PORTODIMARE

geoPORtal of TOols&Data for sustaInableManagement of coAstal and maRineEnvironment (ADRION205)

DT2.8.3 **Ver. 6**

Action Plan on the testing area of Greece **2021**

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List of abbreviations

AIS	Automatic Identification System
AIR	Adriatic-Ionian Region, as defined by the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions concerning the European Union Strategy for the Adriatic and Ionian Region COM(2014) 357 final
API	application programming interface
AZA	Module supporting Allocated Zone to Aquaculture Identification integrated into the GAIR
CEA	Module for Cumulative Effects Assessment integrated into the GAIR
CS	Case study
EEZ	exclusive economic zone, as defined by the United Nations Convention on the Law of the Sea
EU	European Union
EUSAIR	Strategy for the Adriatic and Ionian Region COM(2014) 357 final
GAIR	Geoportal of Adriatic-Ionian Region (the main output of PORTODIMARE project)
ICZM	Integrated Coastal Zone Management, as defined by the Protocol on Integrated Coastal Zone Management to the Barcelona Convention (Council Decision 2010/631/EU)
LSI	Land-sea interaction(s)
MCDA	Multi-Criteria Decision Analysis
MSF	Medium Scale Fishery Footprint
MSFD	Marine Strategy Framework Directive 2008/56/EC
MSP	Maritime Spatial Planning, as defined by Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning
MUC	Module on Maritime Use Synergy and Conflict Analysis, integrated into the GAIR
PARTRAC	Module for supporting particles and contaminants dispersion tracking, integrated into the GAIR
OGC	Open Geospatial Consortium
SSFA	Special Spatial Framework for Aquaculture in Greece
VMS	Vessel Monitoring System

1 PORTODIMARE PROJECT

Almost all coastal and marine areas are under pressure by different human activities that try to fulfil all the demands modern society has. Climate changes and hazards, both manmade and natural, are impacting marine and coastal resources and ecosystems even more. The Adriatic and Ionian seas are, because of their shallowness and semi-enclosed nature, particularly vulnerable to such threats. That is why the PORTODIMARE project is aimed at tackling environmental vulnerability, fragmentation, and the safeguarding of ecosystems in the Adriatic-Ionian Region (AIR). Efficient planning and management of the coastal and marine spaces in the AIR need to be done transnationally to avoid conflicts and support sustainable growth while preserving the ecosystem for the upcoming generations. PORTODIMARE project is in full compliance with the Integrated Coastal Zone Management (ICZM) and Maritime Spatial Planning (MSP) principles and policies and supports the implementation of the EUSAIR Action Plan.

The main output of the PORTODIMARE project is the Geoportal of Adriatic-Ionian Region (GAIR), which integrates and further develops existing databases, portals and tools that were developed within the previous European project and other initiatives. In such a way, most of the available knowledge and resources are efficiently organized and made accessible through a single virtual space. The main components of the GAIR are described in chapter 1.1 and following.

The project implemented a set of Tools for MSP, (modules) used for analytical purposes, mainly to provide information for coastal and marine planning. The intended users' groups include experts and decision makers either from spatial planning and environmental agencies or from public authorities as well as operators such as fishery managers and potential investors. Moreover, research groups and students are invited particularly to build a knowledge base, which could be offered to other users via the GAIR. The use of GAIR and its modules was tested in six pilot sites as a support for the development of action plans for four Countries: Croatia, Greece, Italy, and Slovenia.

PORTODIMARE project includes the following activities: preparation, management, implementation, and communication of the GAIR. The implementation is divided in two parts. The first part encompasses the design and development of the architecture and main components of the GAIR and its tools for MSP. The second part encompasses efforts on the coordination of the training, the testing activities, and the elaboration of the GAIR maintenance and transferability plan, GAIR Practical Guide and Action plans for the countries.

The former one is elaborated in this document. It describes COUNTRY specific action plan as a contribution of the project to national/regional MSP process. As well as for the maintenance of the Geoportal datasets and tools and transfer the use of its modules to target groups within its pilot area and in the country as a whole.

1.1 The GAIR development

The GAIR Report on system architecture and design (DT.1.4.1), describes the system architecture that was used to develop the GAIR. Some of the main purposes of the GAIR are: to guarantee an operational use to public administrations, as well as to scientific and research bodies and civil society; to develop an effective and integrated environment between data and tools; to be well connected to other sources of information; to integrate data and information that are adequately controlled and validated; to be user-friendly for non-technical experts, etc. GAIR follows the MSP implementation process and modular approach that means that GAIR implements multiple modules (tools for MSP) that will enable integrated and sectorial geospatial modelling. Each of the modules has single or multiple objectives and is spatially scalable, that is, they are applicable on local, regional, and on the scale of the Adriatic-Ionian Region. GAIR is based on free and open-source software approach, it is targeting the multi-level community, ranging from students, open public, research/academics, sectorial actors, planners, and decision-makers. The results of each module run will be available within the GAIR, thus allowing sharing knowledge within the community.

The GAIR MSP-driven approach consists of six steps that ensure full support to planning and iteration:

1. definition of the goals of the tool application
2. definition of which module (Tool for MSP) to use for the analysis;
3. definition of the spatial extent of the study area;
4. definition of the module workflow with present or/and future conditions;
5. evaluation of module results by analysis of the result summary on the user's personal computer and GIS software;
6. sharing the results with the PORTODIMARE community through GAIR.

Module run can be based on geospatial layers that are already incorporated in the GAIR and also on multiple geospatial layers that can be uploaded by users.
The content of the GAIR is coming from different sources which include links to existing data already published or accessible through standard OGC web services, geographical datasets that partners have uploaded directly through the Geoportal interface, and geographical datasets that are part of deliverables of past projects (Figure 1).

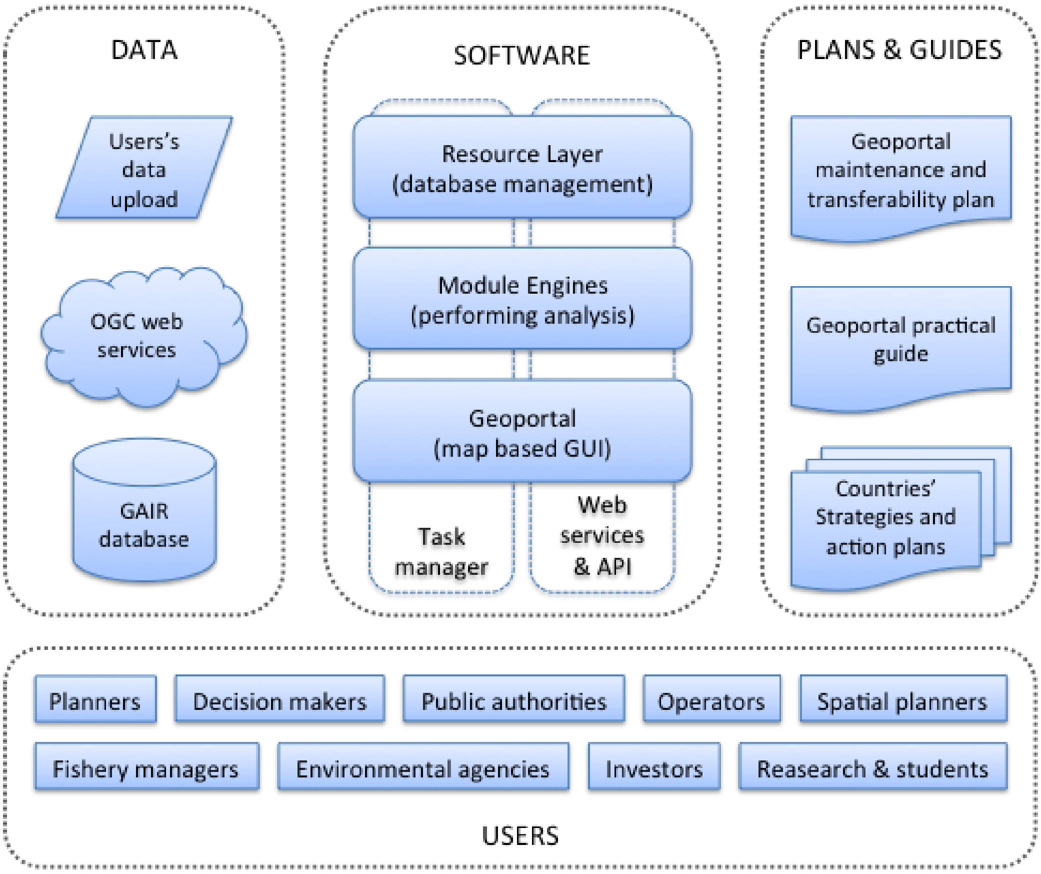


Figure 1 - Components of the Geoportal of Adriatic-Ionian Region (GAIR)

GAIR is based on the GeoNode platform. PORTODIMARE specific applications were built in Django, Python web development framework. Other software solutions that have been used to build GAIR include PostgreSQL with PostGIS, GeoServer, Swagger, Celery, GeoExt, OpenLayers, Leaflet, Wagtail, and others.

The GAIR system architecture consists of five main components (Figure 1):

1. Resource Layer (database management systems and facilities to store datasets, information, metadata, and other resources);
2. Module Engines (for performing module/tool analysis);
3. Task Manager middleware (for orchestrating the GAIR tasks and processes);
4. Web services and API (for publishing the API and for the web services for interaction with resources);
5. the Geoportal (graphical user interface, tools to search, visualize, explore, and analyse resources, and for downloading geospatial layers, maps, and PORTODIMARE model outputs).

Different user profiles with different, hierarchically organized, privileges are defined within GAIR. The authentication layer supports a single sign-on mechanism and is equipped with security precautions, such as automatic password expiring after 180 days.

1.2 GAIR -Tools for MSP (modules)

The PORTODIMARE project implemented seven modules. They differ according to the programming languages (Python and R), user interaction level, and level of long-term support perspective. Because of these differences, two different module integration patterns have been designed:

- direct integration (GAIR API directly execute the module engine) and
- API-based integration (GAIR API performs machine-to-machine communication with an external module/tool).

Module T1.10 does not require real-time analysis and users can use pre-processed layers and pre-configured maps. Interfaces are input forms, characterized by different components and options that can be defined, or are map-based. Graphical user interfaces for the output of each module are map-based, where the main part of the interface is a map on which the output layer is loaded (Figure 2). Other results, like graphs and links to reports, are shown in a side panel.

