Design and Development of an Innovative Information System application to present Natura 2000.

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Abstract. This Paper describes the design and development of an innovative Information system application that uses Google maps and GIS to record and present Natura 2000. For the pilot case study it was selected Natura 2000 in Central Macedonia, Greece. It constitutes a web application and can be expanded to record all Natura 2000 in Greece. It addresses to simple users which will have the opportunity to gain information and explore Natura 2000 in Central Macedonia over the map.

Keywords: information system, google maps, GIS, environmental data, protected areas, Natura 2000

1 Introduction

Today, in "information age" where knowledge is power it is generally acknowledged that organizations depend on their information. The convergence of Information and Communication technologies (ICT), the Internet and all kinds of web-based projects are emerging in a fast pace in our society to generate numerous ICT techniques, tools and services (Andreopoulou, 2011).

It is highly appreciated that our society is characterized by significant changes that shape the new society of evolution science, global economy, information and new technologies. Consequently technology helps human efforts to solve environmental problems. So the various sectors of technology such as, databases, networks, information systems and geographical information systems can contribute decisively to the solution of various environmental issues (Papastavrou et. al., 2008). Web technology, the Internet and all kinds of intranets along with web-based projects are emerging in a fast pace in our society and a huge amount of information move across the WWW worldwide (Andreopoulou, 2009).

Information systems and computers are the driving force behind the transition industrial society to information society (Long, 1998). Moreover it helps to control,

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coordinate, and analyze the problems to decide and develop new products (Tasopoulos, 2005).

Internet is an open community of users and computer networks and acts as a provider for various services and information around the world (Andreopoulou, 2009). Is one of the largest developments in the world of computer networking and represents thousands of individual networks in the entire world. In addition the scientific exploitation becomes exceedingly because daily allows to students, researchers etc. to upload and share programs, books and any information applications fast with precision (Papastavrou et al., 2008).

Google maps is a tool that uses Internet and gives access to free layouts, offers a choice between maps and satellite images. The coverage is global with an image resolution varies according to region and can reach up to 15cm in some areas. Apart from application google gives an Application Program Interface (API) as a tool to create new applications tailored to the needs of the programmer.

1.1 Natura 2000

The Network Natura 2000 constitutes a European Ecological Network of regions that includes natural habitat types and species habitats that are important in European level. The legal bases of Natura 2000 from its founding in 1992 are two instructions of EE the Special Protected areas – *SPA* 92/43/EU and Sites of Community Importance – SCI 79/409/EE. (Dafis 1996, Tsitsoni 2009).

SPA following the designation by States Members, includes automatically in Natura 2000 and managed to follow the provisions Directive Article 92/43/EU. In contrast SCI intergrade by a scientific evaluation and negotiation between State Members of European Commission, according to the results of ecological unit at biogeographic seminars (Min. Of Environment Energy & Climate Change, 2010).

Each member of the European Union should prepare a list of areas that contain species listed in both instructions. Then the list submitted to the European Commission, which after checking added to the network. Greece responded to the Habitants Directive, which aims the conservation of biodiversity with sustainable use of natural resources by creating a network of protected areas. During the implementation of European policy for conservation, 27 operators established in 61 Natura areas (Apostolopoulou and Pantis 2009).

Natura 2000 network protects 18% of the land in 15 countries that constitutes European Union before the accession of new country members in 2004 and negotiated the number and size of protected areas to new countries.

The Directive on Habitats in 1992 requires each EU country to single out those geographical areas the importance of ecological identity makes sites of European importance. Moreover, it requires from EU members to develop management plans. These projects should combine harmoniously the conservation of wild fauna and flora with economic and social activities and be integrated into sustainable development strategy. These sites compose Natura 2000 network.

Meanwhile, authorities have sent valuable information for each area of Natura 2000. As a result, the EU has available over 9.000 maps and 220 sets of digital data.

With these data EU has begun to create a geographical information system which will provide potential information for EU.

