GIS applications as a tool for tourism planning and education: A case study of Chalkidiki

Spyros Avdimiotis
Thomas Mavrodontis
Athanasios S. Dermetzopoulos
Konstantinos Riavoglou

SUMMARY

Geographic Information Systems (GIS) are now recognized widely as a valuable tool for managing, decision making, analyzing, and displaying large volumes of diverse data pertinent to many local and regional planning activities. However, the number of GIS applications for regional tourism planning and education has not mushroomed as in other fields. This is also reflected in the field of sustainable tourism where the adoption of new technologies has been rather slow. Nonetheless, sustainable tourism decision-making and carrying capacity estimation has a lot to benefit from using such technologies. GIS can be used for managing various information needs, estimating indicators and, generally, assisting decision making in the planning phase, as well as in the monitoring and evaluation phases. In the field of tourism education GIS is just starting to become known as a valuable analytical tool by tourism/ hospitality firms and as a tourism economic development tool. However, college graduates with both tourism and GIS skills are virtually non-existent. The case of the Prefecture of Chalkidiki, Greece demonstrates the necessity and the value of such technologies.

Key words:
sustainable development; tourism education; decision making support; carrying capacity; Greece

INTRODUCTION

One of the most remarkable technological innovations in tourism planning and decision making is Geographic Information Systems (GIS). GIS is a computer based powerful set of tools for collecting, storing, retrieving, mapping, analyzing, transforming and displaying spatial and non spatial data from the geographic world for a particular set of purposes that varies for each discipline. Both, GIS and tourism, share a common characteristic, that is, both cross the boundaries of disciplines and application areas.

Spyros Avdimiotis, Technological Educational Institution of Thessaloniki, Department of Tourism Management, Greece
E-mail: soga@tour.teithe.gr

Thomas Mavrodontis, PhD., Technological Educational Institution of Thessaloniki, Department of Tourism Management, Greece
E-mail: mavrodon@tour.teithe.gr

Athanasios S. Dermetzopoulos, Department of Business Administration, University of the Aegean, Greece
E-mail: emtm04002@chios.aegean.gr

Konstantinos Riavoglou, Department of Business Administration, University of the Aegean, Greece
E-mail: emtm04001@chios.aegean.gr

GIS has been applied in many fields including geography, forestry, urban development and planning, and environmental studies. Similarly, tourism has been a subject of interest to geographers, economists, businesses, environmental planners, anthropologists, and archaeologists. As such, the potential for GIS applications in tourism is significant.

GIS is now recognized widely as a valuable tool for managing, analyzing, and displaying a large volume of data pertinent to many local and regional planning activities. At the same time, its use in environmental planning is rapidly increasing. Tourism is an activity highly depended on environmental resources. It is also a phenomenon which, in the event of a lack of planning and appropriate management, is likely to erode its environmental base. Hence, the effectiveness of tourism planning and decision making can be substantially enhanced with the use of GIS applications. Some of the key features of GIS that could benefit tourism planning include: a) Their ability to manipulate data and spatial attributes b) Provide necessary value added information, c) The ease in allocating resources between what are often conflicting demands d) Their adaptability in requirements needs and data changes over time and, e) Their ability to identify patterns or relationships based on particular criteria and support in this way decision making.

ADVANTAGES AND LIMITATION OF THE USE OF GIS IN DECISION MAKING FOR SUSTAINABLE TOURISM

GIS has a number of advantages for supporting decision making and planning for sustainable tourism. Tourism is an activity that strongly implies the geographical dimension for all, users (the tourists), providers and planners. GIS is the technology specifically developed for the management and study of spatial phenomena. Moreover, tourism is a complex phenomenon involving, besides its spatial dimension, social, economic and environmental implications. This is even more important within the context of sustainable development programming, the implementation of which considers the evaluation of economic, social, and environmental parameters against the pre-established targets. Additionally, focusing on the environmental parameter of tourism, GIS has proved to be able to handle a number of different cases related to environmental management.

