RESOLVING SEA AND LAND CONFLICTS IN CYPRUS USING MARINE SPATIAL PLANNING

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ABSTRACT

Marine Spatial Planning (MSP) involves several steps which were supported by using Geographical Information Systems (GIS) such as spatial and temporal analysis, 3D analysis, multi-criteria analysis, Analytical Hierarchal Process (AHP) etc. GIS is used in identifying overlapping sea and land uses and mapping conflict hotspots in the coastal zones of Cyprus. Through this spatial analysis future planning of Cyprus's coastal waters can be achieved by: 1) engaging competing stakeholders; 2) illustrating how MSP can be adapted to aid decision-making in multi-use coastal regions; and 3) developing a preliminary coastal use allocation plan. The successful application of MSP to resolve conflicts in coastal regions depends on the level of stakeholder involvement, data availability and the existing knowledge base. Indeed, this paper presents the existing conflicts in the area of Cyprus based on the information provided by the governmental sector as well from open access sources. This work is part of the MSP project named as 'THAL-XOR', of which 80% funded by the European Regional Development Fund (ERDF) and 20% from national contribution

Keywords: Marine Spatial Planning, Conflicts, Cyprus; GIS

1. Introduction

Adaptive maritime spatial planning (MSP) uses monitoring and evaluation of the effectiveness of spatial and temporal management measures to promote understanding and improve planning and decision-making. An adaptive approach to MSP involves exploring alternative ways to meet management objectives, predicting the outcomes of alternative management measures, implementing one or more of these alternative management measures, monitoring to learn about the effects of management measures, and then using the results to update knowledge and adjust management actions (Douvere and Ehler, 2011)

The demand for marine resources and space is increasing. It is well accepted that there is a growing necessity to balance the needs of different sectors and conservation. Indeed, effective implementation of integrated management, including maritime spatial planning is required to avoid or minimize negative effects of the marine environment and conflicts between different uses as shown by various studies (Calado and Bentz 2013). MSP has become a broadly accepted tool for prospective and active management of cumulative and potentially conflicting maritime uses.

Potential benefits of marine spatial planning with regard to economic activity include (GHK, 2014):

- **Facilitating sector growth**: marine spatial planning can provide a framework that facilitates the sustainable development of different economic activities, therefore helping to enhance income and employment;

- **Optimizing the use of the sea**: marine spatial planning can help to ensure that maximum benefits are derived from the use of the sea by encouraging activities to take place where they bring most value and do not devalue other activities; and
- **Reducing costs**: marine spatial planning can reduce costs of information, regulation, planning and decision-making.

These benefits arised also from several other factors such as 'Conflict resolution'. The potential for conflicts between different marine sectors is increasing over time, particularly as developing sectors such as aquaculture and renewable energy grow in significance. MSP provides a means of avoiding and managing potential conflicts, and ensuring that the needs of different sectors are addressed in a coordinated way.

Any use of the ocean which potentially disrupts any other use of the ocean is a conflict. For example, by siting wind turbines in areas heavily used by fishermen creates a conflict; by siting marine protected zones in important fishing areas creates a conflict; by running shipping lanes through areas with offshore oil rigs creates a conflict. By reducing conflicts, the number of uses and users of the ocean will be able to grow while still: protecting the sensitive and valuable environmental characteristics of the ocean; allowing compatible uses to share ocean space and streamlining permits and paperwork.

2. Conflicts

One of the tasks of the MSP project named as 'THAL-XOR' for the Cyprus and Greece areas, of which 80% funded by the European Regional Development Fund (ERDF) and 20% from national contribution, was the detecting of conflicts . For the aims of the project all the sea and land activities (total number collected: 60) related with MSP planning have been collected. The data were geo-referenced and catalogued into a common geo-database.

Based on these outcomes, a catalogue related to the identification of potential use compatibilities and conflicts between the different activities taking place on Cyprus' marine area was carried out. Each one of these 60 different activities was cross compared with the rest to determine any potential conflict. This comparison was performed overlooking the current spatial location of the uses/activities, based solely to the legal framework and the best practices from other MSP programs. In total more than 3500 comparisons were carried out (table from 60 activities x 60 activities).