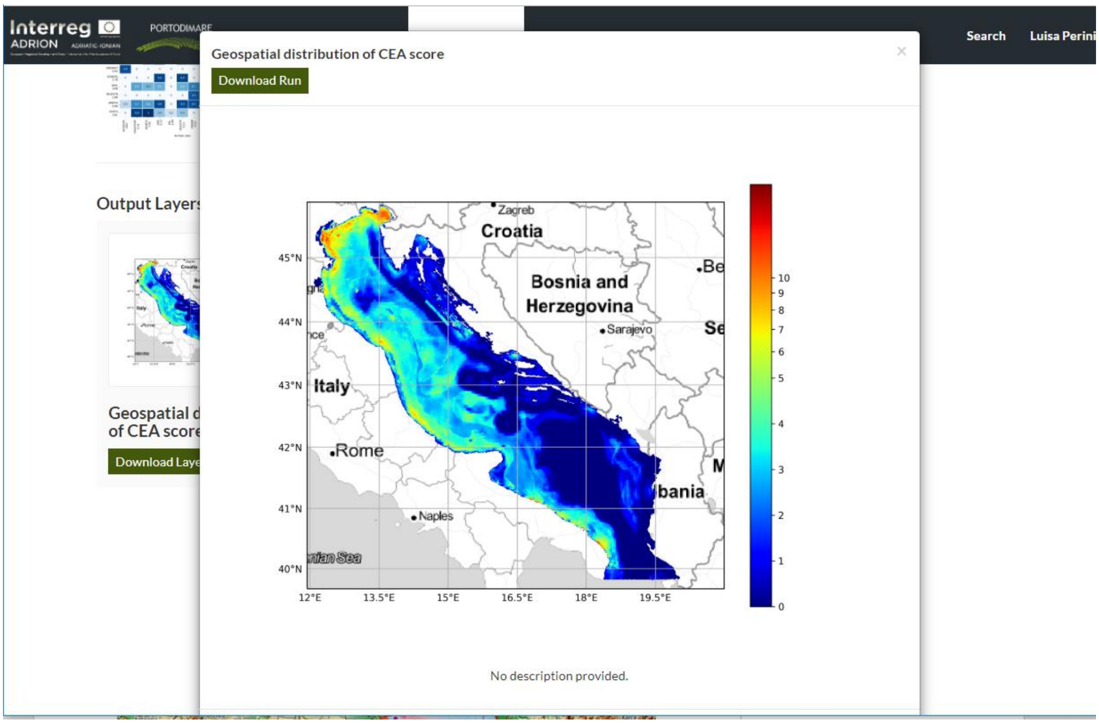


Figure 2 – Example of GAIR - module's graphical interface

1.2.1 Module: Maritime Use Synergy and Conflict Analysis Tool (MUC)

Because of the strong human influence on the Adriatic-Ionian Sea region, geospatial tools that are enabling the analysis of the multi-sector interactions are needed to support Blue Growth and planning strategies and scenarios for conflict mitigation (Depellegrin et al., 2018). MUC tool allows the assessment and mapping of maritime use conflicts (constraints that are creating disadvantages to maritime activities) and synergies (multi-use potentials).

Planners and planning teams, decision-makers, environmental agencies, and research institutions can use MUC. Module inputs are the study area boundary and raster layers about human activities. Module outputs are 1 spatial raster layer and one summary graph and table.

1.2.2 Module: Cumulative Effects Assessment (CEA)

To reach ecological targets in the Adriatic-Ionian Sea region, sustainability goals can only be reached through smart and efficient allocation of the sea space. Geospatial tools supported by the Cumulative Effects Assessment (CEA) can help decision-makers in sea space to choose from different planning options and drive ecosystem-based management (Menegon *et al.*, 2018). CEA is a tool for analysing and mapping the effects of single or multiple human activities on the sea space.

Planners and planning teams, decision-makers, environmental agencies, and research institutions can use this module. Module inputs are the study area boundary, a set of spatial raster datasets about human activities, and a set of spatial raster datasets about environmental components. Module outputs are 3 spatial raster datasets and 4 summary graphs and tables.

1.2.3 Module: Supporting Allocated Zone to Aquaculture (AZA) identification

EU Blue Growth initiative identified aquaculture as one of the key sectors with high potential for sustainable jobs and growth. This module implements the Spatial Multi-Criteria Evaluation (SMCE) methodology for identifying Allocated Zones to Aquaculture (AZA), i.e. marine areas where the development of aquaculture has priority before other uses.

This module is intended for public authorities, current operators, and investors. Module inputs are the user-defined location or area on the map, the optimal growth model, and about 10-30 geospatial remotely sensed and site-specific datasets about constraints, socio-economic and environmental data. Outputs are three geospatial layers (criteria map, constraints, and suitability map), four raw datasets, and one report.

Module: Particle/conservative contaminants dispersion (PARTRAC)

This module is a tool that can be used to calculate the area of influence of a source of contamination by simulating the dispersion of particles. Users can select location, intensity, and inner behaviour of the particles. It is also possible to characterize the particles by a decay time, life duration, and sinking velocity (Ghezzo *et al.*, 2018).

Planners and planning teams, decision-makers, environmental agencies, and research institutions can use this module. Module inputs are the user-defined location or area on the map and hydrodynamic field model targeted for the area of interest and/or season. Outputs are dispersion simulation, influence area map, and summary report warnings and information about reliability of the results.

1.2.4 Module: Coastal Oil Spill Vulnerability Assessment

One of the major risk factors in the Adriatic-Ionian Sea is represented by the transit of the tanker ships that are carrying hydrocarbons and toxic substances. The pollution of the coastline caused by the spilling of the substances that are being transported would cause environmental and economic damage (Caputo &Natrella,

2018). This module can perform oil spill simulations in any area of the Adriatic-Ionian Sea to understand the risk scenarios and conduct a risk assessment.

The module is intended for institutions that deal with the management policies of economic, commercial, or tourism activities in the Adriatic-Ionian Region, emergency management institutions, and citizens and students. Inputs are a user-defined area of interest, geospatial layers about coastal vulnerability, a simplified hydrodynamic field, and data about ships and weather. Module outputs are 3-5 geospatial layers, one animation of oil spill simulation, and 1-5 plots with statistical analysis.

1.2.5 Module: Small Scale Fishery (SSF) Footprint

Most of the professional fishing vessels are not equipped with location monitoring systems (VMS – Vessel Monitoring System or AIS – Automatic Identification System) so it is not possible to map their footprints using those systems (Kavadas et al., 2018). The module for Small Scale Fishery (SSF) Footprint implements an MCDA (Multi-Criterial Decision Analysis) to assess and map fisheries' spatial footprint for SSF and a tool for their visualization.

Users of this module can be fishery managers, scientists, spatial planning managers, and scientific groups. Inputs are up to 9 geospatial layers and weights assigned by the user or by default. Outputs are two geospatial layers and a summary report.

1.2.6 Module: Medium Scale Fishery (MSF) Footprint and Cumulative Effects Assessment on SSF and MSF

This module implements a tool for visualization of fisheries' spatial footprint for MSD, including trawlers, and purse seines. It also includes the estimation of the cumulative additive fishing pressure index (SSF+MSF). Medium scale fisheries are, unlike the small-scale fisheries, usually equipped with VMS and AIS monitoring systems that allow mapping their footprints. In cases where VMS and/or AIS are not available for all spatial and temporal scales, GIS-MCDA based approach is employed.

This module is intended for fishery managers, researchers, spatial planning managers, and scientific groups. As input, the module uses up to 10 geospatial layers that are already stored in the GAIR. Outputs are three geospatial layers, summary reports, and raw data.

2 MARITIME SPATIAL PLANNING (MSP) AND INTEGRATED COASTAL ZONE MANAGEMENT (ICZM) PROCESS AND PLANNING STEPS

2.1 Objectives and principles

Today, the increasing demand for coastal and maritime space for different human activities, and as a consequence, the increasing pressures on the coastal and maritime ecosystems and resources, require an integrated planning and management approach. There are several pillars on which such planning and management should be developed. From the EU Integrated Maritime Policy for the European Union, proposed methodologies such as the UNEP/MAP conceptual framework for marine spatial planning (UN Environment/MAP, 2018) to technical tools developed by several projects such as the GAIR tool developed by the PORTODIMARE project.

The chapter briefly elaborates the main legal documents on which integrated coastal and maritime planning and management are based: the Protocol on Integrated Coastal Zone Management in the Mediterranean (hereinafter ICZM Protocol) (UNEP/MAP/PAP, 2008) and Directive 2014/89/EU establishing a framework for maritime spatial planning (Directive 2014/89/EU). Considering the nature of coastal zones and seas, planning and management processes should take into account land-sea interactions, but also cooperation among countries sharing the same coastal and sea ecosystems. Thus, two more issues are elaborated briefly: a land-sea interaction and a transnational cooperation.

2.1.1 The ICZM Protocol

As an international legal document, the ICZM Protocol drives the Mediterranean Countries to better manage and protect their coastal zones. It complements the existing set of Protocols of the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean. 'Integrated coastal zone management' means a sustainable management and use of coastal zones. Coastal zone is defined as the geomorphologic area either side of the seashore on which the interaction between the marine and land parts occurs. For the management purposes, the coastal zone is defined as the external limit of the territorial waters and with the land limit of the administrative costal units.

The objectives of the ICZM are to:

- Facilitate, through the rational planning of activities, the sustainable development of coastal zones by ensuring that the environment and landscapes are taken into account in harmony with economic, social and cultural development;
- Preserve coastal zones for the benefit of current and future generations;
- Ensure the sustainable use of natural resources, particularly with regard to water use;
- Ensure preservation of the integrity of coastal ecosystems, landscapes and geomorphology;
- Prevent and/or reduce the effects of natural hazards and in particular of climate change, which can be induced by natural or human activities; and
- Achieve coherence between public and private initiatives and between all decisions by the public authorities, at the national, regional and local levels, which affect the use of the coastal zone.

