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# GIS APPLICATIONS IN TOURISM PLANNING. 'A TOOL FOR SUSTAINABLE DEVELOPMENT INVOLVING LOCAL COMMUNITIES'

S. AVDIMIOTIS[a]*, E. CHRISTOU[b]

[a]*School of Social Sciences, Greek Open University, Greece*
*E-mail: rdoffice@tour.teithe.gr*
[b]*Department of Tourism Management, Technological Educational Institution of Thessaloniki, Greece*
*E-mail: vangel@the.forthnet.gr*

**Abstract.** Geographic Information Systems (GIS) are now recognised widely as a valuable tool for managing, decision-making, analysing, 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 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 the various information needs, estimating indicators, and generally assisting decision-making in the planning phase, as well as in the monitoring and evaluation phases. The paradigm of Municipality of Chalkidki – Greece proves the necessity and the value of such technologies.

*Keywords*: sustainable development, decision-making support, carrying capacity.

## AIMS AND BACKGROUND

One of the most remarkable technologic innovation 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, analysing, transforming and displaying spatial and non-spatial data from geographic world for a particular set of purposes that varies for each discipline[1-10].

Both GIS and tourism share a common characteristic, that is, both cross the boundaries of disciplines and application areas. 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, business, environmental planners, anthropologists, and archeologists. As such, the potential for GIS applications in tourism is significant[11-15].

* For correspondence.

GIS is now recognised widely as a valuable tool for managing, analysing, and displaying a large 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 management is likely to erode its environmental base, hence, the strength of tourism planning and decision-making can be enhanced be GIS applications, which provide a toolbox of techniques and technologies of wide applicability to the achievement of sustainable tourism development[16-22].

The following tables illustrate the functional capabilities and the tremendous potential of GIS. Rhind (1990) categorised GIS applications in a structured approach according to the generic questions which GIS are frequently used to investigate. Bahaire and Elliot-White[1] related these categories to the basic applications in tourism, as well as, to GIS functions.

**Table 1**. Capabilities of a GIS

| Functional capabilities of a GIS | GIS basic questions | | Tourism applications |
|---|---|---|---|
| Data entry, storage and manipulation | Location | What is at? | Tourism Resource Inventories |
| Map production | Condition | Where is it? | Identify most suitable locations for development |
| Database integration and management | Trend | What has changed? | Measure tourism impacts |
| Data queries and searches | Routing | Which is the best route? | Visitor management/flows |
| Spatial analysis | Pattern | What is the pattern? | Analyse relationships associated with resource use |
| Spatial modelling Decision support | Modelling | What if...? | Assess potential impacts of tourism development |

Source: Ref. 1.

**Table 2.** Common tourism-related issues and GIS applications

| Problem | GIS application |
|---|---|
| Benchmark/database | Systematic inventory of tourism resources |
| Environmental management | Facilitating monitoring of specific indicators |
| Conflicts | Mapping recreational conflicts: recreation-wildlife; user conflict |
| Tourism behaviour | Wilderness perceptions |
| Carrying capacity | Identify suitable locations for tourism/recreation development |
| Prediction | Simulating and modelling spatial outcomes of proposed tourism development |
| Data integration | Integrating socio-economic and environmental datasets within a given spatial unit |
| Development control and direction | Decision support systems |

Source: Ref. 1.

It becomes clear that tourism and recreation management and planning have a lot to benefit from using such technology. Some of the key features of GIS that could benefit tourism planning include:

1. Their ability to manipulate data and spatial attributes.
2. Provide necessary value added information.
3. The ease in allocating resources between what are often conflicting demands.
4. Their adaptability in requirements needs and data changes over time.
5. Their ability to identify patterns or relationships based on particular criteria and support in this way decision-making.

## GIS APPLICATIONS IN TOURISM PLANNING

Decision-making and planning in tourism development is becoming increasingly complex, since organisations and communities have to come to terms with the competing economic, social and environmental demands of sustainable development. Spatial or environmental data can be used to explore conflicts, examine impacts and assist decision-making processes. Impact assessment and simulation are increasingly important in tourism development, and GIS can play a role in auditing environmental conditions, examining the suitability of locations for proposed developments, identifying conflicting interests and modelling relationships[1-6]. GIS can provide a set of tools, which can be used for tourism planning and development..

