Indicators for sustainable tourism management: a case study using AHP and Delphi to evaluate mountainous areas in Greece

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Abstract: Indicators are identified as a modern tool for measuring and establishing the quality of goods such as tourism and leisure in an area. For this reason, that indicator systems have been introduced across Europe and almost all over the world, aiming to present thematic guidelines by assessing the current situation and analysing the distinct characteristics that provide the prospects for sustainable development. The presentation of such a system of tourism sustainability indicators for Greece was the purpose of introducing this study. The adopted system is expected to provide a high level of detail and to present diversity and new dimensions for tourism plans and studies. The data from the present study ultimately highlights the importance of critical factors and the contribution of a system of indicators to a country.

Keywords: rural development; inSTORM; multi-criteria decision-making analysis; MCDMA; analytic hierarchy process; AHP; Delphi.

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1 Introduction

Leisure activities and tourism are terms that are related to the development of the Greek State in general as well as its developmental policy, while they can be implemented as part of the regional development and evaluation of the factors that contribute to the planning of the area (Soutsas et al., 2006). The Prefectures of Greece comprise different criteria and dynamics, which contribute to the attendance of visitors. It is ultimately through such criteria that the development of a spatial framework and the design of a multifaceted, regional policy with a multidimensional synthesis of economic, social, environmental, cultural and ecological parameters affecting tourism can take place (Polyzos and Arabazis, 2008a, 2008b). It should be noted that in several countries around the world, frameworks for the evaluation of tourism with a spatial and developmental character have been implemented (Curry and Luiz, 1992), acknowledging the fact that tourism presents a multi-thematic plan of an area with an urban character (Xiao, 2013).

After all, it cannot be ignored that environmental resources comprise, according to the United Nations Agenda 2030 (United Nations, 2015; United Nations Sustainable Development, 1992), which is a memorandum of action for human and global sustainability, one of the goals of sustainable development at all levels of developmental growth, aiming to protect the planet from Climate change and other phenomena (United Nations General Assembly, 2015; United Nations Environment Assembly of the United Nations Environment Program, 2016; EU, 2017, 2010).

What is more, according to the United Nations Agenda 2030 of the United Nations, sustainable tourism development presents the major focus of many institutions including governments as it is believed to tackle a plethora of phenomena such as human equality, human rights, poverty eradication, sustainable production of goods, decent working conditions etc. at the international level (Economic and Social Council United Nations, 2017; UNEP, 2012; WTO, 2016).

Thus, in order for Greece to comply with the Union's guidelines and directives, it is imperative to create a portfolio of indicators for tourism with landscape systems as well as spatial analysis entities of the tourism value of leisure and demand. That is, it is expected to divide the country into levels of tourism values based on multiple criteria such as environment, safety, health, entertainment, benefits, economy. After all, spatial planning and sustainable development fulfil a legislative decree for the Greek State as defined by the National Legislation. In turn, a modification of the existing legal framework in Greece (Greek Ministry of Environment Energy and Climate Change, 2013) would be a promising scenario for tourism interventions, which contributes to the economy and the GDP at the national and international level.

The research aims to develop a system of tourism sustainability indicators for Greece with the aim to establish strategies that can create models for other areas as well. The ultimate goal of the present research is to institutionalise of a new evaluation tool for tourism to be used not only for the future governance of the tourism product but also for the adoption of intervention policies in recreation areas and the environment.

The originality of this research lies in the creation of a coherent design using financial valuation methods and tools. The implementation of these tools takes place in the context of sustainable and balanced development, to protect the environment, besides promoting the economic development and the prosperity of rural areas. The research results are an essential tool for highlighting the particularities and comparative advantages of each area examined to plan sustainable tourism development strategically.

The added value the research seeks to establish includes:

a new market trends

b a single strategic plan and program for spas and ski resorts at the international level (special poles of tourism)

c modern dynamics of areas with the above specific characteristics

d new policies and guidelines for mountains and regions.

Additionally, the special conditions and the characteristics of the area, which are influenced by external climatic factors of the time, functioned and contributed as a framework for better planning of the work.

The primary purpose of this research is the economic evaluation and importance of the natural environment for the special and alternative forms of tourism, which should be developed according to the dynamic situation of the area. The ultimate purpose of the research is the use of the results from the valuation studies for:

a better organisation of the tourist product in the study area, based on the principles of sustainable tourism development and the directions of spatial planning (Greek Ministry of Environment Energy and Climate Change, 2013)

b the development of appropriate techniques for managing and protecting the natural environment.

Finally, the present research is related to the planning and presentation of new information and knowledge in the better design, development and implementation of methods and techniques for managing and protecting the natural environment, using modern means to solve problems concerning field research. The study reports on the findings which focus on:

a the promotion of new scientific knowledge and research

b the compatibility of the information provided with the international developments in the particular research field and the prospective research directions

c the provision of detail concerning the specific developmental needs of the country and its particular problems

d the production of modern competitive measures in the single international transnational union with an impact on the modern European market.

The knowledge obtained is likely to provide the foundation and basis for acknowledged or expected, validated contemporary problems of science and influence the current or future state of such areas identifying it as a step towards pioneering research.

The paper is organised as follows: In Section 1, introduction and the research aims are explained. In Section 2, a literature review at the international level is provided. The research methodology is presented in Section 3 and the research area in Section 4. Section 5 presents the results, Section 6 is the discussion and Section 7 is the conclusions of the research.

2 Spatial analysis of tourism at the international level

2.1 A literature review of spatial planning using the AHP

The analytic hierarchy process (AHP) is a multi-criteria decision-making analysis (MCDMA) tool and an operation research methodology, which provides the highest level of detail in a spatial sustainability background while taking into account indicators and strategy criteria depending on the research field under consideration. In recent years, indicators as a multidimensional axis can deliver sustainability and sustainability through their measurement (Curry and Luiz, 1992). The development of the particular methodology is also applicable to the tourism industry around the world aiming to highlight spatial weighting techniques in the environment, the presentation of the strengths and weaknesses of each region, the sustainability performance, and the appropriate choice of scenario and strategy. In this way, regional disparities can be avoided, and the development of opportunities and new actions for sustainable development can be promoted (Shim, 1989). The implications of this methodology, deriving from mathematical equations and formulas, provide the weighing, loads, and priorities needed to be given to spatial planning to achieve a sustainable outcome (Srdjevic and Srdjevic, 2011). The particular methodology is used worldwide aiming to create the necessary impact background to bring about the sustainable effectiveness of resources ultimately. Such a rating process and form of tourism valuation was developed by Carrillo and Jorge (2017) in Spain through the creation and concentration of sustainability indicators with the aim to present the sustainability levels through three dimensions of indicators social, economic, and environmental.

From the evaluation of green and ecological technologies, a multi-criteria decision-making system was developed to investigate climate change and the installation of special equipment in existing tourist buildings through the research of Si et al. (2016). The impacts were examined at four dichotomous levels with different variables from which energy savings management options and a system for assessing the impact of renewable energy sources emerged. A decision-making system of multiple criteria was also presented by Vasileiou et al. (2017) with reference to wind and tidal energy in marine areas of Greece, involving the construction of thematic maps and the use of three types of criteria revealing the developmental results for the Aegean and the tourism which is likely to be developed there. According to Srdjevic and Srdjevic (2011), to produce a different form of energy, such as electricity, alternative proposals and solutions identified were irrigation, recreation, flood protection, water supply, reservoirs, and river traffic.

Table 1 Case studies of implementing AHP at the international level

Study	*Data*	*Country*	*Methodology*	*Variables*	*Major findings*
Wolfslehner et al. (2005)	Decision makers	Austria	AHP-ANP-Delphi	Management of forest resources	Presentation of differences in methods for decision making concerning forest management
Kaya and Kahraman (2011)	Metropolitan plan	Turkey	AHP	Water, air economy, soil, etc.	Decision making on assessing environmental impact
Kallas et al. (2011)	Consumers, restaurants	Spain	AHP vs. choice experiment	Origin, brand, price, socio-economic and demographic variables, etc.	Comparative presentation of consumer preferences based on business research methods and environmental economics
Samari et al. (2012)	Residents	Iran	AHP	Technology, management, participation, etc.	Public-private sector partnership brings positive effects on forestry expansion and environmental resource management
Gao and Hailu (2012)	Quantitative and qualitative data	Australia	AHP	Biological, economic and policy criteria	Presentation of a model in coastal ecosystems by simulating the recreational behavior of fishermen in relation to fishing
Latinopoulos and Vagiona (2013)	Stakeholders	Greece	AHP	Spread of tourism, visitor satisfaction, and environmental impact, etc.	Sustainable design of the protected area of Lake Kerkini
Chou et al. (2013)	Professionals and government data	Taiwan	AHP and regression model	Constructions, bridges, environmental, spatial criteria, plans, price analysis, etc.	Presentation of a strategic planning model for evaluating the efficiency of a construction project
Feng et al. (2014)	Government data	China	AHP	Distance (from the port, swimming area, special recreational interest, etc.) Environmental and social criteria	Environmental impact on coastal ecosystems
Mosadeghi et al. (2015)	Programming management scenarios (local and regional plan data)	Australia	AHP and application of quantitative analysis methods	Land use categories, residential areas, industries, recreation	Development of a model of urban planning and spatial decision making and depiction of spatial areas, alternative scenarios and problem-solving

Table 1 Case studies of implementing AHP at the international level (continued)

Study	*Data*	*Country*	*Methodology*	*Variables*	*Major findings*
Mishra et al. (2015)	Environmental resources (forest resources, rich biodiversity, wildlife, and rare flora) tourism master plan data	India	AHP and GIS model	Slope, exposure, geological background, road network and so on	Selection and identification of the most suitable place for alternative forms of agricultural activities and rural tourism (mapping)
Lee and Lee (2015)	Experts	Korea	AHP	Industries, trade, property status, investments in technology, policy	Strategies for development and prioritising in tourism
Wang et al. (2016)	Visitors	China	AHP	A website of a recreation area, wifi, availability of a mobile application for payment, tourist tour map, online reservations, etc.	information systems, predictions, virtual sights, online marketing and e-commerce, security, and sightseeing in an area are the key factors in tourism evaluation and the attractiveness of a tourist site along with the tourist preferences of visitors
Myronidis et al. (2016)	Meteorogical data	Cyprus	AHP and GIS model	Networks, soils, geology, watersheds, altitude, slope, soil, roads, etc.	Presentation of soil protection policies
Carrillo and Jorge (2017)	Levels through dimensions of data (social, economic and environmental)	Spain	AHP	Tourism costs/inhabitant in euros, hotel occupancy rates, employment rates in the tourism sector, crime, accidents at work, water consumption/inhabitant, waste management, energy consumption, greenhouse gas emissions, etc.	Tourism has been found to play a special role in the economies of regional spatial development
Vasileiou et al. (2017)	Economic, social, technical background	Greece	AHP and GIS model	Wind velocity, wave energy, water depth, distance, etc.	Developmental results for the Aegean and the Greek tourism

Wang et al. (2016) on their part, examined the attractiveness of a tourist site along with the tourist preferences of visitors. In the evaluation, which was carried out using AHP, the strengths and weaknesses of traction tourism were investigated using a sample of visitors at a zoo in China. The results of the study revealed that information systems, predictions, virtual sights, online marketing and e-commerce, security, and sightseeing in an area are the key factors in tourism evaluation. With reference to spatial decision making through multiple criteria and the application of AHP, Mosadeghi et al. (2015) developed an urban planning model. After the application of quantitative analysis methods, the researchers consider that the land use planning process can take place based on programming management scenarios; The findings of the study being spatial decision-making and the depiction of spatial areas, alternative scenarios and problem-solving. For the selection and identification of the most suitable place for alternative forms of agricultural activities and mapping, Mishra et al. (2015) used AHP in the context of environmental resources (forest resources, rich biodiversity, wildlife, and rare flora) in an area of the Himalayas.

