

DEVELOPMENT OF WEBGIS PLATFORM FOR IMPLEMENTING MARINE SPATIAL PLANNING IN CYPRUS

**HADJIMITSIS D.G.¹, AGAPIOU A.¹, THEMISTOCLEOUS K.¹, XAGORARIS Z.¹,
SOULIS G.¹, METTAS C.¹, EVAGOROU E.¹, ALIOURIS K.², IOANNOU N.²,
KOKKOSIS G.³ and PAPATHOMA G.³**

¹ Department of Civil Engineering and Geomatics, Remote Sensing and Geo-Environment Lab, Eratosthenis Research Centre, Cyprus University of Technology, ² Department of Merchant Shipping, Ministry of Transport, Communications and Works (Cyprus),

³ Department of Lands and Surveys, Ministry of Interior (Cyprus)

E-mail: d.hadjimitsis@cut.ac.cy

ABSTRACT

Marine spatial planning (MSP) is a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that usually have been specified through a political process. It has been shown that Geographic Information System (GIS) can be applied in several ways in the MSP process. This paper describes the overall Web-GIS methodology for the implementation of the MSP in Cyprus.

One of the main advantages of using Web-GIS from the traditional desktop GIS is portability and accessibility because it does not require high end hardware and resources. Since it is accessed through the web, the tool can be used by anyone and it can also be used by a number of users simultaneously. The Cyprus University of Technology designed and developed a WEBGIS platform to support the Marine Spatial Planning in Cyprus part of the MSP project named as 'THAL-XOR', which is 80% funded by the European Regional Development Fund (ERDF) and 20% funded from national contribution. The platform has been developed based on the information and support provided by the Department of Merchant Shipping of the Ministry of Communications and Works, and the Department of Lands and Surveys of the Ministry of Interior. This paper presents the Web-GIS application and the advantages of this platform.

Keywords: WebGIS, Marine Spatial Planning, Spatial Analysis, sea activities, Cyprus

1. Introduction

Maritime spatial planning (MSP) aims to contribute to the effective management of marine activities and the sustainable use of marine and coastal resources, by creating a framework for consistent, transparent, sustainable and evidence-based decision-making (Directive 2014/89/EU - Maritime Spatial Planning). Based on the Directive 2014/89/EU each EU member states shall: (a) take into account land-sea interactions; (b) take into account environmental, economic and social aspects, as well as safety aspects; (c) aim to promote coherence between maritime spatial planning and the resulting plan or plans and other processes, such as integrated coastal management or equivalent formal or informal practices; (d) ensure the involvement of stakeholders (e) organise the use of the best available data (f) ensure trans-boundary cooperation between Member States and (g) promote cooperation with third countries.

MSP aims at minimising the conflicts among different sea uses as well as their negative effects by allocating space and applying zoning for different uses. The benefits of MSP include: (a) Reduced conflicts between sectors and create synergies between different activities; (b) Encouraging investment – by instilling predictability, transparency and clearer rules. This will help boost the development of renewable energy sources and grids, establish Marine Protected

Areas, and facilitate investment in oil and gas; (c) Increased coordination – between administrations in each country, through the use of a single instrument to balance the development of a range of maritime activities. This will be simpler and cheaper; (d) Increased cross-border cooperation – between EU countries, on cables, pipelines, shipping lanes, wind installations, etc and (e) protection of the environment – through early identification of impact and opportunities for multiple use of space (European Commission).

2. Development of the WebGIS platform

It has been shown that Geographic Information System (GIS) can be applied in several ways in the MSP process. Indeed, GIS tools can be used in several ways, including delineation of features; as an efficient tool for identifying, locating and visualizing the cover and spatial distribution of resources and uses in the form of maps; as indicators for the assessment of management performance; as indicators of the state compared in different areas or the change of state over time and can also combine several types of spatial data. This paper describes the overall Web-GIS methodology for the implementation of the MSP in Cyprus.

Web-GIS developed in the framework of the “THAL-XOR” project is a “smart” Web-GIS application based on Oracle technology. It is easy to use and manage and is efficient and user-oriented. The THAL-XOR Web-GIS application is able to manage large amounts of data as well as multiple and simultaneous different users, with different profiles and privileges. User login procedures are designed based on control of different user’s profiles and user properties.

During the login procedures, the system responds with user-friendly messages in order to guide the user. The Web-GIS app also provides a friendly environment for system administrators in order to effectively manage authorized system users. This environment provides all necessary tools to change user’s properties and profiles as well as keys and passwords. In addition, the ability to create users groups with selective characteristics is provided. Finally the system provides statistics per user, for different time periods, comparative user data and different statistics representation options (calendar, pies, charts, etc.).

