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Land use suitability analysis of rural tourism activities: Yenice, Turkey

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ABSTRACT

In this study, a land use suitability analysis was conducted for rural tourism in the Yenice district, located in the north-west of Turkey. As part of the research process involved dividing the area in question into landscape units using GIS and RS techniques. A suitability rating for tourism activities in each landscape unit was obtained by following through the steps of the ELECTRE method, individually repeated for each landscape unit. It is considered that the 1st-, 2nd- and 3rd-degree suitable activities were most relevant in the rating of the nine different tourism activities. Therefore assessments were made on the basis of these first three ranks. As a result of the analysis, from the 1st-degree suitable activities identified, the first three were found to be mountaineering, trekking and wildlife observation. From the 2nd-degree suitable activities, the first three were flora observation, trekking and hiking, and from the 3rd-degree suitable activities, the first three trekking, orienteering and mountaineering.

1. Introduction

Many of the benefits brought to us through advances in technology, which have now become indispensable to our everyday living, have also given rise to crowded, noisy, and artificial urban spaces. Many people who live their working lives rather disconnected from the natural world, and who have the economic means, regard their holiday time as an opportunity to escape to a different environment. In the past the concept of a holiday for the majority meant a trip to “the seaside”, to a coastal area, though many people now prefer to spend their time in more tranquil natural surroundings. This change in understanding of “the holiday” has given rise to the concept of "rural tourism" in its current meaning.

According to a report on "Tourism Strategies and Rural Development" (1994) by the OECD, rural tourism movements occurred as a reaction to industrialized cities and the associated stress they caused in the 19th century. However, these rural tourism movements mentioned in the report is very different from the concept of rural tourism, which took off in the 1970s and continues to grow today, in terms of volume of tourist numbers. Ease of travel, particularly through the increase in the number of vehicle owners and the growth of the vehicle rental market internationally, has enabled many more people to reach many more distant places. This is the factor which has made the biggest difference.

It can be seen that there are different approaches to the definition of rural tourism in the literature (Carneiro, Lima, & Silva, 2015; Reichel, Lowengart, & Milman, 2000; Zdorov, 2009; Fennel, 2008; Aref & Gill, 2009; Trukhachev, 2015; Daniloska & Hadzi Naumova-Mihajlovska, 2015) and there is no agreement on a common definition. Nevertheless, it should be acknowledged that rural tourism has evolved since its coinage as a concept and has not remained limited to the idea of tourists staying on farms and to their participation in agricultural activities. As stated by Lane and Kastenholz (2015), rural tourism has become an umbrella concept encompassing many different specific types of tourism rather than the narrow definition of the past (Fig. 1).

Rural tourism is regarded as a valid developmental strategy for rural areas in many developed and developing countries. Founded on rural tourism, this developmental strategy was aimed at the growth of agricultural economies while preserving the existing traditional structure. For instance, as reported by Wang (2006), in Europe rural tourism is widely supported and encouraged as a solution to the social and economic difficulties of the conventional agricultural industry (Su, 2011).

However, although this approach to the development of the agricultural economy has become increasingly popular, Lun, Pechlaner, and Volgger (2016) emphasize that rural destinations should be careful about possible environmental issues, as well as economic and social

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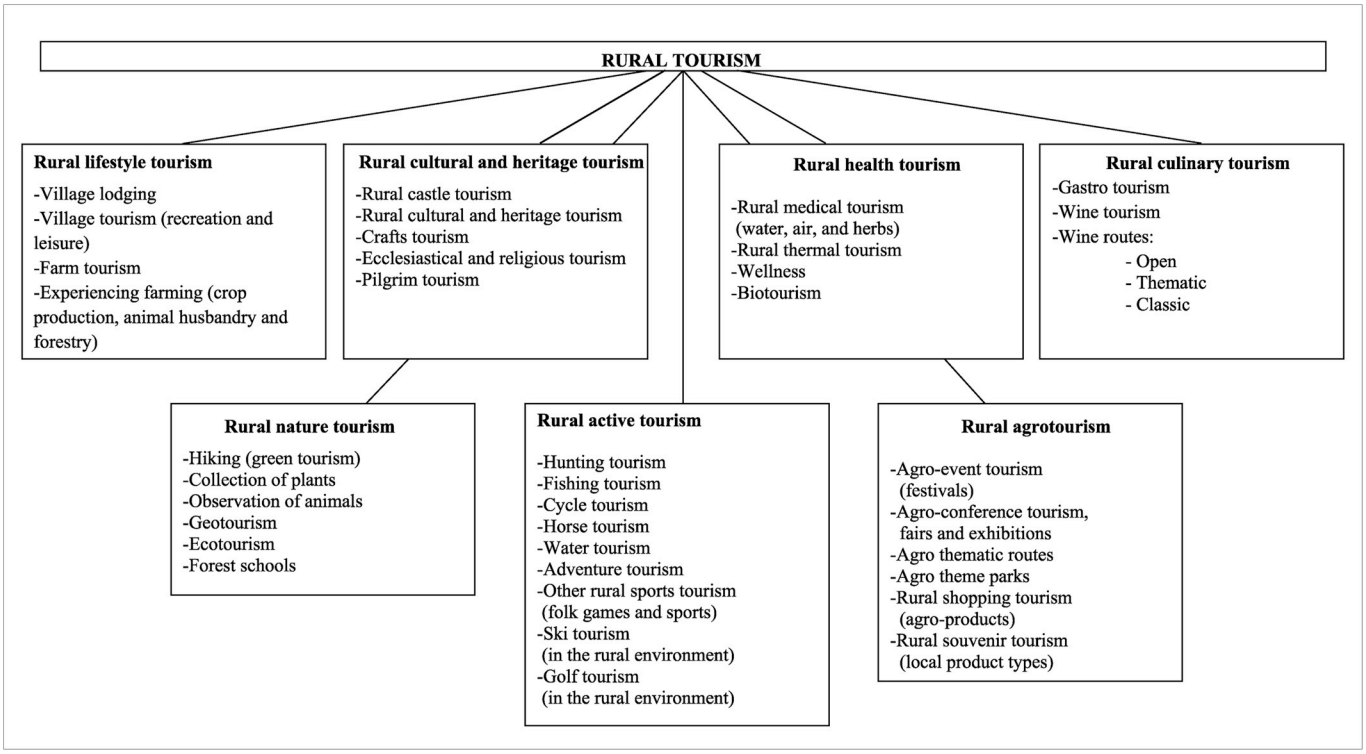

Fig. 1. Rural Tourism (Dávid et al., 2007 as cited in Dávid, 2011).

problems, when basing their economies on tourism-based diversity. Because as also stated by Cánoves, Villarino, Priestley, and Blanco (2004) the rural environment is particularly fragile and sensitive to the development of tourism.

Nevertheless, landscapes involving a variety of ecosystems have a high potential which motivates the development of tourism in rural areas and they are fundamental elements in rural tourism (Carneiro et al., 2015; Lane & Kastenholz, 2015). At this point, there is a need for a methodology which can assess the capacity and potential of rural areas within a tourism framework (Dragulanesku and Drutu, 2012; as cited in Trukhachev, 2015). However, as also stated by Sharpley (2001), different rural areas and communities have different social and economic needs, resource assets, and characteristics. This is why it is necessary to define the suitability of local needs and characteristics for the development of different forms of tourism (even if within environmental parameters).

