and support the private sector to invest in the region and elsewhere.
- **O5:** Existence of specialized and experienced tourism practitioners in the region.
- **O6:** High willingness of the tourism service agencies to send tourists to this region.

Threats

- **T1:** Lack of appropriate and sufficient advertising activities to identify the region.
- **T2:** Lack of sufficient commercial, service, and medical centers in the region.
- **T3:** Increased construction and destruction in this area.
- **T4:** Increased environmental pollution such as remarkable waste production in the region during peak tourism times.
- **T5:** Lack of efficient transportation systems.

On the other hand, the following strategies have been identified:

Strategies

- **ST1:** Developing SE taking into account the existing potentials of the region.
- **ST2:** Improving and enhancing the transportation systems.
- **ST3:** Improving and diversifying tourism services and products to attract tourists and increase their satisfaction.
- **ST4:** Collaboration with residents and training them on developing SE projects/activities.
- **ST5:** Establishing and improving the hygiene units and the medical clinics in the region.
- **ST6:** Encouraging investors and entrepreneurs to establish ecotourism centers in the region.
- **ST7:** Advertising the tourism potentials of the region to tourists and through the media.
- **ST8:** Increasing the positive views of the region to increase the population self-estimation and to inform tourists about the environmental aspects and cultural prosperity of the region.

5.2. Implementation of the clustering method

To classify the strategies defined in Section 5.1, the proposed clustering method is applied and its steps are implemented. Table 3 shows the data collected to form the strategy-SWOT matrix. Specifically, to score each element of this matrix, the average of the scores suggested by the experts is used. According to the values of the strategy-SWOT matrix, W2, O3, T3, O2, O6, S4, and S3 have the greatest impact to determine the strategies. Table 4 reports the values of the strategy-strategy matrix based on the conversion of the strategy-SWOT matrix. This matrix is a high triangular matrix and due to the eight existing strategies in the current research, its dimension is 8×8. The largest number among the elements of this matrix is 132.3, so this number is selected as the FTH value. This value is the CN related to the first and eighth strategies, so these two strategies are assigned to the first cluster. The next largest non-zero number in the row and column corresponding to the FTH value (132.3) which is equal to or 50% greater than the FTH value (i.e., $\geq 132.3\times0.5=66.15$) is 127.4 and it is called the NTHCRC. This number corresponds to ST1 and ST6. ST1 was assigned into the cluster, so the CA condition related to ST6 should be checked. This means that the CN related to ST6 and ST1 (127.4) and the CN related to ST6 and ST8 (93.3) also must be equal to or bigger than 50% of the FTH value ($93.3\geq66.15$). These conditions are met, so ST6 is also assigned to the cluster. All the CNs related to each of the two strategies number one, eight, and six must be removed from the strategy-strategy matrix. This means that the numbers 132.3, 127.4, and 93.3 must be removed. The next NTHCRC value is 98.8, which is the CN related to ST4 and ST8. In order to assign the ST4 to the first cluster, all CNs related to this strategy and all assigned strategies (ST1, ST6, and ST8) must be equal to or greater than 50% of the FTH value (the CA condition related to ST4). One of these conditions is rejected because the CN related to ST4 and ST6 is less than 66.16. Hence, ST4 cannot be assigned to the first cluster. The next NTHCRC value is 89. This value is the CN related to ST1 and ST7. To assign ST7 to the first cluster, all CN related to this strategy and all assigned strategies (ST1, ST6, and ST8) must be equal to or greater than 50% of the FTH value. These conditions are also met because the CN related to ST7 and all other assigned strategies are greater than 66.16. So, ST7 is assigned to the first cluster. Therefore, all these CNs must be removed from the strategy-strategy matrix. Also, the CA conditions related to ST5 and ST3 are examined and these conditions are not met, so these strategies cannot be assigned to the first cluster. There is no other number in the corresponding row and column of the FTH value that respects the 50% rule, so a new cluster is created. From all the numbers remaining in strategy-strategy, the largest non-zero number (i.e., 98.8) is selected and called the NFTH value. This number corresponds to ST4 and ST8. ST8 was assigned to the

previous cluster, so ST4 should be assigned to the new cluster. The largest non-zero number among the numbers corresponding to the row and column of the NFTH value and is equal to and greater than 50% of it (i.e., $\geq 0.5 \times 98.8 = 49.4$) is 55, which now becomes the first NTHCRC value. This value is the CN related to ST4 and ST5. So, the ST5 is assigned to the second cluster. Since there is no other NTHCRC value, a new cluster (cluster three) must be created. All CN related to ST4 and ST5 and all assigned strategies in the first cluster (ST1, ST6, and ST8) must be removed from the strategy- strategy matrix.