In the process of implementing, the several principles should be considered:

- The terrestrial and maritime part of the coastal zone should be considered as a single entity;
- All the coastal elements (hydrological, geomorphological, climatic, ecological, socio-economic, cultural systems) shell be taken into account in an integrated manner;
- The ecosystem-based approach shall be applied (taking into account all the coastal elements but also their continuous interactions);
- Appropriate governance allowing participation of stakeholders shall be ensured;
- Cross-sector institutional coordination shall be required;
- Development of land use strategies, plans and programmes shall be required;
- The multiplicity and diversity of activities in coastal zones shall be taken into account, and priority shall be given, where necessary, to public services and activities requiring, in terms of use and location, the immediate proximity of the sea;
- The allocation of uses/activities in coastal zones should be balanced and unnecessary concentration and urban sprawl should be avoided;
- Preliminary assessments shell be made of the risks posted on coastal zones; and
- Damage to the coastal environment shall be prevented, and where it occurs, appropriately restored.

Some other considerations proposed by the ICZM Protocol are as follow. Economic activities in the coastal zones that are highlighted are: agriculture and industry; fishing; aquaculture; tourism, sporting and recreational activities; utilization of natural resources; infrastructure, energy, ports and maritime works and structures; and maritime activities. The specific coastal systems to be protected are wetlands and estuaries and marine habitats. Also, special consideration to protection shell be given to coastal landscapes, islands and cultural heritage. As coastal zones are contiguous and stretches across national boundaries, national strategies shell be coordinated with the neighbouring ones. Finally, as ICZM instruments, the ICZM Protocol envisage monitoring and observation activities, national and regional strategies and actions plans for ICZM, environmental assessments, as well as definition of indicators in order to evaluate the effectiveness of ICZM strategies and plans.

To implement the ICZM Protocol, the ICZM Process is designed and is intended to guide the implementation of the ICZM Protocol (PAP/RAC, 2012). There are 5 key stages further structured into key tasks for each stage as follows:

1. Establishment	Establishing Coordination Mechanisms Defining Territorial Scope Defining Governance Context Scoping, Engaging Stakeholders Proposing a Vision, Deciding on Strategic Environmental Assessment
2. Analysis and futures	Building the Evidence Identifying Futures

3. Setting the vision	Building Consensus Setting the Direction Measuring Success
4. Designing the future	Formulating ICZM Strategies Plans or Programmes Establishing Management Structure Embedding
5. Realising the vision	Implementing Acting Monitoring and Reviewing

The working outputs of the ICZM Process are: Inception Report, The Work Plan, Scoping Report, Communication Strategy, Diagnostic Report, Alternative Scenarios and Vision Statement. The final and main output is an ICZM Integrated Plan accompanied with an Implementation Programme/Roadmap. While ICZM Integrated Plan sets the objectives that shall be achieved together with long-term governance and implementation structures, the Programme/Roadmap aims at securing the materialisation of the Plan by definition of actions, responsibilities, costs, timeframes etc. The ICZM plans and programmes are either self-standing documents or integrated in other plans and programmes. They could provide support to the spatial planning process by giving recommendations for policies and the instruments for monitoring and evaluation.

Some examples could be found on the following link:

Coastal Plan for the Šibenik-Knin County (PAP/RAC, 2015)

http://iczmplatform.org//storage/documents/pEoju2FqfXjzPoYBLsKZiD3o6ONBXxJ44RTWFt7P.pdf

2.1.2 Maritime spatial planning (Directive 2014/89/EU)

Maritime spatial planning (MSP) is defined as “a process by which the relevant authorities analyse and organise human activities in marine areas to achieve ecological, economic and social objectives“ (Directive, 2014). It is enforced across the EU countries by the Directive 2014/89/EU defining a framework for MSP and obligations to EU countries to establish a maritime planning process. MSP results in a maritime spatial plan. Responsibilities for designing the formats and contents of such plans, including institutional arrangements and allocation of maritime activities, are left to European Member States. In other Mediterranean Countries, non-EU States, the UNEP/MAP Conceptual framework for marine spatial planning is a tool/instrument for the implementation of MSP, is considered as a tool of the ICZM Protocol.

The main MSP objective is to promote sustainable development and growth in the maritime sector considering economic, social, and environmental aspects as well as long-term changes due to climate change. Today, main economic sectors at sea include energy, maritime transport, fisheries, aquaculture and tourism sectors. MSP should manage spatial uses and conflicts in marine areas and encourage multi-purpose uses.

The minimum requirements for MSP are the following:

- To take into account land-sea interactions;
- To take into account environmental, economic and social aspects, as well as safety aspects;
- To promote coherence between maritime spatial planning and the resulting plan and other processes, such as integrated coastal management or equivalent formal or informal practices;
- To ensure the involvement of stakeholders;
- To organize the use of the best available data;
- To ensure trans-boundary cooperation between Member States; and
- To promote cooperation with third countries in accordance.

The Directive stresses the application of the ecosystem-based approach aiming at the sustainable development of the maritime and coastal activities but also ensuring the sustainable use of marine and coastal resources.

A comprehensive guide how to put MSP in practice could be found in a document “A Step-by-Step Approach Toward Ecosystem-Based Management” published by UNESCO (Ehler and Douvere, 2009). The guide identifies ten steps and describes their tasks and outputs, together with lessons learned from already developed maritime spatial plans. Another guiding reference, intended to be short and easy-to-use, is the ‘Conceptual framework for MSP in the Mediterranean” (UN Environment/MAP, 2018). The document elaborates common principles to be used in the maritime spatial planning process:

Adaptive approach	MSP is a continuing iterative process that adapts over time: plans are developed and implemented, conditions monitored, results evaluated, and plans improved, and so on in the planning cycles.
Multi-scale approach	MSP includes Mediterranean, regional, national, and local scales, combining top-down and bottom-up perspectives.
Integration	Integration among themes, sectors, vertical-horizontal cooperation, marine and land-based planning.
Land-sea interactions	Land-sea interaction could be related to land-sea natural processes, among land-sea uses and activities and among land-sea planning and management processes.
Four dimensions of MSP	Maritime space comprises sea surface, water columns and seabed, thus tridimensional space. Activities could share the same space but in different time, thus the fourth dimension is necessary to enable temporal zoning.
Knowledge based project	MSP must be based on high-quality data and best available knowledge.
Suitability and spatial efficiency	Key guiding concepts to achieve sustainability of marine resources, minimize conflicts, maximize synergies.

Connectivity	Connections between elements should be considered such as shipping lines, areas of similar uses, between protected habitats forming a network, among MSP participants in terms of knowledge sharing and cooperation.
Cross-border cooperation	An essential principle to ensure coherent and coordinated MSP plans across the seas, implying cooperation at the methodological, strategic and implementation levels.

The same document proposes the following steps in the development of maritime spatial plans:

1. Starting the process and getting organized;
2. Assessing the context and defining a vision;
3. Analysing existing conditions;
4. Analysing future conditions;
5. Identifying key issues;
6. Design phase
   a. Elaboration of MSP plans;
   b. Strategic Environmental Assessment;
7. Adopting the plan and organizing the implementation;
8. Implementing, monitoring and evaluating the plan; and
9. Cross-step activity: stakeholder consultation.

The above steps need to be tailored to the specifics of the marine area and the specific objectives of the maritime plan.

Main MSP output is a comprehensive spatial management plan for a marine area including zoning, priorities in time and space and covering a 10 to 20 years' time horizon. The plan could include a zoning map and a permit system, to be used as management measures (e.g. permits for fisheries or tourism are issued based on the plan and zoning map).

Some examples can be found on the following link: https://www.msp-platform.eu

2.2 Importance of land-sea interactions (LSI)

Land-sea interaction (LSI) is highlighted by the ICZM Protocol, EU MSP Directive and other MSP documents as an essential aspect that should be taken into account when planning and managing coastal and marine areas. LSI is defined "as a complex phenomenon that involves both natural processes across the land-sea interface, as well as the impact of socio-economic human activities that take place in the coastal zone" (EC DG MARE, 2017) and could have double direction: land toward sea or sea toward land. Planning maritime space implies allocation of land space to some maritime activities while planning land-use implies allocation of maritime space to some land-based activities.

LSI could be classified into the following groups:

Land-sea natural processes	e.g. flow of water and movement of organisms between land and sea ecosystems.
Land and sea usesand activities	Almost all maritime uses need supporting structures on land (e.g. ports for ships) while some of the land uses need sea such (e.g. tourism).
Land and sea planning and management processes	Land and sea activities should be planned in harmonized manner considering the land-sea continuum – implying alignment of the methodologies used
Land-sea socioeconomic interactions	People living at the coast are driving land-sea processes; furthermore, people exchange their experiences, knowledge, and culture.

All these interactions shall be identified and assessed in order to include them into the planning and management processes, either in planning maritime space or land space. LSI analysis is necessary for a harmonized planning and management of the coastal zone, its maritime and land parts.

An example of identified LSI-s among land and sea uses is given in Figure 3.