Lee and Lee (2015) focusing on industry and trade and prioritising the policy and the tourism product, worked on developing and prioritising strategies which need to take place from the Korean tourism perspective. Feng et al. (2014) researched into coastal ecosystems intending to their restoration after an environmental disaster using an unclear AHP in a coastal area of China; the results clearly demonstrated that the worst disasters come from pollution by ships, resulting in water contamination and sediment erosion.

Concerning leisure activities, it was shown that the hierarchy presents quantitative and qualitative data of high accuracy after pairwise comparisons of a series of characteristics. In particular, Gao and Hailu (2012) report that in coral reefs areas, recreation and fishing must take place wisely and preserve natural resources.

In Greece, Latinopoulos and Vagiona (2013) presented tourism development in Lake Kerkini through a sustainability indicator measurement approach using criteria that ensure the harmonic coexistence of man and ecosystem within the frame of tourist visitation of the protected area under consideration.

In the long run, design is also presented by economic valuation methods such as the choice experiment (CE), which presents scenarios of spatial intervention and development of a region. A study conducted by Kallas et al. (2011) is in contrast with sustainability indicators of the AHP so as to obtain assimilation of the market and product preferences. Such preferences of a visitor or consumer can be influenced by how they can get to the place of purchase – exploitation or make use of the physical characteristics of the land as well as its uses. A further study conducted by Myronidis et al. (2016) assessed through a geo-basis of hydrological basins, road networks and geology aiming to develop a reflective model of protection of mountainous regions by creating spatial zones of sensitivity. In addition, focusing on river basins to ensure their rational management, Yavuz and Baycan (2013) conducted a research study which combined both SWOT analysis and AHP as decision-making tools. A combination of the SWOT analysis and AHP was also used by Kajanus et al. (2012) with the aim to develop a strategic management system for the natural environment and natural resources. Graphic presentations and interpretations of the above combination of tools were also presented by Kurttila et al. (2000), who introduced a new hybrid model for forest resources and the priority that should be given to them at a global level. A similar approach was also recorded by Masozera et al. (2006) who aimed to assess the appropriate choice of forest management by policy makers. Another combinational method of Regression Analysis

and AHP was identified by Chou et al. (2013), with the study expanding around the development of tourism projects in Taiwan by exploring the costs, benefits, losses, bids, and potential risks of programs.

In Istanbul, Turkey, metropolitan areas were examined using the AHP to create industrial areas in the context of sustainable environmental management by employing major criteria such as the environment, the society, and the economy (Kaya and Kahraman, 2011). Environmental resources, and more specifically forests, were investigated by Wolfslehner et al. (2005) through the implementation of the 43 indicators of the AHP-ANP-Delphi method, which were identified as part of a national project conducted for the sustainable management and development of a new environmental policy. Samari et al. (2012) implemented a model of spatial change and analysis of forestry shifting with specific project plans that included beneficiaries, partnerships and other bodies, in a region of the Iran.

Considering all the studies presented and analysed above, it proves that indicators are a very useful tool for spatial planning analysis of a tourist destination with high expectations for future of sustainable development. The classification of natural resources, renewable natural resources, institutional and state indicators in such studies influence the results and interpretations of the research studies as well as the design of the areas under consideration, having as their outcome the development of a coherent tourism plan and a spatial planning analysis.

The above analysis of the international literature with reference to AHP follows in tabular form. The categorisation has taken place taking into account the following criteria: study, data, country, methods, variables, and findings.

2.2 A literature review of the Delphi spatial planning method

Delphi spatial planning is a method of market research and marketing strategy research, which has the potential to present the evolution of an area by developing a prediction and impact matrix. The effects that can occur by following the relevant technique can be assimilated and quantified, creating a new spatial background for analysis that results from and can be used as a guide for the future of the corresponding research fields. It should be noted that the use of this multi-criteria method, can help identify different social commodities of reality in line with the requirements of research and science progress (Landeta, 2006).

What is more, Landeta et al. (2008) report on the credibility of the method and the very ambitious results that arise, indicating an innovative use of the information and data in addition to presenting the social and economic advantages for an area. The Delphi spatial planning method has been examined and applied throughout the world according to the existing literature in various subject fields with absolute application to tourism (Gupta and Clarke, 1996). In the field of research in tourism, the Delphi spatial planning method can be efficiently implemented by creating a sustainable leisure management plan with the product offered by a company based on environmental, social, economic, and other considerations being of high quality. After all, recreation is a product and phenomenon that offers multiple benefits to human life and can be managed in different ways that emerge from policy-management-visitor relationships, according to Elands and Marwijk (2012). Besides, it presents a particularly interesting matter of discussion and strategic planning in world tourism committees around the world (Faulkner and Valerio, 1995). In modelling forecasts of tourism demand reviewing the relevant literature, Song

and Li, (2008) proceeded to use econometric models and time series to examine the literature at all levels (statistical implementation model, country of research, topic, publication, publication year, etc.). A similar analysis with empirical results was also made by Witt and Witt (1995). Since the early 1990s, researchers have begun to be concerned with climate change in conjunction with tourism engaging in field studies and interviews such as the one introduced by Loe (1995) who explored and unfolded complex policy questions using the Delphi spatial planning method.

Tourist routes in rural areas also comprise a special aspect of attracting visitors, resulting in the economic growth and the prosperity of rural areas through the pooling of leisure activities for the proper exploitation of natural and cultural wealth. In an area of South Africa, experts were asked to respond to customised questionnaire on the performance and spatial configuration of the projects to be implemented in order to bring about sustainable tourism development in rural areas; the results showed an unprecedented dream of creating a New African area with tourism industry and wealth (Briedenhann and Wickens, 2004). A model of a tourist destination was also developed by Chang et al. (2008) concerning Asian regions, focusing on travel and transit airports and the companies that can manage them with the tool being fully exploited by other contractors of such projects. Also, focusing on industrial regeneration, Gracht and Darkow (2010) emphasised in their research the development of programs with political, legal, economic, social, cultural, technological, and industrial structures, which should serve the integrity of the services provided.

In Canada, and a river basin used as the survey area, and respondents were asked to respond through an online questionnaire platform to water quality management scenarios in the context of climate change. The results of this research initiated the launch of a new policy dialogue on environmental development and contributed to the introduction of new legislation (Coleman et al., 2017). An evaluation of ecosystems goods and services using the methodology under consideration was also undertaken by Curtis (2004), he incorporated economic theory and valuation, multiple analysis criteria, and environmental ecosystem characteristics with the aim of creating a conceptual model for Australia, concerning the sustainable management and development of resources for the creation of landscape-fitting systems for humans. In Slovenia, key issues were presented for the proper management of the information systems of the country through the investigation of factors which affect businesses (Dekleva and Zupančič, 1996).

Spatial exposure analysis and programming through a modification and variation of the Delphi spatial planning were suggested by Zio and Pacinelli (2011) to consult an appropriate school building site in Rome, Italy. They used satellite images and selecting specific mileage and land use, such as amusement parks and archaeological sites (spatial Delphi), so as to record the surveying and spatial planning views of the sample. Within the frame of sustainable tourism development, Domínguez-Gómez and González-Gómez, (2017) explored the perceptions of interest in recreation and golf in a region of Spain; they initiated a new tourism planning based on development and funding programs which strategy indicated that various levels of networks (environmental, leisure, tourism infrastructure, etc.) can be developed to promote and diffuse the culture and identity of an area. Developing and evaluating sustainable tourism development at the local level was the goal of Torres-Delgado and Palomeque (2014) to produce new scientific knowledge using sustainability indicators for Spain through a funded project. García-Melón et al. (2012) adopted the combined, Delphi and analytic network process (ANP) which were applied for the assessment of Sustainable Tourism Development and National Parks and

their management; They created a natural, recreational design in Venezuela that did not exist for identical areas using specific strategies, and in this way creating recreational resorts with ecological, transport and environmentally friendly development criteria. Environmental impacts on tourism were also examined by Green et al. (1990) and Wheeller et al. (1990) and especially the impact on regions in order to develop a new methodology for evaluating the environmental and economic value and importance of tourism for natural resources.

Medical tourism was reviewed by Jaapar et al. (2017) to measure tourist profiles, guest satisfaction, and the motivation of dentists – tourists to travel around the world. The presentation of tourist websites on the internet was evaluated and shaped by Kardaras et al. (2013) using the fuzzy Delphi to identify the needs of their target users. In addition, Kaufmann (2016) reported on the application of multivariate factor analysis and the Delphi method to build a spatial background for Dalmatia. The results showed that factorial analysis can initially establish a background in the light of spatial planning since there may ultimately be recognition of key spatial growth scenarios for the future with reference to tourism, the economy, the population, and households. Kaynak and Macaulay (1984) reported on the development of Delphi panels and the use of a research tool to collect information for the construction of a regional database to measure the dynamic tourism situation in a Nova Scotia research area. In Taiwan, concerning the field of tourism and the implementation of the multicriteria method under consideration, a comprehensive tourism development plan was presented by Kuo et al. (2005) which considered three types of impacts: using resources, emissions, and modification of cultural heritage and identity. Nahuelhual et al. (2013) investigated eco-tourism as a cultural ecosystem service with cartographic backgrounds in an area in southern Chile. The spatial issue of recreation presents a significant challenge for researchers, leading to the imperative need to design a methodological framework with the following components: recreation-ecosystem-culture.

Lee et al. (2008) recorded tourist and traffic forecasts, using quantitative and qualitative methods for estimating visitation frequency of a tourist area in Korea using Delphi-CVM-ARIMA models. The particular use of the combination of methods of economic valuation, operational research, and artificial intelligence was identified as efficient in leading to results for a region with the experience of the managers-designers and professionals being able to eliminate any existing policy, environmental, economic challenges. The development of a system of sustainability indicators with spatial dimension and impact design was conducted in the area under consideration by Miller (2001) who aimed at counting the variation of tourism at the level of visitors, businesses, and resorts with a range and influence of sustainable development. The development of sustainability indicators in the context of urban sustainability was studied by Musa et al. (2015), who used the Delphi system in order to bring about the well-being of residents living in urban areas of Malaysia. Strategic planning was also implemented by Párraga et al. (2014), who used Delphi and SWOT analysis, to reference the new configuration and scheduling of Latin American Ports, which are gateways to markets, economy, and tourist traffic from all over the world and provide market opportunities.

