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Participatory Multi-Criteria Decision-Making Analysis for Assessing the Potential of Ecotourism Development in Prespa Park

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Abstract: In this study, an approach based on an integrated and participatory multi-criteria decision-making analysis was developed and used to identify the best option for tourism development and the main priority factors supporting the ecotourism industry in Prespa Park. The study was based on different empirical analyses and conducted in two parts. In the first part, the PROMETHE II technique coupled with a fuzzy Delphi survey was applied to identify the best type of tourism development. The obtained result indicated that the ecotourism option, was the best one, followed by agritourism, cultural tourism, rural tourism, and finally the "tourism as usual". In the second part, the ecotourism aspects were compared, and the main priority factors supporting the development of a sustainable ecotourism industry were identified using the fuzzy Delphi method and fuzzy analytical hierarchy process. Comparing various aspects of ecotourism, economics seems to be the main driver behind the industry, with social and environmental aspects coming in second and third. We also identified six priority factors supporting ecotourism, to which attention needs to be paid. The findings may aid policymakers and decision-makers in developing long-term strategies to boost the ecotourism industry and reduce environmental damage in Prespa Park and other similar areas.

Keywords: ecotourism; fuzzy Delphi method; fuzzy Analytic Hierarchy Process; multi-criteria analysis; Prespa Park; PROMETHEE method.

JEL Classification: Z32; Q57; D70; R11.

Introduction

The term "ecotourism," born in the late 1960s and early 1970s (Swarbrooke 1999; Fennell 2020), emerged in academic literature in the early 1980s primarily as a reaction to growing concerns about mass tourism's impact on the natural environment (Ceballos-Lascuráin 1993; Gössling and Scott 2012). Since the 1990s, it has been considered one of the fastest-growing segments of tourism (Honey 2008), and now it is a global phenomenon (Kitheka and Davidson 2020).

There is a growing body of studies aimed at showing that analyzing tourism issues, because of those multiple dimensions, requires multiple-criteria decision making analysis (MCDA) techniques (Mihalič 2000; Hawkins 2004; Liu *et al.* 2013; Stević *et al.* 2019). On the other hand, the tourism sector is complex, incorporating a network of interrelated stakeholders and organizations, both public and private, who work together, increasing the dimensions of ecotourism planning, and forcing the use of participatory techniques (Drumm and Moore 2005; Proctor and Drechsler 2006). MCDA was used in this research as a methodological framework.

Tourism, which is an important economic activity at least in North Macedonia and Greece (Fremuth and Shumka 2013), is currently at an early stage in the case study of Prespa Park, but it is still an important source of income and employment with the potential to grow in the future (Grazhdani 2010; Latinopoulos 2020). However, this potential is unexploited, because tourism is seasonal, low-intensity, and basically limited to mainly local people. Karagiannis *et al.* (2010) argue the area has the potential to become an international destination. There is no real trans-boundary tourism on offer at present. Freimuth and Shumka (2013) highlight that Prespa Park is just in the beginning stages of ecotourism and is thus still "muddling through" without a clear plan or strategy. A

strategy for tourism development is lacking. There is an urgent need for the development of functional tourism in the region because the status quo of tourism can have a serious impact on local people's well-being as well as their cultural and natural heritage. This problem was addressed by this research.

Two of the best-known methods in the field of MCDA, namely PROMETHEE and the Analytic Hierarchy Process (AHP), were adopted and employed in the concrete conditions of Prespa Park. The PROMETHEE II method, coupled with the traditional Delphi survey, was used to evaluate five different options (types) for tourism development and identify the best one from an integrated and inclusive perspective. Once the best type of tourism development (ecotourism) was identified, the priority factors supporting its future development were developed, and then six main ones were identified through an expert questionnaire survey, the fuzzy Delphi method (F-DM) and the fuzzy analytic hierarchy process (F-AHP).

This study is unique and excels in two areas: it employs PROMETHEE and the Analytic Hierarchy Process (AHP) in conjunction with the Delphi method for the same collected data, and it applies fuzzy theory to evaluate the potential development of ecotourism in Prespa Park. The study is novel in the fact that it can use an integrated and participatory multi-criteria decision-making approach to find both the best option for tourism development and the most important factors supporting the ecotourism industry in a protected area simultaneously. This represents a modest contribution in the field of participatory multi-criteria decision-making modeling within the ecotourism literature.

1. Literature Review

Making decisions in the field of ecotourism is connected with numerous factors, *i.e.*, criteria, and complex situations involving multiple and often intangible and conflicting criteria (Saaty and Ergu 2015) that stakeholder groups and/or decision makers may assess differently. Using participatory multi-criteria decision-making analysis methods can effectively assist ecotourism planning and management. In this context, various mathematical modeling techniques of various levels of complexity, have been applied to solve participatory multi-criteria problems in the field of ecotourism (Kumar *et al.* 2017; Akbulut *et al.* 2018; Çetinkaya *et al.* 2018; Sahani 2019).

The PROMETHEE methods are part of the outranking methods group. This group was first introduced by Brans (1982) in the form of a partial ranking of alternatives and was then expanded by Brans and Vincke (1985) into a full ranking approach named PROMETHEE. According to Behzadian *et al.* (2010) and Brans and De Smet (2016), several versions of the PROMETHEE methods were developed and adapted to complex decision-making to solve a variety of multi-factor and multi-person decision-making problems and to take into account inputs from a group of stakeholders and decision makers. One of them was PROMETHEE II. According to Macharis *et al.* (2015), it provides a clear picture of each stakeholder's preference as well as the group as a whole, providing strong support for deliberation and negotiation within a common space.