GIS applications may help in several routine tasks in tourism planning: Data access and routine work; Data integration and management; Resource in-

ventory; Area designation and map overlays; Comparative land use and impact analysis; The analysis of visual intrusion; Community involvement and participation.

GIS applications can provide at least three different types of information. *Tourism resource maps* enable planners and stakeholders to analyse the resource set to identify how much is available and where it is; it helps planners and managers determine the capability of an area for the creation of new tourism products or services, identifying locations suitable to tourists or tourism. *Tourism use maps* enable planners and stakeholders to analyse the resource set to evaluate land use options and identify zones of conflict or complementarity's, such as access points, water, wildlife habitats, etc. *Tourism capability maps* enable planners and stakeholders to analyse the resource set to monitor tourist resources at risk due to management, planning decisions and other sectors[1].

Malczewski identifies GIS contribution in all three phases of a decision-making process. GIS can ideally perform the data acquisition, storage, processing and management that the *intelligent phase* implies for identifying opportunities or problems. The design phase is related to the development and the analysis of possible alternatives to the problem identified in the intelligent phase. In a spatial context, GIS, spatial decision alternatives are derived by manipulation and analysis of the data stored in a GIS, using its overlay function. The third and last phase is the *choice phase* and it is about evaluation of the alternatives. GIS contribution here is not as strong as in the previous two. All three phases necessitate the identification and use of sustainable tourism indicators for assessing present situation, identifying weakness, monitoring, and evaluating alternatives. GIS could be the technology to use for identifying and monitoring indicators.

In the case study of Chalkidiki in Greece, the three different types of maps will be used as indicators that will help us to identify suitable locations for tourism/recreation development, simulating and modelling spatial outcomes of proposed development within the given spatial unit.

## ADVANTAGES 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[23-27]. 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. It involves tourists and locals in an interactive way; it generates income, which in many destinations is the major source; also depends on the use of the natural resources and

the quality of the environment. GIS is a technology capable of integrating various data sets both qualitative quantitative in a single system. This is even more important within the context of sustainable development the implementation of which regards 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 integration 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 adaptiveness, to add or remote thematic layers, constraints and data, it is a dynamic tool for planners rather than a static one, capable of being adjusted as new data become available and as tastes and preferences in demand change over time. These characteristics could be of particular importance in sustainable tourism decision-making as both preferences and targets may change in the course of development and in the course of operationalising the concept of sustainable tourism.

The concept of sustainable tourism development is a subject of an on going debate while its implementation aspects are still very fuzzy. This is even more apparent in sustainable tourism management of mass tourism. The development of GIS based decision support system for sustainable tourism planning and management could have a significant contribution in highlighting implementation aspects and offer the framework and the tools for evaluating, monitoring and planning sustainable tourism.

Implementation aspects offer the framework and the tools for evaluating, monitoring, and planning sustainable tourism. Such system would 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. Therefore, a coherent framework should be developed contributing on this way to the sustainability debate and the operationalisation of the term. With particular reference and indicators, GIS can contribute not only to their measurement but also to their definition. GIS distinctive ability to generate new information from the existing datasets and thus offering added value information, can lead to the identification of sustainability indicators which otherwise would not be possible to be defined and measured. This is even more important since talking about sustainable development indicators for which combined information is necessitated while applicable data are not often available. Because of GIS' efficiency in producing maps and other tabular displays, comparisons are facilitated for example between tourism resource features and resources needed for other activities, and thus decision-making is facilitated.

The information communication capabilities of GIS is another feature, which assist decision-making. As mentioned earlier, GIS can be used in a number of cases to enhance citizens and stakeholders participation.