Besides the inclusion of environmental, social and economic parameters in a single system, GIS is an integrating technology capable of working along with other technologies (remote sensing, GPS, CAD, etc) which could further facilitate and offer more tools to sustainable tourism planning and decision making. Another competitive advantage is that, because of its abilities to add or remove thematic layers, constraints and data, it is a dynamic tool for planners, capable of being adjusted as new data become available and tastes and preferences in demand change over time. The development of GIS based decision support system for sustainable tourism planning and management could have a significant contribution in highlighting implementation issues and offer the framework and the tools for evaluating, monitoring and planning sustainable tourism. Such system need to include indicators, criteria for their evaluation based on the established policy goals and possibly weights to reflect relative importance on the parameters examined.

With particular reference and indicators, GIS can contribute not only to their measurement but, also, to their definition. GIS's distinctive ability to generate new information (through the use of metadata) from the existing data sets and, thus, offering value added information, can lead to the identification of sustainability indicators which otherwise would not be possible to be defined and measured. Owing to GIS' efficiency in producing maps and other tabular displays, comparisons are possible, for example, between tourism resource features and resources needed for other activities and, thus, decision-making is facilitated. The information communication capability of GIS is another feature which assists decision-making. As mentioned earlier, GIS can be used in a number of cases to enhance citizens' and stakeholders' participation.

Another remarkable technological innovation in tourism planning and decision-making is the GIS applications over Internet. The multimedia capabilities of the WWW have made it a medium in which visual representations – images, maps, diagrams, and graphs – are as easy to implement as text. Five or so years ago, cartographers, planners and other experts began using the WWW to display static maps, and some low levels of interactivity could be added to the maps by using image maps – click sensitive areas of the map which could hyper-link you to other maps or materials (Krygier 2001:1). GIS vendors and spatial data providers have realized that the WWW will be the next-generation

GIS platform, providing a powerful medium for geographic information distribution, as well as a particularly lucrative new market to exploit. Internet GIS activity is facilitating innovative developments in dissemination, visualization and analysis for planners of the built environment. Internet pages that concern tourism generally offer information on a variety of categories, including travel, geography, and contact details for local tourist information centers, reservation services and event calendars.

However, the use of GIS in decision making has its limitations. Bahaire and Elliot-White (1999) concluded that although GIS is a very useful tool, which can support decision making in sustainable tourism planning and management it is just a tool and does not, by itself, ensure fairness, equity and compatibility with sustainability principles. Bahaire and Elliot-White, furthermore, argued that GIS is not "asocial" data, nor it is "neutral". It may be manipulated to support policies of certain interests. This is also supported by Pearce (2000) who states that, although GIS can enhance access to information and therefore improve democratic practices, it can also be used to promote the interests of particular groups having access to the technology. In light of these warnings, it should be highlighted that GIS is not a decision-making tool; it may facilitate data processing and analysis as well as communicate results but, according Bahaire and Elliot-White (1999:173), it is "unlikely to alter the political character of policy making and thereby produce a more sustainable tourism planning practice". The aim of this paper is to illustrate how data from GIS maps can be used to measure the carrying capacity of the Greece prefecture of Chalkidiki.

MEASURING CARRYING CAPACITY: THE CASE OF CHALKIDIKI, GREECE

The study area was selected to be Chalkidiki, for several reasons. It is situated in a close distance from Thessaloniki, the second biggest city in Greece and, due to natural and cultural resources, is becoming a significant international tourism destination. Over the last decades, Chalkidiki has been through a substantial economic, social and population changes. Tourism contributed decisively towards this direction, while the lack of detailed planning led to negative environmental, social and economic impacts.

Thus, in order to readdress some of the adverse effects of tourism and urban development, the first step is to measure the carrying capacity. In this study, using the advanced technology of GIS carrying capacity was measured in terms of a) lodging, b) water resources and c) coastline. Based on these results an analysis of strengths, weaknesses, threads and opportunities was conducted and implication for tourism development strategies are discussed toward the end of this paper.