Numerous researchers have solved different ecotourism management and planning problems by applying PROMETHEE techniques. Lopes *et al.* (2018), for example, applied the PROMETHEE method within a competitiveness study of eight tourist destinations located in the Northern Region of Portugal. On the other hand, Kaya *et al.* (2013) proposed a fuzzy multi-criteria approach for the selection of the most appropriate site(s) for promoting ecotourism activities in urban areas using a modified PROMETHEE methodology, and made a prioritization among seven different districts of Istanbul. The goal of the study by Koliouska *et al.* (2023) was to promote and investigate the Prespa National Parks area in Greece as an ecotourism destination. This study uses the PROMETHEE II multi-criteria analysis method to analyze and classify the websites that advertise the local tourism enterprises.

The Analytical Hierarchy Process (AHP) has a significant place in the mathematical description of complex processes arising in decision-making (Gunduz and Alfar 2019). It was developed by Thomas L. Saaty in the 1970s (1980) and has been refined since then. AHP is a mathematical approach, the prime goal of which is to determine the normalized weights (importance) of criteria based on experts' opinions (Thirumalaivasan *et al.* 2003; Garfi *et al.* 2011) that are collected using questionnaires. For Saaty (2008), AHP is a method of measurement through pair-wise comparisons and relies on the judgments of experts to derive priority scales.

Kumar *et al.* (2017) argue that AHP gains worldwide attention for its flexibility and effective use and is applied among different multiple-criteria decision analysis methods in different fields (Vaidya and Kumar 2006) and for various purposes (Garmendia and Gamboa 2012; Emrouznejad and Marra 2017). In the publication of Vaidya and Kumar (2006), a literature review of the broad areas of AHP application and its integration with different techniques can be found.

Several researchers (Forman and Gass 2001; García-Melón *et al.* 2012) recommend using the AHP technique to assess different aspects of ecotourism. The AHP method was applied by Bunruamkaew and

Murayama (2011) and Roque Guerro *et al.* (2020) for identifying and prioritizing potential ecotourism sites, the first in Surat Thani Province, Thailand, and the second in a Brazilian municipality. Meanwhile, Kumari *et al.* (2010) used AHP to identify potential ecotourism sites in the West District (a district in the Indian state of Sikkim) based on environmental parameters. Mobaraki *et al.* (2014) used GIS and AHP to assess the capacities and power of ecotourism in Isfahan Township (central Iran). Božić *et al.* (2018) applied AHP to assess the attractiveness of six cultural heritage sites in Phuket, Thailand. The Analytic Hierarchy Process (AHP) and Delphi analysis have been effectively employed to assess critical aspects in the advancement of the Taiwan cruise tourist sector (Teng *et al.* 2020).

Although AHP is one of the most extensively used multiple criterion decision-making techniques (Saaty 1990), it has certain drawbacks, particularly in its inability to capture the ambiguities or mistakes associated with group decision-making. Meanwhile, it has the ability to be easily integrated with multiple techniques, such as fuzzy Logic. As Chen (2000) states, to address these deficiencies and abilities, the integration of AHP and fuzzy theory developed by Zadeh (1965) has been realized. These issues are addressed in the Fuzzy AHP (F-AHP) (Saaty 1987), which, as Torfi *et al.* (2010) emphasize, makes it a robust and flexible decision-making tool. As stated by Ahmed and Kilic (2019), it is utilized to represent human judgments more realistically and to find a balance between ease of computation and accuracy of results. Chan *et al.* (2019) demonstrate the conditions relating to differences between the triangular fuzzy AHP and classical AHP from both a quantitative and qualitative perspective.

F-AHP became a suitable tool for solving real problems in the field of ecotourism. For example, Zabihi *et al.* (2020) used an F-AHP to evaluate the relative importance of physical, natural, environmental, and socio-economic factors for determining the suitability of ecotourism sites in the case study of Babol in Iran. Using Fuzzy-ANP and Fuzzy Delphi methods, Lin and Chuang (2012) evaluate the sustainability of Taiwan's coastal wetlands ecotourism, and Lee *et al.* (2011) develop key success factors of the ecotourism industry in Taiwan.

2. Materials and Methods

2.1. Case Study: Prespa Park

The current study was conducted in Prespa Park (Fig. 1). The Prespa Park region is a good case study, as it is a wetland area of high biodiversity and long human history (Grazhdani 2014a). The trilateral Prespa Park (Albania, North Macedonia, and Greece), which includes both the Micro and Macro Prespa Lakes and their surrounding areas, covers an area of approximately 2,519 km^2 (Hollis *et al.* 1997). The park was declared on World Wetlands Day, February 2, 2000. The area is designated as a Wetland of International Importance under the Ramsar Convention (Ramsar 2013). Ohrid-Prespa area was declared a Transboundary Biosphere Reserve under the UNESCO Man and the Biosphere Programme in 2014 (Unesco 2014).

Figure 1. Prespa Park region

The three countries that share the Prespa Park basin, have designated parks and/or protected areas within their own territories. For Fremuth and Shumka (2013), they are the strongest tourism assets at present.

According to Grazhdani (2018), Prespa Park is a protected ecosystem that provides significant ecosystem services, boasts a plethora of natural, historical, cultural, and ecotourism attractions and artifacts, and is known for its abundant biodiversity of plants and animals, as well as its attractive landscapes. The territory of the Prespa Park includes both the terrestrial portion and the entire aquatic component of the two Prespa Lakes. Park is a particularly vulnerable environment in which it is difficult to balance socioeconomic and environmental protection (Grazhdani 2023).