Suitability analyses involve the use of a wide variety of methods from different fields of science, and the results are used in every field of sustainable development. Suitability analyses constitute a process for determining suitability and convenience (Steiner, 1983), as well as the degree of suitability (Hopkins, 1977), of a specific area for a particular use. These analyses allow planners and governors to analyze the interaction of three factors: 1) place/location; 2) environmental elements; and 3) developmental actions. Analysts can then assess these interactions across many different aspects. For instance: 1) which land use will have the least negative impact on the environment?; 2) qualitative assessments of the environmental impact of proposed developments; and 3) identifying the most and least suitable areas for specific development proposals. Planning officials and private entrepreneurs may use the results obtained to make decisions and develop policies for land use (Collins, Steiner, & Rushman, 2001).

Rezaei (2016) asserts that decision-making can be described as the selection and definition of one of a series of alternatives within the framework of the decision-maker's own preferences. In most cases, many different criteria are applicable in this process; therefore, these are commonly referred to as Multi-Criteria Decision Making (MCDM) problems.

The basic purpose of MCDM is to help the decision-maker choose the best option from the possible alternatives in cases with a large number of criteria, and also to state the precedence of the criteria (Jankowski, 1995). Many different methods have been gathered under the umbrella of MCDM analyses (Huang, Keisler, & Linkov, 2011) and with different theoretical bases (Linkov et al., 2004), e.g. PROMETHEE: Preference Ranking Organization METHod for Enrichment Evaluations; ELECTRE: Elimination Et Choix Traduisant la Realite; AHP: Analytical hierarchy process; and MAUT = multi-attribute utility theory (Kiker, Bridges, Varghese, Sager, & Linkov, 2005).

The ELECTRE (ELimination Et Choix Traduisant la REalité: ELimination and Choice Expressing the REAlity) method, which was selected as most appropriate for this study, has different versions of the method (ELECTRE Iv, ELECTRE IS, ELECTRE II, ELECTRE III, and ELECTRE IV) (Aktaş, Doğanay, Gökmen, Gazibey, & Türen, 2015). But according to Vincke (1992), unlike the other versions, ELECTRE I is used for a selection & elimination procedure based on a comparison among alternatives. The fundamental basis for this method is a pairwise comparison of the alternatives using concordance and discordance matrices (Bojković et al., 2010). As required by this technique, action begins by reference to an initial table. In the table, the columns are divided into options (alternatives) and the lines into criteria. Each criterion is assigned a weight to make its significance clear when compared to the others. At the second stage, concordance and discordance matrices are formulated, which makes possible the comparison of alternatives. At the third stage, the two tables are merged into the final assessment table according to the threshold values determined for the concordance and discordance matrices, and the most suitable alternative is determined (Daşdemir & Güngör, 2002, 2003, 2004).

A review of the literature indicates that the ELECTRE method is applied, in its different versions, in various fields of science (Hokkanen and Pekka, 1997; Daşdemir & Güngör, 2002, 2003, 2004; Akpınar, 2003; Ok, 2006; Ayhan & Hepcan, 2007; Hatami-Marbini & Tavana, 2011; Mendas & Delali, 2012; Botti & Peypoch, 2013; Andrades-Caldito, Sánchez-Rivero, & Pulido-Fernández, 2013; Figueira, Mousseau, & Roy,

Table 1
Operational steps of the ELECTRE I Method (Yaralıoğlu, 2004, p. 182).

Formulation of the decision matrix (A): The lines of the decision matrix contain the decision points whose advantages are required to be listed, while its columns contain the assessment factors to be used in decision-making. Matrix A is the initial matrix formulated by the decision-maker.

$$A_{ij} = \begin{bmatrix} a_{11} & a_{12} & ..... & a_{1n} \\ a_{21} & a_{22} & ..... & a_{2n} \\ \vdots & & & \vdots \\ a_{m1} & a_{m2} & ..... & a_{mn} \end{bmatrix}$$

m:number of decision points
n:assessment factor

Formulation of the standard decision matrix (X): The standard decision matrix is calculated by making use of the elements of matrix A and by using Formula 1

$$x_{ij} = \frac{a_{ij}}{\sqrt{\sum_{k=1}^{m} a_{kj}^2}} \quad (1)$$

Formulation of the weighted standard decision matrix (Y): Firstly, the weights of the assessment factors (w_i) are determined ($\sum_{i=1}^{n} w_i = 1$). Subsequently, the elements in each column of matrix X are multiplied by the weight values.

$$Y = \begin{bmatrix} w_1x_{11} & w_2x_{12} & ..... & w_nx_{1n} \\ w_1x_{21} & w_2x_{22} & ..... & w_nx_{2n} \\ \vdots & & & \vdots \\ w_1x_{m1} & w_2x_{m2} & ..... & w_nx_{mn} \end{bmatrix} \quad (2)$$

Determination of the concordance (C_{kl}) sets: Matrix Y is utilized to determine the concordance sets. The decision points are compared with each other in terms of the assessment factors, and the sets are determined using the relationship shown in the formula. The formula is based fundamentally on a comparison of the sizes of the line elements in comparison with each other. The number of concordance sets in a multiple decision problem is ($m.m-m$), and when formulating the concordance sets indices k and l should be $k \neq l$. The number of elements in a concordance set can be as many as, but not more than, the number of assessment factors.

$$C_{kl} = \{j, y_{kj} \geq y_{lj}\}$$

Formulation of the concordance (C) matrix: Concordance sets are utilized to formulate the concordance matrix (C). Matrix C has $m \times m$ dimensions and does not take any value for $k = l$.

Determination of the discordance (D_{kl}) sets: A discordance set (D_{kl}) corresponds to each concordance set (C_{kl}). In other words, there are as many discordance sets as the number of concordance sets. The elements of a discordance set comprise the j values which do not belong to the concordance set concerned.

$$c_{kl} = \sum_{j \in C_{kl}} w_j \quad (3)$$

Formulation of the discordance (D) matrix: Like matrix C, matrix D also has $m \times m$ dimensions and does not take any value for $k = l$.

$$d_{kl} = \frac{\max_{j \in D_{kl}} |y_{kj} - y_{lj}|}{\max_{j} |y_{kj} - y_{lj}|} \quad (4)$$

Formulation of the concordance dominance (F) matrices: The concordance dominance matrix (F) has m x m dimensions, and the elements of the matrix are obtained by comparing the concordance threshold value ($\underline{c}$) with the elements of the concordance matrix (c_{kl}). The concordance threshold value ($\underline{c}$) is obtained by means of Formula 5 m in the formula denotes the number of decision points. The elements of matrix F (f_{kl}) take the value of either 1 or 0, and there is no value as they show the same decision points on the diagonal of the matrix. If $c_{kl} \geq \underline{c} \Rightarrow f_{kl} = 1$ and if $c_{kl} < \underline{c} \Rightarrow f_{kl} = 0$.