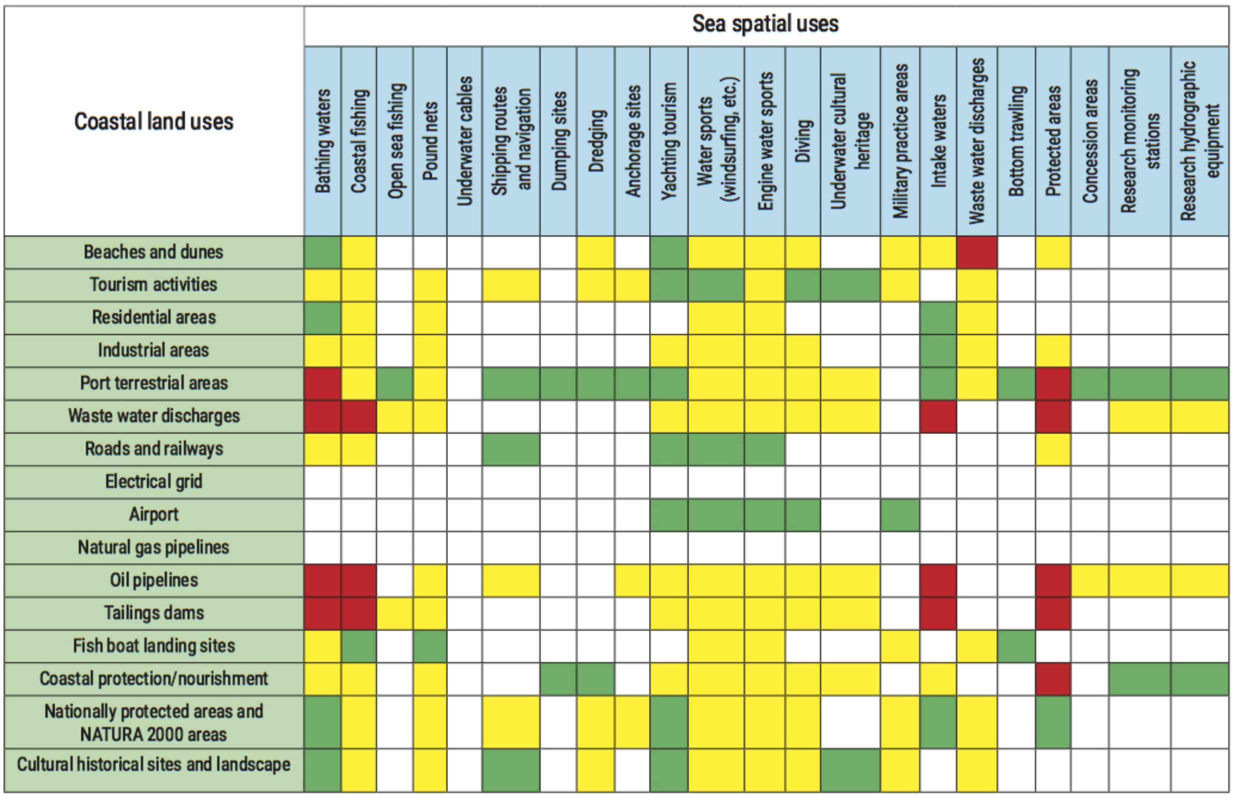


Figure 3 - Matrix of land-sea interactions among uses for Burgas study area (Ramieri *et al*., 2019)

To integrate LSI into any planning process, three phases are proposed (see LSI document):

1. Scoping (setting the context),
2. Analysis (evaluating LSI using selected methodology), and
3. Incorporating into plans.

Within MSP, the above phases are elaborated in more details forming a guideline to perform LSI as follow (Ramieri et al, 2019):

1. Scoping **LSI interaction stocktaking**	Define the spatial domain Identify interactions Localize interactions Describe and qualify interactions Identify key policy – legislative – planning aspects Identify key governance aspects Identify and engage stakeholders)
2. Analysis **LSI interaction in-depth analysis**	Pathways of interactions Spatialize interactions Quantify interactions Analyse temporal dimension
3. Incorporating into plan **Inform the plan about LSI analysis outcomes**	Identify LSI hot-spot areas Identify key messages from LSI analysis.

Some examples could be found on the following links:

http://iczmplatform.org//storage/documents/taFUAsAqp9pOnvq8F4zQmNIhMWBTEvocP0qncF2C.pdf

https://www.msp-platform.eu/sites/default/files/marsplan-bs-burgas_lsi.pdf

2.3 GAIR – a tool supporting MSP processes

Summarizing the above explained concepts involved in the MSP, Figure 4 explains their relations. While Ecosystem-based approach represents a management methodology that takes into account all the system's elements but also their continuous interactions, ICZM Protocol legally enforces but also proposes specific methodological guidelines for integrated coastal zone planning and management. MSP could be seen as an instrument for the implementation of the coastal zone management, for its maritime part. Land-sea interactions, their identification and analysis are a prerequisite for coherent land and maritime spatial planning and thus a required part of both. Finally, the GAIR is a tool supporting the MSP processes including land-sea interactions analysis. What are the MSP's requirements and steps that the GAIR supports?

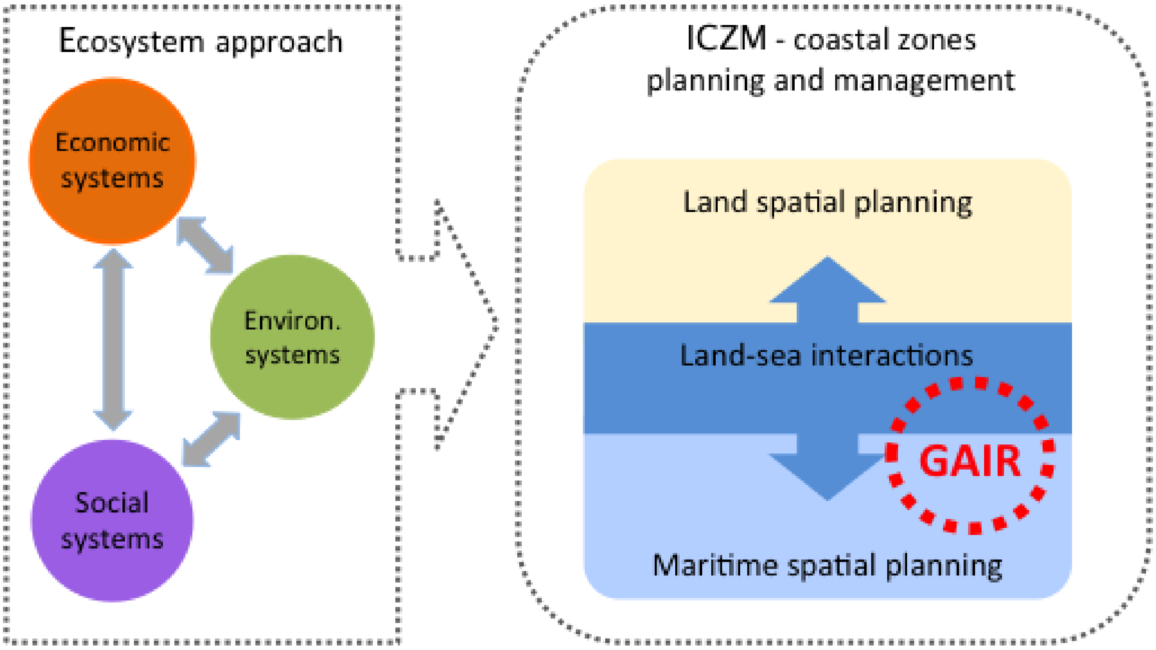


Figure 4 - The support of GAIR in managing coastal and maritime spaces

MSP should ensure several requirements as stated in the previous sub-chapter. The GAIR offers support to all of them. Namely, the GAIR Resource layer ensures the use and organisation of data across the borders and stakeholders, the Module engines provide analytical tools for land-sea interactions' analysis and other analytical tasks such as modelling and development of scenarios, and the Geoportal facilitates stakeholders participation and trans-boundary cooperation (Figure 4).

Regarding MSP steps, Table 1 points out the supporting functions of the GAIR.

Table 1: the GAIR supporting function to MSP steps

MSP steps	The GAIR support
1. Starting the process and getting organized	Resource layer (data collection and management – OGC services and data import functions)
2. Assessing the context and defining a vision	Geoportal (visualising data on maps, tables and charts)
3. Analyzing existing conditions	Module engines (various spatial analysis)
4. Analyzing future conditions	Module engines (various spatial analysis)
5. Identifying key issues	Geoportal (visualising data on maps, tables and charts)
6a. Design phase - Elaboration of MSP plans	Module engines (various spatial analysis) Geoportal (visualising data on maps, tables and charts)
6b. Design phase - Strategic Environmental Assessment	Module engines (various spatial analysis) Geoportal (visualising data on maps, tables and charts)
7. Adopting the plan and organizing the implementation	Resource layer (OGC web services and data export functions) Geoportal (visualising data on maps, tables and charts)
8. Implementing, monitoring and evaluating the plan	Resource layer (data management, OGC web services) Module engines (various spatial analysis) Geoportal (visualising data on maps, tables and charts)
9. Cross-step activity: stakeholder consultation	Geoportal (visualising data on maps, tables and charts)

2.4 Transnational cooperation

The MSP Directive (2014/89/EU) recognises the necessity for cross-border cooperation between Countries, as a part of the planning and management process. The aim is to ensure a coherent and coordinated management across the marine regions.

The cross-border cooperation shall be established among EU Member States and with neighbouring third Countries, hereafter called transnational cooperation because such cooperation should take into account issues of transnational nature. The EUSAIR is a mechanism that supports and enables such cooperation between the AI countries, as one of the four main sub-regions of the Mediterranean.

The MSP Directive stipulates that each EU Member State shall designate the authority responsible for the implementation of the Directive including the responsibility for transnational cooperation. The forms of cooperation are not prescribed into details, but the Directive suggests the following cooperation approaches through the following:

- Existing regional institutional cooperation structures such as Regional Sea Conventions (Barcelona Convention in the case of AIR);
- Networks or structures of Member States' competent authorities;
- Any other method, for example in the context of sea-basin strategies (EUSAIR).

Today, Countries are preparing national and sub-national maritime spatial plans, covering the sea space under their jurisdiction and governed by national laws and regulations. The MSP development process includes the consultation among Countries that share a maritime border (consulting maritime activities and spatial plans of neighbouring Countries and negotiate across borders), but finally, the maritime space is governed by different set of rules.

Although EU Member States are cooperating via international sectorial agreements, there is a need for some supra-national instrument (such as EUSAIR) or body dealing with cross-border aspects of MSP. This is particularly important in Europe, where seas are increasingly congested. There are several MSP instruments that should enhance transnational MSP; among the others, the ones in line with the EUSAIR Action Plan are the following:

- Creation of macro-regional or regional actions as the starting point for successful transnational MSP practices (such as the EUSAIR Action Plan, in the case of the Adriatic-Ionian Region);
- Creation of international/regional sea basins serving as the basis for transnational cooperation (analogue to river basins and sub-basins introduced by Directive 2000/60/EC - Water Framework Directive), and
- Creation of a forum, i.e. a place to discuss and develop approaches to the management of maritime activities in the sea basins (such as the EU MSP Forum[1]).

One of the GAIR tool 's achievements is providing support to transnational cooperation in the Adriatic-Ionian Region. It is realised through enabling data and knowledge sharing and applying the same methodologies and analytical tools among the Countries.