Measuring carrying capacity in terms of water resources

Water resources in Chalkidiki, and especially in the regions where intensive tourist activity takes place, are particularly insufficient or, at least, not sustainable (Sidiropoylos, Tolika and Tolika 2003). Using GIS, the following restrictions are placed: a) acceptable place of underground water resources; b) acceptable levels of salinity and, c) the quantity (S) of water given for use must be between the given limit: $S1 < S < S2$.

The quantities S1 and S2 have been pre-calculated based on a study conducted by the Public Enterprise of Water Supply and Sanitation of Thessaloniki (Adamopoulos 2002) on water demand management, which has taken into consideration the social and financial factors. The quantity (S) is determined as equal to the total quantity of consumption (K). This quantity (K) is distributed for different uses such as drinking water supply or irrigation. and calculated based on the following: $K = \sum_K 1$ with limits N and $i = 1$, where (k1/k)x100 is the percentage corresponding to use i and N is the number of different uses. The costs (C) of these works are counted in Euro and consumption (K) in cubic meters. The quotient C/K represents the cost per consumption unit. Applying these calculations, the average quarterly consumption per capita in the Chalkidiki is 14 cubic meters. Given the fact that the inhabitants of the prefecture during hibernal months exceed the 104,000, the quantity of drinking water is about 1,456,000 cubic meters during the same period. During summer months, and especially between July and September, the population reaches 2,718,543 inhabitants (National Statistic Service 2002), not taking into account those who own cottages within the prefecture. The average water consumption during that period is 38,059,602m², adding an amount of 2,718,543m² made by the permanent inhabitants.

The existing water supply is not sufficient to meet this demand. More precisely, the main water resource shed is located in the area of Fourka, which is characterized by: a) average rain gauge height equal to 600mm; b) significant tourism activity; c) intensive population seasonality d) intensive brackishness problems; e) low water quality (Ca Mg HCO3, and little concision of Na Cl) with water temper between hard ($18^{o} – 30^{o}$ dH) and very hard ($>30^{o}$ dH) and f) frequent floods. A research that was carried out in the region in 1993, showed that, on the prefecture level, there were some hundreds of incontrollable garbage disposal areas where 35% of rural rubbish is disposed. Moreover, there are almost 1,420 waste-dumping sites that accept the remaining 65% of rubbish (Michalidis 2002:140). After examining 102 sites (from the total of 420), it was discovered that only 6,4% fulfilled all of the suitability standards, 12.2% had problems that could be solved while remaining 81.4% was totally inappropriate. From geological perspective it was realised that the 50% of the examined waste dumping sites were located on non-waterproof rocks, while from morphological perspective it was noted that 65% of sites are found in contact with the surface water network (rivers, torrents etc.). As this research was carried out more than a decade ago, a recent inspection of the sites was conducted for the purpose of this study. The inspection revealed that little has change since than. Furthermore, several of these sites have important problems such as sediment shaping, production of gas, ignitions and stench. To solve the problem of inadequate water supply, a radical solution was proposed by the Institute of Geological and Mineral Research to exploit the water resources of Mt. Olympus, where the water clarity is excellent and the percentages of water temper and brackishness very low. The water supply will take place using submarine tubes taking into consideration the respective cost.

Measuring carrying capacity in terms of coastline

Another method to measure carrying capacity is the one that takes into account the coastline length per municipality and the number of tourists that can be accommodated. From the research conducted in 2003 for the purpose of this study, the coastline-satisfaction indicator for Chalkidiki is 0.34. This means that, according to the satisfaction indicator, the total number of tourists that can be accommodated across the coastline, in 2003 was about 62,412. According to the data above,

the coastline-use indicator is 0.50. As the current tourism supply is 11,564 beds, we can estimate the carrying capacity to be almost double, reaching 22,000 beds.

Measuring carrying capacity in terms of tourism lodging facilities

The statistical recording of tourist lodgings is useful, for two reasons, firstly, in measuring territorial fluctuations owed to the spread of tourism and applying various growth models and, secondly, in discriminating various regions in regard to the types of tourism activity.

