

Dassenakis Em., Poulos S., Megalofonou P., Paramana Th., Karditsa A., Chalkiadaki O.,
Petrakis S., Milatou N.
National & Kapodistrian University of Athens, Panepistimioupoli Zografou.
edassenak@chem.uoa.gr, poulos@geol.uoa.gr, pmegalo@biol.uoa.gr,
tparaman@geol.uoa.gr, kkarditsa@geol.uoa.gr, ochalkiadaki@chem.uoa.gr,
spetrakis@geol.uoa.gr, nmilatou@biol.uoa.gr.

THE PARTICIPATION OF NKUA OCEANOGRAPHIC TEAM IN THE SUPREME PROJECT; MARITIME SPATIAL PLANNING IN GREECE AND THE EASTERN MEDITERRANEAN

Abstract

Maritime Spatial Planning (MSP) is a significant tool for the achievement of Good Environmental Status, sustainable development and blue growth in the marine environment. Although cooperation among countries within MSP processes could be considered difficult (cultural, social, policy/ governance differences, non EU membership), it is a guiding principle in EC's Roadmap for MSP and a key issue according to MSP Directive 2014/89/EU Article 11, asking for coherent and coordinated maritime spatial plans across the marine region. Moreover, the EU Strategy for the Adriatic and Ionian Region (EUSAIR) forms the basis for a cross-border cooperative effort to implement MSP.

The main objectives of the SUPREME project is to support the implementation of MSP Directive in EU Member States (MSs) in the Eastern Mediterranean as well as launch and carry out concrete, cross-border MSP cooperation initiatives among MSs. The MSs participating in SUPREME are Croatia, Greece, Italy and Slovenia, with the national MSP Competent Authorities and the Regional Sea Convention UNEP/MAP involved in the consortium. Greece is represented in the project by 4 partners; the Ministry of Environment & Energy; the National Technical University of Athens; the University of Thessaly; the National & Kapodistrian University of Athens (NKUA) concretely addressing MSP local and transboundary issues in Greece and the two selected case studies, the Corinth Gulf/ Inner Ionian Sea and the Myrtoe Pelagos/ Cythera Passage. The present work presents elements of the Greek Country Fiche created in SUPREME as a framework for the MSP process and more specifically geochemical and biological aspects.

Key words

Marine Policy, EU Strategy, MSFD.

Introduction

The high and rapidly increasing demand for maritime space for different purposes, such as installations for the production of energy from renewable sources, oil and gas exploration and exploitation, maritime shipping and fishing activities, ecosystem and biodiversity conservation, the extraction of raw materials, tourism, aquaculture installations and underwater cultural heritage, as well as the multiple pressures on coastal resources, require an integrated planning and management approach (EU, MSPD 2014/89). Europe has a long

history of implementing legislation to protect the marine environment and currently has over 200 directives, regulations and other forms of policy developed for the sustainable use of marine resources and their conservation and protection (Boyes et al. 2016). The Maritime Spatial Planning Directive (MSPD) 2014/89/EU aims at the sustainable growth of maritime and coastal economies and the sustainable use of marine and coastal resources. As defined in the Directive, MSP is a process by which the relevant MSs Authorities analyse and organise human activities in marine areas to achieve ecological, economic and social objectives (EU, 2014).

In the Blue Paper and the Action Plan on an EU Integrated Maritime Policy (IMP), Maritime Spatial Planning was identified as one of the cross-sectoral tools supporting the implementation of the IMP (COM(2007) 575 final). In addition, the IMP's objective is achieving Good Environmental Status (GES) as set out in the Marine Strategy Framework Directive 2008/56/EC, which in fact constitutes the environmental pillar of IMP (EU, MSPD 2014/89).

The MSFD aims to achieve or maintain GES in the marine environment by 2020, to manage human activities in marine areas in accordance with the ecosystem approach and contribute to the integration of environmental concerns into different policies (Article 1, MSFD 2008). Member States are required to apply an ecosystem approach, ensure that pressure from human activities is compatible with GES and cooperate where they share a marine region or sub-region and use existing regional structures for coordination purposes. According to the Commission, any further action on MSP at EU level must be developed in full coordination with, and in support of, current and future policies and initiatives within the field of maritime policy, including in particular the implementation of the MSFD and future developments of ICZM, and fully respecting the existing competences and jurisdictions of the relevant authorities (EU, 2011).