In the Albanian part of Prespa Park, approximately 5,370 people live in 12 villages. The majority of the population works in labor-intensive agriculture (farming and livestock production), which accounts for approximately 75% of the local gross product (Grazhdani 2024a), and is supplemented by some fishing as the primary source of subsistence income. Grazhdani (2015) notes that the Albanian part of the Prespa Park region was traditionally an agricultural region, but recently a notable tourism "boom" began on its coast. Tourism in the area is reported by Grazhdani (2024b) to be seasonal visits, especially during holidays, and small-scale rural and family tourism, based on a few small hotels, private accommodations, and restaurants. For overnight stays, there are 53 hotel beds, 50 private accommodations, and 385 seats in 13 restaurants. Desires to grow and develop the tourism sector in the Albanian part of Prespa Park exist, especially during the last two years, achieving tourism presence multiple times its population, but steps need to be made to enable this growth to be sustainable.

Rural depopulation and unemployment have characterized this region in Greece. According to Sdrali *et al.* (2015), 65 percent of the population in the Greek part (about 1,200 people in 13 villages) continues to rely on agriculture, especially monocultures of beans, for their livelihoods. However, tourism is seen as an alternative means of income generation. The Greek part of Prespa Park has the most developed tourism product in the region and attracts the most visitors. As Sdrali *et al.* (2015) note, there are 25 accommodations with a total capacity of about 570 beds, most of which are affected by seasonality.

The portion of the basin within the territory of North Macedonia is the most densely populated. Over 17,500 people live in one town (Resen) and 40 villages, despite the fact that strong rural-urban migration is causing an aging and declining population. Fruit growing and fishing are the most important economic activities. There is also a small manufacturing base. The tourism industry in the Prespa region of North Macedonia is also very small and seasonal at present, with 7 hotels (201 beds) and an auto camp (334 beds). The lake's pollution load, both here and in Greece, is primarily caused by agricultural chemical and fertilizer run-off.

The productive system in Prespa Park as a whole is not balanced and equally developed in all sectors. A more diverse economy is required to provide the locals with employment possibilities and income sources. The current level of tourism development is village-based and small-scale. There is no real trans-boundary tourism on offer at present. The area has very few private sector tour activities, despite the growth of a few modest activity tour firms in Greek Prespa. The rate of development of this tourism potential has been slow due to a lack of proper planning and financial constraints. According to Fremuth and Shumka (2013), despite these challenges, the Prespa Park basin may unquestionably provide a tourism product to satisfy the demands of an expanding tourism market (Grazhdani, 2024c). The environment needs to be better protected, and awareness of alternative tourism options (including ecotourism) in the area needs to be created.

Both North Macedonia and Albania suffer from a widespread shortage of adequate infrastructure, including roads, water supplies, and sewage facilities. If there is a deficiency in basic infrastructure, we must improve or develop it. However, maintaining the current infrastructure can present additional challenges at times. Thus, sustainable tourism, of which ecotourism is a component, is bettering living conditions for the population of Prespa Park by enhancing the infrastructure for the benefit of tourists. Grazhdani (2010) has shown that the Prespa has a developing ecotourism product. The guiding strategy for the Prespa Park's ecotourism development, according to Karagiannis *et al.* (2010) and Latinopoulos (2020), is to manage natural and human resources in a way that improves local benefits, maximizes tourist satisfaction, and minimizes any developing negative consequences. For rural and semi-urban Prespa Park communities that are keen on improving their socioeconomic welfare while also preserving nature and the region' cultural heritage, ecotourism could be the perfect medium.

There are a number of advantages to Prespa Park in terms of developing ecotourism. Firstly, Prespa Park possesses an abundance of unique natural resources, especially famous mountains, lakes, rivers, natural reserves, forest parks, scenic areas, and caves. There are many activities offered in Prespa Park, such as wildlife observation, bird watching, and hiking and trekking, fishing, hunting, rock climbing**,** cave exploring**,** and camping, among others that directly involve nature. Secondly, it has a rich and diverse cultural and ethnic heritage, which can provide tourists with distinctively attractive traditional customs and festivals. Several Neolithic and Bronze Age hermit chapels, churches, and prehistoric homes can be found in the region, as well as historical layers of

Byzantine and Ottoman monuments (Grazhdani 2014b) with a high potential for tourism (Freimuth and Shumka 2013; Grazhdani 2016). Thirdly, in February 2010, an international agreement was signed between the Ministries of Environment of the three countries sharing the Prespa Lakes basin and the European Commission. Under this agreement, the three states are legally bound to establish permanent structures of cooperation in order to develop a common strategy and to apply measures both for the protection of the natural environment and the human activities in the area.

On the other hand, Prespa Park could potentially benefit from tourism studies to gather reliable data that can guide the industry's growth, especially the ecotourism. Countries must unify their policies and management plans, both vertically and across issues. Protecting natural areas is a cross-border effort that necessitates cooperation among neighboring countries. Coordinated efforts in planning, development, management, and marketing are crucial to Prespa's success as a tourism destination.

As a conclusion, the Prespa Park has the potential to thrive as an ecotourism hotspot, bringing economic growth that will help increase the residents' well-being as well as conserve the sociocultural and natural resource heritage.

2.2. Data Collection

The study was carried out over a two-year period (2017–2018) and used a number of methods to collect data and information. In operational terms, the following inclusive activities were conducted: a field survey, consultations with experts and authorities, and two one-day participatory workshops.