[1] https://www.msp-platform.eu/type-event/forum

3 MSP AND ICZM IN GREECE

3.1 Legal framework, competent authorities and stakeholders

Greece is located in south-eastern Europe and at the north-eastern corner of the Mediterranean Sea. The country has an extensive coastline of about 15000 kilometres, and around 6000 islands and islets that constitute the unique Greek archipelago. Over the 70% of Greece's population is concentrated in the country's coastal zone. The limit of Territorial Waters of Greece is set up to 6 NM in the Aegean Sea, and 12 NM in the Ionian Sea, as the country has recently signed an agreement on maritime boundaries with Italy, delimiting an exclusive economic zone (EEZ) between the two neighbouring nations, with the aim also to resolve longstanding issues overfishing rights in the latter marine region Ionian Sea (see Figure 5). In fact, as already mentioned above, the maritime borders deal with Italy has come into effect in November 2021. However, doubling Greek territorial waters in the Ionian Sea from six miles to 12 has led to a dispute with Albania and the issue is taken to The Hague. Then another agreement with Egypt designating an EEZ in eastern Mediterranean waters is also under way.

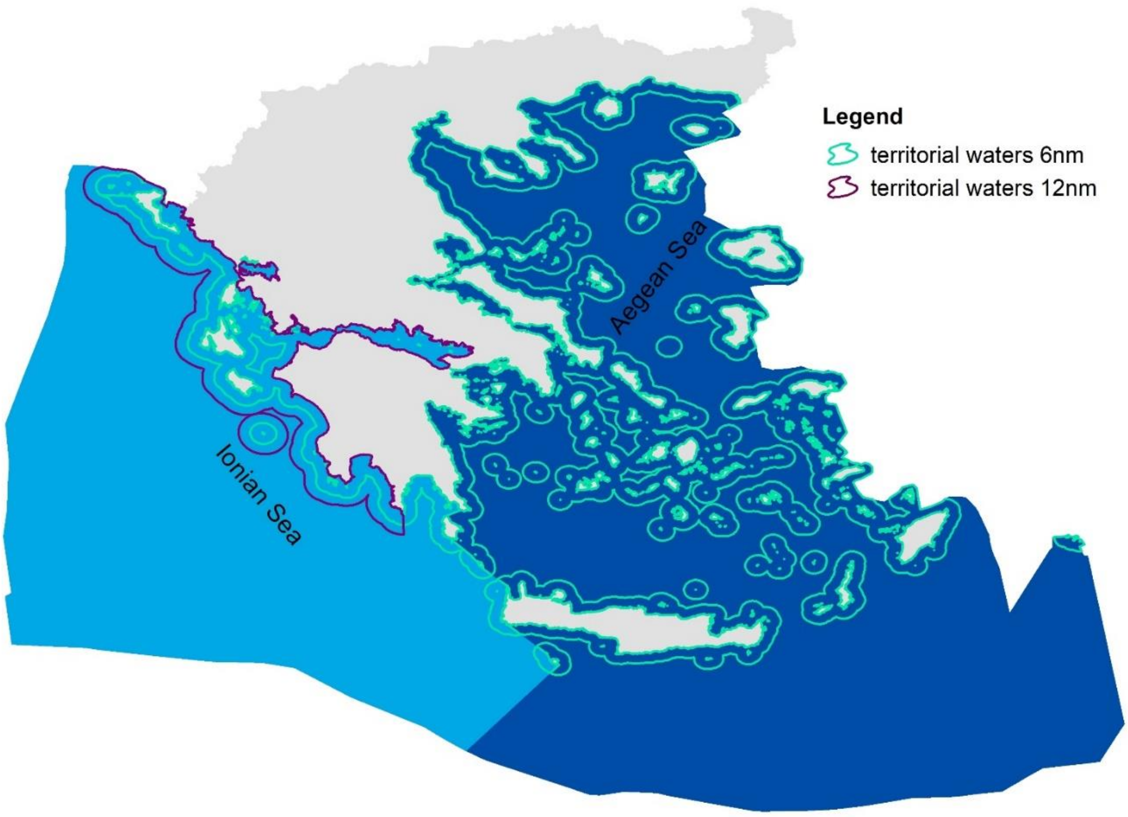


Figure 5 - Territorial waters limits in Greece.

Greece is a maritime nation by tradition, and shipping and maritime trade have been key elements of the Greek economy since the antiquity. Furthermore, fisheries have been also a sector of vital importance for the communities of the island and for the coastal regions of Greece for thousands of years. In the last few decades tourism, and particularly maritime/coastal tourism, has been one of the main contributors to the country's economy, while marine aquaculture is also considered as a success story in Greece's Blue Growth agenda. As a consequence, there is an increasing demand for coastal and marine space, particularly in specific areas, which is currently allocated on a single-sector basis without a plan-based approach. The latter may subsequently lead to conflicts among uses as well as with the natural environment. Indeed there are a number of risks and challenges that need to be taken into account during the blue growth planning in the country that, aside from conflicts between different sea uses resulting in depletion and/or degradation of natural and cultural resources and biodiversity, include also the institutional fragmentation and ineffective marine management/governance and the risk of the low-level knowledge and information diffusion at a local level related to blue economy and blue growth (Kyvelou & Ierapetritis, 2019).

In this vein, Maritime Spatial Planning (MSP), aiming to balance ecological, economic and social interests, is a process that has become increasingly important for the management of maritime activities in the last decade and may also substantially contribute to tackling the aforementioned challenges and facilitate Blue Growth. In the European Union (EU) Seas, the planning of the maritime space is gradually following the provisions of the EU Maritime Spatial Planning Directive (MSPD), adopted by the European Commission in 2014, and transposed to the Greek legal system in 2018 (Law 4546), constituting the key policy document for the future of MSP in Greece.

The 2018 maritime spatial planning law provides the guidelines for the *National Maritime Strategy*, as well as the *Maritime Spatial Plans* that apply to marine and coastal spatial units of sub-regional, regional and interregional character, while one of the most important issues of MSP in the country is its relationship with terrestrial planning, as Article 15 foresees that the authorities while preparing maritime spatial plans should consider guidelines of existing terrestrial spatial plans. On the other hand, the need for more effective coastal zone planning/management, that would also ensure better integration of land-sea interactions in the MSP process as required by the MSPD, remains a challenge because the Integrated Coastal Zone Management (ICZM) Protocol that was adopted in 2008 by the contracting parties to the Barcelona Convention, and specifically aims to address the impacts of coastal development, is yet to be ratified by Greece.

It should be also stressed, however, that the 2018 MSP law besides transposing the definitions on MSP directly linked to the MSP Directive, introduced additional definitions for coastal zone and integrated coastal zone management. The latter has changed in 2020 with Law 4759, that amended the MSP Law 4546, in terms of the geographical scope of MSP that has now been limited to the marine parts of the country excluding thus the coastal zone, and then by renaming the *Maritime Spatial Plans* to *Maritime Spatial Frameworks*; their scope is thus to provide strategic planning guidelines, and they can also be subjected to amendments, whenever this is indicated by a special type of Plan usually associated with investments approved by the government (Coccossis *et al.*, 2020).

The competent authority for the implementation of the MSPD in Greece is the Ministry of Environment and Energy, which will have the ultimate responsibility for MSP implementation at all levels of policy, and has the following responsibilities:

1) designs, within marine waters and coastal zones, the extent and content of maritime spatial planning,
2) ensures the preparation of the national spatial strategy for the maritime space and maritime spatial plans
3) evaluates the implementation of the maritime spatial plan

4) consults with the relevant authorities of other Member States of the European Union and third countries for the formation of cooperation and a common approach, as well as the coordination of their actions concerning maritime spatial planning guidelines. national maritime space strategy,
5) ensures any appropriate way, process, mechanism or program
6) takes all necessary measures to ensure the coordinated implementation of maritime spatial planning by the involved public authorities at all levels of government (national, regional and international or transnational level),
7) is a point of contact with the European Union and its competent members for matters related to the implementation of Directive 2014/89 / EU,
8) participates in national, transnational and cross-border programs, within the framework of its responsibilities
9) supervise and coordinates programs and studies related to spatial planning and implemented in the national maritime and coastal area
10) must inform the European Commission of changes in the information concerning its legal and administrative status.

However, in order to develop an appropriate maritime plan and governance framework in Greece, considering that each marine sector has its own needs and priorities related to spatial allocation of its activities which are usually governed by different authorities (e.g. fisheries and aquaculture by the Ministry of Rural Development, shipping by the Ministry of Maritime Affairs and Insular Policy), the MSP competent authority (i.e. the Ministry of the Environment and Energy) will have to promote the coordinated integration of individual ministerial sectorial policies and action plans.

Furthermore, while the MSP process should aim at allocating the different marine uses by following a transparent participatory approach, that should include also a strong socio-cultural dimension (Papageorgiou and Kyvelou 2018), a special emphasis needs to be placed in the Greek coastal and mainly island communities, that depend on sustainable maritime activities to ensure the achievement of inclusive prosperity goals. The latter is also linked with provisions of the EU Cohesion Policy, that aims at reducing disparities between regions by encompassing the identification of place-based niche areas of competitive strategic potential; such place-based outcomes should be one of the key ingredients of the MSP processes developed in the different regions.

In this sense, multi-stakeholder governance mechanisms acting as enablers to the development of smart specialization strategies (RIS3) that focus on solving major societal challenges at regional/local scales, should be directly linked to strategic and forward-thinking MSP efforts. Hence, effective governance interventions are needed for mainstreaming efforts and outcomes of relevant stakeholder working groups under different policy agendas (e.g. cohesion, environmental, planning) with the aim to link considerations of MSP issues, as the planning process should not only reflect place-identities but actually it should be based on the natural and social capital characteristics of the different marine areas/regions. Due to the heterogeneity of marine space, in terms of the high diversity of its natural capital and the socio-economic opportunities in the different regions, the country would benefit from tailor-made MSP implementation approaches at regional (and if needed at local) scale. Indeed, according to Papageorgiou and Kyvelou (2018), MSP should pave the way for practical tailor-made planning, that takes into account the characteristics of the different marine/coastal social-ecological systems. In order to accommodate the aforementioned challenges, an effective MSP governance system is thus needed in the country, that should consider efficient collaboration and integration at a horizontal level (e.g. interministerial), as well as vertically, between national, regional and local administration levels. The above are in accordance with Kelly et al. (2018) suggesting that institutional and legal frameworks for marine governance, involving transformative change of institution values and practices, need to be developed in order for the countries to achieve an integrated management of their maritime space. At the moment, EU countries have adopted a variety of approaches and strategic options, that depend greatly on geopolitical circumstances, regional commitments and domestic policies which may constitute the basis for improving existing MSP governance systems (Casimiro & Guerreiro, 2019).