By repeating the proposed method, all strategies are assigned to the different clusters (CL) as follows:

- ✓ **CL1:** ST1, ST8, ST6, and ST7
- ✓ **CL2:** ST4 and ST5
- ✓ **CL3:** ST3 and ST2

5.3. Prioritizing the strategies by TOPSIS method

The TOPSIS method is applied to prioritize the strategies. In this subsection, two modes are considered and their results are compared. In the first mode (Section 5.3.1) it is assumed that first, the strategies are assigned to different clusters by the proposed clustering method and then the strategies within each cluster are prioritized by the TOPSIS method. On the other hand, in the second mode (Section 5.3.2), the strategies are prioritized directly by means of the TOPSIS method, without making use of any clustering approach.

Table 3: Strategy-SWOT matrix.

		SWOT factors																				
		S1	**S2**	**S3**	**S4**	**S5**	**S6**	**W1**	**W2**	**W3**	**W4**	**W5**	**O1**	**O2**	**O3**	**O4**	**O5**	**O6**	**T1**	**T2**	**T3**	**T4**	**T5**
Strategies	**ST1**	2.1	2.8	8.1	5.6	1.7	6.4	4.7	5.2	6.2	4.1	1.9	4.2	8.3	5	3.2	0	4.4	2.3	0	3.2	0	4.7
	ST2	8.9	0	0	0	0	0	0	4.3	0	0	9.2	0	3.7	0	0	0	0	0	0	3.8	0	0
	ST3	0	0	0	9.1	0	0	0	2.9	0	0	2.8	4	2.6	0	0	0	4.6	0	3.1	6.8	0	0
	ST4	0	6.3	0	0	6.1	0	0	3.1	8.9	8.6	0	0	0	5.5	0	5.3	0	0	2.1	3.6	7.8	5.3
	ST5	0	0	0	0	0	0	0	7.9	2.1	0	0	0	5.6	6.7	4.4	0	4.7	8.3	7.8	7.3	0	0
	ST6	2.4	3.6	5.1	4.7	1.3	2.8	0	5.9	0	0	0	8.9	5.7	5.8	7.9	7.1	6.6	7.4	6.9	0	0	0
	ST7	4.2	4.3	7.8	3.3	2.5	5.8	9	0	0	0	0	0	0	8.2	0	0	3.1	0	0	0	0	0
	ST8	4	5.2	5.8	4.1	7.4	5.9	0	6.6	0	8.3	0	0	2.7	3.8	0	0	3.9	0	0	5.1	8.2	7.9

Table 4: Strategy–Strategy Matrix.

		Strategies							
		ST1	**ST2**	**ST3**	**ST4**	**ST5**	**ST6**	**ST7**	**ST8**
Strategies	**ST1**	-	50.6	65.6	80.3	84.8	127.4	89	132.3
	ST2		-	36.1	14.8	32.6	30.9	13.1	39.1
	ST3			-	21.6	39.2	65	20.1	48.4
	ST4				-	55	59	32.9	98.8
	ST5					-	91.6	22.7	54.3
	ST6						-	71.5	93.3
	ST7							-	79.3
	ST8								-

5.3.1. Prioritizing the strategies within each cluster

According to the results reported in subsection 5.2, the strategies are assigned to three different clusters: the first cluster includes ST1, ST6, ST7, and ST8, the second cluster includes ST4 and ST5, and the last one contains ST2 and ST3. Therefore, to prioritize the strategies within each cluster, the TOPSIS method is used. The implementation of the TOPSIS technique is based on the idea of considering the strategies as alternatives and the SWOT factors as criteria and all required weights are considered equal. The results of implementing the TOPSIS method are shown in Table 5, which includes the rank of each strategy in the three clusters in addition to its score, which is an output of the TOPSIS method. According to Table 5, for the final prioritization, the first strategy in the first cluster has the highest priority, then the first strategy of the second cluster and, finally, the first strategy of the third cluster has the third rank. Moreover, the second strategy of the first cluster has the fourth priority and so on. Consequently, the final prioritization is as follows:

$$ST6 \rightarrow ST5 \rightarrow ST3 \rightarrow ST7 \rightarrow ST4 \rightarrow ST2 \rightarrow ST8 \rightarrow ST1$$

Table 5: Prioritizing the strategies within each cluster using the TOPSIS method.

		Rank							
		1		2		3		4	
		Strategy	Score	Strategy	Score	Strategy	Score	Strategy	Score
Cluster	1	6	0.295	7	0.265	8	0.222	1	0.218
	2	5	0.534	4	0.466	-	-	-	-
	3	3	0.558	2	0.442	-	-	-	-

5.3.2. General prioritization of the strategies

In this case, all strategies are prioritized directly using the TOPSIS method. In other words, the method proposed in subsection 4.2.3 is not used here to perform any clustering of the strategies. Table 6 shows the results of the strategies' prioritization by the TOPSIS method with the scores.