In May-June 2017, a field questionnaire survey, which was based on samples taken following the strategy to meet statistical reliability and validity objectives, was conducted in Prespa Park. The survey used in this study was administered following the Dillman (2011) method. 400 questionnaires were distributed to the residents selected randomly in the Prespa Park watershed. The questionnaire have to be returned by the respondents within 5-7 days. The initial packet included the questionnaire, a contact letter, a booklet of the survey, and a pre-addressed and stamped return envelope. The completed questionnaires were mailed back. The number of usable questionnaires was 226 (56.4%).

The questionnaire items were accurately written and then sent to a panel of experts (including survey researchers, tourism industry experts, economists, environmentalists, and specialists specific to statistic design) to check the content and construct validity. To refine the questionnaire, a pilot field test was conducted to clarify the questionnaire's comprehensiveness, content validity, and potential areas of ambiguity (Fink 2013; Nardi 2013). 30 residents within the watershed were chosen to make comments on the questionnaire's clarity and ease of use. The final version of the questionnaire was adjusted to include the suggestions provided by the expert panel and the field test.

In order to measure the questionnaire's internal consistency, Cronbach's alpha was used: the closer the alpha is to 1.0, the more reliable it is (Nardi 2013). The Cronbach's alpha for this study was 0.83. All of the questions were checked to make sure they were appropriate for the research before being placed into the database. For data analysis, was employed SPSS 21.0.

The field survey was then followed by consultations with stakeholders and authorities and was complemented with two one-day workshops.

2.3. Data Analysis Methods Applied

2.3.1. Fuzzy Delphi Method (F-DM)

The Delphi multi-round survey is a widely and successfully used procedure based on a group of experts arriving at an acceptable degree of consensus regarding the attributes of interest. As Angus *et al.* (2003) and Mirhosseini (2016) emphasize, the Delphi technique, according to Powell (2003), is a sequence of successive questionnaires or "rounds" that alternate with regulated feedback, with the aim of finding the most trustworthy consensus among the viewpoints of a "group of experts." According to Richey *et al.* (1985), they reach consensus by iteratively administering and subsequently applying data from questionnaires, using highly ranked items from one questionnaire to formulate the next.

It is a flexible method that is useful in achieving consensus in large, complex problems with uncertainty, and as Landeta (2006) notes, it is accepted as a valid technique for a variety of research purposes, including environmental management and planning (Angus *et al.* 2003; Curtis 2004; Hayes 2007), recreation (Austin *et. al*. 2008), tourism research (Garrod and Fyall 2005; Donohoe and Needham 2009), and ecotourism (Donohoe 2011; Mirhosseini 2016). Finally, as Kaynak and Macauley (1984) claim, the Delphi technique is not a decision-making

tool, but rather a tool of analysis, and as such, the aim is not to achieve a definitive answer, but instead to aid in the development of possible solutions based on the Delphi results.

Because the traditional Delphi method has limitations such as vagueness, uncertainty, the impreciseness of human decisions (Ocampo *et al.* 2018), and a lengthy procedure time (and the associated high research costs), scientific research frequently employs its modification, the fuzzy Delphi method. It was proposed about three decades ago by Ishikawa *et al.* (1993). According to Roldán López de Hierro (2021), the Fuzzy Delphi Method (F-DM) is a modified and enhanced version of the traditional Delphi technique that incorporates fuzzy data in experts' opinions and utilizes triangulation statistics to determine the distance between the levels of consensus within the expert group.

In this research, F-DM was employed. The key steps implied in this study were as follows: During Step 1, each Delphi expert provides possible interval values for each evaluated criterion. The minimum value of this interval represents the most conservatively perceived value, while the maximum value represents the most optimistically perceived value of the assessed criteria.

During Step 2, an analysis of 'the most conservative perceived values' and "the most optimistic perceived values," given to each assessed criteria *i* by all of the experts, was performed. After the extreme values falling outside the "two times the standard deviation" are eliminated, the minimum value C^i_L, the geometric mean C^i_M, and the maximum value C^i_U of "the most conservative perceived value" that has not been eliminated, as well as the minimum value O^i_L, the geometric mean O^i_M and the maximum value O^i_U of "the most optimistic perceived value," are determined.

During Step 3, through the foregoing steps, the triangular fuzzy number Ci = (C^i_L; C^i_M; C^i_U) of "the most conservative perceived value" and the triangular fuzzy number Oi = (O^i_L; O^i_M; O^i_U) of "the most optimistic perceived value" of each assessed item *i*, were established.

During Step 4, the following methods were used to verify the degree of consensus among experts: a) no grey zone exists; b) the grey zone exists but there is a small difference between the experts' advice; and c) the grey zone exists but there are large differences between the experts' advice.

During Step 5, based on Step 4, Gi (the importance of the consensus degree) equal to the mean value of C^i_M and O^i_M for each criterion, was calculated. The higher the Gi value, the higher the experts' common conscious level. Finally, the arithmetic mean of all Gi values was calculated. This was used as a threshold value to select a suitable number of assessed items. More information about the fuzzy Delphi survey methodology can be found in Gil-Lafuente *et al.* (2014).

Twenty experts were chosen for the current study to participate in the Delphi process and to answer the questionnaires via email. The experts were from tourism organizations, tourism travel agencies, protected area management units, agriculture agencies, tourism and environmental NGOs, and academics in the fields of leisure and tourism.

2.3.2. PROMETHEE Method

The PROMETHEE method belongs to the family of outranking methods and represents one of the most frequently used methods of multi-criteria analysis (Silva *et al.* 2010; Lu *et al.* 2007; Brans and Mareschal 2005; Figueira *et al.* 2005). It is a pair-wise comparison methodology to evaluate and compare a finite set of *n* alternatives A = (a_1, a_2, . . ., a_n) in terms of *m* multiple criteria C = (c_1, c_2, . . ., c_m).