3.2 Preparation of maritime spatial plans or coastal management plans

Greece is in the process of preparing its maritime spatial plan that need to be adopted on the basis of the provisions of the EU MSP Directive by 2021. As a matter of fact, the process is running late for many Member States including Greece, and the competent Ministry expects to submit the draft of the 'Plan" at the end of 2021 to public consultation, before presenting the draft to the European Commission. MSP is considered as a complex and multidimensional process, whose character is principally determined by the application scale. In Greece MSP can be developed at national, regional and local levels, the key issues being the poor interaction with the development policies and coherence with the existing spatial plans (Strategic special/Regional/Local Plans); at large spatial scales, strategic MSP should ensure and promote synergies and compatibilities between spatial development, and sectoral policies, while at small spatial scales, the character of MSP should be regulatory and should focus on resolving conflicts and promoting synergies between marine uses (Stefani et al., 2019).

Up to now, MSP issues are addressed in sectoral plans, that have been elaborated so far for aquaculture, tourism, industry and renewable energy, and that include spatial planning guidelines for the land-based, coastal and marine segments of each sector. Furthermore, there are Spatial Plans at the regional level, which however focus on the spatial management of land activities and coastal areas only. Indeed, due to the great importance of the coastal zone in Greece, fundamental national legislation on coastal management has been introduced since the 1980s, which however is rather fragmented and often has contradictory objectives (Simboura et al., 2018). Although the integrated coastal zone planning/management remains a complex issue requiring systematic approach and data gathering (Beriatos & Papageorgiou, 2011), the ICZM Protocol that would definitely contribute towards this direction has not entered into force in the country, as already mentioned above.

However, the only truly marine spatial plan in Greece is the **Framework for Common Spatial Planning for Aquaculture** (Common Ministerial Decision No 31722/2011). This framework, that promotes the zoning of the sea allocated to aquaculture (allocated zones to aquaculture (AZA)) with the aim to avoid interference between possibly conflicting activities, received a lot of criticism by stakeholders representing the fisheries (mainly small-scale) and tourism sectors during the consultation process that took place in the area of western Greece, under the Interreg ADRION project ARIEL. Such consultation coincided with the beginning of the PORTODIMARE testing phase, and hence provided valuable insight on MSP objectives that seemed relevant also for the PORTODIMARE case study area. Indeed, in the framework of two consultation meetings with fisheries and aquaculture stakeholders, organized by the Region of Western Greece in 2018, fishers highlighted that policy-makers do not take their needs into consideration underlining their absence from any decision making process and particularly from the process related to the proposing of new zones for aquaculture development, as appearing in the Special Framework for the Spatial Development of Aquaculture in Greece which, according to fishers, are located on traditional SSF fishing grounds (ARIEL DT.1.2.4).

Then, there is the **National Strategy for Tourism**, that makes a spatial distinction of coastal areas into Developing and Developed ones. A number of prohibitions and constraints exist for the fisheries sector, mainly for trawlers and purse-seiners which vary from no-take areas to spatial-temporal bans.

Finally, there are spatial management plans for the two marine protected areas (MPAs); the Zakynthos Park in the Ionian (Presidential Decree (P.D.) 906 D'/21.12.1999) established for the protection of the marine turtle *Caretta caretta*, and the Alonissos Park in the Aegean (Common Ministerial Decision 621/23537/2003) for the conservation of the Mediterranean monk seal *Monachus monachus*. In the latter two MPA plans there is explicit zoning of specific marine activities referring to varying protection levels in accordance with the foreseen biodiversity conservation objectives.

In 2018, Greece has also increased the designation of its Natura 2000 network sites at sea; however, as up to now, Natura sites are in many cases all over Europe considered as "paper parks" (WWF, 2017) and the same is true for the Greek Network. It seems crucial that the designation of protected areas in the European seas should be based on systematic conservation planning principles that need to be embedded in the MSP process (Fraschetti *et al*., 2018).

Finally, a number of MSP related projects were implemented in the last decade, that have shed light on some issues of concern that will need to be addressed to proceed with effective planning strategies; certain projects in which the MSP competent authority was involved led to the development of pilot plans in different areas of the country (https://www.msp-platform.eu/countries/greece).

As for the area of the Greek case study in PORTODIMARE project, which is located at the western part of Greece in the Ionian Sea, the existing spatial management provisions are as follows:

- fishery-related spatial prohibitions in designated areas/periods;
- a number of Natura 2000 sites, for which no spatial management schemes exist;
- both developing and developed coastal touristic areas as appearing in the national strategy for tourism, and although the latter information does not refer to marine planning, it definitely affects land-sea interactions;
- the Sectoral National Spatial Plan for the aquaculture, which is particularly relevant for the Greek case study area, as fish farming units there yield about 30% of the total fish farming production in Greece, and within the latter Plan there are also provisions for the further development (including the spatial expansion) of the sector within the boundaries of the area under study.

Based on the above, and as the MSP competent authority was not involved in the project, the scientific team of HCMR took the initiative and decided to focus the testing effort for the Greek case study on the **interactions between aquaculture activities**, considering also the provisions of the relevant legal document, and fisheries and tourism. As for the conservation priority ecosystem components, seagrass (*Posidonia oceanica*) meadows, the common dolphin (*Delphinus delphis*) and the monk seal (*Monachus monachus*) have been selected to be included in the analysis of the Testing phase of the GAIR modules.

The objective of the study was therefore to use the GAIR applications for analysing the existing and selected future conditions in the study area, with the aim to contribute with new knowledge on the MSP step related to the "analysis of existing and future conditions", being of crucial importance in the MSP process, and evaluate outcomes from the 'testing exercise' that could provide feedback for future applications and the development of planning scenarios at the sub-regional, regional and interregional scale, as foreseen by the 2018 MSP law of Greece. The ultimate goal was to identify possible barriers and challenges that need to be addressed to improve the approaches related to the aforementioned MSP step, and in line with the latter provide suggested actions (i.e. a proposed Action Plan (AP)). Finally, following the presentation of the legal aspects related to MSP in Greece, proposed actions related to governance issues and stakeholder engagement have been also drafted and were included in the AP section of the present deliverable.

4 TESTING AREA

4.1 Presentation of the testing area

The testing of selected spatial modules developed within PORTODIMARE was carried out in a well-defined area of the Ionian Sea, Western Greece (Figure 6). The Greek Case Study is located between the western coasts of the country and the islands of Lefkada, Ithaca and Kephalonia, and includes the Inner Ionian Archipelagos, which is an important marine mammal area (IMMA), and the outer part of the Patraikos gulf. In the coastal zone there is a relatively increased urbanization, and the aforementioned islands constitute important touristic destinations hosting relevant infrastructure facilities (hotels, marinas etc). The most important, truly marine, activities that take place in the study area are fisheries and aquaculture while there is also increased maritime traffic. Consultation with local stakeholders has revealed spatial conflicts between aquaculture and mainly small-scale fisheries, and then aquaculture and coastal tourism.

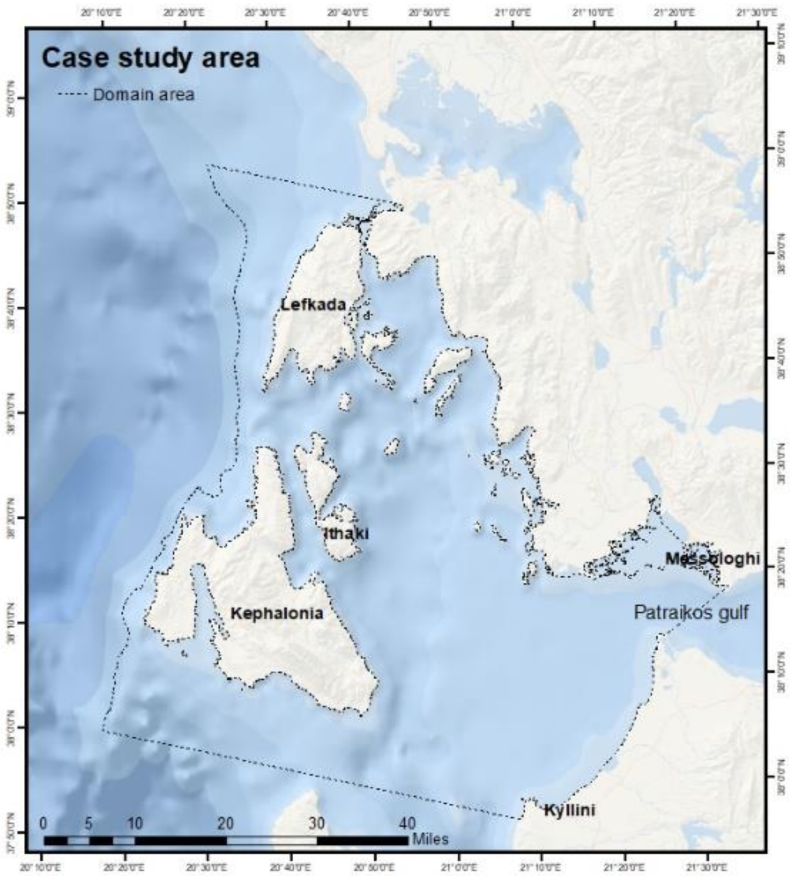


Figure 6 - Case Study area.

In the frame of PORTODIMARE, spatial data for the major human activities taking place in the marine part of the case study area, and for three ecosystem components, that are described briefly below, as they are presented in more detail in DT2.4.1, have been compiled from various sources and were stored in the GAIR.

4.2 Human activities

In relation to marine activities/uses, the following ones have been taken into account in the Greek case study area and are visualized in Figure 7, except for fisheries; the spatial distribution of the latter sector was studied in the frame of two modules (SSF and MSF) presented in DT2.4.1, and has been also addressed in section 4.2 of this report.