Since, the classification of areas is almost complete EU 2007, focusing on the direction of management particularly to assess whether the Natura 2000 network eventually effectively protect the species and habitats (Martínez et al., 2006, Sánchez-Fernández et al. 2008). The Habitats Directive aims to conserve biodiversity through sustainable use of natural resources and strengthens decision-making processes to create or improve national systems of protected areas (Maiorano et al., 2007). The effective implementation of European policy on the conservation areas NATURA 2000 is a highly complex process, involving many different contexts indifferent EU Member States (Hiedanpää, 2002).

Addition to restricting trade with endangered species, bird protection directive and directive on the conservation of natural habitats of wild fauna and flora are centralized of Community law for nature conservation and species. Natura 2000 based on the finding that habitat protection is the basis for a successful protection of species (Wikipedia, 2009).

Sites of Community importance relating to habitats that are in danger of disappearing from the natural range have a limited natural range due to the reduction or because their land and are important examples of typical characteristics of one or more of the regions: Alpine, Atlantic, Continental and Mediterranean. The articles that focus on the Community interest are those which are in danger, are vulnerable and may in future include in endangered species and are rare (KALLISTO, 2009).

Central Macedonia hosts 40 NATURA 2000 sites, the largest number, and represent the 13,5% of total. Includes the prefectures of Hmathia 2 sites, Thessaloniki 8 sites, Kilkis 4 sites, Pella 5 sites, Pieria 9 sites and Xalkdiki 12 sites.

The aim of this project is to design and develop an information system, which will record and present specific environmental information with a focus on Natura 2000 sites and will be offered to any scientist or citizen or organization directly, in a valid, reliable and comprehensible way.

In particular, this paper has as various objectives: to develop a geographical application that exploits free backgrounds using Google Maps API, to provide centralized display information on Natura 2000 in Central Macedonia, to create an application where the base will be enriched with specific environmental information on protected areas and to offer easy, immediate and pleasant access to users who will have the opportunity to gain information and to explore the Central Macedonia over the map.

2 Methods and Materials

To create the application we used spatial data of Natura 2000 sites occurring in central Macedonia, and documents containing information about the area. For the collection of data addressed to companies that provide geographical information as well as official websites of Greek authorities to ensure that the data are valid.

The information system that will be designed will be a web application. For this reason it was necessary to construct an interactive website which will support online

the application, and the Application Program Interface API Google, the model that we used to integrate Google maps on our website. This is a set of classes with Properties, Events, Methods structured in a way that enable access to data and allow them to recover and enrich them before display. The API has been created for use with the programming language JavaScript. Alternatively, the proposed methodology using PHP or ASP Script that creates the HTML commands in JavaScript. A variant of this method has been developed in this work. Inside the main application environment is created at runtime (at runtime) HTML code with JavaScript commands that use the Google Maps API.

The programming languages were used PHP and JavaScript. PHP is a script language from the server side, designed for web and an open source product. PHP code translates in the web server by creating HTML code or other output (Welling and Tomson, 2006). Javascript is a scripting language and is used for creating interactive webpages as our application and integrated to the code, when the page reaches the browser reads the script and follow the instructions (Siafakas and Xrimatopoulos, 2009).

To design the structure and appearance of the application firstly we used Arc map with tool "*export to kml*" to extract shapefiles to KML (Keyhole markup language) format that is valid for application.

KML is a file format used to display geographic data in an Earth browser such as Google Earth, Google Maps, and Google Maps for mobile. KML uses a tag-based structure with nested elements and attributes and is based on the XML standard. Kml processing, was produced in Microsoft Visual Studio and Google Earth.

Finally to integrate kml files and documents we used MySQL which is a powerful system for managing relational databases. So the next step taken after the stage of collecting and processing data was organized and putting them into a database and then SQL through PHP calls the base and displays the data in the application.

