# The Use of Geographic Information Systems (GIS) in Environmental Education and Awareness: The Case of Hiking Trails in the Island of Karpathos-Saria Cluster

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**Abstract.** Nowadays, the conditions of life are increasingly changed with requirements for qualitative days to form a return to nature, the environmental awareness developing into an imperative, being yet a level pressure form to the "government". Significant Push tools to empower people and turning their needs to the "natural" way of life, are the design and the information strategy and education environment. Modern information-education environment has thoroughly evolved and enriched by the use of Geographic Information Systems (GIS). Geographic Information Systems are undoubtedly applications which can highlight and restore the importance of the environment on the world stage, through various activities.

**Keywords:** Environmental Education, GIS application, Environmental routes, Arc Map

#### 1 Introduction

The increasing spread of technological developments in the IT and telecommunications has made it possible to directly access to vast amounts of information every kind (Andreopoulou et.al., 2011).

The use of ICT (Information and communication, technology), and the Internet can support the educational process and awareness of students in environmental matters (Stamoulis et al, 2008). Their influence on environmental education has the following results (Stamoulis et al. 2008):

- Greater involvement of students.
- More active participation during activities.
- Facilitate and extension activities for empirical research in the classroom and at

The use of ICT in environmental education (EE), can support significantly the educational process, and the effort to raise the awareness of students. (Stamoulis et all, 2008).

The ICT help the learning and teaching, and also can facilitate the work of the teacher, who can utilize ICT as cognitive and investigative tool (interactive

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multimedia, simulations, educational games), as a regulatory instrument, as a communication tool (communication with various actors, students, digital libraries), as an information search tool (on line databases) (Tastsidis, Hatzimichael, and Anthony, 2010).

The rapid growth of new information and communication technologies and their penetration in the communication work production processes bring about radical changes in all areas of human activity (Castells, 1998).

One useful tool which belongs to category of ICT, absolutely is the Geographic Information Systems (GIS). Summary, regarding the definitions given for GIS occasionally, it is worth mentioning some of them. A definition of Goodchild (1985), is the following: "GIS it is one integrated system for collecting, storing, managing, analyzing and display information on geographical nature matters". The "Integrated" means that the GIS is treated not only as a sum of machines and programs, but as a new, different technology.

One also successful definition given by Carter (1989) and according to this, GIS is "all those information systems which focus on territorial interests and phenomena at scales of all the earth until the unit property".

Geographic Information Systems have the same characteristics as the other information systems, with the additional feature of being the spatial dimension. There is large number of GIS, many of which are known by other names.

It is worth to note that an effective GIS must based on the following principles (Maniatis, 1996):

• The system to be developed must be useful to political leaders who take decisions, ie

users.

- The techniques used for the collection, processing and analysis of data, should be designed to expertise and general infrastructure that exists.
- The level of system performance and, by extension, possibilities of a computer, to comply with the needs and mainly financial capabilities and expertise.
- 1. The assumptions that used to derive conclusions should be mentioned clearly and unequivocally in each option programs based on information of GIS.

Applications of GIS are varied and relate to matters of nature, economic, technical issues and geographical / cartographic. GIS used for spatial and development planning in geographic and topographic applications but especially they have great use in protection of the environment and environmental education and awareness. For this reason, was made particular reference to them at the World Conference on the Environment in Rio De Janeiro in June 1992 (Chaloner, 1992).

Moreover, GIS can be correlated to the environmental education with effectively way. First of all, EE is a continuous lifelong learning process focus on the future as addressed to people regardless of their age or their field of activity extends to all stages of life (Daskolia, 2004).

Also, it is a form of education in a dynamic character, as it is not stagnant over time, but follow and absorb all social, economic, technological and cultural changes that occur in a way that is never detached from modern human life, have then and meet all environmental challenges (Tsampoulou - Skanavi, 2004).

The purpose of environmental education is the surrounding area (Georgopoulos, 1986). The spatio - temporal placement and processing of data is a key element in

any examination of issues related perivallonitkis education. It is impossible to develop an environmental education program and not to refer to factors relating to space. With the specific capabilities that have GIS in analyzing spatial data suggest that relate directly to the EE.

Facing the GIS as educational tools within the EE we can only see through the overlay of thematic maps direct correlation with the interdisciplinary approach (xalkidas et al, 1998).

In addition to, GIS can support interdisciplinary learning activities. They are a powerful tool which is possible to combine and integrate the knowledge students gain both in IT and in other subject areas such as natural sciences, literature, mathematics and foreign languages artistic (Pardalidis, 2007).

Moreover, allow to students through environmental education have better control in apokteitheisa knowledge because enhanced analytical, synthetic thinking and collaboration (disessa 2000).

Also, the possible beneficial effects of the integration of GIS in the educational process have been studied and discussed in the international education community. (Kontosi 2007). The Thomson (1987), characterizes as a source of data with which one can learn everything related to the world (Audet, 1993), while teachers who designed them environmentally recognize many advantages in their application.

Finally, Environmental education has found an ally in the effort for environmental awareness tourism and specific environmental.

Greek tourism is characterized by increased seasonality. In recent years, efforts are made to mitigate the seasonality of tourism, but also to tackle the high concentration of tourist influx in specific regions of the Greek territory. These efforts focus on creating alternative forms of tourism, one of which is the environmental-educational tourism.