$$\underline{c} = \frac{1}{m(m-1)} \sum_{k=1}^{m} \sum_{l=1}^{m} c_{kl} \quad (5)$$

Formulation of the discordance dominance (G) matrix: The discordance dominance matrix (G) also has $m \times m$ dimensions and is formulated in a way similar to matrix F. The discordance threshold value ($\underline{d}$) is obtained by means of Formula 6 The elements of matrix G (g_{kl}) also take the value of either 1 or 0, and there is no value when they show the same decision points on the diagonal of the matrix. If $d_{kl} < \underline{d} \Rightarrow g_{kl} = 1$ and if $d_{kl} \geq \underline{d} \Rightarrow g_{kl} = 0$.

$$\underline{d} = \frac{1}{m(m-1)} \sum_{k=1}^{m} \sum_{l=1}^{m} d_{kl} \quad (6)$$

Formulation of the aggregate dominance matrix (E): The elements of the Aggregate Dominance Matrix (E) (e_{kl}) are equal to the mutual multiplication of elements f_{kl} and g_{kl} where matrix E has $m \times m$ dimensions depending on matrices C and D and is again made up of the value of 1 or 0.

Determination of the order of importance of decision points: The lines and columns of matrix E show the decision points. For instance, if matrix E is calculated as follows,

$E = \begin{bmatrix} - & 0 & 0 \\ 1 & - & 0 \\ 1 & 1 & - \end{bmatrix}$ it turns out that $e_{21} = 1, e_{31} = 1$, and $e_{32} = 1$. This indicates the absolute superiority of decision point 2 over decision point 1, of decision point 3 over decision point 1, and of decision point 3 over decision point 2. In this case, if the decision points are represented by the symbol A_i(i = 1, 2,.....,m), then the order of importance of the decision points will beA_3, A_2, and A_1.

2016; Eren & Özarı, 2016). The operational steps of the ELECTRE I method are laid out in Table 1.

In this study, a land use suitability analysis was carried out for rural tourism in the district of Yenice, located in the north-west of Turkey. This involved firstly dividing the land into landscape units using Geographic Information Systems (GIS) and Remote Sensing (RS) techniques. Then these units were assessed within the framework of the ELECTRE I method and their degrees of spatial suitability for the proposed types of rural tourism were determined. Finally, the areas required to be developed for rural tourism were agreed and various proposals were then put forward for consideration.

2. Materials and methods

2.1. Study area and study materials

Yenice is one of the 11 districts of Çanakkale province. It is located between northern latitudes 40 05 45–39 39 59 and eastern longitudes 26 58 06–27 30 31, occupying the south-east of Çanakkale province. It lies within the Biga Peninsula in the south of the Marmara Region. Yenice was established on the northern slopes of the Massif of Ida Mountains, on the north coast of the Gulf of Edremit and effectively forms the border between the Marmara Region and the Aegean Region (Cürebal, Efe, Sönmez, & Soykan, 2014), Yenice is the district of the province with the largest surface area (1367 km^2) and is surrounded by Balıkesir in the east and south, the district of Bayramiç in the south-west, Çan district in the west and north-west, and by the district of Biga in the north (Fig. 2). There are 71 villages in Yenice district, and it has a total population of 35,796 people.

The key landscape elements of the area are the forestlands, covering approximately 60% of the whole area, followed by agricultural land, transitional woodland shrub, natural grassland, and water bodies.

The main elevations in the district are Mount Sakar (Asar) (929 m) and Mount Aladağ (963 m). Mount Sakar separates the two major plains of the district, Küçük Agonya and Büyük Agonya. These plains are of tectonic origin.

As reported by Koçman (1993), the weather in the area is typically characterized by a semi-moist Marmara climate (Kabakçı, 1999). As

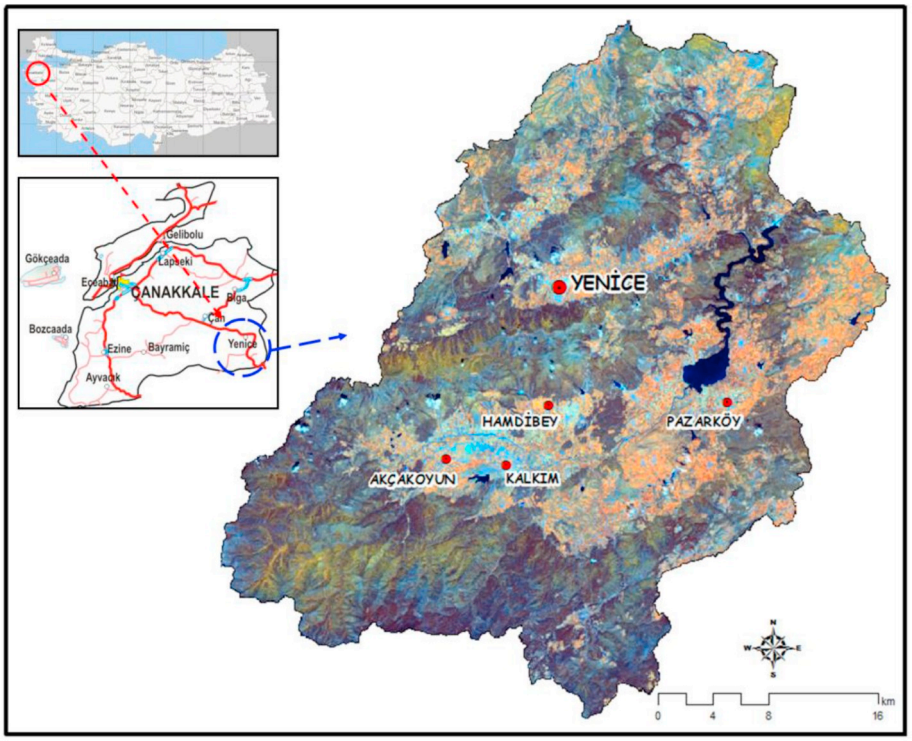

Fig. 2. The study area.

there is no high elevation which might significantly affect the climate in the Yenice Merkez (Küçük Agonya) part of the area, it is chiefly determined by the Marmara Sea. Therefore, summers are hot and with little rain, while winter months are cold and rainy. However, since the Büyük Agonya plain is located between the extensions of Ida Mountains, it is sheltered from the direct effects of both the Marmara Sea and the Aegean Sea. So the degree of continental climate somewhat predominates (Kabakçı, 1999).

Three types of forest vegetation are found in the region: coniferous, leafed, and composite forests. The coniferous forests are composed of *Pinus brutia*, *Pinus nigra* ssp. *pallasiana* and *Abies nordmanniana* ssp. *Equi-trojani* forests. *Abies nordmanniana* ssp. *Equi-trojani* is endemic to Ida Mountains. It rarely descends to the level of 400 m and its optimum distribution is between 1000 and 1400 m. Below these coniferous forests are such shrub species as *Quercus infectoria, Juniperus oxycedrus, Sorbus umbellata, Pyrola chlorantha,* and *Crategus monogyna*. The leafed forests are composed of *Fagus orientalis, Castanea sativa, Carpinus betulus*, and *Quercus* sp. These forests also house shrub species such as *Sorbus domestica, Sambucus nigra, Rubus caesius, Rhododendron flavum, Luzula forsteri, Taxus baccata, Rosa canina,* and *Ilex aquifolium* (Özel, 1998).