Another remarkable technologic innovation in tourism planning and decision-making is the GIS applications over Internet. WWW has been hailed in the popular press as revolutionary medium of communication for the third millennium. The Web is opening up new forms of computer-mediated communications, allowing for new forms of information dissemination, social interaction and collaborative working. WWW has garnered far ranging interest from those of us interested in the representation and analysis of geographic information. Thus, is seen as an exciting medium for numerous reasons: it can be accessed by a global audience, on almost every computer platform, and does not require expensive software or specialist training to use. 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[26]. GIS vendors and spatial data providers have realised 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 development in the dissemination, visualisation and analysis tools for planners of the built environment. Internet pages that are concerning tourism generally offer information on a variety of categories, including travel, geography, contact details for local tourist information centres, reservation services and event calendars.

## LIMITATIONS OF THE USE OF GIS IN DECISION-MAKING FOR SUSTAINABLE TOURISM

Bahaire and Elliot-White[1] conclude that GIS is a very useful tool, which can support decision-making in sustainable tourism planning, and management based on the sensitive use of resources and local needs. However, they note that GIS is just a tool and does not by itself ensure fairness, equity and compatibility with sustainability principles. Bahaire and Elliot-White argue that GIS is not 'asocial' data, not it is 'neutral'. It may be manipulated to support policies of certain interests. As Picles argues, although GIS can enhance access to information and there enhance democratic practices they can also be used to promote the interests of particular groups having access to the technology. Anyway, GIS is do not make decision themselves; they may facilitate data processing and analysis as

well as communicate results, but, according to Bahaire and Elliot-White, they are 'unlikely to alter the political character of policy-making and thereby produce a more sustainable tourism planning practice'.

## MEASURING CURRYING CAPACITY IN THE MUNICIPALITY OF CHALKIDIKI – GREECE, USING DATA FROM GIS MAPS

*Research methodology*. As has been mentioned above, collecting the data and defining the indicators for the Currying Capacity Calculation, are the critical issues of the methodology. The software used was the ARC/VIEW 8.2 edition, where 4 shape files were created. The 1st contains the general map of Chalkidiki, while the 2nd all towns and villages. The 3rd shape file contains rivers and lakes. The last and the most critical shape file include all possible accommodation (hotel rented rooms, camping, etc.). Information was gathered in urban planning offices, and by using simple GPS equipment in order to find the exact coordinates of the buildings.

*The calculation of Tourism Operation Indicator* (*T.O.I.*). According to researchers, the currying capacity can be defined as the maximum number of tourists that can be accommodated in a specific area (place of reception of tourists) without causing any undesirable alteration in the natural economic and social environment of the host community

The estimation of the currying capacity can contribute:

1. To determine the limits and the level of tourism development in a specific area.

2. To reach safe conclusions for the mapping of developmental strategy.

For each area (coastal and mountainous) specific criteria and indicators are used in order to locate spatial differentiations that are essential for the analysis of tourist offer and demand in the region.

The Tourist Operation Indicator (T.O.I.) is used to address the intensity of tourist phenomenon, in a given territorial unit (place of reception). In the case study of Chalkidiki, the territorial unit of analysis is each Municipal Apartment – 14 in total – and the calculation of T.O.I. is related to the total of the Prefecture.

The Table that follows is indicative.