Table 2 Case studies of implementing Delphi method at the international level

Study	*Data*	*Country*	*Methodology*	*Variables*	*Major findings*
Kaynak and Macaulay (1984)	Experts	Canada	Delphi	Hotels, motels, resorts, gift shops, fast-food outlets, duty free shops, museums, theme parks, etc.	Presentation of developmental scenarios and goals for sustainable tourism
Dekleva and Zupančič (1996)	Businesses	Slovenia	Delphi	Corporate impact criteria	Developing standards for implementing results in Central and Eastern European countries
Briedenhann and Wickens (2004)	Tourism experts	Southern Africa	Delphi	Environmental criteria, facilities, activities, routes	New African Tourism Dream
Curtis (2004)	Experts	Australia	Delphi	Water regulation, erosion and biological control, soil, biodiversity, recreation, etc.	Economic valuation of the total value of goods and services of an ecosystem
Kuo et al. (2005)	Experts	Taiwan	Delphi	Air, water, soil, noise, forest resources, cultural heritage, biotic resources, ecosystems, etc.	Evaluation of policy and variation with the presentation of a system of indicators for the future
Lee et al. (2008)	Visitors and experts	Korea	AHP-Delphi-CVM	Willingness to visit (WTV), socioeconomic characteristics, region, population	Indicators contribute to predictions for travel and visits to an area
Chang et al. (2008)	Airport data	Taiwan and China	Delphi	Trips, costs, distance, infrastructures, navigation aids, etc.	The demand for a trip varies based on the qualitative and quantitative characteristics of an airport
Zio and Pacinelli (2011)	Experts	Italy	Delphi	Maps, land use, kilometre distance, etc.	Presentation of scenarios for selection and management of an area in cases of environmental disasters
García-Melón et al. (2012)	Stakeholders, experts, managers	Venezuela	Delphi and ANP	Water quality, landscape beauty, biodiversity, transport, ecoefficient holiday villages, environmentally friendly leisure activities, etc.	Combination methods of business research bring about and achieve sustainable tourism information in an area
Nahuelhual et al. (2013)	Experts	Chile	AHP and Delphi	Leisure, ecosystem criteria shaped in a GIS model	Presentation of a landscape scale for tourism

Table 2 Case studies of implementing Delphi method at the international level (continued)

Study	*Data*	*Country*	*Methodology*	*Variables*	*Major findings*
Torres-Delgado and Palomeque (2014)	Experts	Spain	Delphi	Population, demand, offers, facilities, energy, water, land uses, roads, pollution, etc.	Developing a system of sustainability indicators for tourism with environmental, social, and economic dimensions
Párraga et al. (2014)	Experts	Latin America	Delphi and SWOT	Port facilities, location, road connections, transfer, etc.	Location can influence and be positive factors in decision making
Musa et al. (2015)	Experts	Malaysia	Delphi	Environment, air/water pollution, biodiversity, climate change, urban design, etc.	Air pollution significantly affects and affects the environmental well-being of the area
Kaufman (2016)	Experts	Croatia	Delphi and factor analysis	Population, demographic dynamics, socio-economic structure, characteristics of tourism development, etc.	Growth forecast models by 2031 show larger age groups moving to different areas and population decline comprising a major issue
Coleman et al. (2017)	Stakeholders and experts	New York	Delphi	Transport, forestry, energy, land use, agriculture, river management, etc.	Validation of interventions for water protection in the context of climate change
Domínguez-Gómez and González-Gómez (2017)	Stakeholders	Spain	Delphi	Recreation criteria	Creating a new identity of an area by combining environmental and tourist networks
Jaapar et al. (2017)	Tourists	Malaysian	Delphi and factor analysis	Access to dental care information, quality, cost savings, cultural similarity, supporting services, purpose of visit, etc.	Dental science can be used as a factor in creating tourism in an area
Zhang (2017)	Experts	China	ANP and Delphi	Economy, environment, society	Presentation of a system of sustainability indicators for the adaptation of tourism to environmental phenomena and chemical compounds

A similar sequence was also applied by Tavana et al. (2012) regarding the Caspian Sea and its strategic planning with factors of research, technology, environment, culture, economy, and geography among others. Multiple stages and perceptions of the respondents were explored in the study conducted by Tolkach and King (2015), who used a qualitative analysis approach to develop tourism and empower businesses to meet challenges, tackle inexperience, inadequacy, and lack of knowledge (focusing on marketing and funding) to support rural areas. A similar approach was that of Tolley et al. (2001), who aimed to capture the future of Europe through indicator scenarios using questionnaires. In Tibet, using neural networks and linear equations and models, Zhang et al. (2015) evaluated the sustainability of tourism levels in a new emerging tourist destination, using a genetic algorithm simulating the evolution of sustainability and future viability exploiting different strategies and scripts. In a more recent study by Zhang (2017), evaluation of regional tourism strategies was conducted concerning low carbon dioxide emissions using ANP which is an AHP variant and fuzzy Delphi.

The above analysis of the international literature with reference to Delphi method follows in tabular form. The categorisation has taken place taking into account the following criteria: study, data, country, methods, variables, and findings.

3 Methodology

3.1 Sample

The sample size for the population of the prefecture of Pella was estimated based on the types of simple random sampling (Zerva et al., 2018; Tsiantikoudis et al., 2013). Since the variables refer to ratios, the total sample size is given by the formula:

$$n = t^2 p(1-p) / e^2 \quad (1)$$

where

p ratio estimation.

T the value of the student distribution for probability $(1 - \varphi) = 0.95$ and $n - 1$ degrees of freedom.

To estimate the sample the size, a pre-sampling size of 50 people was required. The sex variable showed the largest sample size, with a ratio of:

- 46% men
- 54% women

$p = 0.54$ so $1 - p = 0.46$ and therefore, the sample size is: $n = t^2 p (1 - p) / e^2 = 1.96\ 2 * 0.54 * (1 - 0.54) / 0.05\ 2 = 381.61$.

In effect, the sample size is 382 people and is representative of the general socio-economic conditions of the local population.

3.2 Sustainability indicators

In this section we present the evaluation of impact (AHP) in pairs along with the analysis of effect (Delphi) by encompassing the variables used with a consistency of significance of incidence more or less (Srdjevic and Srdjevic, 2011; Chen et al., 2013; Latinopoulos and Vagiona, 2013; Srdjevic et al., 2017; Vasileiou et al., 2017):

a Larger significant impact has values of: 1-3-5-7-9 (higher significance): 1 = equal incidence, 3 = weak effect and 9 = absolute prevalence of incidence when the evaluation takes place bottom up.

b Less significant impact is given by: 1-1/3-1/5-1/7-1/9 (lower significance) when the evaluation takes place top down.

Table 3 Evaluation example of AHP matrix framework

in	*in1*	*in2*	*...*	*...*	*inv*
in1	*1*	3	5	7	9
in2	1/3	*1*			
…	1/5		*1*		
…	1/7			*1*	
inv	1/9				*1*

For the evaluation of the above, we constructed the following:

c Vulnerability indicators showing whether there will be endurance and resistance in the scenario, with values: (–1, 0, +1).

d Insight indicators reflecting the respondent's sense of how the scenario should be applied in the near future, with values: (0 and +1).

e Objective crisis indicators referring to the confidence interval of the survey, with values: (–1, 0, +1).

f Sustainability indicators referring to the sustainable application of the scenario over time, with values: (–1, 0, +1).

Finally, CI and CR and λmax were estimated according to the following formulas (Gao and Hailu, 2012; Etongo et al., 2018):

$$CI = (\lambda \max - n)/(n-1) \tag{2}$$

$$CR = CI / RI \tag{3}$$

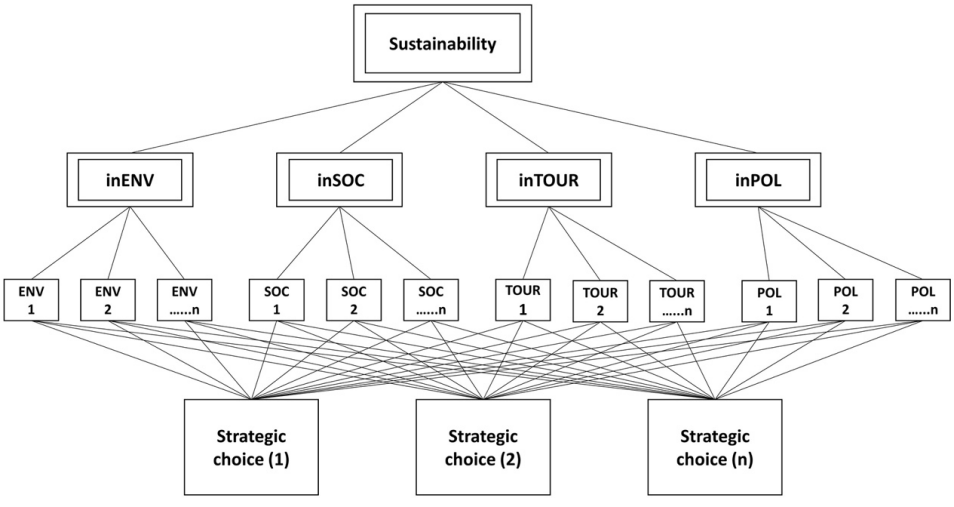
It is worth mentioning that other methods of multicriteria analysis have been rejected (such as the PROMETHEE group, the ELECTRE Group, the DEA method and linear programming) as they are mainly applied according to the available literature with the financial data and the quantitative data that they deal with. TOPSIS was also rejected on the grounds that it is the MCDM method used for the formation and mechanism of food production, supply and logistics of the food market, and not for tourism and sustainable tourism development, and economics of the environment, and values and preferences (Arabatzis and Grigoroudis, 2010; Arabatzis et al., 2010; Velasquez and Hester, 2013; Lima et al., 2014; Vlontzos et al., 2014). Finally, for the influence matrices, the positive

and negative effects scale (Jose, 1996) was used with ascending and descending order respectively of panel values of (high negative effect) –4, –3, –2, –1, 0 (no effect) and (high positive effect) +4, +3, +2, +1 (Siomkos, 2004). The decision-making system implemented could not have been completed without the extraction of the indicators for tourism, which paved the way for significant benefits to users of the region taking into consideration environmental, social, and economic problems. After all, land use transformations in a spatial framework of analysis encompass the contribution and presence of human activity as a whole.

The variables and analysis criteria used for the implementation of the Delphi method in the study are presented the following table with the corresponding indicators.

Figure 1 shows the analytical scopes for the Sustainability indicators for tourism at all levels, which were applied in order to produce the best intervention scenarios.

Figure 1 A decision-making system of sustainability indicators



Coding of DSS

Level 1	Sustainability.
Level 2	inENV, inSOC, inTOUR, inPOL.
Level 3	Environmental indicators, socio-economic indicators, tourism indicators, policy indicators.
Level4	(1, 2, …, n) choice strategy.
Strategy_1	Creating jobs and employment.
Strategy_2	Absorption and increase of investments.
Strategy_3	Reconstruction of cultural and natural heritage identity.
Strategy_4	Land usage and sustainable management of environmental resources.
Strategy_5	Planning and landscaping.