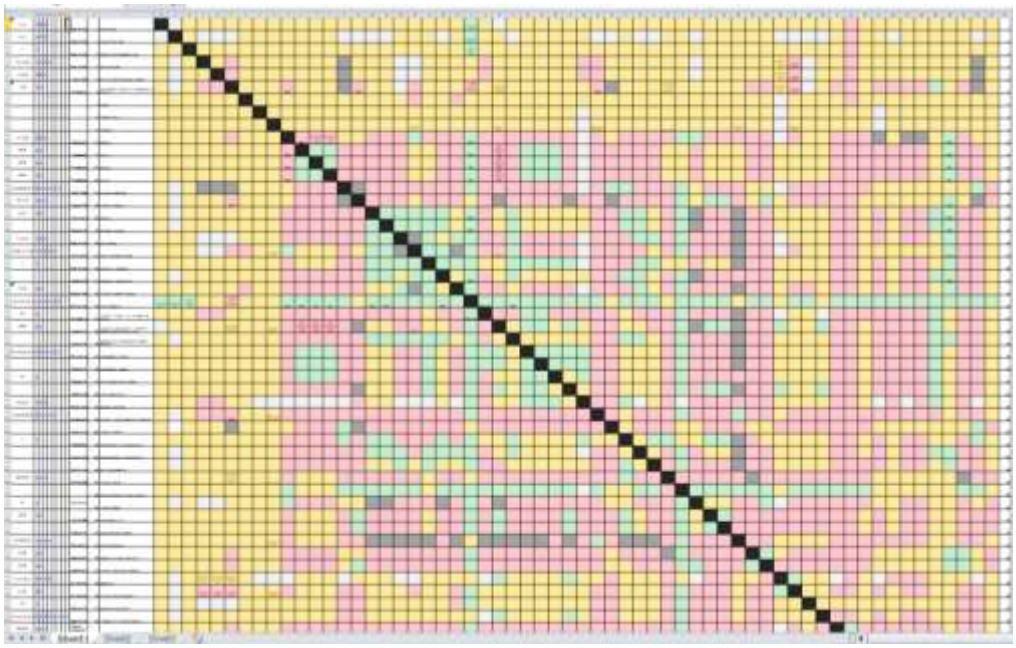

Figure 1: Conflicts between the different sea and land activities (in red) for the 60 different data that have gathered for Cyprus MSP.

Then the results of these conflicts were carried out in a GIS environment as shown in Figure 2. The final map can support local stakeholder so as to understand where the pressure from the different conflicts can be easily identified. In order to achieve a robust and reliable spatial analysis for the whole dataset a model was also constructed in the ArcGIS environment as shown in Figure 3