**Table 3.** Calculation of the Tourism Operation Indicator (T.O.I.)

| Municipal apartment | Accommodation | | | | Camping (p/p density) | Area ($km^2$) | Population 2001 | T.O.I. |
|---|---|---|---|---|---|---|---|---|
| | total | hotels | rented rooms | rented settlements | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Municipality Apartment of ANTHEMOUNDA | | | | | | | | |
| Vavdos | 6 | 0 | 6 | 0 | 0 | 100.1 | 653 | 0.01 |
| Galarino | 0 | 0 | 0 | 0 | 0 | 24.2 | 247 | 0.00 |
| Galatista | 0 | 0 | 0 | 0 | 0 | 101.3 | 3144 | 0.00 |
| Doumbia | 0 | 0 | 0 | 0 | 0 | 23.4 | 640 | 0.00 |
| Municipality Apartment of ARNEA | | | | | | | | |
| Arnea | 132 | 0 | 132 | 0 | 0 | 69.4 | 2250 | 0.08 |
| Varvara | 29 | 0 | 29 | 0 | 0 | 90.3 | 718 | 0.04 |
| Neochorio | 4 | 0 | 4 | 0 | 0 | 21 | 847 | 0.02 |
| Paliochoriou | 33 | 0 | 33 | 0 | 0 | 47.6 | 1501 | 0.05 |
| Stanos | 13 | 0 | 13 | 0 | 0 | 60.4 | 857 | 0.03 |
| Municipality Apartment of ZERVOCHORIO | | | | | | | | |
| Geroplatanos | 0 | 0 | 0 | 0 | 0 | 13.5 | 422 | 0.00 |
| Crimni | 0 | 0 | 0 | 0 | 0 | 9.9 | 557 | 0.00 |
| Marathousa | 0 | 0 | 0 | 0 | 0 | 44.6 | 678 | 0.00 |
| Palaiochora | 8 | 0 | 8 | 0 | 0 | 50 | 894 | 0.02 |
| Rizon | 0 | 0 | 0 | 0 | 0 | 21.5 | 603 | 0.00 |
| Municipality Apartment of KALLIKRATEIA | | | | | | | | |
| Ag. Pavlos | 0 | 0 | 0 | 0 | 0 | 13.7 | 576 | 0.00 |
| Lakkoma | 0 | 0 | 0 | 0 | 0 | 20.5 | 777 | 0.00 |
| Nea. Gonia | 0 | 0 | 0 | 0 | 0 | 20.2 | 426 | 0.00 |
| Nea Kallikrateia | 789 | 659 | 130 | 0 | 0 | 24.2 | 7497 | 0.43 |
| Nea Silata | 66 | 0 | 66 | 0 | 0 | 30.3 | 1603 | 0.14 |
| Municipality Apartment of KASSANDRA | | | | | | | | |
| Afitos | 2190 | 870 | 1320 | 0 | 0 | 23.8 | 1224 | 7.52 |
| Kalandra | 1057 | 697 | 0 | 0 | 360 | 16.8 | 774 | 8.13 |
| Kallithea | 3630 | 3220 | 410 | 0 | 0 | 3.8 | 796 | 120.01 |
| Kassandreia | 3218 | 2343 | 442 | 433 | 0 | 61.1 | 3063 | 1.72 |
| Kassandrino | 103 | 103 | 0 | 0 | 0 | 36.7 | 467 | 0.60 |
| Kriopigi | 2793 | 1898 | 580 | 0 | 315 | 12.4 | 599 | 37.60 |
| Nea Fokia | 2647 | 389 | 410 | 0 | 1848 | 32.5 | 2054 | 3.97 |
| Fourka | 1679 | 844 | 75 | 760 | 0 | 19.1 | 1202 | 7.31 |
| Municipality Apartment of MOUDANIA | | | | | | | | |
| Ag. Mamas | 1075 | 859 | 0 | 0 | 216 | 20.3 | 1342 | 3.95 |
| Ag. Panteleimonas | 0 | 0 | 0 | 0 | 0 | 10.1 | 452 | 0.00 |
| Dionisiou | 117 | 117 | 0 | 0 | 0 | 8.6 | 1303 | 1.04 |
| Zografou | 0 | 0 | 0 | 0 | 0 | 5.7 | 385 | 0.00 |