Strategy_6 Development of projects and programs.

Strategy_7 Programming of recreational values.

Table 4 Variables – criteria of spatial Delphi panels (matrix)

Indicator	*Sub-criterion*	*Variables*
Environmental indicators	Altitude, soil, slope/aspect, quality, land use, paths-routes, forestry species	0–500 m, 501–1,000 m, 1,001–1,500 m, 1,501–2,000 m, 2,001–2,500 m, 2,501–3,000 m, Alfisols, entisols, inceptisols, mollisols, vertisols, forests, partly forest and shrub roof, agricultural areas-crops, pastures, barren area, urban green, agricultural use, natura 2000 areas, houses, recreation, mountain settlements, recreational routes, educational-thematic paths, cycling trails, trails accessible to the disabled, living paths, Abies, Pinus nigra, Pinus sylvestris, Fagus, Quercus, Castanea.
Socio-economic indicators	Poverty and social exclusion, low intensity population, high intensity population, demographic trend	Free courses-education support, enhancement-poor households, enhancement-rich households.
Tourism indicators	Visitor typology (cluster analysis), recreational activities (factor analysis), recreation value (travel cost method-TCM), internal competition, external competition, domestic cooperation, international cooperation, infrastructure, road network	Green tourists with a motivation for the mountain and the forest, tourists looking for spa tourism and health reasons, tourists of alternative adventure, activities related to water resources in the countryside, the flora and fauna, activities related to the atmosphere and climatic conditions, recreational activities related to forest resources, activities related to cultural resources, activities related to grassland, land use and ground cover, recreational activities related to the therapeutic natural resource, extreme leisure activities, low-risk recreational activities, leisure activities of developing relationships and expanding-shaping personality through the sport, recreational value (demand) of the area 143,543,000€, Thermal Springs of Langada, Thermal Springs of Agistro, Ski centre of 3–5 pigadia, Ski centre of Vasilitsa, Ski centre of Bansko, Ski centre of Parnassos, Ski centre of Pertouli, Jageralpe ski centre, Zugspitze German, facility modernisation, park planning-location, opening of road internet, forest opening, withdrawal of agricultural land
Policy indicators	National funding, European funding, law revision	LEADER, CLLD, INTERREG, HORIZON, Amendment-transformation of Special Framework for Spatial Planning and Sustainable Development for Tourism (SFSPSDT).

3.3 Research schedule

To explore the views of visitors to the particular research area regarding the economic valuation of the goods and services offered by organised alternative tourism concerning

environmental resources and their contribution to improving the quality of life and local and regional development, economic valuation surveys based on primary field surveys (questionnaire surveys) were used. Specifically, the travel cost method (TCM) and the CE were employed. In particular, through the TCM application, the tourist value of leisure and the demand for leisure arise. These values are considered as critical for planning the tourism development of an area as they assess the existing demand for recreation and the aesthetic value of the surrounding landscape in the study area (baseline scenario). The TCM Method was selected due to the fact that in the mountainous area there are two recreational areas, which comprise poles of attraction and are of major tourism significance for the economy while the estimation of its tourist value and leisure value (impact factor) is unknown. Its implementation is also identified as suitable for use in forest recreation and recreational sampling and the natural resources surrounding the research areas.

Figure 2 Methodology research flow chart (see online version for colours)

Next, a methodology was used to construct a system of indicators of sustainable management of the natural environment and sustainable tourism development (Indicators on a Local Scale) to group the voluminous information gathered at the analysis stage, and formulate alternative local proposals.

The results obtained from the above methodologies were then utilised by applying new valuation research based on CE. During the CE implementation, alternative management scenarios (scenarios of interventions in the natural environment and tourism development) were examined, which were designed to be proposed as alternative management proposals to visitors and residents of these areas. The evaluation of the proposed scenarios ultimately results in the best policies for improving the economic, social, and environmental parameters that are directly or indirectly related to the tourism of the region. What follows is the flow chart of the research that was implemented with a detailed analysis of each stage of its development.

Figure 3 Analytical research methodology regarding the stages of analysis (see online version for colours)

Figure 2 presents a detailed account of the steps of the decision-making system implemented for the sustainable management of tourism and environment in the study area. This methodological tool is a methodological approach to financial evaluation and business research methods in order to extract information for respective areas for which there is no relevant knowledge. It is worth mentioning that the Greek state does not currently have a portfolio for the sustainable tourism of the country regarding the levels and indicators of sustainability and their capacity which in turn results in deficit concerning information and relevant data. Also, the fact that for most recreation areas there is no exact number of visitors, counting of visitors and tickets, assessment of leisure values, tourist value and sustainability indicators, presents a problem which will be undoubtedly of particular concern to European Union policies in the coming years. Besides, it should be noted that such research tends to be rare in Greece as well.

Finally, the following figure presents the analytical methodology developed for the purposes of the present study so as to extract an integrated approach to an assessment system for the impact of tourism. The evaluation stages are shown in detail, and the methodological approach was followed in each possible recreational landscape.

3.4 Research area

The mountain range of Voras was selected as a research area due to its major environmental significance. In particular, large areas of it belong to the Natura 2000 network due to the importance of their species according to the ENVIREG (Greek Ministry of Physical Planning and Public Works, 1995) Program of the Ministry of Environment, Spatial Planning and Public Works. However, the mountain range is of scientific interest as well since it is a Pole of Intensive development of special alternative forms of tourism (mountain tourism, adventure, rural, cultural, thermal, therapeutic, wellness, ski). Both the spa and the ski centre found there make it very attractive for leisure while tourism, presents a source of income and supply chain for the local economy. For the above reasons, the area becomes a tourist resort which according to the Greek Ministry of Environment Energy and Climate Change (2013) belongs to the category of intensive development poles of special forms of tourism.

What follows is the analysis of the area concerning its spatial design combined with the natural environment, tourism, economy, society and the characteristics forming a comprehensive background of an analysis of strengths, weaknesses, opportunities, and threats. The following were taken into account:

a The National Special Spatial Planning Framework for Tourism and Sustainable Development

b the existing business programs and plans of services and elected officials

c forest management studies

d a tourism development study

e The ENVIREG Project of the Hellenic Ministry of Environment, Spatial Planning and Public Works.

Table 5 Spatial planning of alternative forms of tourism in the research area

	Strengths (S)		*Opportunities (O)*
S	Alternative forms of tourism and leisure activities, areas with high natural value and importance, natural resources (forestry, healing, grassland, aquatic, herbs, therams), geothermy, hydropower, traditional and preserved settlements with a high cultural ID, nodal geographic location and location, modern transport networks, local tourist networking of tourist destinations, scheduling visitation, wind power, solar power.	O	Altitude, image formatting by the media, annual management, funding from European programs, saving energy, improving the quality of human life, synthesis of uses of land and natural landscapes.
	Weaknesses (W)		*Threats (T)*
W	Loss of demand abroad, bulky European markets, a decline in traditional characteristics over the years, same day visits from nearby destinations, low quality of tourism infrastructure, non-promoted local products, missing cartographic data, fuzzy logic and sense of direction of site layout.	T	High quality tourist product by competitors, expensive destination due to the economic crisis in relation to the services provided, insufficient promotion, thefts, bureaucracy, electricity problems, climatic conditions, lack of skilled human resource, insufficient legislative design and environment, high competition from Balkan countries, pollution, natural disasters-extreme phenomena (fires, floods, landslides, erosion, avalanches snow, storms, ice), extensive – illegal logging, deficient management.

4 Results

The corresponding indicator weights and the consistency index and consistency ratio estimators according to mathematical modelling and the random consistency index parameters for each indicator are presented. In the results of level 2 of the AHP analysis, social indicators are identified as having the most weighing and priority with the ones of the environment following next. However, moving to the next stage, it is found that new criteria have to be taken into account in shaping the area. The indicators of the scenario showed a promising outcome for the region.

Figure 5 presents the scenario with four dimensions of indicators set with impact in km. At this level and stage of the analysis, the greatest result is 30 km from insights indicators while the minor is 10 km from objective crisis indicators.

The results from level 3, highlighted not only the critical parameters that were taken into account in the planning of the tourist package and plan but also the interventions that need to be implemented. Particular attention needs to be paid to the outcome of the results on environmental indicators, and especially on RES, which showed a consistency of responses and high weight of sustainable choice for the region. Also, concerning the tourist indicators, the second strand of each market and labour indicator offered an important finding while the policy indicators highlighted the importance of the state on

this issue. Finally, the scales of insights, viability, objective judgment, and vulnerability have graphically depicted the implementation of the scenarios and the kilometre distance on index impact. What is also noteworthy, is the last core formed regarding all the indicators in an application with the corresponding λmax and CI and CR.

Figure 4 Weights of four-dimensional indicators

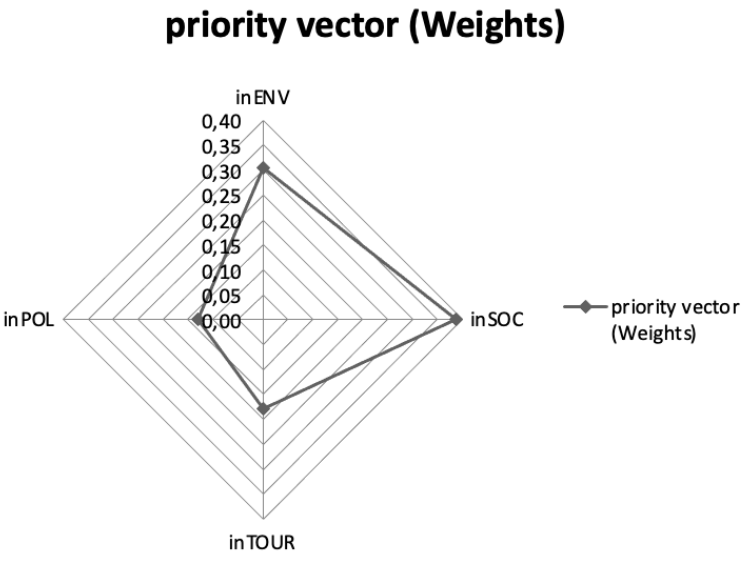
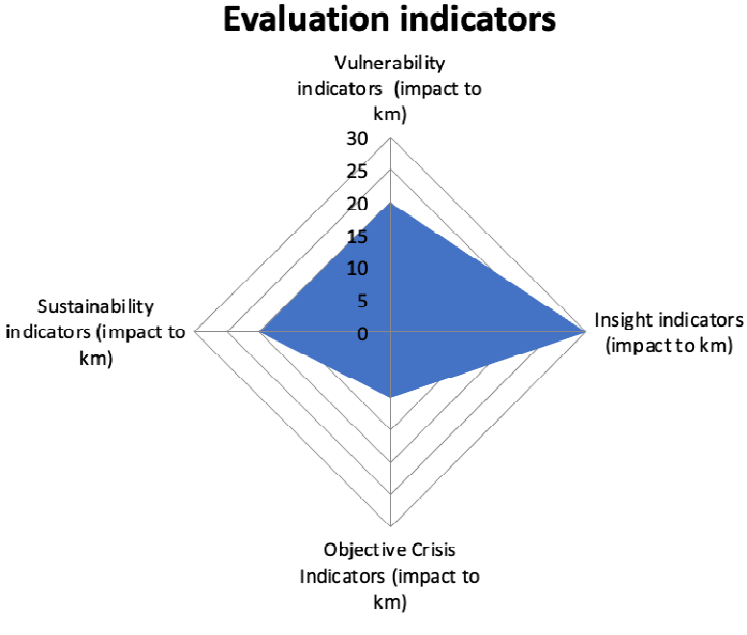