When studies on the natural fauna of Yenice were examined (Berber, Yıldız, Bulut, & Satılmış, 2008; Sarı, Balık, Ustaoğlu, & İlhan, 2006), it can be seen that different inland water fish species (*Salmo trutta macrostigma, Leuciscus cephalus, Rhodeus amarus, Phoxinus phoxinus, Vimba vimba, Chalcalburnus chalcoides, Barbus tauricus Escherichi, Cobitis fahirae, Gobio gobio, Tinca tinca,* and *Astacus leptodactylus*) were found in the dam lakes at the district. In addition, according to information obtained from the Branch Directorate for Nature Protection and National Parks of Çanakkale Provincial Directorate for Environment and Forestry, various examples of the species *Capreolus* sp., *Vulpes* sp., *Canis* sp., *Sus scrofa* and *Ursus arctos* were detected in the drive counting carried out in the game area at the district of Yenice.

With regard to archaeology, there is no evidence of regional settlement in the region until the early 6th century B.C., in the Archaic Period, except for two ancient settlement areas, namely Gümüşler Asartepe and Sofular Asartepe. Most of the settlements were established immediately after the arrival of the Persians at Troia and they continued until the early 4th century B.C., when Spartans invaded the region (Körpe, 2008). Subsequently, a period of Persian domination was followed by Alexander and then the Roman and Byzantine Empires at different times in history. It began to be controlled completely by Turks in the 1300s (Özen, 2008).

Geologically, Yenice is made up of two depressions surrounded by those extensions of Ida Mountains, which are not very high. One is the Yenice Depression (the Küçük Agonya Plain), while the other is the Kalkım Depression (the Büyük Agonya Plain), located in the south of Yenice and which extends in an east-west direction (Kabakçı, 1999). According to Tutkun et al. (2006), there is also the Yenice-Gönen fault, which is located on the southern branch of the North Anatolian Fault (NAF) and extends in a NE-SW direction. This fault is approximately 70 km long and constitutes one of the most important active and right-lateral strike-slip faults of this region (Erdim, 2008). An earthquake occurred in north-western Anatolia on March 18, 1953 and was felt across vast areas. The epicenter of the earthquake was around 12 km to the east of Yenice, while the magnitude of its surface wave was 7.4 and its focal depth was between 10 and 12 km (Herece, 1990). In the aftermath of this earthquake, the city displayed a development with a grid plan (Özen, 2008). Furthermore, according to Bilgin (1969), continuous faults were discovered throughout the northern, western, and south-western margins of the Kalkım Depression. To the north of the Kalkım Depression are thermal springs in the Hıdırlar Village, which also support this (Kabakçı, 1999).

The economic structure of Yenice is founded largely on agricultural activities. There are also small-scale agricultural enterprises for the processing of agricultural products (District Governorship of Yenice, 2009). Modern, conventional methods are collectively used in both plant and animal production activities. Additionally, according to ITO (1997); minerals such as lead, copper, zinc, limestone, kaolin, feldspar and lignite are also extracted within the district borders of Yenice (Aslan & Koncagül, 2008). The current level of tourism activity in Yenice is not sufficient to provide significant economic input.

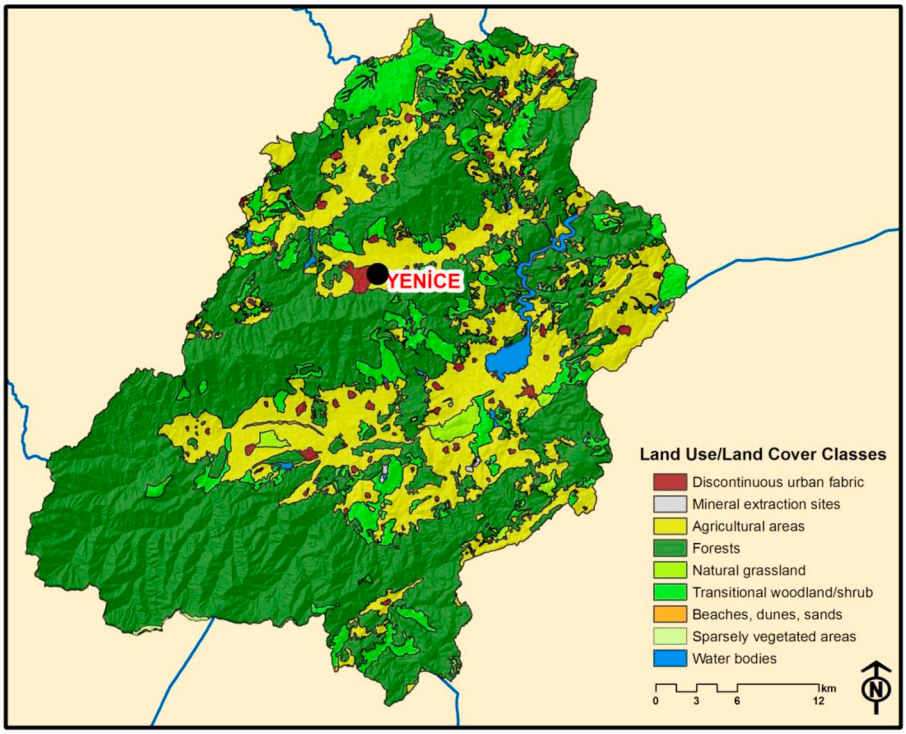

Fig. 3. Land use/land cover map of yenice.

In addition to the main area of focus (the district of Yenice), seven framework RapidEye satellite images and fifteen topographical maps with a scale of 1:25,000, dated 2009 and covering the area, were used within the framework of the study. Also, major contributions to the study were made by various sources, as follows: soil maps from the Directorate General for Village Services, forest management maps from Çanakkale Regional Directorate for Forestry, climatic data from the Directorate General for Meteorology covering the last 30 years, a geomorphological map from the Directorate General for Mineral Research and Exploration and a map of protected areas obtained from Çanakkale Directorate for the Conservation of Cultural and Natural Properties.

3. Methodology and data analysis

To digitize and examine the data and the maps, ERDAS Imagine Professional software and Arc-GIS 9.3 software were used. Calculations for the ELECTRE method were carried out using FORTRAN 95.

The satellite images were classified to establish the current land use situation of the study area. At this stage, CORINE (Coordination of Information on the Environment) (land cover nomenclature) subclasses were taken as the base. In line with this classification system, the land use classes determined for the district of Yenice can be seen in Fig. 3, while their surface areas are shown in Table 2.

Table 2
Land use and land cover classes.