However, a complete data of tourist lodging facilities is difficult to obtain, especially when it comes to the auxiliary tourist lodgings such as furnished apartments, villas and rooms to let. In Chalkidiki, illegal lodging facilities are common, in some cases exceeding the number of registered ones, fuelled by demand of near by Thessaloniki residents as well as by a desire of rural population to own a holiday cottage in the area. Another shortcoming in the official statistics is due to the fact that hotels often misreport information such as the number of overnights or the occupancy rate (for tax avoidance reasons or because of competition). Furthermore, even if statistical data concerning the geographic distribution of tourism lodgings provide useful clues regarding the importance of tourism and its territorial distribution it is not, however, capable to present a real territorial approach to mapping out the tourist activity.

For this reason, a number of indicators have been proposed in order to contribute to better territorial approach of tourism activity planning and management. The indicator proposed by Defert (1967:133) is the tourism operation indicator of a zone that "measures tourist tensionality, as it is expressed by the simultaneous coexistence of two different types of population (tourists and local population) inside the same region". The significance and types of interventions that take place because of tourism differ from a region to region, owning to different regional characteristics. Consequently, the need to categorize the regions according to their tourist orientation becomes explicit. The tourism operation indicator (TOI) was calculated through the following function: TOI$= (A \times 100)/B$, where A$=$ number of existing beds and B$=$ number of local population. The way that TOI is interpreted, based on Boyer (1982) is presented in Table 1.

Table 1
TOURISM OPERATION INDICATOR (according to Boyer)

TOI	
> 500	****** Very significant tourism activity
100 – 500	***** Significant tourism activity
40 – 100	**** Mainly tourism activity
10 – 40	*** Important tourism activity (not main)
4 – 10	** Tourism activity of lesser importance
< 4	* Hardly important tourism activity

The survey results have been calculated for three different time periods, namely: 1976, 1992 and 2001.

Table 2
CALCULATION OF TOI IN 1976, 1992 AND 2001

	Accommo-dation	Area in sq km.	Popu-lation 1976	TOI
A.Mamas	0	20,26	1212	*
N. Potidaia	0	17,68	1094	*
Afytos	0	23.78	838	*
Kallithea	2,342	3,78	422	******
Kriopigi	171	12.43	457	***
Polichrono	0	17.4	826	*
Chanioti	483	10.45	528	*****
Pefkochori	0	19.69	1149	*
N. Skioni	0	22.24	832	*
Fourka	0	19.08	684	*
Kassandra	0	61.05	2536	*
Ag. Paraskevi	0	27.99	438	*

	Accommo-dation	Area in sq km.	Popu-lation 1992	TOI
A.Mamas	432	20,26	1212	***
N. Potidaia	30	17,68	1094	*
Afytos	65	23.78	838	**
Kallithea	2,786	3,78	422	******
Kriopigi	2,288	12.43	457	******
Polichrono	389	17.4	826	****
Chanioti	1,626	10.45	528	*****
Pefkochori	824	19.69	1149	****
N. Skioni	118	22.24	832	***
Fourka	245	19.08	684	***
Kassandra	27	61.05	2536	*
Ag. Paraskevi	86	27.99	438	***

Table 2 **CONTINUED**

	Accommo-dation	**Area in sq km.**	**Population 2003**	**TOI**
A.Mamas	725	20,26	1377	****
N. Potidaia	24	17,68	1588	*
Afytos	959	23.78	1231	****
Kallithea	3,126	3,78	779	*****
Kriopigi	1,846	12.43	594	*****
Polichrono	1,386	17.4	106	*****
Chanioti	2,940	10.45	968	*****
Pefkochori	1,764	19.69	1668	*****
N. Skioni	172	22.24	889	***
Fourka	844	19.08	1203	****
Kassandra	45	61.05	3166	*
Ag. Paraskevi	130	27.99	449	***

	Total Accommo-dation	**Area in sq km.**	**Population 2001**	**TOI**
Prefecture Total:	76,354	2,918	105,156	****

