GIS and Remote Sensing Class, NRS509  
Fall 2011  
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GIS IN SUSTAINABLE TOURISM DEVELOPMENT

This paper briefly summarizes the cases of application of Geographic Information System (GIS) in the process of sustainable tourism planning and implementation.

The United Nations Environment Programme (UNEP) and the World Tourism Organization (WTO) define sustainable tourism as a "Tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities". It requires informed participation of relevant stakeholders and strong political leadership, as well as consensus building. Achieving sustainable tourism is a continuous process and it requires constant monitoring of impacts, introducing the necessary preventive and/or corrective measures whenever necessary (UNEP and WTO, 2005). Sustainable tourism includes eco-tourism, green travel, environmentally and culturally responsible tourism, fair trade and ethical travel. It requires taking the impacts and needs into account in the planning, development and operation of tourism. It is a continual process of improvement and one which applies equally to tourism in cities, resorts, rural and coastal areas, mountains, and protected areas. It can apply to all forms of business and leisure tourism (UNEP and WTO, 2005).

Sustainable tourism pursues the goal of economic development without damage on biological and ecological resources. However, numerous case studies reveal the problem of unsustainable tourism which causes severe adverse environmental impacts induced by infrastructure development and tourists’ demands, such as water and energy consumption, waste generation and so on. Therefore, a proper management system in the sector of tourism development is crucial.

GIS, being a tool for data mapping and analysis, serves as an efficient and effective tool for managers to trace the dynamics, predict different scenarios and make appropriate decisions in tourism planning and implementation. It helps various stakeholders to decide on land use for tourism development, and becomes an integral part of spatial decision support systems in tourism business.
Tourism is a complex phenomenon involving besides its spatial dimension, social, economic and environmental implications. GIS is a technology capable of integrating various data sets both qualitative and quantitative in a single system. (Bas Boers & Stuart Cottrell, 2007)

In tourism and sustainable tourism development, particularly, GIS can be used for various analyses, planning, and mapping purposes, such as: inventory of tourism resources, monitoring of specific indicators, mapping recreational conflicts, recreation-wildlife, identifying suitable locations for tourism and recreation development, simulating and modeling spatial outcomes of proposed tourism development. GIS can also serve for integrating socio-economic and environmental datasets within a decision support system (Bas Boers & Stuart Cottrell, 2007).

GIS has been also extensively used in the coastal zone analysis and appears to play a role in the development of integrated coastal zone management. The integration of GIS with predictive models is extremely important in coastal management efforts worldwide (Dimitra Kitsioua, Harry Coccossisb, Michael Karydisa, 2002).

What distinguish GIS from other information systems are their abilities of representing, storing, managing, analyzing, and visualizing spatial and non-spatial data in an integrated environment. GIS, as spatial information systems, have found many possible applications in various fields, including business. It can also be a valuable tool for investigating specific questions that pertain to tourism development including location, condition of the area, trends and changes, routing to and through the site, and patterns associated with resource use (Andrew S. Dye, Shih-Lung Shaw, 2007).

The paper reviews number of examples of how GIS appeared helpful for various stakeholders in examining the implications of land-use decisions in tourism development, as well as describes the cases of GIS application for research purposes in the sphere of tourism development.
Works Cited


Annotated Bibliography


The article describes the use of GIS in the sphere of research and planning of tourism development in a sustainable way through community participation and stakeholder interaction. The participatory approaches (PA) and geographical information systems (GIS), further referred to as “PAGIS”.

PAGIS was used in a small community of New Zealand called Marahau. It is located at the southern entrance of the Abel Tasman National Park at the top of the country’s South Island. The area where the Marahau National Park is located is the sunniest spot of the nation with a mild climate and a range of recreational possibilities. Tourism, mostly locally owned, has become one of the largest occupations and sources of income for the country along with forestry, fishing and horticulture. Therefore, a survey was conducted in four stages, including a mapping exercise, to analyze the changes and environmental impacts caused by tourism activities, as well as obtain the local residents’ views and opinions on the areas of concerns and future development. A total of 96 individuals out of a total of 165 adult residents participated in the survey. The local residents were interviewed and provided an aerial photography to flag the areas of importance, areas of concern or problems and areas of future relevance in Marahau. They were also provided with color coded stickers to mention three things they liked, three they disliked about Marahau and three they feared for the future of the community and place them on the map.

This article describes how GIS served as a tool to visualize the issue, creating a platform for a dialogue and community participation in the decision-making process. A community or a group sets up a process to control its own development.


This article describes how GIS was used in creation of a Spatial Decision Support System (SDSS) in one of the largest National Parks in the US, the Great Smoky Mountains
National Park (GSMNP). The GSMNP is the second largest national park in the US established in 1934, it has an extensive biodiversity of over 100,000 plants and animals. The GIS-based SDSS was created in the GSMNP with the purpose to help the visitors explore, know better and plan their visits to the GSMNP. The author describes the process of GSMNP data (physical features, park amenities and park facilities) interpolation in a form of geodatabase, including additional attributes (e.g. windflower), for the creation of the TrailFinder SDSS. The TrailFinder SDSS was designed in a simple way that didn’t require the user to be familiar with the GIS. Thus, the new users were enabled to give their preferences of trails by choosing the number of miles, trail by car, horse or foot, and the trail difficulty, as well as additional attributes through the advanced search option. As a result, the system would produce a visual map showing the best trails ranked accordingly. In the next page the user can also rank his/her factors of preference, i.e. set the points of interest (waterfalls, lookouts, historical sites etc.), park facilities or biology (wildflowers, elk, deer, black bear). Each factor is hyperlinked to a map showing the spatial location of the relevant features with a brief description of the place. The author also recommends measuring the efficiency of the system in the future by conducting a survey of tourists and obtaining their impressions of their park visit. He also suggests that GIS-based SDSS should be migrated into a web-based GIS application for the greater benefit of users who will be able to plan their trip more efficiently and well in advance. It is also suggested to enhance the system by linking it to online routing tools and weather information.