Aquaculture	The only aquaculture type in the study site is fish farming, and the area yields about 30% of the total fish farming production in Greece. The main cultured species in the 55 farms of the study area are the sea bream (Sparus aurata) and the sea bass (Dicentrarchuslabrax).
Fishing Ports	There are 13active fishing ports with a maximum capacity of 5402 GT.
Marinas	There are four marinas, the biggest one, with total capacity of 620 yachts up to 45 m in length, located at the island of Lefkada.
Cables	A number of underwater cables are laid on sea bed of the study area.
Shipping	Important maritime traffic also takes place in the study area.
Fisheries	Three subsectors are included: small scale fisheries (SSF), bottom trawlers (OTB) and purse seiners, the latter two comprising the medium scale fisheries (MSF). The spatial distribution of the three subsectors is presented in section 4.2 (Modules SSF and MSF).

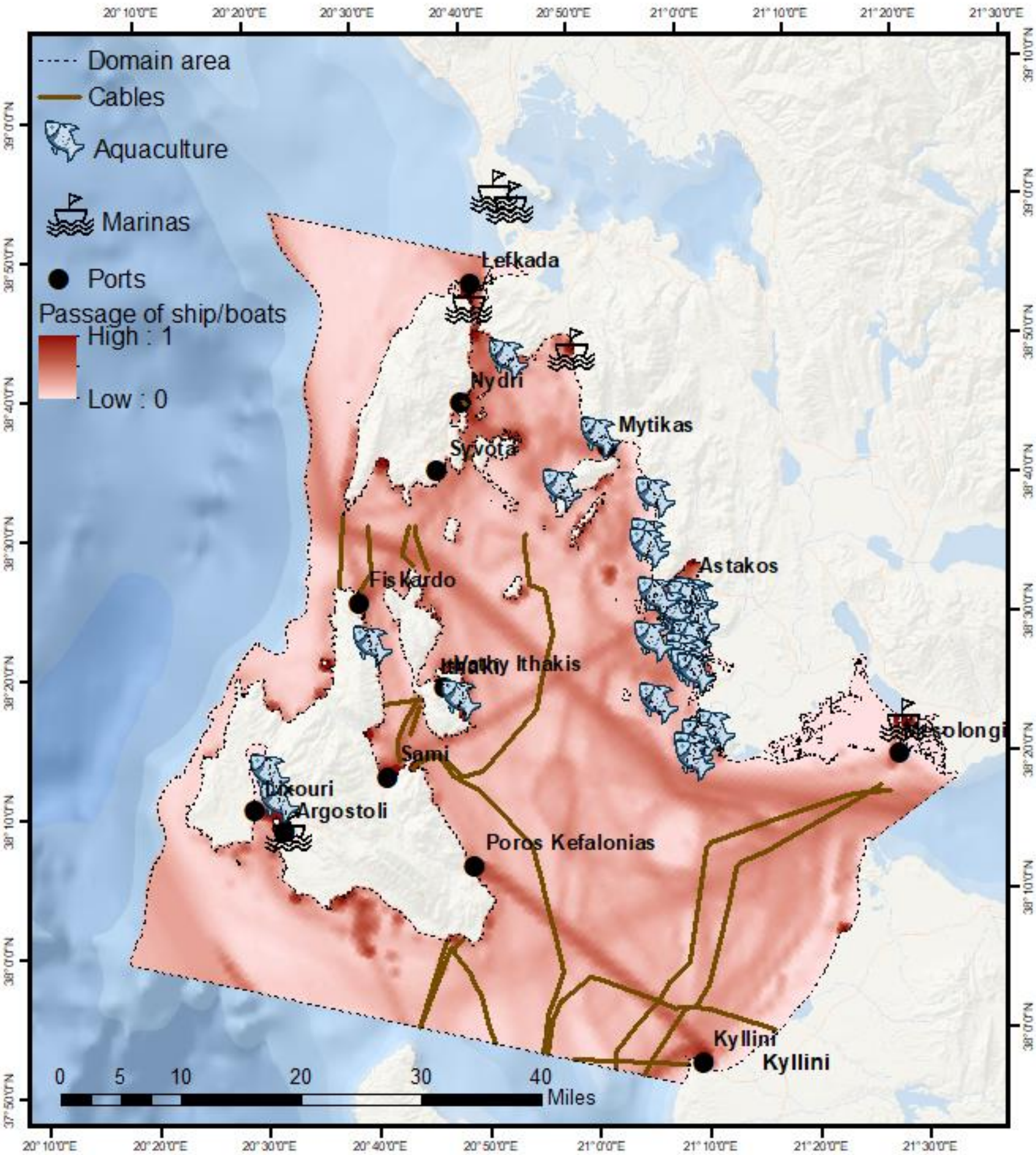


Figure 7 - Marine activities/uses (aquaculture, ports, marinas, cables, shipping routes) in the case study area

4.3 Ecosystem components

Three conservation priority ecosystem components, have been selected to be further analysed in the frame of the Greek case study, and particularly for the application of the cumulative effects analysis (CEA) module:

- the Neptune sea grass (*Posidonia oceanica*),
- the common dolphin (*Delphinus delphis*) and
- the monk seal (*Monachus monachus*).

Figure 8 visualizes the existing spatial information on the distribution of the three ecosystem components in the Ionian Sea CS area.

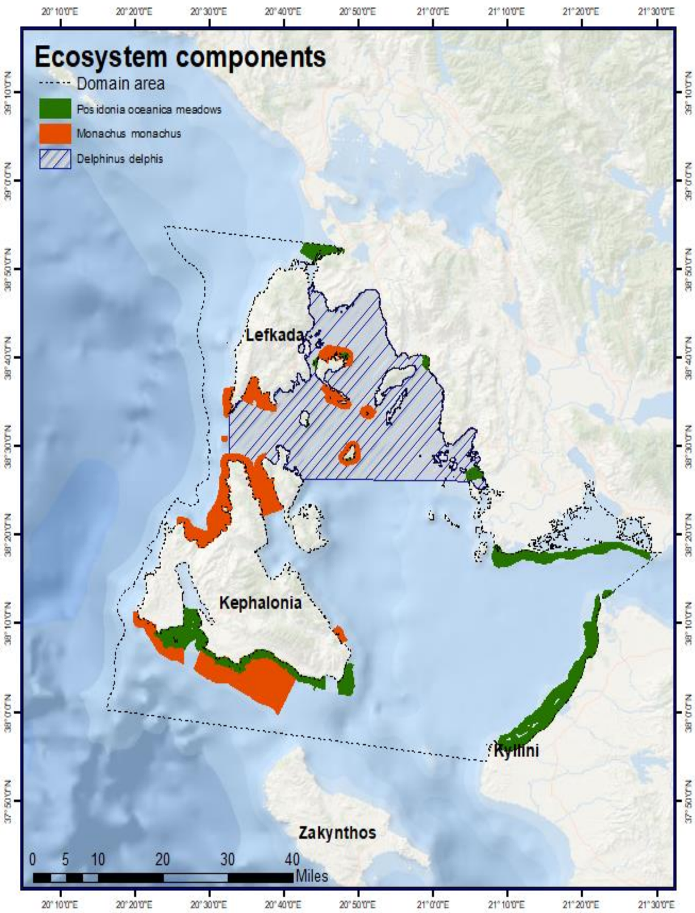


Figure 8 Spatial distribution of the selected ecosystem components in the Greek CS

A point that should be highlighted however is that at the case study area there is a general lack of data particularly on different ecosystem components. The species to be studies were thus selected as data were either relatively more robust (the case of seagrass meadows), or at least historical data sets exist (the case of the marine mammals).

4.4 GAIR -tools for MSP (Modules) tested

In the framework of the Greek case study, the GAIR was used to support the MSP step related to the analysis of existing conditions in the study area of western Greek waters, trying also to integrate some information on potential future trends derived from official documents (e.g. the Special Framework for Aquaculture Development in Greece), as well as other sources (e.g. stakeholder engagement/consultations in other research projects). The lack of robust and consistent data particularly related to future conditions as well as the fact that no stakeholder interactions were foreseen in the Greek case study of PORTODIMARE did not allow mapping of future demands and identify alternative scenarios. So the only point elaborated in relation to the MSP step on analysing future conditions referred to mapping legal provisions for aquaculture and tourism.

The following chapters show the **four modules** implemented in the framework of PORTODIMARE and integrated in the GAIR that **have been tested in the Greek case study**.

4.4.1 Modules on Small Scale Fisheries (SSF) and Medium Scale Fisheries (MSF) footprint.

HCMR was responsible for the implementation of the modules on Small Scale Fisheries - SSF and of the module on Medium Scale Fisheries - MSF (see Deliverables 1.11.2, 1.11.3, 1.12.2, 1.12.3 of PORTODIMARE project). The SSF module integrates the most influential components and criteria affecting the small-scale fisheries, by combining Multi-Criteria Decision Analysis methods and geospatial techniques. This module was tested to estimate a spatial fishing pressure index for SSF in the case study area. Then, the seven-steps methodological process described in detail in DT1.12.2 was used to estimate the fishing effort from SSF in the Greek case study. As for the spatial footprint for MSF, it was based on the analysis of trawlers' and purse seiners' VMS and AIS monitoring systems.

The output layers of SSF and MSF modules are presented below (Figures 9&10). The maps visualize areas with varying levels of fishing pressure exerted by SSF and MSF based on the respective modules run in the case study area.