Source: Field research, Department of Tourism Management, T.E.I of Thessaloniki

The Kassandra peninsula

In the already developed, in regard to tourism, part of the Kassandra peninsula (Figure 1a and 1b), different levels of tourism development can be observed among the various districts, as illustrated in Table 2. Thus, Kallithea is, in regards to tourism, the most developed community of the entire peninsula, with the largest percentage of tourist overnights, mostly in hotels and, to a lesser degree, in rented rooms. Clearly, the image that this community presents is that of a tourism resort. The indicator of tourism operation appears to be remarkably high (401), and the community is classified as a significant tourist destination, according to Boyer (1982) classification, although the TOI is lower by 27,62% in comparison to 1992. Other significant tourist destinations on the Kassandra peninsula are Kryopigi and Kallithea with an index of 311, Chaniotis with a tourism operation index of 304. Polichrono and Pefkochori with the index of 130 and 106 respectively. They are classified as eminent tourist areas. Paliouri, on the other hand, with the index of 84 is classified as main tourist attraction. Similar to Kallithea, the second most populated destination – Kassandra – also records a drop in TOI of 2% in comparison to 1992. In contrast, Nea Fokia with a relatively small concentration of

Figure 1a
THE MAP OF CHALKIDIKI

tourism lodgings of just 2.2% of the sum of the Kassandra peninsula, consisting equally of hotels and rented rooms, presents an image of a coastal village rather than a tourism resort, and the majority of its residents are engaged in agriculture and fishery rather than tourism.

Accordingly, its TOI is 5, and it is classified as a municipality district with small tourism activity. Kalandra, with TOI of 106 is also classified as an eminently tourist

THE EARLY STAGE OF THE DIGITIZED MAP OF CHALKIDIKI
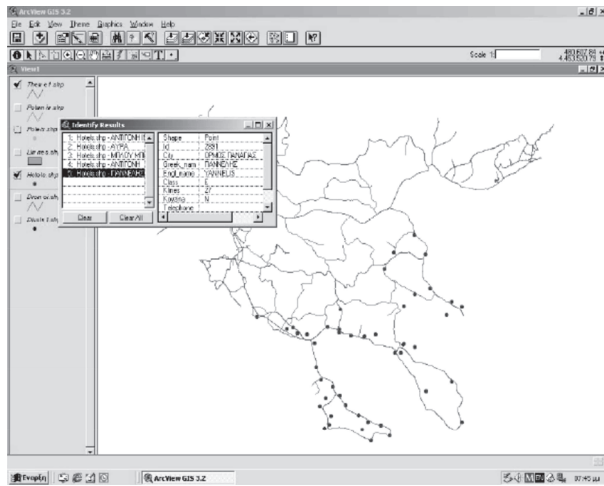
area. Agia Paraskeyi, Nea Skioni and Fourka have an indicator of tourism operation respectively of 29, 19 and 70. The first two are classified as municipality districts with important tourist activity, this being nevertheless not their main activity, while the latter is classified as an eminent tourist destination. Afytos, with an indicator tourism operation of 78, is characterised as an eminently tourism-oriented municipality, as is Agios Mamas, with the index of 53. Finally, Kassandreia, the second largest community of the aforementioned in aspect of demographics and currently the administrative center of the new municipality of Kassandreia, also has a small proportion of tourist lodging (2%).

The indicator of tourism operation is 1 and its classification is that of almost non-existent tourist activity, not unlike Nea Potidea, which has an indicator of 2. This, of course, is due to the lack of tourist lodgings, and not by lack of visitors / tourists. On the other hand, some of the areas appear to have an over-concentration of lodgings. This is due to rented rooms, apartments and private houses, which occupy the largest percentage in the Kassandra peninsula.