It is important to stress that both MSFD and MSP require a regional cooperation through and coordination of activities between Member States (MS) and, whenever possible, Third Countries sharing the same marine region or subregion. Clearly, these cooperation activities are strictly linked to the several priorities that each MS adopts in its marine waters, sharing the management of threats and risks of the region or sub-region (Maccarrone et al, 2015). In essence, cross-border governance is required to be more effective so that it has a greater impact on users of the sea and its environment (Boyes & Elliott, 2014).

MSP and MSFD represent different perspectives on the marine environment and its quality. While the MSFD aims mainly at marine environmental protection, the MSP promotes sustainable growth and maritime economies and focuses on human use. However, MSP also has an environmental objective and GES promotes sustainable use of marine goods and services and are both relevant for sustainable development. Some elements of GES have a place specific component that will respond directly to spatial planning. Marine spatial planning can be used to support achievement of descriptor goals under certain provisions provided (plan review if GES is threatened, regional coherence, preparation of Environmental Impact Assessment, addressing cumulative effects). In this way, MSP can be embedded in an ecosystem approach (Gilbert et al, 2015). Jones et al. (2013) compare the 'soft sustainability' of the MSP Directive where the needs of different maritime sectors are balanced, with the 'hard' sustainability of the MSFD in which ecosystem conservation is the foundation of the ecosystem-based approach.

The MSP, as a legislative instrument, should indirectly apply the ecosystem-based approach, as referred to in Article 1(3) of the MSFD with the aim to ensure that the collective

pressure of all activities is kept within levels that are compatible with the achievement of GES (Douvere, 2008). The final objective is using the ecosystem approach for evaluating the cumulative impacts and informing and developing marine spatial planning that is able to guarantee availability and the durable use of goods and services (Kelly et al., 2014), whereas assessing the status of marine ecosystems under an Ecosystem Approach is fundamental to informing management decisions (Borja et al, 2016). By resolving conflicts and regulating maritime activities that are drivers of state changes, MSP can make a significant contribution to achieving GES (Gilbert et al, 2015).

Methodology

Since GES is to be achieved at subregional or regional sea levels (MSFD, Art. 3/4, EU 2008), MSP needs to be coherent at multiple spatial scales (Gilbert et al, 2015). Therefore, a key objective of SUPREME project is to support the implementation of Maritime Spatial Planning Directive 2014/89/EU in the EU Member States of the Eastern Mediterranean. The Eastern Mediterranean Basin is a functional area defined by the Adriatic, Ionian, Aegean and Levantine Seas, where the marine, coastal and terrestrial areas are considered as interconnected systems and where intensified transfer of goods and people, as well as services take place. The SUPREME participating countries in the area, Croatia, Greece, Italy, Slovenia, share several common MSP related issues and challenges, such as the need for environmental conservation and management, the developed coastal tourism, the need for sustainable management of fisheries and fish stocks, the possible exploitation of marine natural gas and oil resources. Attention to land-sea interactions also highlights impacts of unsustainable land-based activities on coastal areas and marine ecosystems.

As maritime activities have a cross-border dimension, national decisions have an impact on adjacent countries. Member States sharing a common approach to the management of marine space in the same sea basin will find it easier to meet these challenges (COM(2008) 791 final). In addition, although the responsibility for MSP lies at the national level and addresses maritime activities in a nation's Exclusive Economic Zone (EEZ), a transnational, subregional, and even a regional sea perspective is called for when maritime activities and/or their effects cross national borders (Gee et al, 2011).

Therefore, in the framework of SUPREME, a basin scale analysis strongly MSP oriented was developed creating a comprehensive framework about relevant MSP issues in the Eastern Mediterranean. The main objectives were to; (i) harmonize all the information available on the entire SUPREME domain; (ii) summarise, organize and synthesise knowledge considering the necessity of undertaking an MSP process; (iii) recollect and elaborate on priorities, concerns, critical issues and knowledge gaps; (iv) set the state of knowledge in order to frame the subsequent phases in implementing the MSP process.

This initial analysis considered relevant characteristics of the area, with emphasis on cross-border issues including; the marine environment; maritime activities and key sectoral and socio-economic trends; emerging pressures and conflicts in the use of maritime space; legal framework and related issues, governance structure and planning issues. Existing information, knowledge and experiences were gathered considering the Barcelona Convention with its relevant Protocols and processes - ICZM Protocol and the Ecosystem Approach- the present implementation relevant policies - MSFD, WFD, H&B Directives, CFP and other. Review of existing policy documents has taken place leading to a synthetic understanding of the Eastern Mediterranean area, considering planning priorities and

addressing in particular cross border critical issues and data gaps. Although each of the above mentioned Directives has specific objectives, Boyes and Elliott (2014) have highlighted the importance of linking their efforts in order to attain their objectives in a more coherent way (Figure 1).