The environmental-educational tourism is considered one of the most important developing tourist markets and can offer significant benefits to an area with a rich cultural elements, which are a magnet for educational / informational tourism, derived both from Greece and abroad. The environmental-educational tourism include organizing educational-information programs for students and people with environmental concerns, educational and cultural programs, awareness programs and knowledge of Greek cultural heritage and nature.

Greece, a country with rich cultural elements and excellent tourist product, and can be a magnet for people seeking to acquire special knowledge or training on issues of special interest such as the environment. Tool for the development of environmental-educational tourism is the creation of technical infrastructure, the emergence of which is constructively through the use of Geographic Information Systems (GIS). Typical examples are organized hiking trails, such as those of Northern Karpathos-Sharia.

## 2 Study Area

The study area of this work is the island of Karpathos. The island of Karpathos is located in the southeastern Aegean Sea between the islands of Rhodes and Crete, refraining 82 miles from the port of Rhodes (26 miles

from the edges of the islands) and 46 from the port of Sitia (40 miles edges of islands) while Piraeus is 280 miles. Km. It is the second largest island of the Dodecanese after Rhodes and possessing the highest peak (Good Lake) to 1215meters.

The island featuring intense mountainous terrain which starts from the south of the island with 508m. Mount head and culminates in the center of the 1215m. altitude. Then a mountainous backbone crosses over the island including the island of Sharia in the northern tip of the island with an altitude of 630m.

The intense mountainous terrain and poor soil productivity had as a consequence, during the last century, the migration of much of the local population and today exist on the island about 6000 inhabitants and counted about 40,000 Karpathians worldwide.

Administratively divided in Karpathos Municipality held the southern part of the island and 2/3 of the surface and the Olympus community together with the island of Sharia cover the remaining 1/3 of the island and 10% of the population.

In recent decades the development of tourism has stopped bleeding migration and there is a strong growth in this area.



Fig. 1. Satellite description of study area from Google Earth.

#### 3 Materials and methods

For the present work, we used the Arc Map 10.2 software. It is worth to note that all the hiking routes in the island of Karpathos are twelve. We selected one of them "Route ol4" to visualize it on the map. More specifically, as base map we used a map year 2007 through the website www.ktimatologio.gr, as we can see in image 2. Using GPS, collected coordinates for the routes in EGSA 87, in significant points of the

hiking route, which have particular environmental value and we reflected them in map. In Arc Map, we created a geo database which contains shape files necessary for the creation of map, and we digitized the route, delimited it with the tool "line" of Arc Map, following the digitization standards. Furthermore, we created a map with contour as we can see in the figure 3, which can help someone to understand the difficulties of route.

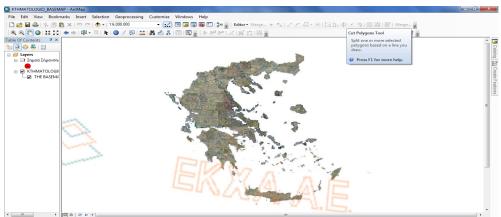


Fig. 2. Basemap that used for the work.

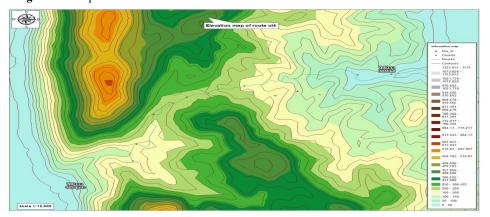


Fig. 3. Contour map.

As far as concerned the geo database, this consists of two shape files with the following names: "Coords" and "routes". The first file, consists of the coordinates (that collected with GPS) of the route and the second one, consist of the shape of the route as we can see in figure 3.

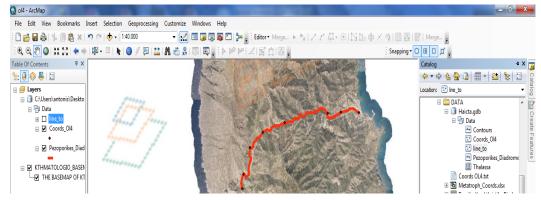


Fig. 4. Route display with red line

In addition to, using the "layout view", as we can see in figure 4, created the map of hiking routes. The map has the following scale: 1:12.000. Finally, placed an image using images from "Google earth" in the map, via the tool "insert picture" of Arc Map.

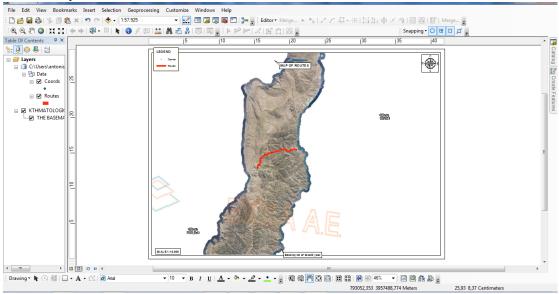


Fig. 5. Process of creation map of hiking routes.

### 4 Results and Discussion

We can see that GIS can contribute effectively in the environmental education with the creation maps. These maps can be the base for the EE and awareness both for visitors and students. This thematic map (image 6), can give significant information (after the import of correct shape file), which related to EE and awareness. Points of interest and a variety from physical landscapes can visualized

and give to the map an environmental side. Moreover, both the map and the general procedure creation of it can give to schools for the course of environmental education. With this way students will understand how GIS contribute in the EE. It is worth to note that the map of contour is also helpful to someone because it gives significant information about the difficulties of route.

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