3 Results

The application is based on Google Maps platform which provides integrated digital backgrounds (cartographic and satellite).

The Home page of application “Natura 2000-Central Macedonia” presented in Fig. 1, consists of the following: *Map area and tools* (Zoom in-out, Scroll, Swap View, Back view), *Selection of thematic levels* (Natura SCI, Natura SPA) and *Library*.

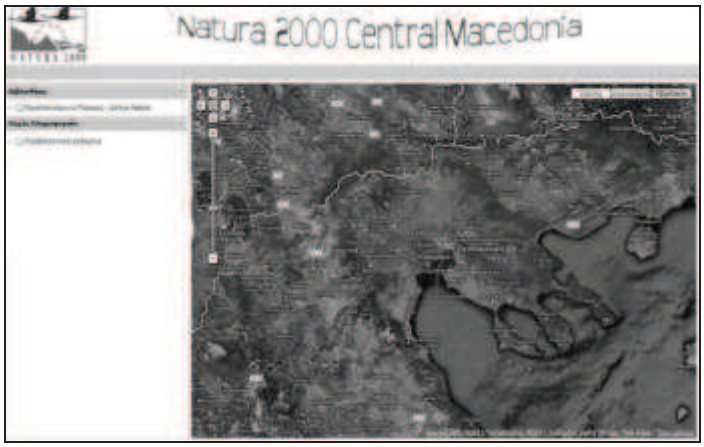

Fig. 1. Home Page.

3.1 Map tools

We can move the map just by holding the left mouse button or with the tool located on the left tab of the map (Fig. 2). To make zoom in-out move the bar which is below the navigation buttons or with the mouse by scroll in-out.

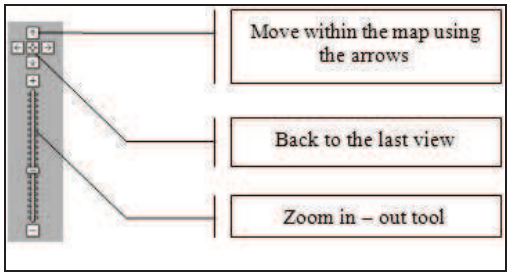

Fig. 2. Map tools that help users to locate in the map.

Moreover there is a possibility to change the map display format to Map, Satellite and Hybrid and the final map views are presented in Fig. 3, Fig. 4. and Fig.5.

Fig. 3. Map View

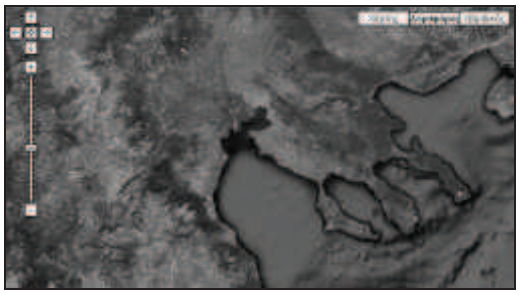

Fig. 4. Satellite View

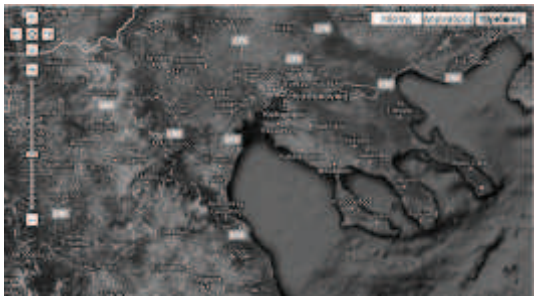

Fig. 5. Hybrid View

3.2 Contents

Application has two basic categories and each one has subcategories. To show the contents of the subcategories we make click on the arrow icon or double click to the text of subcategory.