CORINE Classes	Surface area (ha)
1.1.2.Discontinuous urban fabric	1647
1.3.1. Mineral extraction sites	237
2.0 Agricultural areas	35,655
3.1 Forests	79,079
3.2.1. Natural grassland	1261
3.2.4. Transitional woodland/shrub	14,683
3.3.1. Beaches, dunes, and sands	110
3.3.3. Sparsely vegetated areas	124
5.1.2. Water bodies	1490

As in previous studies, the process of determining the landscape units is based on an ecological classification. According to Koç and Şahin (1999), ecological classes are determined by considering the potential for natural vegetation as well as such factors as climate, soil conditions (e.g. texture, drainage, depth, pH value, organic matter content, salinity, and calcareousness), morphological and geological structures, and groundwater level. The landscape sections displaying identical or similar characteristics in this respect each make up distinct classes.

Ecological units were also taken as the basis for the planning process in a PhD study entitled “Landscape Assessment of the Asarsuyu Basin in Düzce and Development of the Management Model” by Uzun (2003, p. 471). In his study, Uzun (2003, p. 471) stated that there was no specific method or sequence in determining the criteria. The reason for this, the criteria to be taken for evaluation, can vary according to the field of study, and some criteria can come to an important situation according to the field studied. When previous studies on the subject are examined, it can be seen that many different criteria were used to create the landscape units.

Taking account of the study by Erol (1993), and similarly the method of Uzun (2003, p. 471), some of the criteria which they considered valuable for rural tourism, and for the homogeneous partition of the land, were used to create the landscape units in this study. Firstly, the area was assessed according to great soil groups and elevation groups, and then divided into landscape super-units.

The area has a soil structure which consists of alluvial soil, red-brown Mediterranean soil, colluvial soil, brown forest soil, non-calcareous brown forest soil, rendzinas, and vertisols. The rendzinas and vertisols in this classification were not included in the assessment since it had a relatively small surface area. Finally, six great soil groups (A, E, K, M, N, and T) seen in the district of Yenice were used to create the landscape super-units.

As elevation is acknowledged as an essential factor for the concept of rural tourism (contributing to the presence of wildlife and to scenic value), this was another criterion used to divide Yenice into landscape super-units. Yenice has different elevation groups ranging from 80 m to

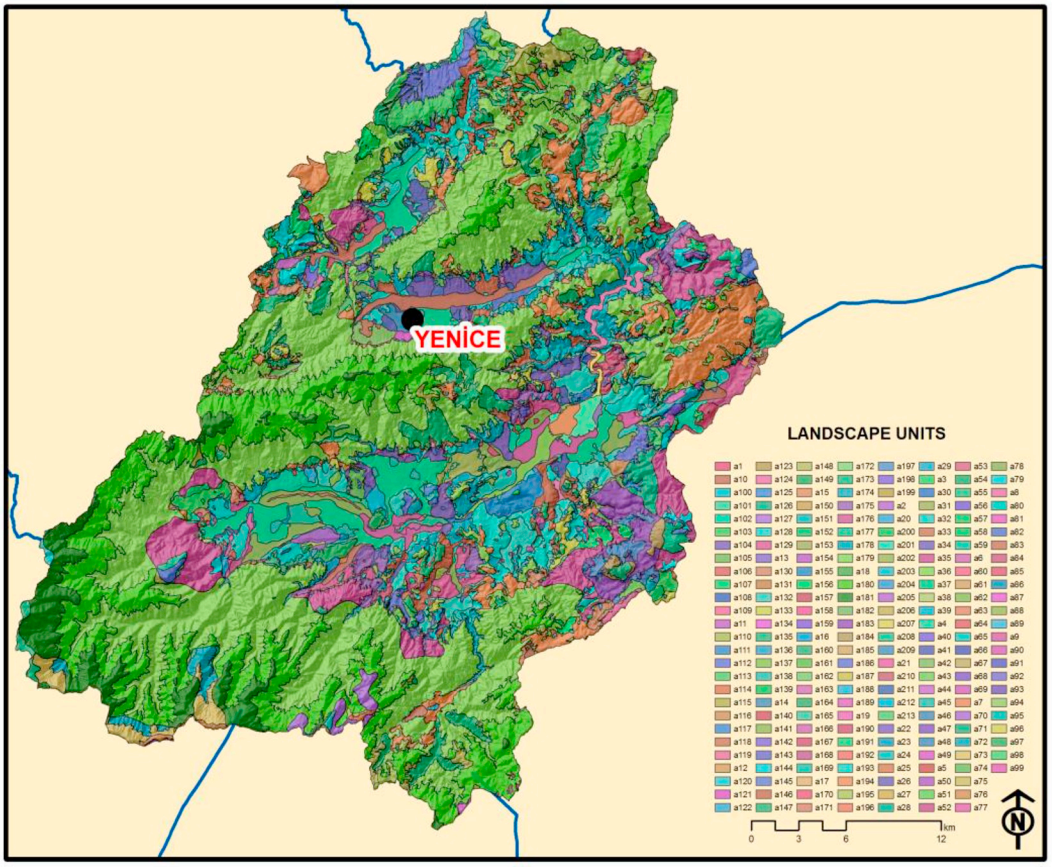

Fig. 4. Landscape units.

1430 m. The elevation groups were sub classified as 80–300 m, 300–600 m, 600–900 m, and 900–1,430 m according to their distribution in the area and whether a settlement was located on them. These two criteria, current land use map and land capability classes were overlaid with ArcGIS 9.3.1 program. As a consequence of these overlaying operations, the study area was divided into 213 landscape units (Fig. 4).

An assessment form was drawn up to determine the spatial suitability of tourism activities carried out in the rural areas. The form included those activities considered feasible for the district of Yenice and the factors affecting the implementation of these activities. These factors were determined to be: slope, land use capability class, current land use, climate, geomorphology, proximity to water bodies, proximity to roads, and presence of historical fabric. In addition, these factors were also elaborated within themselves. All the tourism activities were assigned scores for each factor by a group of specialists, consisting of the project team and faculty members from the departments of tourism, geography, and landscape architecture. A score range of 1–5 was selected, with 1 being the “least suitable" and 5 being the “most suitable". In this way, according to the available natural and cultural factors in any particular landscape unit, that unit was assigned the relevant scores for each of the tourism activities listed on the form. In some cases, factors coincided within one landscape unit and in such cases; the percentage of the area covered by the factor within the unit was taken into consideration and multiplied by the agreed scores, thereby creating a single value. No relationship to the score was found between some factors and activities (for instance, Historical Fabric-Flora Observation). In this case, the point at which the factor and the activity coincided was determined as “Unrelated” and took the value of "zero". The Assessment Form prepared is shown in Table 3.

According to the "climatotherapy" specialists, the climate of areas with monthly mean temperature values of 20°C–32 °C, relative humidity values of 30–70%, 10 or more sunny days or 10 or fewer fully overcast days, and an average wind speed less than 6 m/sec, is considered positive for human health (Ülker, 1988). In this light, and in line with the data for the district of Yenice obtained from the Directorate General for State Meteorological Affairs, the climate factor in the assessment form attracted the highest score for all types of rural tourism.