Figure 5 Evaluation indicators with km effect (see online version for colours)



The last part of the AHP analysis was completed with the analysis strategies for each indicator. At this stage, the highest level of details is presented, with the results being valuable to the design of the product. Most of the indicators have shown consistent and sustainable results with a sustainable CR estimate of < 10%, which also highlights the involvement of the respondents in the project coordination. In particular, the following environmental indicators did not receive high weighing: inFOR1, inFOR3, inFOR7, inFOR9, inFOR12, inFOR14, inFOR17, inRAN1, inRAN2, inRAN3, inGAME1, inGAME3, inWET1, inWET3, inWET5, inWET7, inWET8, inWET9, inRES2, inRES4, inSPA1, inSPA2, inSPA3, inSPA5. From the Social and Economic Indicators, the inSOC7, inSOC8, inSOC10, inSOC11 did not indicate consistency and impact weighing. However, only one parameter, the one of competition, inTOUR1, seems to be of no particular concern to the respondents, which highlights a high-quality tourist product without the risk of competition. Finally, concerning the policy indicators, inPOL13 and inPOL15, the responses provided suggest that no strategy is needed. The remaining criteria have demonstrated strong interpretable components of the direction that should be given to the region. It is worth mentioning that this research is the only one that examines the tourist status of a region and provides the maximum level of detail on the goals to be set for sustainable development in Greece. The models that were formed with the highest level of detail for each index are presented in Figure 6.

Figure 6 Indicators of action on environmental resources strategy (see online version for colours)

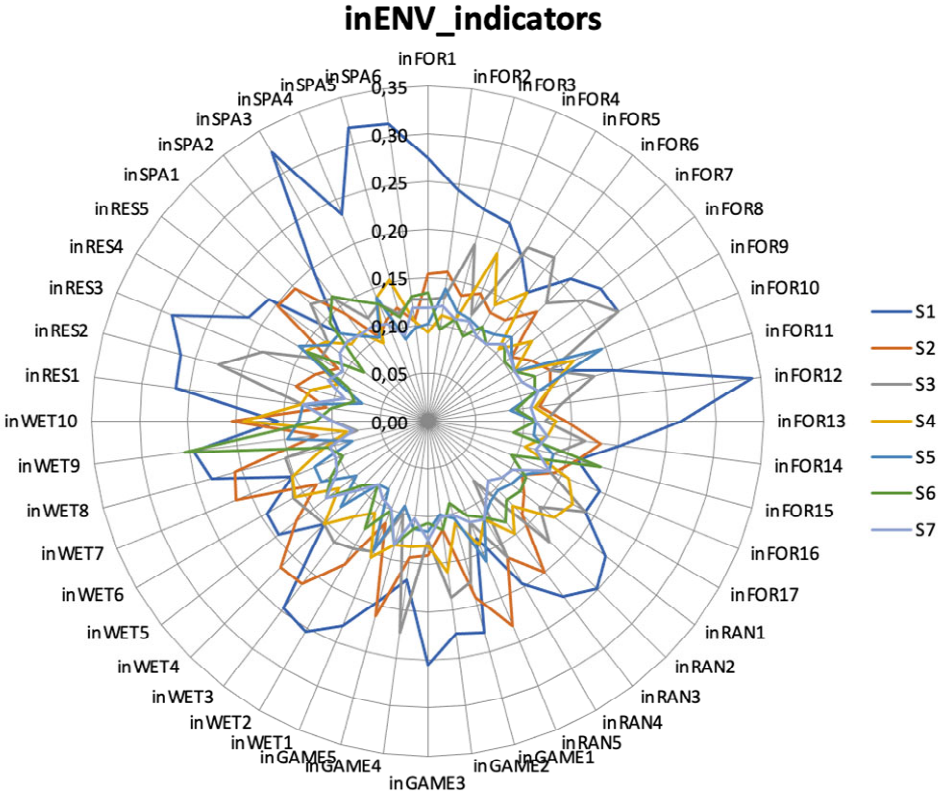


Figure 6 shows the indicators per strategy action for each indicator in each dimension. We conclude that from the strategies implemented and proposed to the respondents in terms of environmental resources, some are more and some less applicable. It is particularly impressive that the first strategy can be applied to the maximum extent in almost all indicators. This criterion was taken into account in the next stage of the research.

Figure 7 Indicators of strategic socio-economic criteria action (see online version for colours)

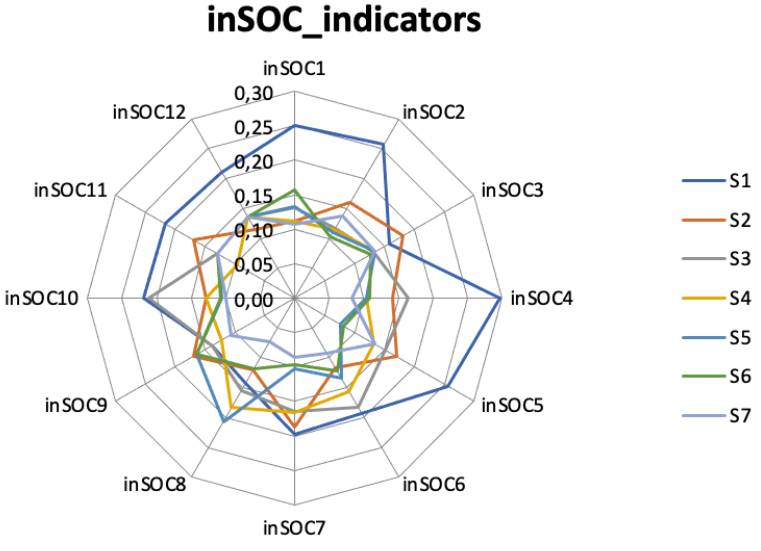
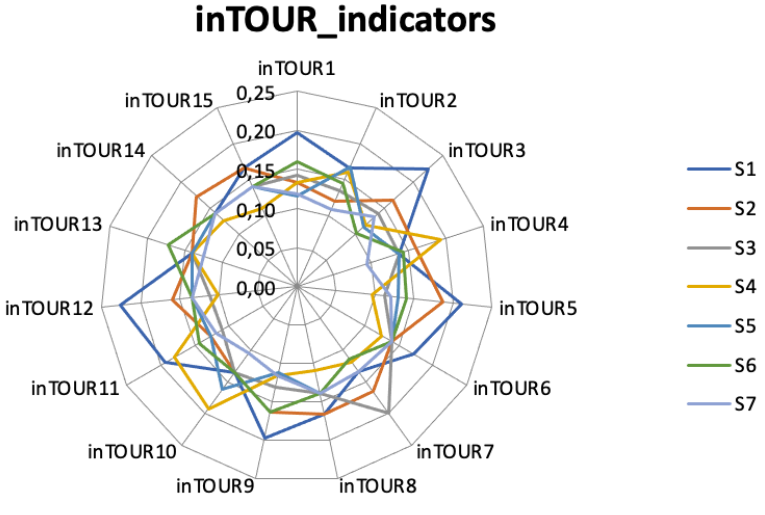


Figure 8 Indicators of tourism strategic action (see online version for colours)

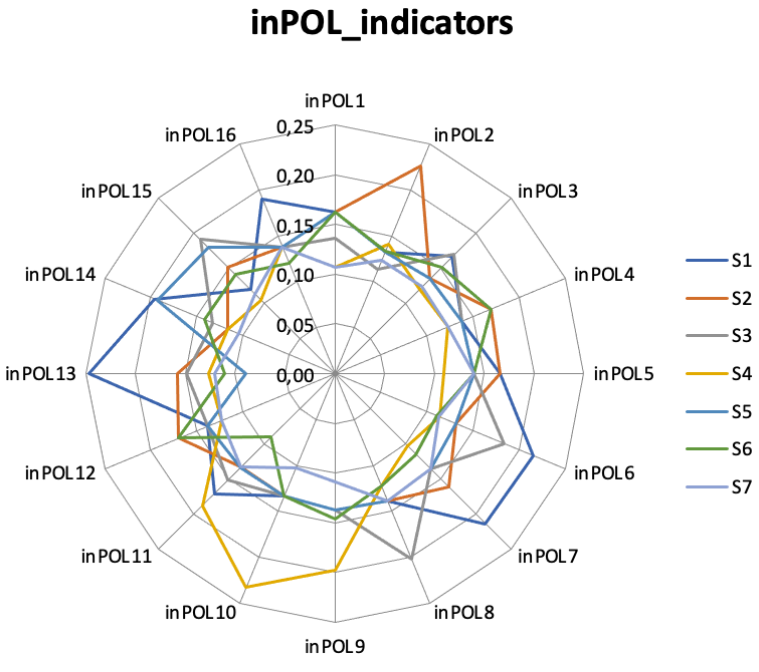


The strategies implemented and proposed to the respondents in terms of socio-economic criteria are applicable according to the hierarchical analysis. In particular, the first

strategy can be applied in this dimension to the maximum extent to almost all indicators (Strategy1: job creation and employment).

The tourism criteria in total, seem to have more or less application per strategy action of each indicator in each dimension according to the strategies implemented and proposed to the respondents. It is interesting that the first strategy can be applied in this dimension to the maximum extent in almost all indicators (Strategy1: job creation and employment). With S3 and S4 following in the index inTOUR10, inTOUR11 and inTOUR7, respectively.

Figure 9 Indicators of policy strategy action (see online version for colours)



The diagram above shows the indicators per strategy action of each indicator in each dimension. We can conclude that the strategies implemented and proposed to the respondents in terms of policy criteria in total are more or less applicable. It should be noted that the first strategy can be applied in this dimension to the maximum extent (Strategy1: job creation and employment) in inPOL13 and inPOL6 and inPOL7. With S3 & S4 following inPOL9, inPOL10 and inPOL8, respectively. Finally, S2 seems to apply only to the inPOL2 index.

The core that eventually emerged with the indicators per strategy action of each indicator in each dimension in inSTORM is presented above. The results of the research showed that the first strategy can be applied to the majority to the maximum extent (Strategy1: job creation and employment). This criterion was finally taken into account at a later stage of the research.