Table 6: Prioritizing the strategies only using the TOPSIS method.

Strategy															
1		2		3		4		5		6		7		8	
Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score
3	0.131	6	0.114	5	0.122	8	0.108	7	0.111	1	0.158	2	0.133	4	0.123

According to the results of Table 6, ST6 obtained the first rank and ST4 was positioned in the last one. The full sequence of prioritization is as follows:

$$ST6 \rightarrow ST7 \rightarrow ST1 \rightarrow ST8 \rightarrow ST3 \rightarrow ST2 \rightarrow ST5 \rightarrow ST4$$

5.3.3. Comparison

Table 7 represents the results of ranking the strategies in the two considered modes, including a combination of clustering method and TOPSIS method and only TOPSIS method. By comparing the two modes of subsections 5.3.1 and 5.3.2, it is clear that the ST6 obtained the first rank in both modes. But in the first mode, the last rank belongs to ST1 and in the second one, it belongs to ST4. It is worthwhile noting that the result of prioritizing the strategies in subsection 5.3.2 highlights how the strategies that belong to each cluster were placed next to each other. This outcome confirms the accuracy of our proposed clustering method. For more details, for example, if we are able to implement only three strategies due to budget limitation, according to the first mode, ST6,

ST5, and ST3 will be selected, but second mode suggests to select ST6, ST7, and ST1. The strategies selected in the first mode are from different clusters and this means that they include more weaknesses, strengths, opportunities, and threats, which increase the chance of a balanced ED in the region, which is not guaranteed from the results of the second mode.

Table 7: The comparison of the results obtained from the two different modes.

Rank	1	2	3	4	5	6	7	8
Combination mode	ST6	ST5	ST3	ST7	ST4	ST2	ST8	ST1
TOPSIS method	ST6	ST7	ST1	ST8	ST3	ST2	ST5	ST4

6. Discussion

Nowadays, the findings of many studies show the big attention paid in the tourism field to the issue of sustainability, characterized by its three dimensions (Zhang, 2016). Ecotourism plays an important role to achieve STD in each country (Ioppolo et al., 2013). Ecotourism is enumerated as a powerful branch of tourism that can be used for the development of Iran's economy (Riasi and Pourmiri, 2015). This country has many unique natural attractions and that does not benefit from their advantages so far. Therefore, the importance of efficient and appropriate planning to develop the concept of ecotourism in Iran and to gain advantages from such an industry are necessary and essential (Tavassoli, 2002). Lafour region is one of the Iranian regions that are full of attractions and natural resources, and it has a great potential to reach ED. The purpose of this study is not only to examine the factors affecting ED in Lafour region, but also to introduce appropriate strategies to develop SE in the region. Sustainable Ecotourism Development (SED) leads to improving the economic, social, and environmental situations of any region. The results indicate that EPs of this region have not been well exploited and tourists do not have the right information about the area. Therefore, this issue highlights the motivation and importance of our research.

Based on the obtained results, it is observed that some factors affect the ED in the Lafour region. One of the most effective and important factors is the lack of efficient facilities and services in this area compared to other competing tourist destinations. Indeed, in other destinations that are equally suitable for ecotourism activities around the Lefour region, more and diverse facilities and services are provided. Also, considering similar tourism hubs of the country, the growth rate and improvement speed of ecotourism conditions are higher than in this region. Thus, this factor is considered a major weakness for the region which causes loss of competitiveness and attractiveness of tourists with respect to the competing areas. However, having the potential to become an important ecotourism hub in the province and the country is considered an effective factor. Lafour region has many pristine and unique natural attractions such as mountains, springs, waterfalls, and forests, which make this region a potential place for SED. This region also has orchards of various fruits and agricultural fields that give a special sight to the region. All these indicate the proper environmental conditions of the region to promote ecotourism activities. Another effective factor is the high desire of people to spend their leisure time in the pristine natural areas. Therefore, the government can use these potentials to reach ED in the Lafour region with the help of local people and relevant officials. However, these days, the major factor threatening the environmental aspect in the Lafour region is the increased construction and destruction activities in the area. Indeed, non-local people are buying lands (or old buildings) to build (or transform them into) private villas for their leisure time. Despite the excessive land sales as well as the rising construction costs, the destruction of the natural attractions of the region is advancing without ceasing. In addition, the natural face of the region has turned into an artificial

one and the originality and genuineness of the region are endangered with the entry of non-local people. Therefore, defining appropriate strategies to deal with this important environmental threat is very important.