to be continued

Continuation of Table 3

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|
| Nea Moudania | 990 | 180 | 320 | 490 | 0 | 16.1 | 6489 | 0.95 |
| Nea Podidaia | 923 | 131 | 792 | 0 | 0 | 17.7 | 1601 | 3.26 |
| Portaria | 22 | 22 | 0 | 0 | 0 | 20.7 | 1421 | 0.07 |
| Simantra | 0 | 0 | 0 | 0 | 0 | 31.6 | 2526 | 0.00 |
| Flogita | 351 | 144 | 207 | 0 | 0 | 10.9 | 1501 | 2.15 |
| Municipality Apartment of ORMILIA | | | | | | | | |
| Metamorfosi | 2255 | 867 | 601 | 0 | 787 | 27.8 | 710 | 11.42 |
| Ormilia | 1215 | 780 | 435 | 0 | 0 | 60.2 | 4043 | 0.50 |
| Municipality Apartment of PALLINI | | | | | | | | |
| Ag. Paraskeyi | 476 | 130 | 346 | 0 | 0 | 28 | 455 | 3.74 |
| Nea Skioni | 1234 | 241 | 660 | 0 | 333 | 22.2 | 933 | 5.96 |
| Paliouri | 1257 | 714 | 243 | 0 | 300 | 30.8 | 858 | 4.76 |
| Pefkoxori | 4773 | 1729 | 2832 | 0 | 212 | 19.7 | 1738 | 13.94 |
| Polichrono | 3666 | 1620 | 2046 | 0 | 0 | 17 | 1050 | 20.54 |
| Chanioti | 4086 | 3334 | 752 | 0 | 0 | 10.4 | 913 | 43.03 |
| Municipality Apartment of M. PANAGIA | | | | | | | | |
| Gomati | 68 | 0 | 68 | 0 | 0 | 75.6 | 639 | 0.14 |
| Megali Panagia | 36 | 0 | 36 | 0 | 0 | 110 | 2749 | 0.01 |
| Pirgadikia | 282 | 128 | 154 | 0 | 0 | 19.3 | 515 | 2.84 |
| Municipality Apartment of POLIGIROS | | | | | | | | |
| Ag Prodromos | 0 | 0 | 0 | 0 | 0 | 27.4 | 453 | 0.00 |
| Vrastamna | 4 | 0 | 4 | 0 | 0 | 110.2 | 1149 | 0.00 |
| Olinthos | 16 | 16 | 0 | 0 | 0 | 20.7 | 1127 | 0.07 |
| Palaiokastro | 0 | 0 | 0 | 0 | 0 | 28.8 | 217 | 0.00 |
| Poligiros | 2631 | 1793 | 423 | 205 | 210 | 199.4 | 6146 | 0.21 |
| Sana | 0 | 0 | 0 | 0 | 0 | 14.9 | 475 | 0.00 |
| Taksiarxis | 154 | 0 | 154 | 0 | 0 | 69.6 | 1072 | 0.21 |
| Municipality Apartment of SITHONIA | | | | | | | | |
| Ag. Nikolaos | 4671 | 741 | 751 | 1029 | 2150 | 90.7 | 2276 | 2.26 |
| Metagitsi | 0 | 0 | 0 | 0 | | 42.1 | 784 | 0.00 |
| Neos Marmaras | 7378 | 3243 | 2271 | 0 | 1864 | 118.5 | 2893 | 2.15 |
| Nikiti | 3419 | 1866 | 993 | 0 | 560 | 71.6 | 3048 | 1.57 |
| Municipality Apartment of STAGIRON – AKANTHOU | | | | | | | | |
| Ammoliani | 1297 | 334 | 451 | | 512 | 12 | 564 | 19.16 |
| Ierissos | 922 | 333 | 329 | | 260 | 52.6 | 3138 | 0.56 |
| Nea Roda | 1122 | 705 | 417 | | | 16.3 | 1247 | 5.52 |
| Olympiada | 688 | 88 | 324 | | 276 | 13.5 | 656 | 7.77 |
| Ouranoupoli | 2044 | 1113 | 697 | | 234 | 21.3 | 959 | 10.01 |
| Stagira | 0 | 0 | 0 | | 0 | 43.3 | 376 | 0.00 |
| Stratoniki | 0 | 0 | 0 | | 0 | 86.2 | 745 | 0.00 |
| Stratoni | 45 | 19 | 24 | | 0 | 12.4 | 1192 | 0.30 |

to be continued

Continuation of Table 3

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|
| Municipality Apartment of TORONI | | | | | | | | |
| Sati | 3676 | 738 | 1916 | 0 | 1022 | 53.4 | 2871 | 2.40 |
| Sikia | 6761 | 517 | 599 | 876 | 4769 | 140.6 | 1155 | 4.16 |
| Municipality Apartment of TRIGLIA | | | | | | | | |
| Eleochori | 0 | 0 | 0 | 0 | 0 | 13.1 | 244 | 0.00 |
| Krini | 0 | 0 | 0 | 0 | 0 | 14.1 | 548 | 0.00 |
| Nea Plagia | 303 | 130 | 173 | 0 | 0 | 10.9 | 1451 | 1.92 |
| Nea Tenedos | 0 | 0 | 0 | 0 | 0 | 25.1 | 356 | 0.00 |
| Nea Triglia | 0 | 0 | 0 | 0 | 0 | 49.4 | 2945 | 0.00 |
| Petralona | 0 | 0 | 0 | 0 | 0 | 9.3 | 377 | 0.00 |
| Prefecture total: | 76354 | 33655 | 22676 | 3795 | 16228 | 2918.1 | 105156 | |