The analytical table presenting the strategies depicting the sustainability indicators in cases of the best implementation policies emerged follows below:

Table 6 Strategic planning after the storm (rainbow for the area)

inSTORM								
Indicators for sustainable tourism management								
Acronym-code	*Indicator*	*Strategy*						
		S1	*S2*	*S3*	*S4*	*S5*	*S6*	*S7*
inFOR1	Production of firewood							
inFOR2	Avoidance of landslide risk				☺			
inFOR3	Avoiding fire risks							
inFOR4	Reforestation				☺			
inFOR5	Avoidance and control of soil erosion				☺			
inFOR6	Risk avoidance and flood control			☺				
inFOR7	Extensive logging							
inFOR8	Protection of endangered flora and fauna				☺			
inFOR9	Conservation and development of forest resources and their role in the global carbon cycle							
inFOR10	Maintaining the health and vitality of forest ecosystems					☺		
inFOR11	Maintaining and strengthening the productive functions of woodland (woody and non-woody products)				☺			
inFOR12	Conservation, protection and enhancement of forest ecosystem biodiversity							
inFOR13	Conservation and enhancement of forest management functions (soil/water)				☺			
inFOR14	Maintain other socio-economic functions and conditions							
inFOR15	Configuration of climate phenomena						☺	
inFOR16	Promotion of protected areas				☺			
inFOR17	Maintaining and enhancing landscape aesthetics							
inRAN1	Production of grassland resources							
inRAN2	Production of livestock products							
inRAN3	Production of organic products							
inRAN4	Herb production				☺			
inRAN5	Mushroom production		☺					
inGAME1	Game							
inGAME2	Reproduction of mammals				☺			
inGAME3	Bird reproduction							
inGAME4	Gamekeeping			☺				
inGAME5	Game farming		☺					

Table 6 Strategic planning after the storm (rainbow for the area) (continued)

inSTORM								
Indicators for sustainable tourism management								
Acronym-code	*Indicator*	*Strategy*						
		S1	*S2*	*S3*	*S4*	*S5*	*S6*	*S7*
inWET1	Maintaining water quality							
inWET2	Management of hydrologic basin				☺			
inWET3	Storage and release of heat							
inWET4	Irrigation for domestic and urban use		☺					
inWET5	Irrigation for agricultural use							
inWET6	Aquaculture				☺			
inWET7	Prevention of contamination and water pollution (waste, pathogenic micro-organisms, hydrocarbons, scraps, etc.)							
inWET8	Underground aquifer enrichment and drought prevention							
inWET9	Ultra violate radiation protection							
inWET10	Developing thermal sources		☺					
inRES1	Solar energy				☺			
inRES2	Wind energy							
inRES3	Geothermy				☺			
inRES4	Hydroelectric energy							
inRES5	Biomass	☺						
inSPA1	Balneotherapy							
inSPA2	Hydrotherapy							
inSPA3	Hydro kinesiotherapy							
inSPA4	Prevention of diseases				☺			
inSPA5	Wellbeing							
inSPA6	Thermal water				☺			
inSOC1	NGO				☺			
inSOC2	Implementation of European actions and programs				☺			
inSOC3	Income at domestic level		☺					
inSOC4	Funding – investments				☺			
inSOC5	Green technologies				☺			
inSOC6	Biological cleaning function and investment on sanitary landfill site				☺			
inSOC7	Actions for climate change							
inSOC8	Developing volunteer programs							

Table 6 Strategic planning after the storm (rainbow for the area) (continued)

inSTORM								
Indicators for sustainable tourism management								
Acronym-code	*Indicator*	*Strategy*						
		S1	*S2*	*S3*	*S4*	*S5*	*S6*	*S7*
inSOC9	Collaboration between universities – research centres and the local population		☺					
inSOC10	Environmental education							
inSOC11	Volunteer programs							
inSOC12	Environmental information and awareness				☺			
inTOUR1	Empowering entrepreneurship				☺			
inTOUR2	Satisfaction of visitors					☺		
inTOUR3	Strengthening the intensive developing of special forms of tourism				☺			
inTOUR4	Infrastructure				☺			
inTOUR5	Safeguarding				☺			
inTOUR6	Formation of groups of tour operations				☺			
inTOUR7	Massive visitation			☺				
inTOUR8	Marketing-promotion			☺				
inTOUR9	Intensity of recreational activities				☺			
inTOUR10	Highlighting the typology of visitors				☺			
inTOUR11	Competition							
inTOUR12	Technical assistance for business cooperation				☺			
inTOUR13	Promotion of tourism demand						☺	
inTOUR14	Conferences		☺					
inTOUR15	Promotion of tourism culture		☺					
inPOL1	Obsolete instructions by the Greek tourism organisation						☺	
inPOL2	Non-existent tourism management studies		☺					
inPOL3	Primary laws			☺				
inPOL4	Bureaucracy						☺	
inPOL5	State inaction		☺					
inPOL6	Lack of scientific knowledge and research				☺			
inPOL7	Lack of technology				☺			
inPOL8	Lack of qualified personnel			☺				
inPOL9	Property status				☺			

Table 6 Strategic planning after the storm (rainbow for the area) (continued)

inSTORM								
Indicators for sustainable tourism management								
Acronym-code	*Indicator*	*Strategy*						
		S1	*S2*	*S3*	*S4*	*S5*	*S6*	*S7*
inPOL10	Insignificant funding for studies and surveys				☺			
inPOL11	Ecological problems				☺			
inPOL12	Deflated specifications by Special Framework for Spatial Planning and Sustainable Development for Tourism (SFSPSDT)						☺	
inPOL13	Migration flows							
inPOL14	Stone spatial designs	☺						
inPOL15	Regional disparities							
inPOL16	Outdated specifications of environmental impact studies	☺						

Figure 10 Indicators of inSTORM strategy action (see online version for colours)

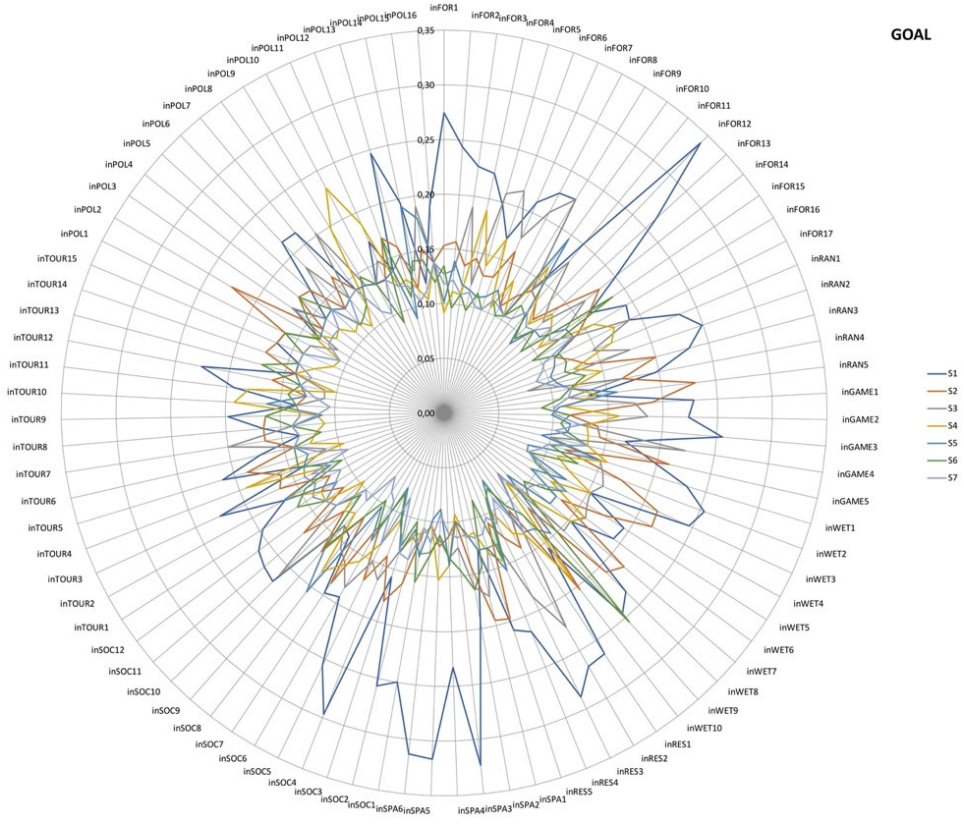
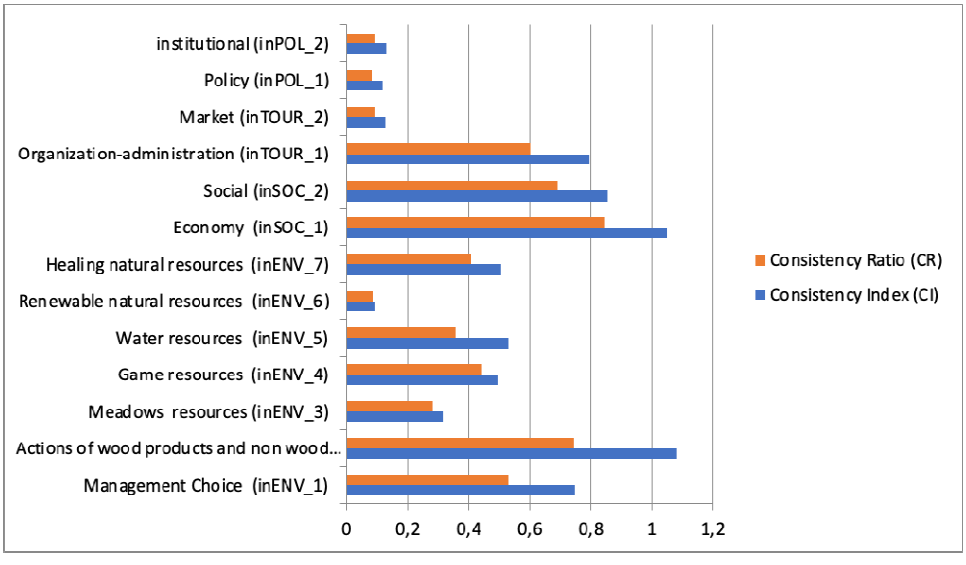


Figure 11 shows the CI and CR indicators in inSTORM. We find that the greatest consistency was presented in renewable natural resources as < 10% of the total indicators.

Figure 11 CI and CR indicators for all dimensions of inSTORM (see online version for colours)



The effects of the Delphi method at the specific analysis level in the area of tourist interest considered are presented graphically in the light of the dimensions of each indicator which was applied. Of the six regions, the three ones, the ski centre, the airport and the wetland, appear to be influenced by the system of indicators applied. In particular, the R^2 values showed high correlations between the kilometre distances and the effects exercised according to the sample responses (0.865 and 0.8824, respectively). The other three ones with low R^2 index value are presented in Appendix of this study.