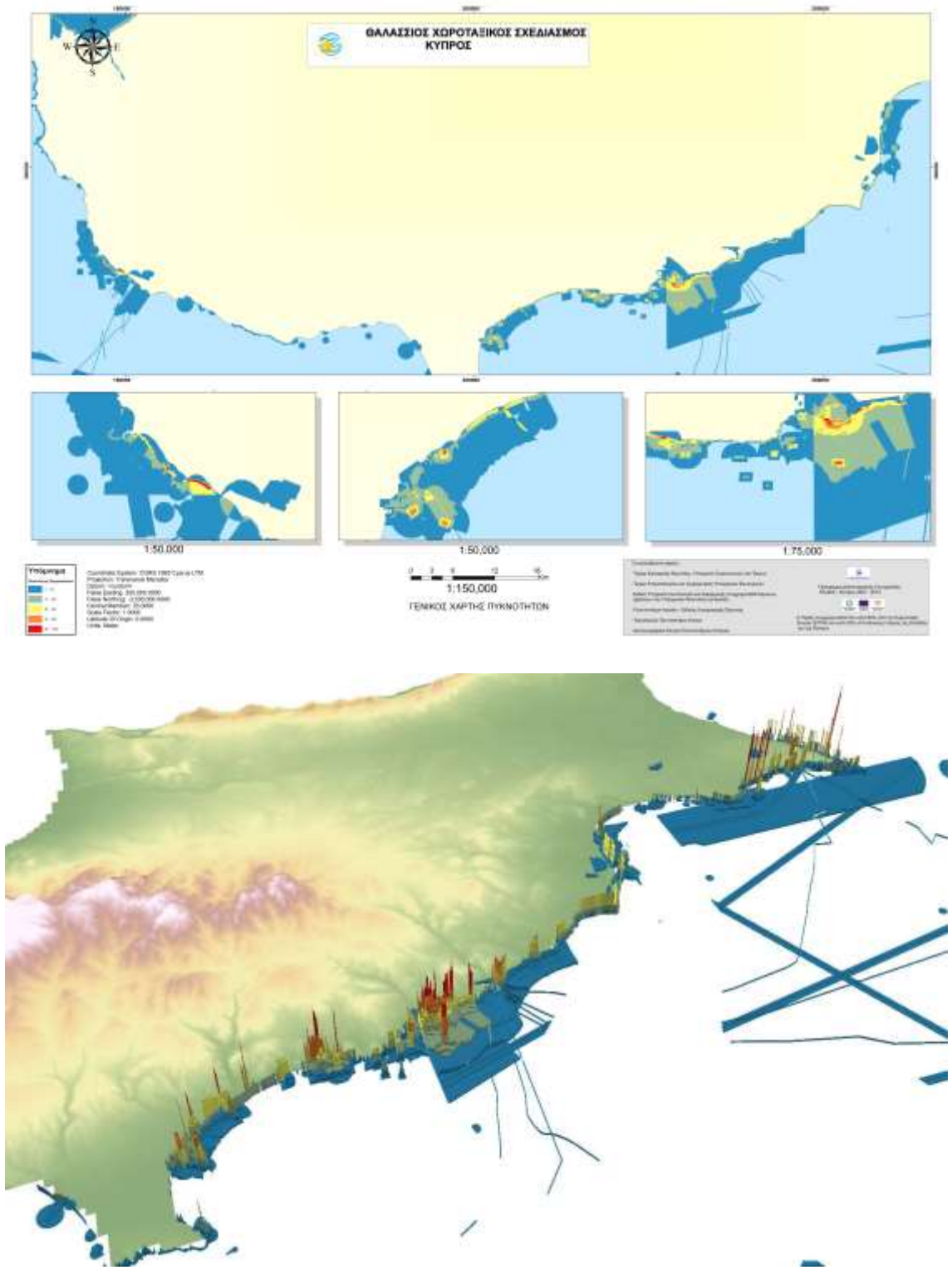

Figure 2: Cumulative conflicts between sea and land activities (2D top and 3D bottom view)

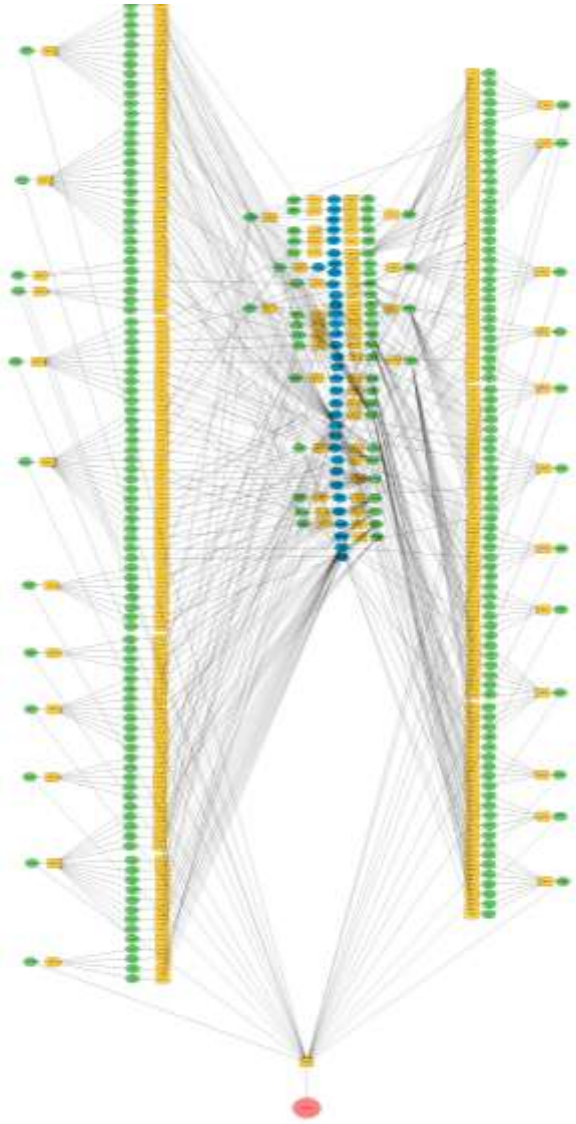

Figure 3: Model builder in the ArcGIS environment for identification of the conflicts for the MSP of Cyprus

3. Conclusions

The current paper aims to demonstrate the potential use of GIS for mapping sea and land conflicts as part of the MSP program.In Europe, MSP initiative is a part of the long term strategy of the European Union to support sustainable growth in the marine and maritime sectors as a whole, called “Blue Growth”. As specified by the EU (European Commission, 2012), the 'blue' economy represents roughly 5.4 million jobs and generates a gross added value of almost €500 billion a year. In fact seas and oceans are considered to be drivers for the European economy and have great potential for innovation and growth. Blue growth strategy is hence “the maritime contribution” to achieving the goals of the Europe 2020 strategy for smart, sustainable and inclusive growth. The absence of MSP implies the presence of many difficulties that inevitably cause problems in the environment, society and economy. In Cyprus, the geographical location and the massive area of its EEZ (compared to its land size) are two very important reasons for the formation of a precise and integral MSP. Conflicts between the different activities can be resolved using GIS tool. As Tuda et a. (2014) argue, a successful application of MSP to resolve conflicts depends on the level of stakeholder involvement, data availability and the existing knowledge base.

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