Library Menu includes environmental information about Natura 2000 in Central Macedonia such as *Directive 92/43/EU* about Natura 2000, Features about Natura in Central Macedonia and *Catalog* of Natura 2000 sites. By choosing the document the user wants one new tab opens to browser in a pdf format. (Fig.6)

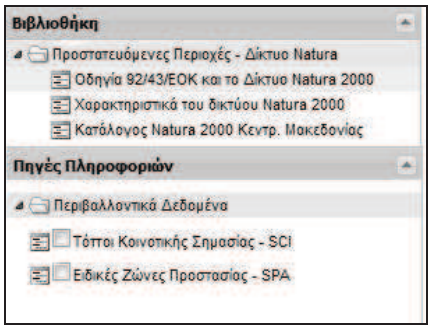

Fig. 6. Left frame menu and contents.

Resources Menu is the basic menu of the application and includes kml files about Natura 2000 displaying to the map. The two subcategories are: *Special Protected Areas – SPA* and *Sites of Community Importance – SCI*. To display those information to the map just check the checkbox before the text.(Fig.6)

SCI maps of Central Macedonia are also presented in the map. By clicking over the icon of the Natura 2000 site user wants, an explanation window appears and shows the name and the code of Natura 2000 site. There is a link below which opens a pdf file for further information (Fig. 7)

Fig. 7. SCI sites of Central Macedonia displaying on the map.

SPA sites of Central Macedonia are displayed on the map. By clicking over the icon of the Natura 2000 site user wants an explanation window appears and shows

the code of Natura 2000 site. There is a link below which opens a pdf file for further information (Fig. 8)

Fig. 8. SPA sites of Central Macedonia displaying on the map.

4 Conclusion

The application is named "Natura 2000-Central Macedonia" and it is an Information system application that uses Google maps and GIS to record and present Natura 2000. For the pilot case study it was selected Natura 2000 areas in Central Macedonia, Greece. It constitutes a web application and can be expanded to record all Natura 2000 in Greece. It addresses to simple users, which will have the opportunity to gain information and explore Natura 2000 in Central Macedonia over the map.

Nowadays, internet is the primary information tool and is part of our everyday life because provide to users free access to a vast range information.

In addition, development of science and technology require the use of information in the forestry sector since the industry was facing several problems. Briefly mention the use of information technology to sectors in forestry, forestry legislation, forest protection area, improvement and expansion of forest management, exploitation and development of forests, environmental organization and management of the forest service, field research, planning and development (Panitsidis, 2010). Information systems are vital part of sector of planning and development, and that application described can be a useful tool in planning and development process in Central Macedonia.

This project was created using Google Maps API, offers to any citizen, scientist or institution effective information about Natura 2000 found in Central Macedonia and specific forestry knowledge about Natura 2000 protective areas.

This application has the following advantages:

- Graphical user interface: The user interface is fully graphical (GUI) after using all known features (mouse, windows, menus, functions, function buttons and pick lists
- Interface based to Internet technologies: All functions are available via web interface. Access is widely used by all Internet browsers (Internet Explorer, Mozilla Firefox, Opera, Apple Safari, etc) without having to install additional applications.
- The user interface has an open design philosophy to not confuse the user. This concerns the use of a common color palette and the use of common symbols for identical and similar functions.
- The response time of the computer system is minimized, so the user does not have to look at the computer screen waiting for the results.
- Its use does not require any specialized computer knowledge.
- Easy and quick search, navigation and access to hierarchical directories and files in accordance with multiple thematic categorizations.
- The application data is completely reliable that can be used as data for new studies work and any form of research.
- Easy updating, adding and deleting information available in case of changes points of interest or additional special events.
- Ability to print the displayed maps and information

A future extend of the "Natura 2000-Central Macedonia" application would be to incorporate data for all Greece territory, to add new detail categories, to enhance connection with a Geographical Information System, to extract kml for personal use, to communicate with construction projects and management of databases that may have other special features, to import audio and video and to finally become a user-friendly multimedia application.

The application is edited in the Greek language as it is targeted to Greek users, however, a future extend would also be to be also edited in English and german language, aiming to expand the target audience.

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