This article discusses the development and implementation of Geographic Information System (GIS) in the organization and its advantages for tourism in one of the regions of Albania, the district of Elbasan. The district of Elbasan has an area of 3292 km2 and a population of 434,911 habitants (population for 2009). It is limited in north and north-west with the district of Tirana, in east and south-east with the district of Korca, in west and south-west with district of Berat. Thirty eight percent of the district of Elbasan is formed by mountains, thirty four per cent by hills, and twenty eight by fields. Tourism potentials have been discovered in Elbasan region, however the lack of digital information for tourism facilities and destinations, internet-based comprehensive information, insufficient marketing
and promotion of the region tourism, as well as lack of a technology-driven approach for the region’s tourism have hampered a successful tourism development. It was necessary to build a database containing information of tourism facilities in Elbasan region and a web-based GIS.

Based on the above-mentioned needs, a database was created including the layers and sub-layers for traditional cultural tourism (museums, art galleries, cultural, religious and national festivals, and historical monuments, natural features such as sites and buildings, arts and crafts); eco-tourism (mountains, waters, falls, springs, national parks, forest reserves, botanical/zoological gardens etc); notable modern features and facilities (hydroelectric power, sporting facilities and other notable engineering structures); and travel and accommodation facilities, travel agencies; as well as other related data to tourism.

Bederiana SHYTI et al. highlight the essence of multimedia GIS database in attraction of stakeholders and investors to the tourism development in Albania, and thus recommends to make the GIS database available on the website of the Albanian government.


The article discusses how GIS was used to identify spatial locations of polluted areas, and assess the level of tourism impact on coastal resources and ecosystems in the Island of Rhodes, Greece. The Island of Rhodes lies in the eastern Mediterranean Sea and covers an area of 1400 km2 and receives over 1 million visitors during the summer, thus, tourism is the main occupation and a source of income.

The study area was divided into zones extending 500 m away from the coast (sub-areas). The environmental quality of the zones was measured using the parameters of phosphate, nitrate, ammonia, and phytoplankton cell numbers and their spatial distribution.

The krigging method of interpolation was used and resulted in four thematic maps, according to the eutrophication scaling (eutrophic, upper-mesotrophic, lower-mesotrophic, oligotrophic).
The impact matrix of the Regime multiple criteria method was then created. Additional parameters included: population, number of shops, non-cultivated agricultural area/cultivated agricultural area as causes of nutrient supply to the sea coastal zone (especially the cultivated areas, due to the use of pesticides which are in the category of POPs), number of hotel beds, and sandy beaches. The sub-areas then were assessed based on the created Impact Matrix of Regime Multiple Criteria. Depending on what parameters were selected as priority, the sub-areas were ranked as the most favored and least favored, from socio-economic and environmental point of view.

The author highlights the aspect of simplicity in application and the clarity of results obtained without applying any complex analysis. Although there’s a difficulty to define the priorities of the criteria, the methodology allows analyzing the dynamics and simulating future development scenarios, says Dimitra Kitsioua et al.


The publication describes the new GIS-supported approach for sustainable tourism infrastructure planning (STIP) in protected areas. The process of developing of alternative trails with less impact on resources and environment, using GIS, in Sinharaja Forest Reserve, a tropical rainforest in Sri Lanka’s southwestern wet zone, is reviewed in this paper. Some specific sustainability criteria of the STIP implemented in GIS included: trail should contribute to the protected area development objectives; should enable visitors to realize their desired and expected experiences; should safeguard resource-carrying capacity standards; should limit resource impacts.

In this study, the STIP integrated three phases: visitor segmentation, zoning and a transportation network planning phase. After a hierarchical cluster analysis, the ‘culture’ and ‘nature’ visitor segments were selected for planning trail networks. Carrying capacity-based zoning (“forest cover” and “slope gradient”) was done with the purpose to demarcate specific areas for different types of land use. Once visitor segments were identified in phase 1 and zones produced in phase 2, visitor segments were directed to zones that provide a satisfying visitor experience, this was performed though grid overlays in GIS.
As a result of the analysis, two visitor segments were mapped, demonstrating STIP’s application as a ‘comprehensive’ and ‘operational’ planning approach. However it is noted that spatial and temporal visitor preferences were not accounted for in maps due to the lack of techniques for analyzing visitor preferences on a substantial, spatial and temporal coherence level simultaneously. The author also reveals that the concept of carrying capacity could not be implemented fully due to the absence of the option to compute least-cost paths while applying zonal side-conditions in the ArcInfo 8.1. Thus, it is recommended to resolve it through modification of the least-cost path algorithm.


This paper examines and reflects on GIS approach in management of environmental impacts of tourism in the case of German National Park in Bayern city, Germany. A set of sustainability indicators was selected to evaluate the environmental impacts on the national park.

During the study the zoning method based on the carrying capacity of land and protected areas was used. This method supported in decision making on which areas should be excluded from tourism development and which should be limited. For the purpose of analysis three maps were digitized and necessary layers were obtained. Borders of different protection zones were inserted (core zone, temporary protection zone, buffer zone). Physical features datasets were added, such as hiking are, ski area, deer resting zone etc. Representing all layers on the map showed different pictures. The overlapping zones were analyzed and decisions on excluding certain leisure activity (for example, where wildlife is a priority), or adjusting the zones were taken based on this.

This example demonstrates the usefulness of GIS in management and decision making due to its capacity to create large complex databases that are easy to manipulate, organize and update.