Figure 12 Effect of indicators on kilometre distance to the ski centre (see online version for colours)

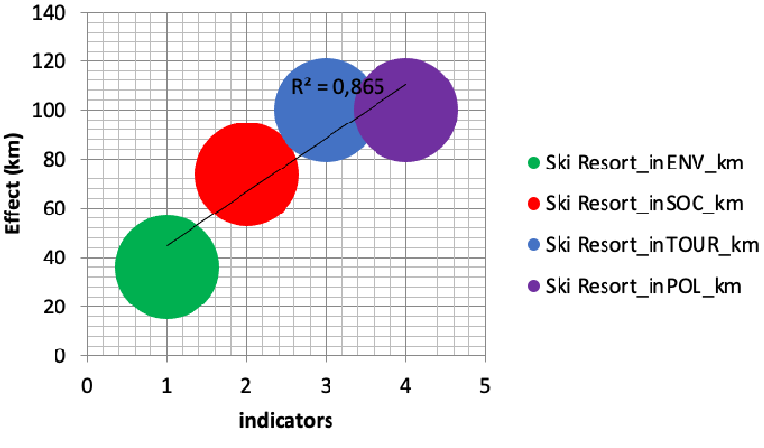


Figure 13 Effect of indicators on kilometre distance from the airport (see online version for colours)

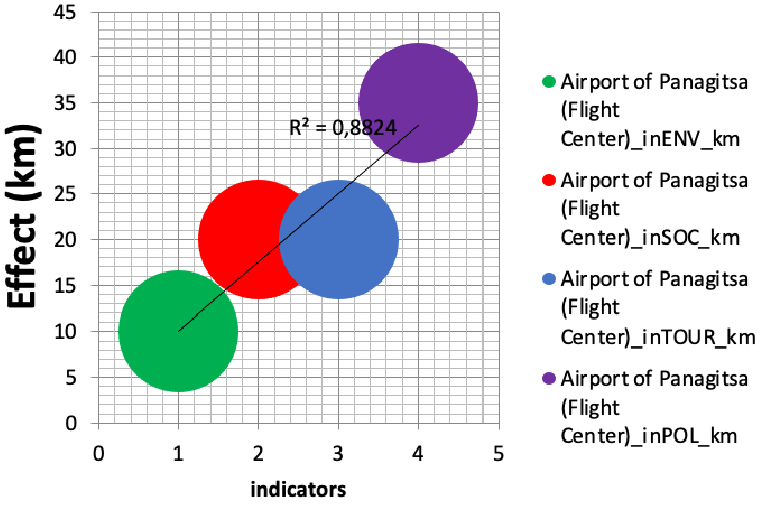


Figure 14 Effect of indicators on kilometre distance to the Agra wetland (see online version for colours)

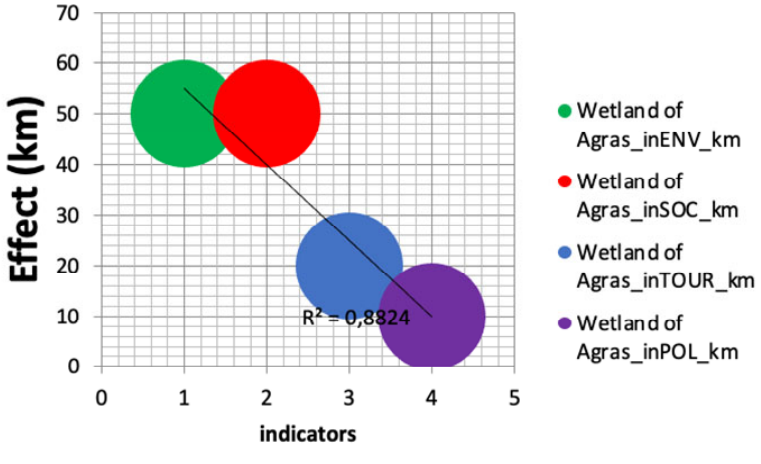


Figure 15 shows the validation of the effects exerted on the ski centre by the four dimensions of the indicators applied. We can conclude that socio-economic criteria and tourism seem to positively influence the ski centre to a great extent, with policy having lower positive to negative effects.

Regarding the validation of the effects exerted on the area of the Pozar Thermal Baths by the four dimensions of the indicators applied, the analysis of the results showed that environmental, tourism and policy criteria have a very positive effect on the Baths, with socio-economic ones having less positive effects.

Figure 15 Validation of ski resort (see online version for colours)

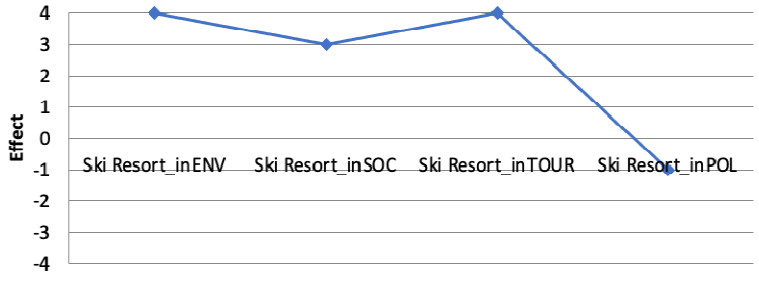


Figure 16 Validation of thermal springs (see online version for colours)

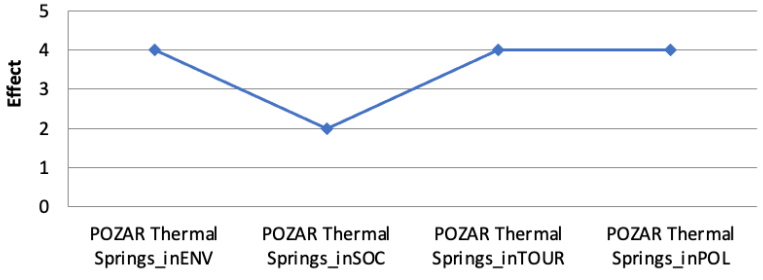
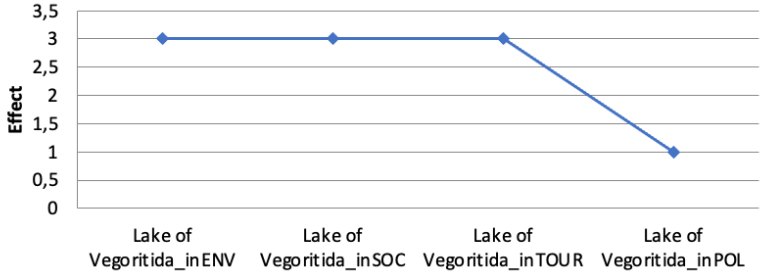


Figure 18 shows the validation of the effects exerted on Panagitsa Airport by the four dimensions of the indicators. It can be concluded that environmental and tourism criteria seem to have an impact and influence to a great extent the Panagitsa Airport, in contrast with socio-economic and policy ones which have zero impact.

Figure 17 Validation of lake (see online version for colours)



Environmental criteria as well as tourism and socio-economic ones, seem influence to a great equal extent the Lake area, in contrast to policy ones which have less positive effects. The four dimensions of the indicators applied are presented in the following diagram.

Figure 20 shows the validation of the effects exerted on the Agra-Vryta-Nisi Wetland by the four dimensions of the indicators applied. It can be concluded that environmental criteria seem to impact and influence to a great extent the wetland, in contrast to policy

criteria which have less positive effects and are followed by tourism along with socio-economic ones.

Figure 18 Validation of the airport (see online version for colours)

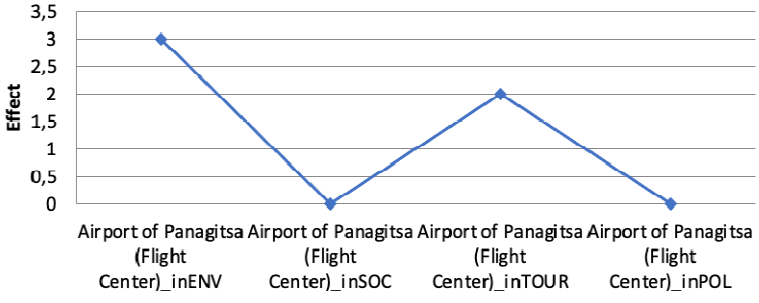


Figure 19 Validation of old village (see online version for colours)

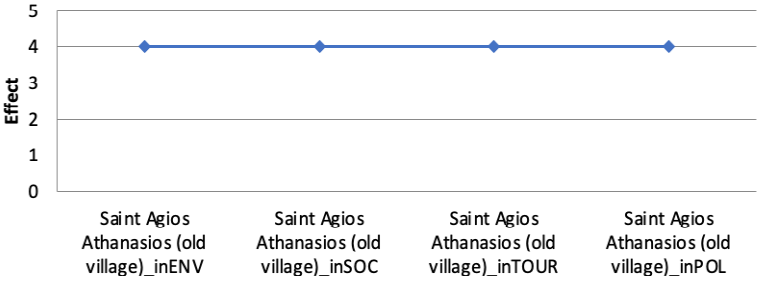
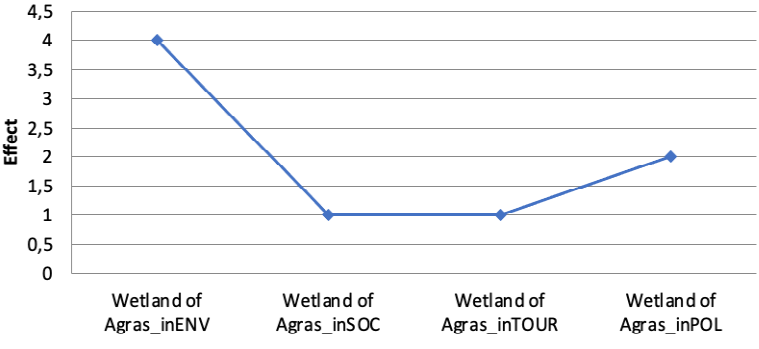


Figure 20 Validation of wetland (see online version for colours)



In the last area of the mountain settlement of Agios Athanasios, the results of the research showed that all the criteria seem to have an impact and positively influence to a great equal degree, which is very close to the one of the ski centre in the mountainous area of Voras, following the validation of the effects exerted on the four dimensions of the indicators applied.

All things considered, the above diagrams present the validations effects of all indicators set by the four dimensions in research area. We conclude that in the first one

area of Ski resort the environmental, tourism and socio-economic criteria influence and have a very positive effect on it, while the policy criteria have a negative effect. In the second one area, the Thermal Springs of Pozar the environmental, tourism and policy criteria are influential and have a very positive effect. In the third area, the airport, the environmental and tourism criteria have a very positive effect. Lastly, the environmental criteria affect positively all areas.

5 Discussion

The present research provides opportunities for the rational utilisation and management of the natural environment in areas that can be poles of special tourism forms. It provides opportunities for designing and implementing scenarios, interventions, and policies with a specific developmental goal. In particular, it:

a offers the maximum level of detail in the science and research of natural resource economics and business evaluation currently available

b creates a new methodological framework for sustainability indicators for tourism

c rebuilds standards for tourism management studies.

Its findings can lead to:

a standard leisure management frameworks converging with international standards

b extension of the active winter season through investments and development of green entrepreneurship and utilisation of the spring season

c a new methodological framework and economic evaluation plan of the environment and natural resources for excellent selection and management of areas with special characteristics

d new specifications of the Greek Ministry of Environment Energy and Climate Change (2013) for tourism in Greece.