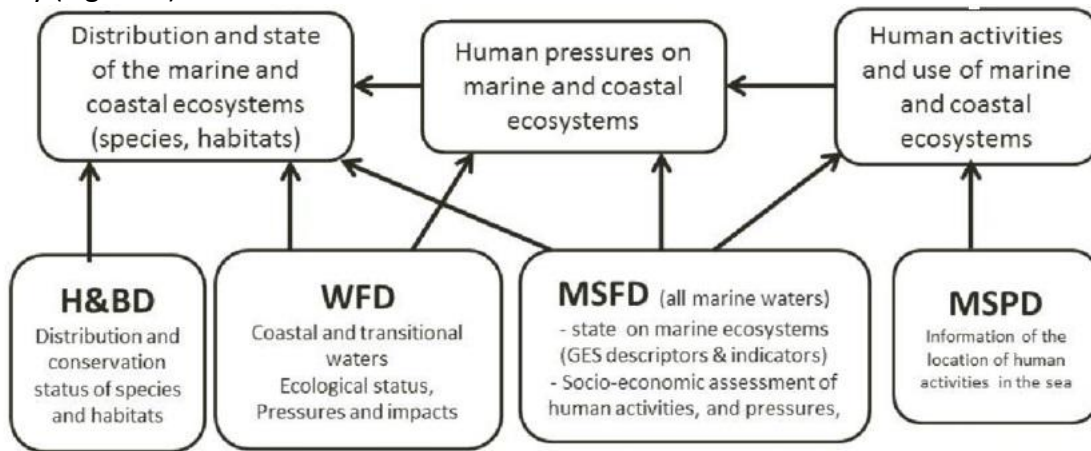


Figure 1: Overview of the linkages between the MSFD, WFD, the H&BD and the MSPD illustrating how the assessments and data produced by these directives can feed into each other (source: Boon et al, 2015).

The relevant MSP knowledge gathered was organized and compiled in a Country Fiche produced at national level for Croatia, Greece, Italy and Slovenia in a synthetic and comparable way. The Country Fiche was based on the 11 Qualitative Descriptors of the MSFD and has incorporated the specificities, concerns and issues of each MS's marine waters. Questions were provided for each chapter to guide the elaboration of the relevant knowledge for the 'basin scale analysis strongly MSP oriented'. The Fiches included the following components;

- 1 – General Overview,
- 2 – The Marine Environment (MSFD based/oriented),
- 3 – Maritime activities and their socio-economic trends,
- 4 – Land-sea interactions,
- 5 – Conflicts and synergies in the use of maritime space,
- 6 – Legal framework and governance structure,
- 7 – Planning Issues ,
- 8 – Transboundary issues.

Besides, in the Supreme project five case study areas are undertaken (Figure 2):

- Northern Adriatic (Italy: Friuli Venezia Giulia, Veneto and Emilia Romagna Regions)
- Slovenian territorial waters (Slovenia)
- The Dubrovnik-Neretva County (Croatia)
- Inner Ionian Sea - Corinthian Gulf (Greece)
- Myrtoon Pelagos – Cythera Passage (Greece)

This work presents elements of the Greek Fiche addressed by the National & Kapodistrian University of Athens, in particular geochemical and biological aspects.



Figure 2: The SUPREME Case Study areas

Results – Discussion

The SUPREME Country Fiche gathered the summary of the existing MSP relevant knowledge in the Eastern Mediterranean marine area, with emphasis on cross-border issues, and has incorporated the specificities and concerns of each Country’s marine waters.

The Greek Fiche contained information on all the designated components;

1 - The main characteristics of the marine area, geographical and physical features and jurisdictional considerations have been described in the **General Overview** as briefly depicted in Table 1.

Table 1: Geographical and physical features

Coastal area	Marine Area	Underwater Sediments	Surficial Oceanographic Characteristics	Hydrography
Coastline of 16000 km; about 7500 km belonging to more than 6000 islands and islets; only 117 of those islands are inhabited.	Greatest depth 5127 km, Oinouses Well, off the SW Peloponnese. The shelf area (water depth <200 m) constitutes the 20.5 % of the sea bottom of Greece)	The most frequently occurring textures are and sandy mud found on the shelf areas, under the influence of rivers as well as in most of the deep basins of the Aegean Sea. The mud component found on the shelves is of terrigenous origin. The sand fraction is almost entirely biogenic.	Generally cyclonic circulation in the Aegean Sea, with warm, saline water entering from the Levantine through the eastern Cretan Straits and continuing northwards to the Eastern Aegean where it subducts below the lighter water coming from the Black Sea. The Black Sea water mass moves along the East coast of Greece to the South.	Very extended hydrographic network due to mountainous relief. Most of the rivers deploy in the Greek territory, whereas some have their source or mouths in neighboring countries.