When determining degrees of influence of different factors on tourism activities in this study, it was essential to calculate the weighted scores of the factors when compared with each other. For this purpose, the group of specialists was asked to assign weight scores in the range 1–10 (with 10 being the most important) to the factors in the assessment form by considering their impact on rural tourism activities. At this point, the arithmetic mean of the value assigned to each factor by each specialist was calculated, then the percentage weight of each factor was deduced according to its share of the total. The final sum of the weight scores should be equal to one. Therefore, any small figures at the stage of dividing the weight scores by the total score were rounded. The weighted scores of the factors were determined as a result of the assessments carried out (Table 4).

4. Results and discussion

The numerical values obtained as a result of all these assessments were used at each step of the mathematical operations within the scope of ELECTRE. A program written in FORTRAN 95 was used for the operational stages of the ELECTRE method. The predetermined weighted scores were also included in the process at the formulation step of the weighted standard decision matrix. All subsequent steps of the method continued in line with the program written for the project. To formulate

Table 3
The assessment form.

		PROPOSED TYPES OF TOURISM								
FACTORS		Horse Riding	Cycling	Flora Observation	Camping	Mountaineering	Wildlife Observation	Orienteering	Hiking	Trekking
Slope	0–2%	4	5	5	5	1	2	5	5	5
	2–6%	4	4	4	3	1	2	4	5	4
	6–12%	4	3	3	2	1	3	4	4	5
	12–20%	5	2	3	1	2	3	3	3	5
	20–30%	5	1	2	1	4	5	2	1	3
	> 30%	1	1	2	1	5	4	1	1	1
Land Use Capability Class (LUCC)	CLASS I	1	1	3	1	1	1	1	1	1
	CLASS II	1	1	3	1	1	1	1	1	1
	CLASS III	1	2	3	2	1	1	1	2	2
	CLASS IV	5	5	4	4	4	5	5	4	4
	CLASSES V-VIII	5	5	4	4	5	5	5	5	5
Current Land Use	Transitional Woodland/Shrub	4	4	3	4	2	3	4	5	5
	Natural Grassland	5	2	4	4	3	4	4	5	5
	Water bodies	1	1	3	1	1	5	1	1	1
	Sandy Area	2	1	2	1	1	1	2	1	1
	Mineral Extraction Sites	1	1	1	1	1	1	1	1	1
	Forest	5	4	5	2	5	5	5	5	5
	Sparsely Vegetated Area	4	4	3	5	4	2	3	4	3
	Agricultural Areas	1	1	2	1	1	1	1	1	1
	Discontinuous Urban Fabric	1	3	1	1	1	1	1	1	1
Climate	Wind 6 m/sec >	5	5	5	5	5	5	5	5	5
	Temperature 20–32 °C	5	5	5	5	5	5	5	5	5
	Relative Humidity 30%–70%	5	5	5	5	5	5	5	5	5
Geomorphology	Mountain with a Flat Summit	1	3	5	1	5	4	1	1	3
	Tableland	4	5	4	5	4	4	3	3	5
	Narrow Valley concordant with the Structure	2	3	3	2	5	5	4	2	4
	Level Plain and Valley Floor	5	5	5	5	1	2	5	5	5
Proximity to the Water Surface	0–500 m	5	2	5	1	1	5	5	3	2
	500-1000 m	5	5	4	5	5	4	4	5	5
	1000–2000 m	4	4	3	3	4	3	4	3	3
	> 2000 m	1	2	3	2	2	3	4	1	2
Proximity to the Roads	0–500 m	4	2	2	3	2	2	5	5	5
	500-1000 m	4	5	3	5	5	3	5	4	4
	1000–3000 m	4	4	4	3	5	4	3	3	3
	> 3000 m	3	2	5	1	2	5	1	1	1
Historical Fabric	Culturally Protected Site-Historical Assets	4	4	UNRELATED	UNRELATED	UNRELATED	UNRELATED	UNRELATED	5	5

Table 4
Weighted scores of the factors.

Factors	Weighted Scores
Slope	0.15
LUCC	0.06
Current land use	0.24
Climate	0.17
Geomorphology	0.1
Proximity to the water bodies	0.11
Proximity to the road	0.13
Historical fabric	0.04

the decision matrix, the first step of the ELECTRE method, the pre-designed assessment form was used. That is, the decision matrix in this study is the assessment form which encompasses the types of rural tourism and the factors affecting them. In the ELECTRE, the lines of the decision matrix contain the decision points and the columns contain the assessment factors. The assessment form, drawn up in this study was prepared to be the exact opposite of ELECTRE. This was aimed at displaying the form on the page without any problems. However, when using the assessment scores in the program, the line-column changes were made as required for the steps of the ELECTRE.

The above-mentioned ELECTRE steps have been repeated in each landscape unit. Thus, the superiority rating for the rural tourism activities in each landscape unit was obtained. It was considered that the activities, that take the first three of the ranks (the first three activities that are most suitable) in the units in these ratings will be more important for spatial planning in the future.

According to the results obtained, mountaineering was determined as the 1st-degree suitable activity in the highest number of units. The total area of these units is 43,219 ha. Trekking, wildlife observation, orienteering, cycling, flora observation, and hiking are the other activities that determined 1st-degree suitable, respectively. As a result of the rating; flora observation was determined as 2nd –degree suitable activity in the largest area (64,059 ha) and in the highest number of units. The other activities that determined as 2nd-degree suitable are trekking, hiking, orienteering, horse riding, cycling, wildlife observation, camping and mountaineering, respectively. According to the rating results; trekking was determined as the 3rd-degree suitable activity in the highest number of units and in the largest area (47,675 ha). Orienteering, mountaineering, flora observation, cycling, hiking, horse riding, camping, wildlife observation were determined as 3rd-degree suitable activities, respectively. The tourism activities determined to be the most suitable for the area in its entirety are seen in Fig. 5. The surface areas covered by the activities are shown in Table 5 based on their degree of suitability.

Among the activities assessed, the activity of mountaineering covered the largest surface of the map section for 1st-degree suitability. In particular, due to the presence of important elevations in the south of the area and the increase in slope in this area, mountaineering emerged

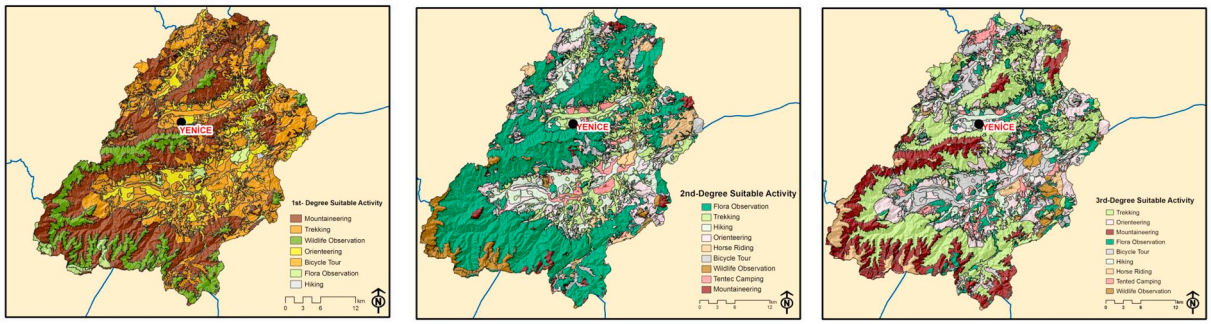

Fig. 5. (A) 1st, (B) 2nd and (C) 3rd degree suitable.