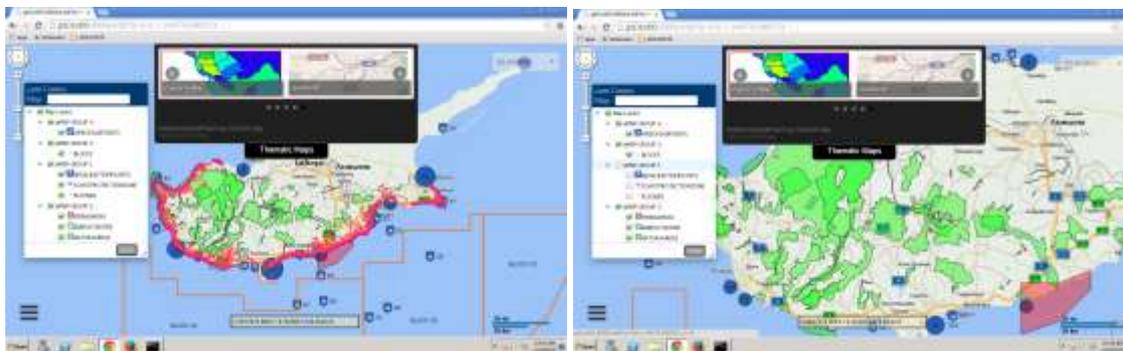


Figure 1: Interface of the Web-GIS application for the “THAL-XOR” project

The system administrator has "real-time" information regarding page usage and active users. The mapping environment provides the ability to easily select the map of interest through the use of a mapping carousel. The user can select the map of choice by scrolling between different maps, which include access to map previews, map names and descriptions.. The access to different data layers of information takes place through the use of a layer control tool. Mapping information is organized in different levels and groups, according to its characteristics. The mapping environment provides all standard data display tools, including display on/off, Pols grouping, zoom in/out, pan, rotate, move, etc.

The user has the ability to select and deselect different levels of mapping information and customize the mapping view according to his personal needs (carousel display off, map legend display on, etc.). In addition to the above, the user may focus on specific points of interest (Pols) or mapping areas to check mapping information in comparison with aerial or satellite raster images. Attribution windows are providing details for selected Pols.

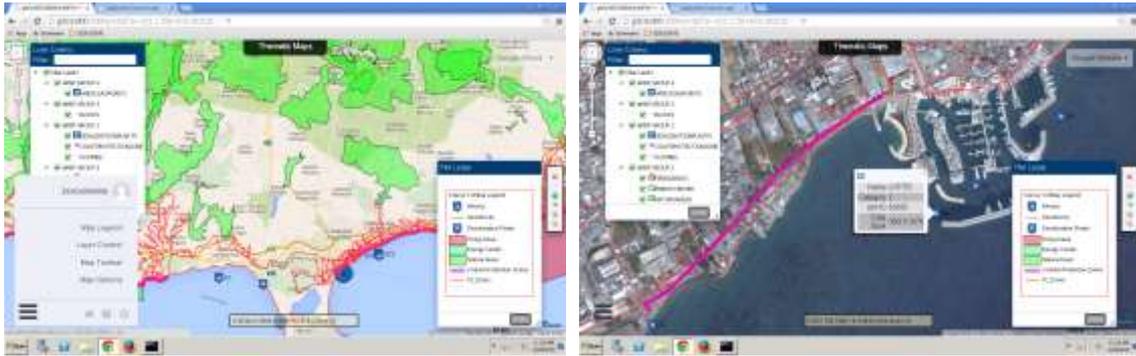


Figure 2: Information from specific Pols

All menus may be transparent in order to further facilitate mapping inspection, especially in the case of a mobile device. Base maps may vary according to provided base map options (Google Street, Google Satellite /Hybrid, ELocation, OpenStreet Maps, etc.). Finally, on-line help is provided to any stage of the WebGIS application usage. The users may access the on-line user guide electronically, display or print it, through any mapping environment and find details regarding the effective use of the Web-GIS app.

Web-GIS allows experts and stakeholders to observe the different activities both in the marine as well in the coastal areas of Cyprus so as to decide the best strategy for the MSP of Cyprus. GIS spatial analysis can be used so as to map the different conflicts between the activities (Figure 3), as this has been demonstrated by Hadjimitsis et al. (2015).