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

According to the results of T.O.I., the places of reception are categorised as follows: > 500: mass tourism station that was created recently; 100-500: big tourist station; 40-100: Tourism Municipality or community; 10-40: Municipality or community with important tourist activity; < 4: almost non-existent tourist activity.

**Table 4**. Measurement of Carrying Capacity using the indicator of square meters of beach per tourist

| Total capacity | Beach ($km^2$) | Capacity* | Users** | Level of saturation*** | M.A. Ormilias |
|---|---|---|---|---|---|
| Metamorfosis | 225 | 56400 | 3760 | 4936 | 1.31 |
| M. Panagias | | | | | |
| Gomati | 68 | 100000 | 6667 | 343 | 0.05 |
| Pirgadikia | 282 | 54400 | 3627 | 792 | 0.22 |
| M. Poligiros | | | | | |
| Poligiros | 2631 | 210600 | 10040 | 6225 | 0.44 |
| M.A Sithonia | | | | | |
| Metagitsi | 0 | 2300 | 153 | 0 | 0.00 |
| M. Stagiron- Akanthou | | | | | |
| Amoliani | 1297 | 17400 | 1160 | 2264 | 1.95 |
| Nea Roda | 1122 | 131200 | 8747 | 3603 | 0.41 |
| Ierissos | 922 | 293200 | 19547 | 5074 | 0.26 |
| Olimpiada | 688 | 250000 | 16667 | 2101 | 0.13 |
| Ouranoupoli | 2044 | 133700 | 8913 | 5251 | 0.59 |
| Stratoni | 0 | 213000 | 10333 | 745 | |
| Stratoniki | 45 | | 1420 | 1287 | 0.91 |
| TOTAL | 11354 | 1425500 | 59033 | 32621 | 0.34 |

Source: Field research, Department of Tourism Management, T.E.I of Thessaloniki.
* 15 $m^2$ /per user; ** includes all divisions of hotels and rented rooms; *** in high season.

Especially, for the coastal municipal apartments, the currying capacity is calculated using the indicator of *square meters of beach per tourist*, measuring the capacity and the degree of blue flag beaches saturation and result conclusions with regard to the biggest possible number of beds in municipal apartments.

*Research conclusions*. From the above table we conclude that the level of saturation of the beaches is 0.34. This means that according to indicator, the tourist population that can be accommodated in the costal zone is more that 62.412 persons. (Summer lodgings of population of near municipalities are not included.) Accordingly, the level of coastal use is close to 0.50. Taking into account that the current offer is 11.564 beds, we conclude that the currying capacity is almost double, reaching 22.000 beds.

## CONCLUSIONS

Tourism is a highly complex activity, and thus requires tools that aid in an effective decision-making to come to terms with the competing economy, social and environmental demands of sustainable development. Application of GIS in tourism and recreation planning illustrates that it is a strong and effective tool that can aid in tourism planning and decision-making. The power of GIS lies not only in the ability to visualise spatial relationships, but also beyond the space to the holistic view of the world with its many interconnected components and complex relationships (Killical and Killical, 2001).

Impact assessment and simulation are increasingly important in tourism development and GIS can play a role in auditing environmental conditions, examining the suitability of locations for proposed developments, identifying conflicting interests and modelling relationships with consistent spatial data on tourism locations, characteristics of these locations, tourist flows. As long-term visitor use data its applications will grow significantly. The paradigm of Chalkidiki – Greece demonstrates the ability to map all spatial differentiations, measuring the currying capacity of the area. The outcome of the measurement is a safe tool leading to the sustainable development of the specific area.

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