West coast of Chalkidiki

The Boroughs, that constitute the group of western coast (A. Pavlos, N. Sylata, N. Triglja) have almost non-existent tourist activity. Except for Kallikrateia, these were regions of arbitrary layout and have no beds. Moreover, even nowadays, there is still a great number of rented rooms and small apartments that exist without being recorded. In this case, the indicator of tourist operation is almost negligible. In addition to that, the regions of N. Kallikrateia, N. Plagia, N. Flogita and

Dionysos with indicators of tourism operation 9, 9, 7 and 6 respectively, are considered of minimum (or small) tourist activity. From this group N. Moudania (with an indicator of 3), have almost non-existent tourist activity.

The peninsula of Sithonia

Regarding the group of municipal departments that constitute the peninsula of Sithonia, it is observed that only two of them can be characterized as eminently tourist areas. These are N. Marmaras and Metamorphosis that, for the time being, have indicators of tourist operation of 114 and 130 respectively. Thus, they are characterized as important tourist destinations. From the rest we observe that Ormylja and Sarti, having indicators of tourist operation 15 and 61 respectively, are characterized as following: the first one has an important tourist activity but not a primary one, while the second one is primarily a tourist region. Polygyros (28) is characterized as a destination with important tourist activity but not a significant one. The rest of the tourist departments, that is to say Nikiti and Sykia (with 50 and O respectively) are characterized as following: the first one as being mainly tourist whiles the second one as a region with non-existent tourist activity.

Advantages and weaknesses of current tourism development (SWOT analysis)

All across the prefecture a double tourism character is shown: developed summer and coastline tourism on one hand, and development of special interests tourism in inner areas, on the other. The SWOT is presented in Table 3.

CONCLUSIONS

Tourism in Chalkidiki– in its dominant form – will be overall threatened if does not respond in a direct and dynamic way to the challenge of competition and the need for improvement of quality. For this reason an investigation of tourist demand should take place. By using and analyzing tourist currents, which are differentiated per type and region, we observe that: a) in the coastal regions the demand begins from May until October while the peak period is from July to August; b) the number of overnight stays by foreign

Table 3
SWOT ANALYSES OF THE TOURISM IN THE REGION

Strengths	Weaknesses
✓Rich natural resources – environmental and cultural resources ✓Good level of satisfaction and positive "word of mouth" ✓Reasonable prices ✓Existence of potential demand ✓Good transport network (charter flights destination) with the main tourist generating markets	✓Inadequate utilisation of the historical and cultural resources ✓Inadequate connection with the natural – environmental resources ✓Inadequate tourism education and training of human resources ✓Inadequate environmental protection, that drives into rural – toft degradation and loss of traditional character ✓Low quality of services and lack of professionalism ✓Difficulties in developing tourism activities during low season (December – March)
Opportunities	**Threats**
✓Exploring opportunities and possibilities for developing, upgrading and promoting prefecture's dynamic ✓Good positioning in both western and eastern European markets ✓Familiarity with the European and overseas markets ✓Increase of "sun and sea" tourism ✓Existence of additional resources and possibilities of network development with the periphery and the wider region (e.g. insular areas depending on "sun and sea" tourism) ✓Generally positive and familiar image, since it is a safe European tourism destination without any negative incidents or preconceptions	✓The international competition and market growth ✓Danger of further market share loss for Greek tourism that will have consequences on regional tourism ✓Spectacular improvement of certain competitive destinations without respective price increase ✓Danger for our country to turn into an expensive tourist destination because of the currency ✓Traditional demand that is controlled by the force and influence of tour operators ✓Continuously increasing competition and continuously increasing product range, with low prices ✓Reduction of repeated visitors ✓Continuously more effective and aggressive tourism marketing campaigns of the competitors ✓Weakness of substitution of Western Europe with new markets (e.g. central and eastern Europe) in near future ✓Stagnation in the overseas markets

tourists is, in total, larger than the one of the domestic tourists. The peak period is determined by the Greek tourists (or the peak period generally attracts the Greek tourists) while foreigners show a more even pattern of arrivals from May to October and c) in general terms Chalkidiki attracts middle-class tourists, mainly from Central Europe, who prefer travelling in the form of organised travel package.