The PROMETHEE method is based on a mutual comparison of each alternative pair with respect to each of the selected criteria (Brans and Mareschal 2005). In order to perform option ranking by the PROMETHEE method, it is necessary to use the preference function between two alternatives, a_i and a_k under each criterion c_j provided by decision-makers. The larger the function value is, the bigger the difference between alternatives (Brans and Mareschal 2005). After defining the value of function preference of alternative a_i in relation to alternative a_k for each criterion, it is necessary to calculate the index of preferences of alternative a_i in relation to alternative a_k. After determining index preference, it is finally possible to calculate an alternative flow index, whose value represents the significance of the alternative.

Brans and Vincke (1985) developed an extended method of PROMETHEE II, for complete ranking from the best to the worst of a fixed set of possible alternatives. It is based on a calculation of the net outranking flow value (Φ) that represents the balance between the positive (Φ^+) and negative (Φ^-) outranking flows. Positive (Φ^+), negative (Φ^-), and net flows (Φ) were calculated by the software according to the equation established by Brans and Mareschal (1985). According to the preference index, the positive flow $\Phi^+(a_i)$ and negative flow $\Phi^-(a_i)$ of each alternative a_i can be defined. The corresponding net flow $\Phi(a_i)$ can then be calculated as follows: $\Phi(a_i) = \Phi^+(a_i) - \Phi^-(a_i)$, which can be positive or negative. Φ is used to obtain an impact ranking based on the principle that the

higher the net flow value, the higher the priority of the impacts. For more details, see Brans and Vincke (1985), Anand and Kodali (2008), and Brans and De Smet (2016).

Based on the net flow values, the preference relationships between two alternatives can be determined. The higher the net flow, the better the alternative (Brans and Mareschal, 2005). So, if $\Phi(a_i) > \Phi(a_k)$, then alternative a_i will be ranked before alternative a_k; while if $\Phi(a_i) = \Phi(a_k)$, then the two alternatives a_i and a_k will have the same rank. For more details about the PROMETHEE methodology, Brans and Mareschal (2005) and the PROMETHEE 1.4 Manual (2013) can be consulted.

The key steps implied in this study were as follows: The procedure began by identifying the tourism development options and associated criteria through consultations with stakeholders and authorities, a panel of experts, and a one-day workshop. In step two, the pair-wise comparisons of options for every criterion were calculated. Meanwhile, in step three, the preference function was obtained. During the fourth step, the global preference index was calculated. In step five, the positive, negative, and net outranking flows for each option were computed. According to the net outranking flows, the options were ranked in descending order.

2.3.3. Fuzzy Analytical Hierarchy Process (F-AHP)

The Analytic Hierarchy Process (AHP) presents a powerful technique for analyzing and solving complex decision-making problems that involve multiple criteria at multiple levels (Razandi *et al.* 2015). By utilizing both mathematics and psychology, the AHP is able to break down a complex decision-making problem into a number of different hierarchical levels. Pairwise comparisons are used to determine the weights for each criterion and alternative, and the Eigenvector method is used to establish priorities. This structure lets it measure and combine many different factors in a complex decision-making process, which makes it easy to put the parts together into a whole.

Nowadays, the AHP analysis method, along with fuzzy set theory (F- AHP), has been extensively used in the multi-criteria decision-making analysis process. In this research, an F-AHP approach was applied. The procedure for using the F-AHP in this study was structured into four steps as follows: During the first step, a hierarchical structure was set up. This structure included the goal (to identify the main priority factors supporting the development of the ecotourism industry in Prespa Park), the ecotourism aspects (environmental, economic, and sociocultural), and the main priority factors that support the growth of ecotourism.

During the second step, we determined the priorities of the variables at each level by constructing a set of pair-wise comparison matrices of all the variables in relation to each other. The pair-wise comparison illustrates how much variable *A* is more favorable or important than variable *B*. These logical preferences were measured using Saaty's 1–9 scale. So, during this second step, first an AHP questionnaire was composed and distributed by email to the Delphi experts for assessment. Each expert offered a possible value for each assessed issue based on Saaty's 1–9 scale, where score 1 indicates equal importance and score 9 reflects the extreme importance of one factor compared to another (Saaty 1980). Next, the triangular fuzzy numbers were used to express the experts' fuzzy opinions. Hence, a fuzzy positive reciprocal matrix was established. Further, a set of fuzzy pair-wise comparisons at each level in the hierarchy were set up. Lastly, a final comparison matrix was established.

During the third step, the consistency test was conducted. This was checked by calculating the consistency ratio (*CR*). As Scholl *et al.* (2005) highlight, *CR* specifies the degree of consistency or inconsistency. According to Saaty (2008), consistency can be satisfied if *CR* is less than 0.1; otherwise, the pair-wise comparison matrices must be repeated.

During the fourth step, the weight determination was realized. To do that, first, using a triangular membership function and geometric means (Efe 2016), the fuzzy weights of criteria at various stages of the fuzzy matrix were yielded. Next, using the modal value dominancy method (Krejčí *et al.* 2017), all weights obtained by fuzzy geometric means were defuzzified, and then, using the arithmetic mean procedure proposed by Chang and Lee (1995), they were normalized. Lastly, the overall normalized weight values of the hierarchy were calculated.