The methodological plan (data validation method) of the decision-making system was created and complemented with the use of specific scientific methodologies of the economics of the environment and operational investigations (multi-criterion analysis of decisions), which included the causality of the relations investigated, resulting in the presentation of the used research techniques (developing a new conceptual model after all the necessary controls). The methodological framework used in the present study scientifically identifies the tourist information that was extracted. With regard to the operational tools employed, such as SWOT analysis (Lun et al., 2016; Bertram and Larondelle, 2017), the spatial background was developed using geospatial data such as forest species, land use, soil, polygons, among other, and creating an extensive background for spatial analysis and evaluation (Voces Gonzalez et al., 2010; Votsis, 2017; Maryati et al., 2016; Ioannou et al., 2018).

The descriptive findings are analysed and discussed to show how the strategies implemented regarding forest resources are applied. It is impressive that the S1 strategy can be applied to the inFOR12 index. With reference to pasture resources, strategy S1 is also implemented at level (0.25) with inRAN1. inRAN2, inRAN3. The strategies

proposed to the respondents for implementation regarding the game resources are applicable, as well. Particularly impressive is the fact that for the first strategy (S1), the inGAME3 index can be applied at the level (0.25). In terms of water resources, for inWET2 and WET3 the S1 strategy can be applied, and for WET9 the S1 and S6 strategy can be applied almost equally. Regarding the renewable natural resources, the inRES1, inRES2 and inRES3 indices can be applied at the level (0.30) for the first strategy, S1, which makes a special impression. Regarding the thermal natural resources for the strategy S1, the index inSPA5 and inSPA 6 can be applied at the level (0.30).

Following the methodology of the indicators, the findings were used to construct the CEs. Especially, at the third level of analysis (inENV, inSOC, inTOUR, inPOL), the result of renewable energy sources (environmental indicators) was highly impressive, with the solar energy source identified as the first choice, and policy option, the second choice, followed by wind energy. Then, concerning the tourism indicators, the ones that showed high performance of sustainable choice were those of the market (i.e., parameters that regulate the market of a tourism product), while finally, all policy indicators presented acceptable CI and CR estimates.

In order to construct the properties of the CE and the general profile of the choice card, in addition to the above, the following issues were considered:

a the approval of the modification of a special framework of spatial planning and sustainable development for tourism and its strategic environmental impact study

b the approval of a special framework for spatial planning and sustainable development for renewable energy sources and its strategic environmental impact study

c the results of the sample of the TCM from the first stage of this DSS methodology

d the business plan of the municipalities of the region

e relevant legislation governing investments and labour law of the country (Law 4146/2013 on the formation of a friendly developmental environment for strategic and private investments and other provisions, Law 4472/2017 on public pension provisions and amendment of provisions of Law 4387/2016, measures to implement fiscal targets and reforms, social support and employment arrangements, medium-term fiscal strategy framework 2018–2021 and other provisions, and the act of the Cabinet suspending appointments and recruitment in the public sector)

f case law on protected area management bodies and other provisions (Law 4519/2018)

g Law 3937/2011 on conservation of biodiversity and other provisions.

In particular, the parameters and dimensions used are presented (policies), emphasising that the methodology is based on a random utility theory models (RUM) of the CE (Bithas et al., 2018; Emmanouilides and Sgouromalli, 2013; Emmanouilides et al., 2011). However, in the present research, tourism, legal, economic, social, and environmental criteria for reconstructing the following model were considered. For the characteristics whose values are defined with levels and are qualitative and not quantitative, that is, they are categorical variables, dummy variables are used (Emmanouilides et al., 2011; Brey et al., 2007; Christie et al., 2007; Hensher et al., 2005).

The suggested leisure policies which can offer alternative scenarios for pleasure and entertainment in an area while avoiding deterrent environmental factors are:

a technical constructions and network of trails

b natural resources and sights

c leisure activities and available facilities

d employment of individuals

e willingness to pay for a ticket (WTP)

f placement of photovoltaic systems

g electricity supply

h biodiversity in the area.

Sustainable tourism development, therefore, can bring positive developments in the region and present an important prospect of the future in line with international literature (Lane, 2018; Ryan, 2018; Higgins-Desbiolles, 2018a, 2018b; Jamal and Camargo, 2018; Liang and Chan, 2018; Laing, 2018; Mihalic, 2016; Pabel and Pearce, 2018; Wang et al., 2010).

Some of the research questions that were asked and examined by the present research were:

a the way of designing the infrastructure and the adequacy of the ski equipment in an area

b the formation of the recreation typology and visitor satisfaction in poles of intensive development specialist forms of tourism

c the development of standard tourism management studies with sustainability indicators for tourism

d the way to improve the methodology for assessing the tourist value of a leisure pole

e the viability of ski resorts in the light of climate change

f the rational management of health and spa tourism product in Greece

g the availability of spatial planning in similar areas

h the formation of natural landscape systems for tourism

i the presentation of a tourism plan of leisure activities for an area.

Contributing to research, science, and the Greek governance and policy, this research is an integrated decision-making system for sustainable mountain management in Greece. Furthermore, it aims to create a potential future portfolio based on tourism demand indicators and form an impact assessment system for tourism, by building a structured knowledge base for sustainable tourism management in Greece (model tourism management studies, considered for implementation in municipal stores – public bodies). In this case, it is possible to set up such a portfolio, to reduce and normalise specific risks. Taking into account the Agenda 21 of the United Nations Conference on Environment and Development (UNCED), it is found that programs, projects, and decision systems are

shaped according to each state's particular characteristics by creating new institutional structures and significant changes of governance and policies. Besides, the development of the specific research methodology has identified standards and guidelines to be used in the future in other respective areas of national and European scope and scale (poles of special forms of tourism). The aim is to plan their sustainable tourism development at a national and European level for a single network of poles of specific and alternative forms of tourism in the EU, highlighting theories of regional development. What is more, an important factor contributing to science is the investigation of changes in tourism demand in these areas due to climate change and the planning to adapt/mitigate the effects of climate change on local tourism development, offering security and shielding of these areas in terms of climate change.

6 Conclusions

The present research is expected to contribute to tourism development in the region in the following ways:

a its findings highlight unknown aspects of the particular area, which also concern other areas in Greece, since there are no bases of indicators for tourist viability and tourist recreation value as well as travel cost models from which optimal management policies were produced

b it suggests the mobilisation of the authorities and public institutions towards the sustainable management of the tourist product

c the main argument presented in this study is the development of a comprehensive decision-making tool for tourism in a context where the special planning framework for tourism has deficiencies and weak standards, and there is lack of tourist visitation records

d the issues addressed in this study focus on the presentation of new scientific proposals for the region, and the provision of a new theoretical and empirical background for Greece.

A theoretical basis giving new dimensions to the factors, the level of satisfaction of visitors and their intention to visit ski resorts and spa towns around the world was introduced with successive variables emerging for the new winter tourism in Greece.

The limitations of the present research concern the special characteristics and peculiarities of the leisure pole based on and influenced by critical external factors. The authorities and the state are directly related to this survey as the state does not have an index bank for tourism. In this way, it is made possible to transform the constrains identified into new opportunities, such as the use of such areas in different seasons of the year.

The new interventions in the field of tourism, as well as the policy principles of tourism development, highlighted the importance of environmental resources (forestry, aquatic, game, meadows, healing, renewable), especially in recreational areas which are strongly related to the environment, culture, economy, tradition and the sustainable development agenda.

Suggestions for further research are:

a to apply this methodology at the national level

b to apply it to foreign resorts by comparing them.

These comparisons will have a significant impact on foreign tourism policy and fair competition. By implementing the methodology in the present research, the proposals for the region are initially considered at the local level which mirrors and reflects the economic, environmental, cultural, and spatial impact with a national scope. Thus, the integrated knowledge base system for evaluation and decision making on the pole of intensive development of special and alternative forms of tourism in the mountainous region of Voras highlights the following proposals:

a the creation of a new game shelter

b the promotion of winter tourism 365 days a year (operation of the ski centre and the baths with different conditions of viability and function adapted to climate change)

c the development of more beds in the region

d the establishment of a new mountain settlement in the region

e the design of cableway to connect the baths with the ski centre

f the placement of RES and energy utilisation in areas with high solar, wind and hydro potential

g the extension of the ski centre

h the development of a hotel unit within the baths

i the introduction of a casino

j the introduction of alternative leisure activities and the planning of recreation parks

k the payment of a ticket to the Thermal Natural Resources in order to estimate and financially appreciate the resource on a yearly basis and obtain visitation data

l the creation of new Olympic dimension ski slopes at the ski centre in order to claim the Winter Olympic Games to be held in Greece, and in particular, on the highest peak (as suggested by participants in the study).

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Appendix

Figure 21 Effect of Indicators on kilometer distance to the Pozar Thermal Springs (see online version for colours)

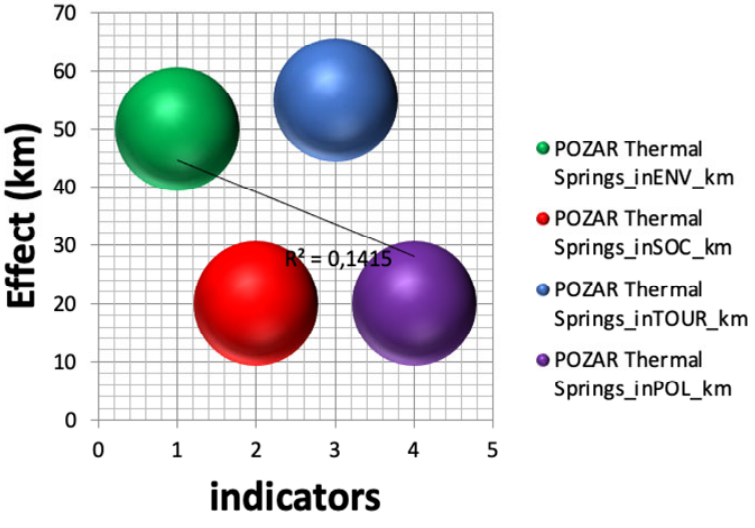

Figure 22 Effect of Indicators on kilometer distance to the Lake of Vegoritida (see online version for colours)

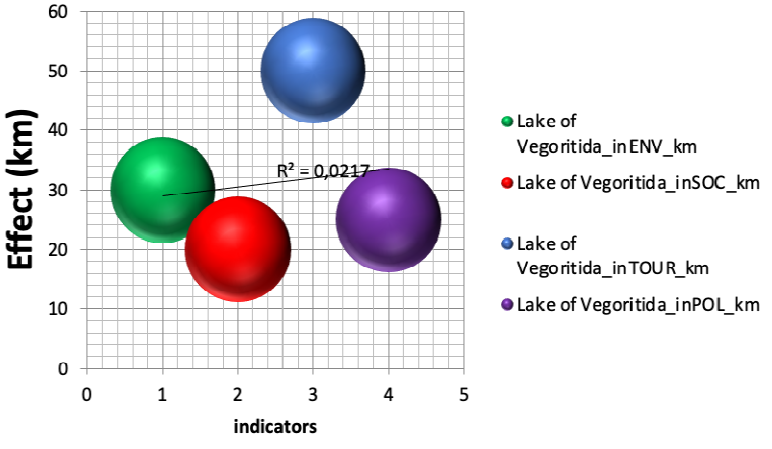

Figure 23 Effect of Indicators on kilometer distance to the Saint Agios Athanasios village (see online version for colours)