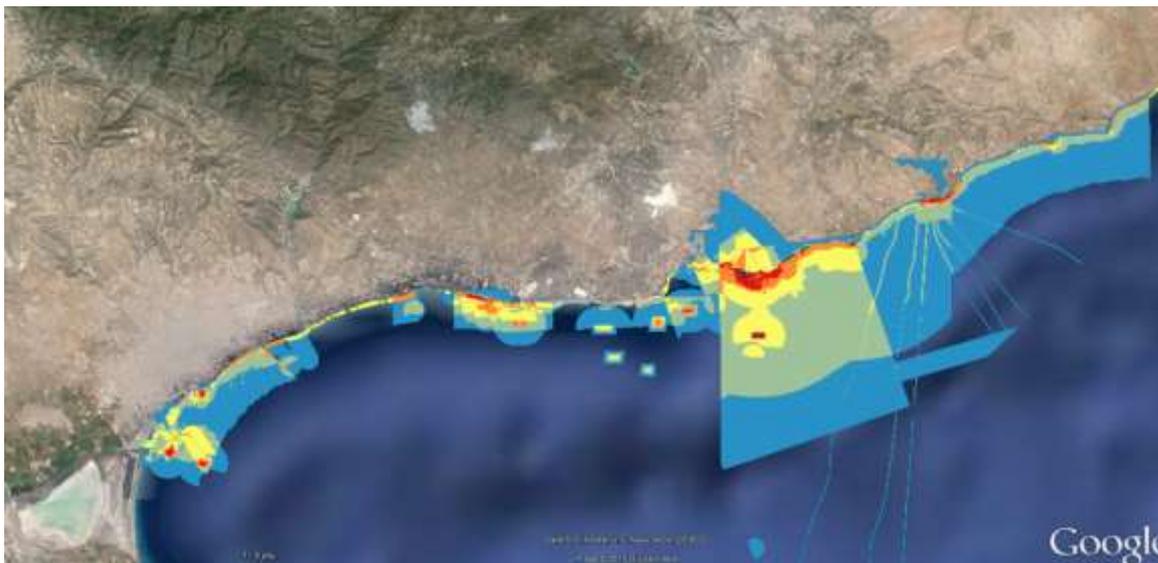


Figure 3: Spatial analysis of conflicts between the different activities in the Limassol area

3. Conclusions

Marine spatial planning (MSP) is a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that usually have been specified through a political process (UNESCO). During recent years, marine spatial planning has been the focus of considerable interest throughout the world, particularly in heavily used marine areas (Ehler and Douvere, 2009). Characteristics of marine spatial planning include ecosystem-based, area-based, integrated, adaptive, strategic and participatory. MSP is not an end in itself, but a practical way to create and establish a more rational use of marine space and the interactions between its uses, to balance demands for development with the need to protect the environment, and to achieve social and economic objectives in an open and planned way (UNESCO).

Developing a Web-GIS based tool such as 'THAL-XOR Web-GIS' addresses the need for fast, easy access to multi-layered GIS data and tools for the purposes of MSP planning. It enables stakeholders and the public access to the results of the analyses and assessments of the MSP over Cyprus. This will assist further the governmental strategic plans to get existing MSP activities, existing and future MSP conflicts and future MSP planning.

ACKNOWLEDGEMENTS

The Action entitled: "Cross-Border Cooperation for the development of Marine Spatial Planning" referred as THAL-CHOR (in Greek ΘΑΛ-ΧΩΡ) is co-funded by the European Regional Development Fund (ERDF) by 80% and by national funds of Greece and Cyprus by 20%, under the Cross-Border Cooperation Programme "Greece-Cyprus 2007-2013".

REFERENCES

1. Directive 2014/89/EU - Maritime Spatial Planning, URL: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32014L0089>.
2. Ehler C., and Douvère F. (2009), Marine Spatial Planning: a step-by-step approach toward ecosystem-based management. Intergovernmental Oceanographic Commission and Man and the Biosphere Programme. IOC Manual and Guides No. 53, ICAM Dossier No. 6. Paris: UNESCO. p. 99
3. European Commission, Maritime Affairs, URL: http://ec.europa.eu/maritimeaffairs/policy/maritime_spatial_planning/index_en.htm (accessed 15/07/2015).
4. Hadjimitsis G., Agapiou A., Mettas C., Themistocleous K., Evagorou E., Cuca B., Christiana P., Nisantzi A., Mamouri R., Soulis G., Xagoraris Z., Lysandrou V., Aliouris K., Ioannou N., Pavlogeorgatos G., Marine Spatial Planning in Cyprus, Proc. SPIE. 9535, Third International Conference on Remote Sensing and Geoinformation of the Environment (RSCy2015), 953511. (June 19, 2015) doi: 10.1117/12.2195655
5. UNESCO Marine Spatial Planning, URL: http://www.unesco-ioc-marinesp.be/marine_spatial_planning_msp (accessed 15/07/2015)