3. Results and Discussion

3.1. Assessing and Prioritizing Different Options for Tourism Development with PROMETHEE II in Prespa Park

Assessing and prioritizing different options for tourism development is a useful way to increase efficiency in decision-making. As a result, in this study, an MCDA procedure was designed with the goal of carrying out this prioritizing task. To address this problem, we used the PROMETHEE II method coupled with a fuzzy Delphi survey. In the selection and evaluation process, the following three sequential phases were conducted: The

tourism development options and associated criteria were identified during the first phase. To assemble a comprehensive list of options and criteria for identifying the best option for ecotourism development, first there were organized consultations with local stakeholders and authorities. Then, a one-day workshop was organized and attended by about 30 participants who had a good knowledge of the problems under investigation, including ecotourism experts, economists, academicians, and representatives from tourism, agriculture, and protected area management authorities who work directly or indirectly on the study area.

Upon arrival at the workshop, participants were given background information on the study (including goals and objectives), a summary of the survey results, and how the research and workshop relate to this process. The findings from consultations with stakeholders and authorities were also presented in order to get some feedback and ratification of this part of the research. A series of short presentations and panel discussions were used to brief participants on the key principles of the participatory MCA analysis, the possible tourism development options, and their features in Prespa Park. The participants were asked to assess the criteria for analyzing the tourism development options against a preliminary list developed by a panel of experts. The meeting was characterized by intense debate among the participants.

At the end of the workshop, the following five tourism development options were identified: (O1) the status quo, or tourism as usual; (O2) agritourism; (O3) ecotourism; (O4) cultural tourism; and (O5) rural tourism. Option O1, "tourism as usual," represents the current scenario for the tourism industry in the region, leaving the system on its own without any type of intervention. Then, a preliminary list of 15 criteria was made (see the section on collecting data in this paper for more information).

According to Macharis *et al. (*2004), PROMETHEE is based on the assumption that the decision maker or stakeholder is able to weigh the criteria appropriately when the number of criteria is not too large. As a result, a filtration procedure was required before the developed criteria could be used in the PROMETHEE II method. This was released through the Fuzzy Delphi survey. So, a questionnaire with 15 items was prepared and then distributed by email to the Delphi experts for assessment. Their assessment was based on a range of 0–10, with 10 signifying the most important and 0 the least important. In this study, the procedure described in sub-section 2.3.1 was implemented using the statistical Expert Choice Software (2002).

Table 1. Results of fuzzy Delphi method for Prespa Park

Evaluation criteria	Oi			Ci			Mi*	Zi**	Gi
	O^i_L	O^i_M	O^i_U	C^i_L	C^i_M	C^i_U			
Employment opportunities	8	9.6	10	4	7.2	9	3.2	1	8.4
Touristic itinerary design	9	9.7	10	6	6.9	8	2.8	−1	8.3
Agricultural resources	8	9.5	10	5	6.1	7	3.4	−1	**7.6**
Biodiversity/ native biota	7	9.2	10	3	6.1	7	3.1	0	**7.7**
Cultural events and festivals	9	9.8	10	5	6.9	8	2.9	−1	8.3
Water quality and lakes health	9	9.7	10	5	6.6	8	3.1	−1	8.2
Local product diversity and quality	7	9.1	10	3	6.2	8	2.9	1	**7.5**
Aesthetics/scenic views	9	9.8	10	3	6.3	9	3.5	0	8.1
Spacious guestrooms	9	9.7	10	5	6.3	8	3.4	−1	8.0
Socio-cultural and historic heritage	9	9.9	10	5	6.8	8	3.1	−1	8.4
Participation of residents	9	9.6	10	3	6.3	7	3.3	−2	8.0
Convenience of connected traffic	8	9.4	10	5	6.1	7	3.3	−1	**7.7**
Marketing promotion	7	8.9	10	2	5.4	7	3.5	0	**7.2**
The integrity of the farm facilities	8	9.4	10	5	6.9	8	2.5	0	8.1
Staff service quality and attitude	8	9.6	10	5	6.7	8	2.9	0	8.2
Threshold value (Gi)	8.0								

*$M_i = O^i_M - C^i_M$; **$Z_i = C^i_U - O^i_L$

Source: The author's collected and elaborated survey data for 2017-2018

The threshold value of this study was 8.0. Based on this calculated threshold value, five evaluation criteria (40 percent of the total) with a Gi value (in bold) less than 8.0 were deleted at the end of the fuzzy Delphi survey, leaving ten. These remaining ten criteria provided the basis for the development of the third phase of analysis. The results obtained are shown in Table 1.

Then, during the third phase, the PROMETHEE II procedure was applied to establish weights, compare among them five different tourism development options, and identify the best option based on the aggregation of the criteria. Mareschal (2012) made the software PROMETHEE Version 1.3, which was used to carry out the steps in section 2.3.2.

The results (Table 2) indicated a top ranking for the ecotourism (O3) option, and the other options are ranked in descending order as follows: O2 (agritourism), O4 (cultural tourism), O5 (rural tourism), and lastly, O1 (tourism as usual).

Table 2. PROMETHEE flows and ranking

Outranking flows	Options				
	O1	O2	O3	O4	O5
Φ^+	0.2845	0.3541	0.3572	0.3018	0.2943
Φ^-	0.1764	0.1782	0.1443	0.1893	0.1981
Φ	0.1081	0.1759	0.2129	0.1125	0.1062
Ranking	5	2	1	3	4

Source: The author's collected and elaborated survey data for 2017-2018

The participatory multi-criteria evaluation approach of tourism options in Prespa Park described above highlighted the fact that maintaining the current regime of tourism management was not an appropriate option. The process supports a change to alternative tourism, one component of which is ecotourism.

3.2. Identifying Main Priority Factors Supporting Ecotourism Industry in Prespa Park

The development of sustainable ecotourism is influenced by many factors, which need to be identified. In this second part of the research, the Fuzzy Analytic Hierarchy Process method, coupled with a Fuzzy Delphi survey, was used to identify the priority factors supporting future ecotourism industry development in Prespa Park. The procedure was employed in two phases of analysis.