The Territorial Waters of Greece extend up to 6 nm following the Lausanne Treaty. The designation of the Greek Continental Shelf has only taken place in the common maritime

borders with Italy (Ionian Sea) with a 1978 agreement (Law 786). Greece has not proclaimed an Exclusive Economic Zone.

2 - The knowledge of **the marine environment** and the progress towards Good Environmental Status is essential in order to inform the MSP process, as well as the identification of knowledge gaps. The environmental features characterizing the Greek marine environment were described in the Country Fiche following the MSFD descriptors whereas the most critical areas and activities that constitute the main source of anthropogenic pressures impacting the environment were identified; Structure, functions and processes of marine ecosystems (Species, Habitats, Ecosystems, including food webs) considering MSFD qualitative descriptors 1, 3, 4 & 6; Anthropogenic pressures on the marine environment (biological, physical, substances, litter and energy) considering MSFD qualitative descriptors 2, 3, 5, 6, 7, 8, 9, 10 & 11. Priorities and concerns in relation to the state of the environment and related anthropogenic pressures have been highlighted.

Although the MSFD does not directly regulate maritime activities, their impact must be taken into account for the determination of good environmental status. Annex VI lists examples of possible measures, including spatial and temporal distribution controls and tools for coordinated management. Some Member States have declared that they will use MSP to implement the MSFD (e.g. EU (COM(2008) 791 final).

Structure, functions and processes of marine ecosystems

Regarding **species**, Greece provided information on Seabirds (*Phalacrocoracidae*, *Anatidae*, *Laridae*, *Procellariidae*, *Hydrobatidae*, *Sulidae*, *Stercorariidae*, *Alcidae*), Zoobenthos (> 2,650 taxa), Marine mammals (*Monachus monachus*, *Balaenopteridae*, *Physeteridae*, *Ziphiidae*, *Phocaenidae*, *Delphinidae*), Marine reptiles (*Caretta caretta*, *Chelonia mydas*, *Dermochelys coriacea*), Fish (476 marine species). For **habitats**, *Posidonia* beds, Coralligenous formations and Marine caves were mentioned. Finally, for **food webs** the spatial increases in jellyfish distributions (*Aurelia aurita*, *Cotylorhiza tuberculata*) were mentioned as well as the decline of commercial stocks in the cases of the decapods, fish, bivalves, gastropods.

Several knowledge gaps were identified; species population levels and distribution, biology, ecology, habitat conditions and specification of threats for Marine mammals; young survival, migration routes, foraging areas of adult turtles for Marine reptiles; Limited data regarding the presence of coralligenous formations in Ionian Sea and the northern Levantine coasts; need for further mapping to determine the full extent of this highly variable habitats, lack of detailed mapping of habitats for the Greek Seas, detailed censuses of the distribution of marine caves needed; lack of maps of the species spatial distribution.

Anthropogenic pressures on the marine environment

As the marine environment is not a closed system, pressures may derive from drivers outside a planned area and activities within a planned area may cause pressures beyond the planned area. In the former instance, external sources of pressures will need to be considered in making plans. For example, nutrient loads from land-based sources might place limits on aquaculture development because the combined loads cause eutrophication (Gilbert et al., 2015). Coastal marine environments are usually influenced by human-induced and natural pressures, which may alter their functioning and finally contribute to ecosystem degradation and pollution problems (Borja et al., 2010).

As far as **biological** pressures are concerned, Greece reported on Microbial pathogens, Non-indigenous species, Extraction of species and Enrichment with nutrients (agricultural activities, aquaculture, riverine input). The most important knowledge gaps identified

concerned the data availability for NIS, the inadequate information/registry of point sources and diffuse sources, uncertainties in the evaluation of the Greek fisheries status.

Regarding **substances, litter and energy**, the Greek Fiche included information on nutrients (diffuse/ point sources), contamination by hazardous substances (radionuclides, heavy metals, WWT), acute pollution events, marine litter and underwater noise.

The main knowledge gaps identified concern nutrients input loads, registry of point/ diffuse sources, industrial or other discharges, recording of acute pollution events and their Impacts on the ecosystems, data on marine litter water column, sea surface and the open sea as well as the impact of litter on marine organisms, micro-plastics and the spatial/ temporal distribution of noise sources.