7. Managerial implications

In this paper, we provide some practical, effective, and useful strategies for achieving sustainable development goals for ecotourism in the region. Defiantly, through implementing these strategies by the relevant officials, of course, with the help of local residents, tourists, and all stakeholders, a long and effective step can be taken to achieve the predetermined goal.

According to sub-section 5.3, ST6 must be implemented first. ST6 states that to develop ecotourism in the Lafour region, investors and entrepreneurs should be encouraged to establish ecotourism centers in this region. This will help not only in generating income for the owners of these centers, but also in developing the economy for the region with the creation of new jobs. It will also contribute to increasing the satisfaction of tourists and increase the number of visitors to the region. ST6 is positioned in a cluster with ST1, ST8, and ST7, which indicates the high correlation between these strategies. ST1 states that by taking advantage of the EPs existing in the Lafour region, such as natural attractions, special culture, gardens, and agricultural lands, it is possible to develop SE. Examples of activities that can be promoted to reach this target are (i) holding specific traditional rituals of the region and (ii) organizing agricultural tours whose aims are learning, having fun, and buying organic products. ST7 highlights the importance of the media to consider sustainability issues in ED for the region. Through utilizing media power and promotional campaigns, tourists' awareness about the region and its potentials will increase. Therefore, the consequences will be reflected in encouraging the tourists to visit the region. However, the increasing number of tourists in the region, from one side, may threat the environment (including the increased waste production rate), and from the other side, may gradually damage the special culture characterizing the region. Therefore, ST8 focuses on the environmental and socio-cultural aspects of SED. This target can be achieved through educating the tourists to preserve the natural resources, not release their produced waste into nature, and to respect the region's culture. This way, tourists will contribute to the preservation of the region and to making it more fortunate and preventing possible negative effects. ST2 and ST3 suggest improving the transportation system to facilitate the movement of tourists within the region and increasing the number and variety of the required services for ED in Lafour, respectively. Moreover, one of the main problems of the Lafour region is the lack of health services (such as toilets and baths) as well as medical clinics. Thus, determining an effective strategy to solve these problems is essential, which has been addressed in ST5. Finally, ST4 outlines the role of locals to reach SED. This strategy further emphasizes the role of local people in guaranteeing the environmental and social aspects of sustainability (Srinivas et al., 2018). For example, given that the culture of the region is completely different from the tourists' culture, it will be necessary to educate residents on treating tourists properly to avoid negative social events or cultural conflicts. Besides, locals should be taught the effective ways to preserve the natural environment of the region and its heritages. For example, one way to implement this rule is by avoiding selling their lands to non-locals and also by avoiding unnecessary and environmentally unfriendly construction.

8. Conclusions

Sustainability in TD is one of the most burning and significant issues in the modern world. Ecotourism plays an important role in actualizing sustainable development of societies. Therefore,

countries with high EPs pay special attention to this business. Iran is one of the most important and potential countries for ecotourism activities in the world and benefits from its extraordinary position on the world's map. Lafour region, situated in the north of the country, has all the pre-requisites for suitable ecotourism features. However, the ecotourism conditions in this region have not yet reached their real and suitable position. Therefore, this research is conducted to improve and develop the current ecotourism situation in the Lafour region. First, the factors affecting the development of ecotourism in this region such as strengths, weaknesses, threats, and opportunities are identified through interviews with tourists, local residents, and experts, field observation, and analysis on similar works in the LR. Then, 8 practical and useful strategies for SED in this region based on SWOT analysis and opinions of the experts are determined. The strategies are clustered using the proposed heuristic method that we developed here in this ecotourism context, but that is very general and can be used in any other clustering application. Then, the strategies within each cluster are prioritized by the use of the TOPSIS method. Our main reason to adopt the clustering method in this study is to reach a balanced sustainable development. The results show that the highest priority is assigned strategy ST6, which focuses on encouraging investors and entrepreneurs to invest and establish ecotourism centers in this region. However, it should be noted that implementing only ST6 or following a step-at-a-time policy cannot be adopted in this context. The goal can be reached, indeed, only through implementing all the strategies, given the strong correlation among all the strategies suggested in this study. We are confident that our results and findings will greatly contribute to developing SE in the region. Undoubtedly, achieving the desired goals in the region and implementing the strategy requires the allocation of enough and sufficient budget by the government, proper planning, and employing experts. In addition, the goal cannot be achieved without the cooperation of the government, relevant authorities, stakeholders, local people, tourists, and all individuals who directly or indirectly influence the achievement of the target. At present, the lack of sufficient attention of the government to this region and the lack of sufficient budget can be considered two important deterrents in achieving the goal. For future research, investigations can be carried out to evaluate the impact of each strategy in achieving the target and to determine the optimal value for budget allocation by the government to achieve the goal.

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