as the most suitable activity in this section. There are definite natural assets which lend themselves to the development of mountaineering in Yenice. The area has a slope rate equal to or greater than the required 20%. Furthermore, when climatic data are considered (e.g. mean temperature, humidity, and wind speed), it can be seen that they are within the limits required for human comfort. In addition to this, the high scenic value of the area is an attraction in itself. Transport links to Yenice and the transportation network within the district can currently be considered adequate. Nevertheless, in the event of an increase in demand, it will be necessary to develop transport connections between Yenice and the neighboring provinces and districts, in terms of both the frequency and comfort of services and to upgrade roads in the district to cope with more intensive use. Mountaineering is an activity which local people tend to view positively as it has minimal impact on their traditional way of life. This is an important factor for tourism activities. An activity which is disapproved of by local people cannot be expected to be a long-term proposition.

When the map of 1st-degree suitable activities is considered, it can be seen that trekking was found to be the most suitable activity in the areas immediately outside those designated for mountaineering. This is due to the degree of slope in these areas dropping below 20%. Localities with high scenic value, richness in vegetation and ease of transportation and communication links are necessary for the appeal of trekking routes. The research indicates that, in terms of scenic value and richness of vegetation, there are extensive areas with this potential in Yenice District.

Wildlife tourism involves watching and observing wild animals. But it can also encompass the attractions of touching and feeding animals. It can take place in a range of settings, from captive, semi-captive, to in the wild (Newsome, Dowling, & Moore, 2005).

Wildlife watching was determined as one of the most suitable activities for development in high areas. There, human activity is relatively limited and the vegetation in the forests provides a far more suitable environment for wildlife. Moreover, the game area in Kalkım, Yenice is another location where this type of tourism could be developed. However it is important to note that any new arrangements or activities which disturb the natural life of the animals in question must be avoided. In parallel with this, it is also essential to ensure the safety and security of visitors.

Orienteering is a tourism activity which has drawn increasing attention recently. People of all ages including children can participate in it. Sloping land (less than 20%) which is not very steep is the most favored terrain but, in order to make the activity more interesting, topographically varied areas are preferred. So these areas are expected to have a variety of types of vegetation. The right climatic conditions, within comfort limits, are also necessary. When the map of 1st-degree suitability is considered, it is evident that orienteering comes very close to trekking in suitability. From this perspective, Yenice is a highly suitable location for orienteering. Therefore these two activities might be regarded to some extent as alternative options.

The activity of cycling was found to be 1st-degree suitable for areas of Yenice with a slope rate of 0–2%. Also, the settlements and their close vicinity are areas where cycling activity was found 1st-degree suitable. The provision of mountain bikes would also allow access to higher levels and more sloping terrain.

While flora observation is interpreted as plant observation and recognition activity in their habitats (Sayılan, 2008), the existence of vegetation is accepted as a pre-requisite for the tourism usage in an area (Kayode, Akinyele, & Ayeni, 2017). In terms of this tourism activity, not only woody species but also grassy species are very important. In various studies (Dinç and Öztürk, 2013; Akpınar, 2003; Koday, Kaymaz, & Kaya, 2018; Akpınar Külekçi & Bulut, 2016; Sayılan, 2008) it is mentioned the contribution of especially grassy species to tourism. Yenice has a significant potential for this activity with its rich woody and grassy flora. As a result of analyses, it was determined that the flora observation had a limited area in high areas on the map of 1st-degree suitable activities. However it was found to be the activity covering the largest area on the map of 2nd-degree suitable activities.

Hiking is an activity which can take place under similar, but generally less strenuous, conditions than trekking. It requires trails which have a relatively shallow slope (between 0 and 6%), which are not too far from vehicular roads (0–500 m), which have drinking water or tap water available at specific intervals, which have rich vegetation and which have a scenic value that raises interest and enhances the visual experience. To this end, if available, any historical asset or feature will also make these trails more attractive. In the assessment, the smallest

Table 5
Surface area of (A) 1st, (B) 2nd and (C) 3rd degree suitable.

A)	Rural tourism activity	Surface area (ha)	B)	Rural tourism activity	Surface area (ha)	C)	Rural tourism activity	Surface area (ha)
	Mountaineering	43,219		Flora Observation	64,059		Trekking	47,675
	Trekking	37,237		Trekking	17,382		Orienteering	20,699
	Wildlife Observation	19,601		Hiking	12,760		Mountaineering	19,707
	Orienteering	16,641		Orienteering	10,121		Flora Observation	11,568
	Cycling	13,548		Horse Riding	8992		Cycling	10,935
	Flora Observation	3937		Cycling	8392		Hiking	10,262
	Hiking	92		Wildlife Observation	6868		Horse Riding	6217
				Camping	3203		Camping	4432
				Mountaineering	2497		Wildlife Observation	2781

surface area was determined for this activity on the map of 1st-degree suitable activities. However, this should not mean that hiking is an unsuitable activity for Yenice. Since it collected similar factor values to those for trekking and orienteering, it may be feasible even though the suitable areas are more limited. Indeed, on the map of 2nd-degree suitable activities, the third surface area after that of trekking belongs to this activity.

From the analyses, horse riding was not among the 1st-degree suitable activities. The main reason for this is the limited water surface in the area, as the availability of water is a necessary factor for this activity. The factor of proximity to the road was another determinant for the activity of horse riding. The settlements were determined as suitable areas for horse riding and also for cycling. On the map of 3rd-degree suitable activities, horse riding was also determined to be suitable in a limited area in the southern section with a high elevation. Riding has not yet become as popular in Turkey as in other countries. Economically, it is not preferred by the majority. However, making this activity available on a more widespread basis may help to strengthen the potential of Yenice for rural tourism. Building riding stables and other facilities will require a certain economic level. In this light, this is a tourism activity which may require to be created through a different system (e.g. a municipality- or cooperative-supported study) in comparison with other activities.

Camping was not included on the map of 1st-degree suitable activities, but it was on the maps of 2nd- and 3rd-degree suitable activities. Locations with a slope rate of 0–2% and limited vegetation were determined as more suitable for camping. Also, places close to water and to the vehicular road (500–1,000 m) were identified. Camping as a leisure activity has not yet become as popular in Turkey as it has in other countries. But the kind of campsites more frequently encountered on the Aegean and Mediterranean coasts have just begun to emerge in the Çanakkale locality.

For camping, Yenice has slightly more limited possibilities due to its climatic conditions. Also, camping sites require more extensive design studies than the other activities. Such issues as the satisfactory provision of essential services (e.g. water, electricity, and WC), and the disposal of the resulting wastes entail a lot of additional planning.