The complete and long-term development of the region is located mainly in the rearrangement of the offered product and services. What is proposed is the constitution of the following networks per category of special/alternative form of tourism: a) religious pilgrim tourism with an emphasis on the Mount Athos and the particular glamour of worships for the Greek and the wider Orthodox and Catholic world; b) mountainous peripatetic tourism on the basis of the tracks of Mountain

Table 4

STRATEGIES AND MEASURES TO ENSURE VIABLE TOURISM INDUSTRY IN THE PREFECTURE

AXIS 1 Establishment of tourism products in new, viable tourist destinations
Measure 1.1 Protection, exploitation and management of the natural and historical environment
AXIS 2 Creation of new, special as well as alternative tourism products
Measure 2.1 Improvement and creation of special thematic tourist substructure
Measure 2.2 Reinforcement of tourism enterprises able to offer specialised tourism products
AXIS 3 Re-establishment, in sustainable terms, of the mature tourism regions
Measure 3.1 Control and management of development of mature tourist regions
Measure 3.2 Improvement of the quality of the tourism product
AXIS 4 Horizontal control of tourism's repercussions in the environment
Measure 4.1 Control of practices of tourist consumption and recreation (amusement) in nature
Measure 4.2 Control and management of destination tourism transport facilities constructions
Measure 4.3 Contribution of tourism towards financing environmental protection and management
AXIS 5 Improvement of quality and competitiveness of the existing tourism products and services
Measure 5.1 Adoption of environmental models in tourism facilities
Measure 5.2 Adoption of models of quality management in tourism destinations
Measure 5.3 Reinforcement of the competitiveness through the promotion campaigns
AXIS 6 Improvement of management and promotion in new markets.
Measure 6.1 Promotion of collaborations between the stakeholders.
Measure 6.2 Search for new markets
Measure 6.3 Improvement of training and socio-economic situation of those employed in tourism industry

Holomonta, and by and large of the wider mountainous range of Chalkidiki (these are described in the digitized maps); c) congress tourism, in combination with incentive travels and the convention/ congress facilities mainly in the area around Thessaloniki; d) agro tourism that is based on the rich, productive, cultural and social resources of the countryside; e) marine tourism with appropriate activities and tours being developed and offered to the market, such as small cruises that might offer sailing or diving in the gulfs of Chalkidiki and operators providing connection with the islands of Northern Aegean and f) education tourism based around exploitation of the historical wealth of Chalkidiki. To that end, in order to accommodate the rich findings from a large number of excavations sites, it is of particular importance that the number of museums be established around the municipality. Based on the research conducted for the purpose of this study, a number of strategic directions that can be defined and measures to achieve them is outlined in Table 4.

REFERENCES

- Adamopoulos V (2002) Research of Environmental Impacts of Waterworks. Water Supply and Drainage Company of Thessaloniki. Research (based on a research conducted by the company)

- Bahaire T. and Elliott-White M. (1999) The application of Geographical Information Systems (GIS) in sustainable tourism planning: A review. International Journal of Sustainable Tourism, 7 (2), 159-174.

- Boyer M. 1982; (1ère édit. 1972) - Le Tourisme, Le Seuil, Peuples et société.

- Defert P. (1967) Le taux de fonction touristique, les cahiers du tourisme. série A, no 5. Aix-en-Provence: CET.

- General Secretariat of National Statistical Service of Greece (2002) Available from: http://www.statistics.gr/. [Accessed 12 December 2004].

- Krygier J. (2001) World Wide Web Mapping and GIS: An Application for Public Participation. NACIS Cartographic Perspectives: State University of New York at Buffalo, Department of Geography.

- Michalidis G. (2002) Central and West Macedonia Tourism Development Plan, Phase A, Introduction. 130- 143.

- Pearce D. G. (2000) Tourism plan reviews: Methodological considerations and issues from Samoa. Tourism Management, 21 (2), 191-203.

- Sidiropoulos E., Tolikas P. and Tolika D. (2003) Study and Research Network of Water Resources of Greece and Cyprus. International conference Greek and Cypriot Water Resources Research Network, Katerini 20/6/2003.