3 - MSP is commonly defined as a process of public authorities analysing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic and social objectives (COM, 2010, 771). Thus, the Greek Country Fiche contains elements of **Maritime activities and their socio-economic trends** as depicted in Table 2.

Table 2: Maritime activities in Greece

Sectors / Activities	
Extraction of living resources	Fish and shellfish harvesting (professional, recreational)
Extraction of non - living resources	Extraction of oil and gas (including infrastructures)/ aggregates/ water
Cultivation of living resources	Aquaculture (including infrastructure)
Transport	Transport infrastructure/ Shipping/ Shipbuilding
Physical restructuring of coastline or seabed	Coastal defense and flood protection
Production of energy	Non-renewable energy generation(including infrastructure)/ LNG facilities Electricity Transmission & communications (submarine cables/pipelines)
Tourism & leisure	Maritime and Coastal tourism /Cruise tourism / yachting
Public sector	Defense/ Military Areas

Highlighting some aspects of the above mentioned maritime activities; aquaculture constitutes a primary sector of significant socio-economic importance and Zones for Organized Development of Aquaculture have been created. Hydrocarbon exploitation is limited to the oil extraction of the Prinos Complex but the legal framework has been updated recently, allowing for exploration and exploitation of hydrocarbons. Regarding energy production, there is a 10-year programme to upgrade submarine energy cables networks including the interconnection of Cyclades, Crete and reinforcement of existing networks as well as the Alexandroupolis Independent Natural Gas System and 4 projects under development with transnational importance.

There is lack of spatial data for marine mineral resources whereas the national legal framework is unclear and complex. In addition, there is lack of spatial data concerning the existing coastal hard works (coastal walls, breakwaters, groins), soft engineering solutions (beach replenishment) and reclamation works.

4 - The land-sea interface of the maritime uses constitutes the basis for a holistic and integrated planning approach. The main connection points and land-sea hotspots have been identified, as well as natural dynamics and processes taking place in the different areas. Land-Sea Interactions (LSI) are either due to natural processes or uses and activities.

LSI due to natural processes; River sediment transport, River flooding, Coastal erosion, Marine flooding, Sea Level Rise.

LSI due to uses and activities; Human induced eutrophication, Industrial activity, Acute pollution events.

5 - Effective MSP responds to the need to resolve conflicts among maritime uses, and between uses and the marine environment, and provides the opportunity to address the cumulative effects of use (Douvere and Ehler 2009, European Commission 2013).

6 - 7 - 8 - The Legal framework and governance structure, Planning and Transboundary issues addressed all other necessary issues to provide the MSP process with.

Conclusion

Increased human activities on Europe's seas leads to competition between sectoral interests, such as shipping and maritime transport, offshore energy, ports development, fisheries and aquaculture and environmental concerns (COM (2008) 791 final). The Greek Country Fiche showed that almost all the maritime uses appearing in the whole Mediterranean basin are present and concentrated in the Greek seas; transport of goods and passengers, fisheries, aquaculture, oil & gas, energy and communication cables, coastal tourism, military uses, sand extraction, protected areas. As identified by the IMP, Maritime Spatial Planning is a cross-cutting policy tool enabling public authorities and stakeholders to apply a coordinated, integrated and trans-boundary approach. The application of an ecosystem-based approach can contribute to promoting the sustainable development and growth of the maritime and coastal economies and the sustainable use of marine and coastal resources (EU, MSPD 2014/89). As Marine spatial planning comprises data collection, stakeholder consultation, participatory plan development, and subsequent stages of implementation, enforcement, evaluation, and revision (EC 2008, Ehler & Douvere 2009), the Country Fiches developed in the framework of the Supreme project constitute valuable sources for marine planning.

Linking the Maritime Spatial Planning with MSFD, other existing legislations and Integrated Coastal Zone Management may provide a powerful tool to integrate governance across sectors and help to attain the aspiration on achieving GES. As described in IMP it is important to develop coordinated, coherent and transparent decision-making in relation to the Union's sectoral policies affecting the oceans, seas, islands, coastal and outermost regions and maritime sectors, including sea-basin strategies or macro-regional strategies, whilst achieving GES.

Acknowledgements

The work presented was supported by the European Maritime and Fisheries Fund of the European Union - through the Grant Agreement EASME/EMFF/2015/1.2.1.3/01/S12.742087 - SUPREME, corresponding to the Call for proposal EASME/EMFF/2015/1.2.1.3 for Projects on Maritime Spatial Planning (MSP).

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