All evaluations in this study indicate that the **mountaineering**, **trekking**, **orienteering**, **wildlife observation** and **flora observation** are the activities that should be given priority for rural tourism in Yenice district. Also, this study, responds to the question of where the proposed rural tourism types should be developed in terms of land use suitability in Yenice district.

Yenice is a settlement in which the economic structure is based very substantially on agriculture, in which traditional customs and patterns of life continue and which still maintains its original fabric. It also has the benefit of various natural assets in the landscape, including the influence of Ida Mountains, on whose slopes it was established. The ongoing activities of agricultural life, the natural features and cultural characteristics of the area and the diversity of the topography all combine to make Yenice an attractive potential destination for rural tourism.

5. Conclusion

As stated by Towner (1996), rural areas have been regarded as suitable areas for tourism and recreation and have been used for this purpose for a very long time (Butler, Hall, & Jenkins, 1998). Rural tourism first consisted largely of tourists visiting farms, staying in farming areas, and participating in agricultural activities. However, as asserted by Nair, Munikrishnan, Rajaratnam, and King (2015), rural tourism is now acknowledged as a multi-dimensional concept involving the experience of farming activities and nature at first hand, of the cultural characteristics of various rural localities, and of their traditional way of life.

Tourism is acknowledged as an effective catalyst for the socio-economic development and renewal of rural areas (Sharpley, 2002). Due to the many problems that agricultural economies are confronted with, rural tourism is supported and encouraged in many developed and developing countries through a range of policies.

However, tourism development can also lead to serious ecological problems in areas where they proliferate. Changes made in response to the expectations of users (e.g. new buildings such as hotels and motels, as well as new roads), fast population growth, rapid infrastructural expansion and environmental pollution can all cause irreversible damage and disturb the ecological equilibrium.

For this reason, one of the most important preconditions for the successful development of rural tourism is the protection of the landscape. If the integrity of landscapes and rural areas is to be protected, rural tourism must provide economic benefit. Furthermore, it will succeed only if it includes all three pillars of the sustainable development triangle: economy, environment, and society (Daniloska & Hadzi Naumova-Mihajlovska, 2015).

To evaluate the ecological pressures likely to result from tourism activities, not just today or tomorrow but into the future, it is necessary to identify the most suitable activities for different areas before tourism pressure intensifies. Suitability analysis, which can be defined as the assessment and classification of land according to its suitability for particular uses (FAO, 1976), is a valuable tool in this process. The basis of the studies to determine the suitability of land use is various factors that define the characteristics of the field and land use alternatives. These factors have a primary effect on the results. At this stage, the problem is that the researchers cannot adequately and accurately evaluate different information from various sources.

MCDM provides a systematic and strong mechanism (Cengiz & Akbulak, 2009) to the researcher to accurate analysis and evaluation. The integration of GIS and MCDM in the land use analysis studies, in particular, provides much more successful results. In this direction, for the research, the ELECTRE I method was selected from among the available multiple-criteria decision-making options, and a rural tourism suitability map of the area was developed with the help of such current scientific tools as satellite images, remote sensing, and geographic information systems. The proposed tourism activities in the study were assessed according to various criteria, and the most suitable areas for these activities throughout the district were determined. When an assessment is made for these activities, whose land use suitability is determined, the following issues become important.

Although mountaineering was determined to be the most suitable activity in the proposed activities for the area in general, not everyone can participate in this activity, due to some specific training and material requirements. Therefore, arguably trekking should be included in rural tourism plans as it is an activity preferred by many more people than mountaineering. However, some arrangements are required to improve both activities. In case of emergencies, intervention units should be established. Communication facilities should also be uninterrupted. In addition, the detailed determination of the trekking routes in various surveys based on this study will enable this activity to be developed in Yenice. Flora observation and wildlife observation were determined also as one of the most suitable activities. Trekking and observation routes should be established in a conservation-based approach, especially for endemic species.

Horse riding has not yet become popular in Yenice or in Turkey. However, the natural landscape characteristics of Yenice are suitable for this activity. The local people should be supported economically and educationally to make this activity available on a more widespread.

Hiking, orienteering and trekking are similar activities in some respects. It can be deduced from this that it may be possible to diversify activities by arranging common routes for trekking, hiking, and orienteering. This would provide the option for activities to be run on their own or concurrently at different times.

Besides these activities that determinate in this study, the festivals and traditional celebrations are the important cultural richness of

Yenice. Many of these festivals and celebrations have been carried out for many years. The local people should be supported and encouraged for sustainability of these activities. They are important also for marketing handicrafts and agricultural products.

For all the activities proposed within the framework of the study, it is necessary to increase the quality and to improve the quality of accommodation, food and beverage services, shopping opportunities in Yenice district. Health services should also be developed. In addition, infrastructure and transportation problems that may occur with possible tourism activities should be determined in advance and precautions should be taken.

The awareness of local people about natural landscape and cultural landscape characteristics of Yenice should be increased. Furthemore, training should also be given to the local public for the tourism sector. Because to provide the need of qualified staff to a large extent within the local community is closely related to the concept of rural tourism. According to Fleischer and Tchetchik (2005), being an agricultural producer providing agricultural product and tourism service in rural tourism provides more efficient production. The agricultural producer providing rural tourism services can use the resources more efficiently than the non-agricultural producer. In this sense, the realization of the rural tourism activities by the local people is of great importance both in terms of more efficient production and the benefit of the region.

Perhaps the most important issue in addition to the above considerations is to ensure the sustainability of traditional plant and animal production activities in Yenice. Furthermore, conservation and improvement of pastures for sustainable agricultural use in mountain ecosystems is also very important for rural tourism.

In conclusion, Yenice hosts important natural and cultural assets in its landscape, watched over by of Ida Mountains, on whose slopes it was established. The district contains rich vegetation including endemic species such as *Abies nordmanniana* subsp. *Equi-trojani* as well as a diverse range of natural fauna. Everyday life is characterized by conventional agricultural activities, allied with rural traditions and customs and small-scale handicrafts all of which contribute to the cultural wealth of the locality. These features of Yenice are being discovered by more and more people every day through modern media and communication. It is inevitable that rural tourism activities in the locality will continue to grow in future. Besides providing a scientific and protection-focused analysis using current methods, tools, and data, this study represents a valuable reference source for any future planning study to be carried out for Yenice. This is especially important as the existing natural and cultural resources have not yet been impacted by the negative aspects of tourism. But the process of developing rural tourism activities in Yenice and of significantly supporting rural development should not end with this study. The process can only be completed through further detailed examination, based on these studies of land suitability. The participation of local people and local government is crucial, with the primary aim of protecting natural and cultural assets, and subsequently with the establishment of effective monitoring and control mechanisms.

Author contribution

Study conception and design: Ayhan, Cengiz, Acquisition of data: Ayhan, Analysis and interpretation of data: Ayhan, Cengiz, Özkök, Tatlı Drafting of manuscript: Ayhan Critical revision: Ayhan, Cengiz, Özkök, Tatlı.

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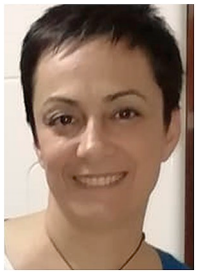

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