The objective of Phase I was to establish an initial hierarchical structure representing a consensus of experts' opinions. This initial hierarchical structure (of two levels) was constructed based on the research aim: to identify the main priority factors supporting the development of the ecotourism industry in Prespa Park. On the first level, there were three pillars (parts) of sustainable ecotourism: environmental, economic, and sociocultural. On the second level, there were priority factors that help ecotourism grow. The priority factors were developed through a literature review, consultations with stakeholders and experts, and a second one-day workshop. At the end of the workshop, a preliminary list of 26 priority factors was approved.

In order to achieve consistency among the levels and to make reasonable and effective pairwise comparisons, Saaty (2008) suggested that the number of elements in each level or sub-level should be fewer than seven. So, before the developed priority factors were entered into the second level, they needed a filtration procedure. This was released through the Fuzzy Delphi survey. The same procedure and software used in the previous section for the fuzzy Delphi survey, were also used in this paper section.

Finally, based on the calculated threshold value of 7.5, at the end of the fuzzy Delphi survey, 11 factors (42.3% of the total) were deleted and 15 remained (Table 3). These remaining factors made up the second level of the hierarchical structure of potential priority factors in the ecotourism industry. This provided the basis for the development of the second phase of analysis.

The purpose of Phase II of the analysis was to screen for the 15 priority factors using the Fuzzy Analytic Hierarchy Process. This offered the opportunity to arrive at an objective set of main priority factors. So, at first, based on the list of 15 priority factors, an AHP questionnaire was composed and distributed by email to the Delphi experts for assessment. Each expert offered a possible value for each assessed issue based on Saaty's 1–9 scale. Then, the pair-wise comparison of priority factors was carried out, and a comparison matrix was also prepared. Next, through the fuzzy analytical hierarchy process, the relative weights of the related main ecotourism aspects (pillars) were estimated. Expert Choice Software (2002) was used for analyzing the consistency test and calculating the weighting.

The weighting accuracy was checked by calculating the consistency ratio (*CR*) at their respective levels and in the entire hierarchy (Table 3). The results indicated that the CR values were all < 0.1, and this meets an acceptable deviation scope as recommended by Saaty (1980). This result indicated that previous and subsequent judgments of experts at all levels were consistent. The overall consistency ratio (CR) of the hierarchical

framework was 0.065. Since this value is below 0.1, the inter-level relationships within the hierarchical structure were appropriate, and the consistency of the entire hierarchy was satisfactory.

Finally, using the F-AHP method coupled with the F-DM, the normalized weights of the analyzed priority factors were calculated. Based on the normalized weights, the ranking of priority factors in Prespa Park in descending order, was carried out. The larger the value of the normalized weights, the better the priority factor. Table 3 summarizes the results.

Table 3. Weight analysis of main priority factors in ecotourism industry of Prespa Park

1st level		2nd level		
Ecotourism aspect (pillar)	Normalized weight	Priority factors supporting ecotourism development	Normalized weight	Rank
Environmental	0.323	Conservation of biodiversity, ecosystems, and landscapes	0.107	1
		Encouraging ecologically sustainable practices	0.052	10
		Improving cooperation between ecotourism and nature resources management	0.065	7
		Developing environmentally friendly infrastructure, activities, products and services	0.084	5
		Raising awareness of environmental protection	0.038	14
Economic	0.436	Generating revenue to fund natural resources conservation and management	0.089	4
		Improving job opportunities for local communities	0.078	6
		Production and consumption of locally grown seasonal and organic foods, and local goods, and services	0.101	2
		Stimulating enterprises that are less harmful to the environment	0.048	11
		Promoting of local image and attracting investment	0.041	13
Sociocultural	0.241	Improving social welfare and material, and spiritual life of local people	0.061	9
		Building up local people's confidence, self-esteem, pride, and dignity	0.044	12
		Protecting and developing the heritage values, local culture, customs, and practices	0.098	3
		Participation of local stakeholders in decision-making and involvement in ecotourism industry	0.063	8
		Ensuring local social order and security	0.031	15
Consistency ratio (CR) = 0.065 < 0.1				

Source: The author's collected and elaborated survey data for 2017-2018

In 1961, Daniel had the idea that most industries normally have three to six critical factors that decide their success or failure. According to Daniel's (1961) point of view, this study identified in descendent order the following six main priority factors (with the weighted values given in brackets): "Conservation of biodiversity, ecosystems, and landscapes" (0.107), "Production and consumption of locally grown seasonal and organic foods, and local goods and services" (0.101); "Protecting and developing the heritage values, local culture, customs, and practices" (0.098); "Generating revenue to fund natural resource conservation and management" (0.089), "Developing environmentally friendly infrastructure, activities, products, and services" (0.084); and "Improving job opportunities for local communities" (0.078).

These main priority factors represent sustainable ways of conserving and protecting the natural environment and cultural heritage, while at the same time stimulating economic development and the social well-being of the local communities. With the right management and combined with the active involvement of all local communities, there are reasons why ecotourism can be developed in Prespa Park.

This section of the paper showed that using the fuzzy analytical hierarchy process, coupled with the fuzzy Delphi survey, in the concrete conditions of Prespa Park was an effective way for developing and then, identifying the main environmental, economic, and sociocultural priority factors supporting the development of the ecotourism industry, which can be used in the future as strategies for ecotourism development and management in the study and similar other areas.

Conclusions

The research was carried out in two parts. In the first part, the PROMETHEE II outranking method coupled with a fuzzy Delphi survey was used to rank options (types of tourism) for tourism development in Prespa Park. To do that, a finite set of possible options and a set of evaluation criteria, were needed, which were identified through consultations with local stakeholders and authorities, a panel of experts, and a one-day workshop. For the developed criteria, a filtration procedure was needed, which was realized by the fuzzy Delphi method. Finally, the PROMETHEE II software was applied to establish the net outranking flows and compare the tourism options between them. The result showed that ecotourism was the best option, followed by agritourism, cultural tourism, rural tourism, and lastly, tourism as usual.

This study was also specifically aimed at examining the priority factors that enable ecotourism development in Prespa Park. For this reason, in the second part of the research, a hierarchical structure of two levels was first constructed. In the 1st level, three aspects (pillars) of sustainable ecotourism were included, and in the 2nd level, priority factors supporting ecotourism development were included. The ecotourism aspects and priority factors were selected through a literature review, consultations with stakeholders and experts, and a second one-day workshop. Then, using the fuzzy Delphi survey, a filtration procedure for priority factors was employed. Using the F-AHP method coupled with the F-DM, the normalized weights of the analyzed ecotourism aspects and priority factors were calculated. Finally, based on Daniel's (1961) point of view and the values of normalized weights, six main priority factors were identified. The findings revealed that two of them were related to the environment, three to the economy, and one to the sociocultural aspect. They demonstrated how the outcomes of ecotourism are linked to the economic, environmental, and sociocultural pillars that drive sustainable development.

This study provides a promising framework for handling the complex ecotourism decision-making problem. In view of the fact that the ecotourism industry is still in its infancy in Prespa Park, the results obtained can enable decision makers and planners to develop integrated policies, measures, and strategies on where to concentrate efforts for ecotourism development in the area over the short and/or long term and help the administrators and authorities of ecotourism enterprises attract tourists and create profitability.

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Declaration of Competing Interest

The author declares that she have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Declaration of Use of Generative AI and AI-Assisted Technologies

The author declares that she has not used generative AI and AI-assisted technologies during the preparation of this work.

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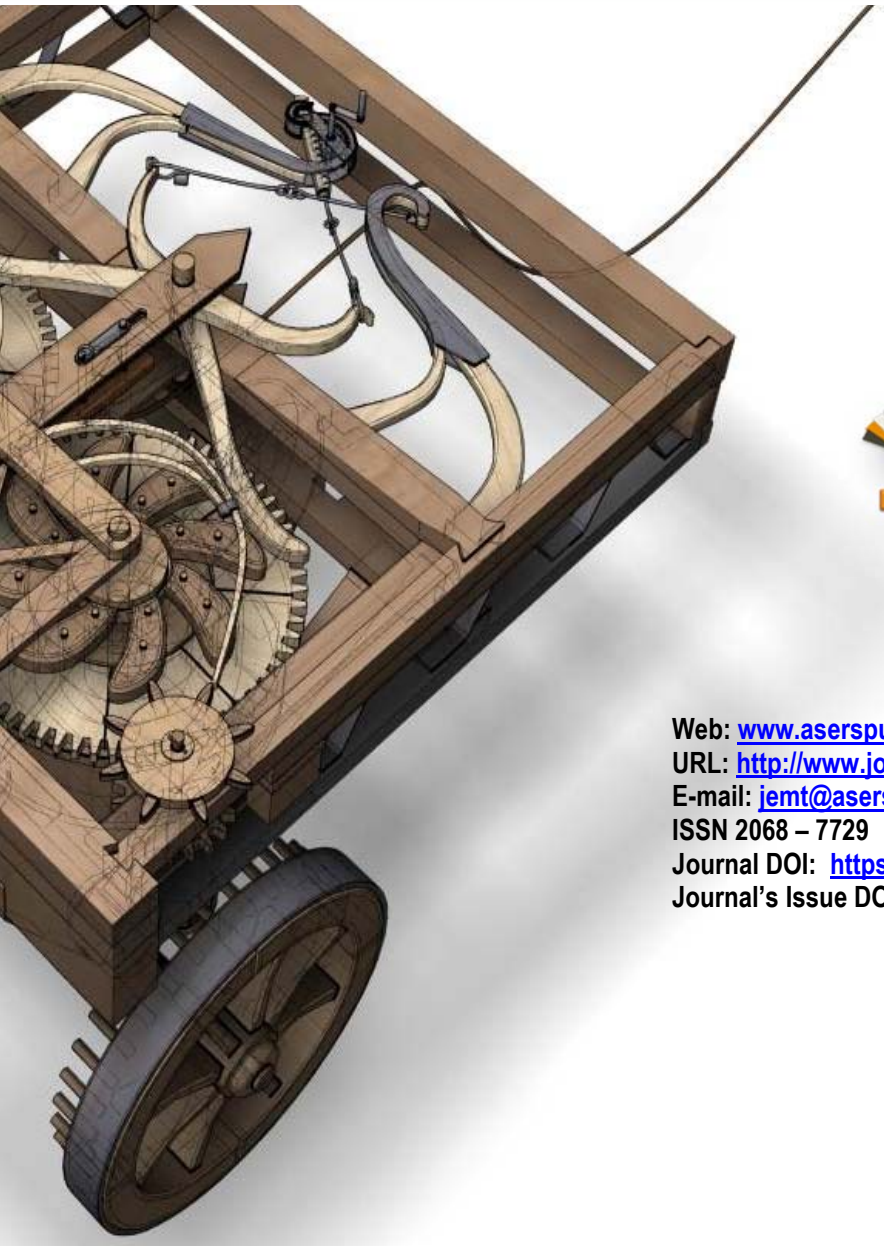

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