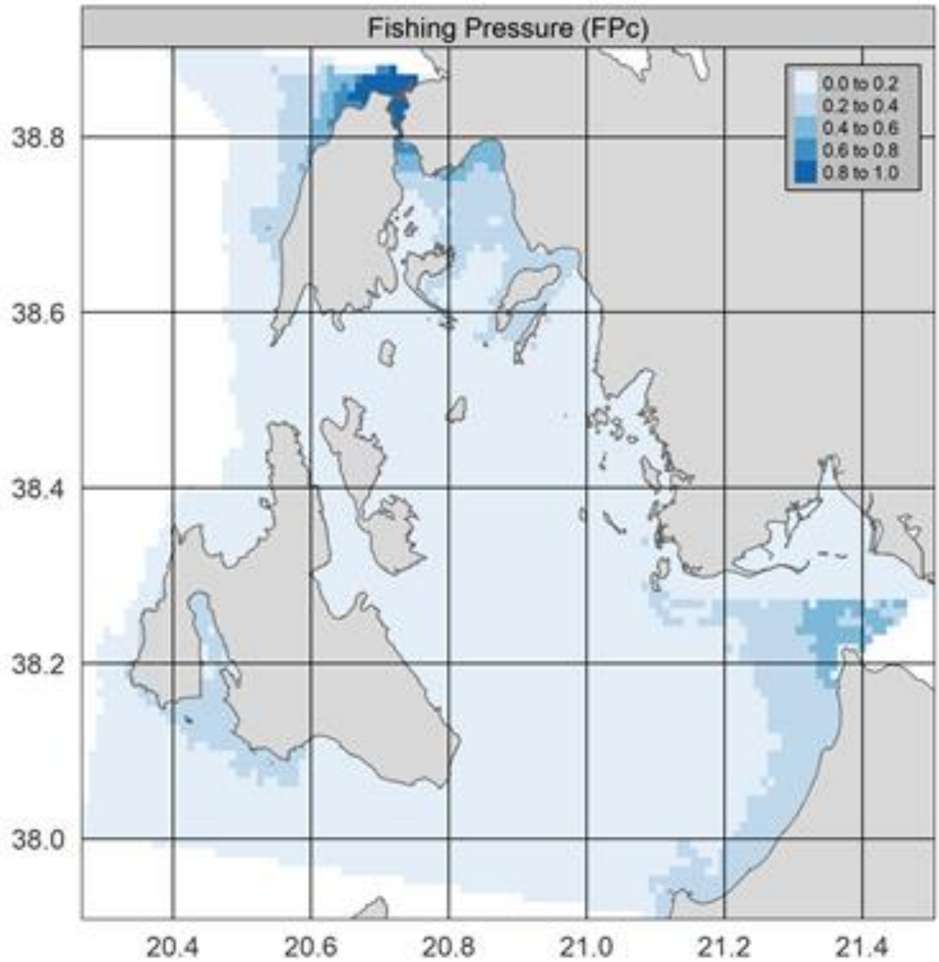
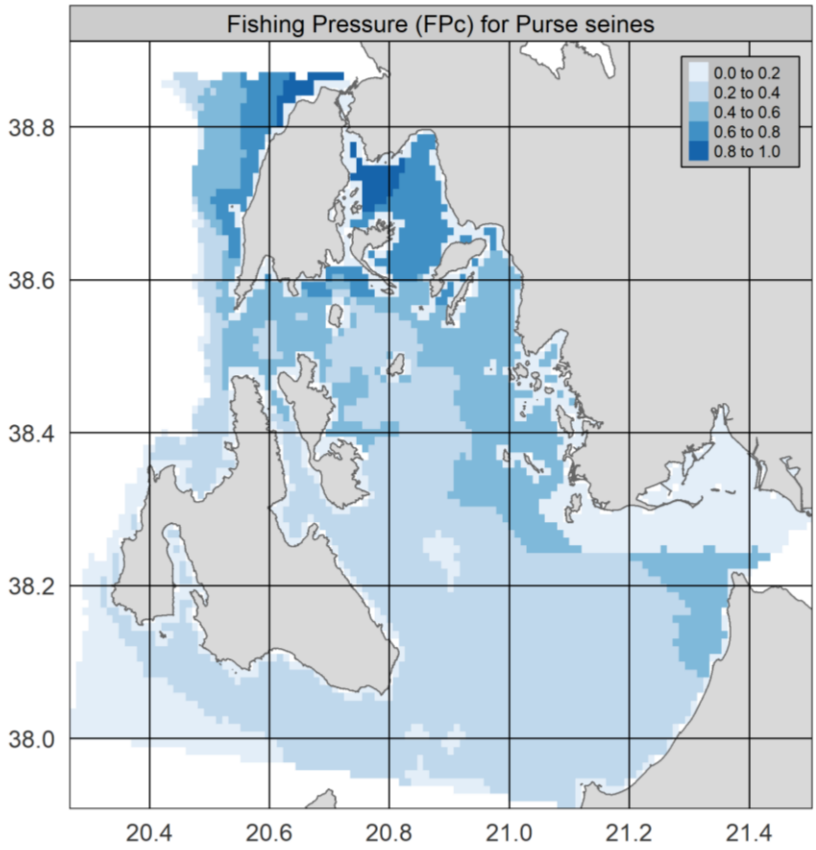
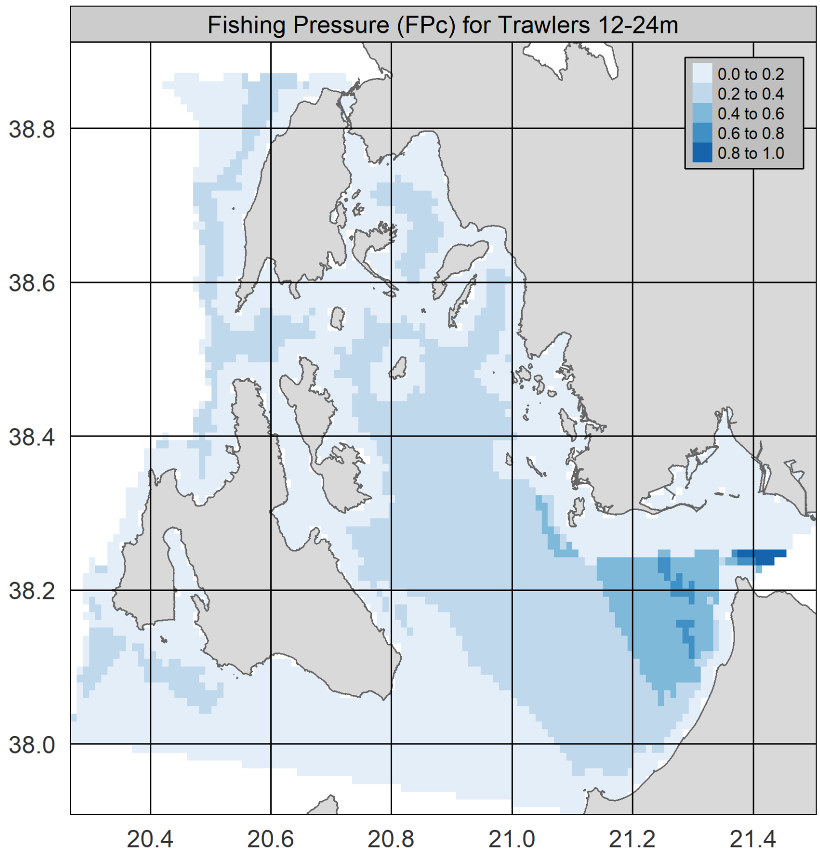


Figure 9 - Fishing pressure index for Small Scale Fisheries



Fishing Pressure (FPc) for Purse seines
0.0 to 0.2
0.2 to 0.4
0.4 to 0.6
0.6 to 0.8
0.8 to 1.0
38.8
38.6
38.4
38.2
38.0
20.4
20.6
20.8
21.0
21.2
21.4



Fishing Pressure (FPc) for Trawlers 12-24m
0.0 to 0.2
0.2 to 0.4
0.4 to 0.6
0.6 to 0.8
0.8 to 1.0
38.8
38.6
38.4
38.2
38.0
20.4
20.6
20.8
21.0
21.2
21.4

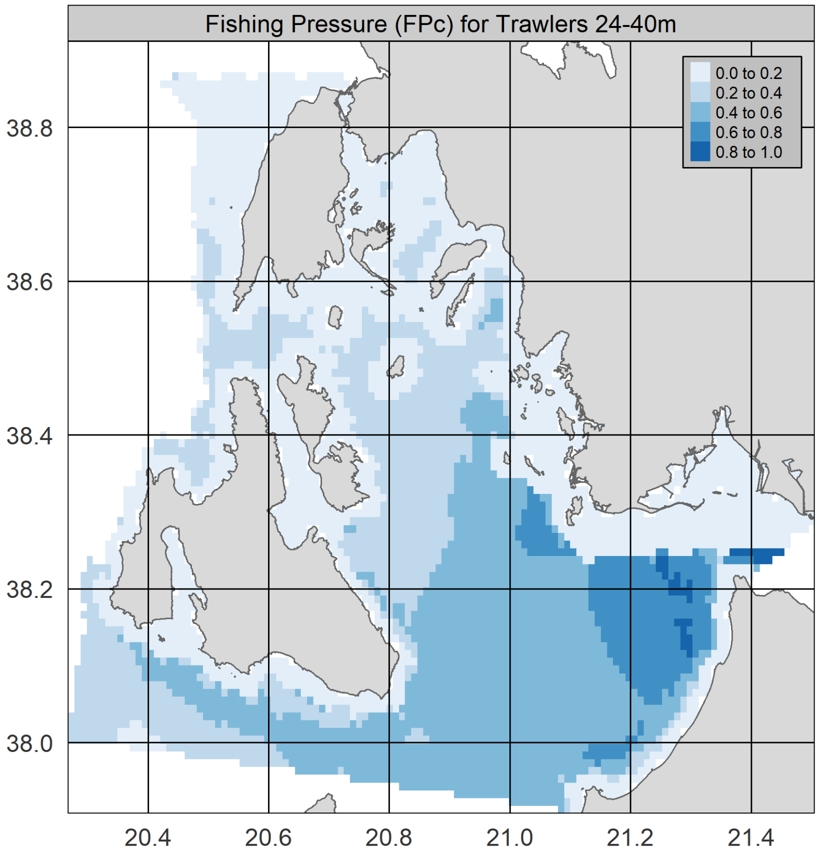


Figure 10 - Fishing pressure index for Medium Scale Fisheries

4.4.2 Module for mapping Allocated Zones to Aquaculture (AZA).

The module for mapping Allocated Zones to Aquaculture was implemented by CORILA (PORTODIMARE project partner n. 2, see Deliverable 1.8.1). The AZA module implements a spatially explicit Multi-Criteria methodology aimed at identifying those marine areas where the development of aquaculture may be suitable. The criteria applied for the analysis in the case study were:

- finfish optimal growth,
- wave height, and
- distance to harbour.

The AZA module was tested for the most important farmed species of the study area, i. e. the European seabass and the gilthead seabream.

The main output coming from the application of the AZA module is a raster map visualizing those sites that seem to be suitable for finfish aquaculture development in the case study area. Figure 11 displays the suitable areas identified by the AZA module run and the zones proposed by the Framework for Common Spatial Planning for Aquaculture in Greece, showing a relatively good agreement of the latter with the AZA module results.

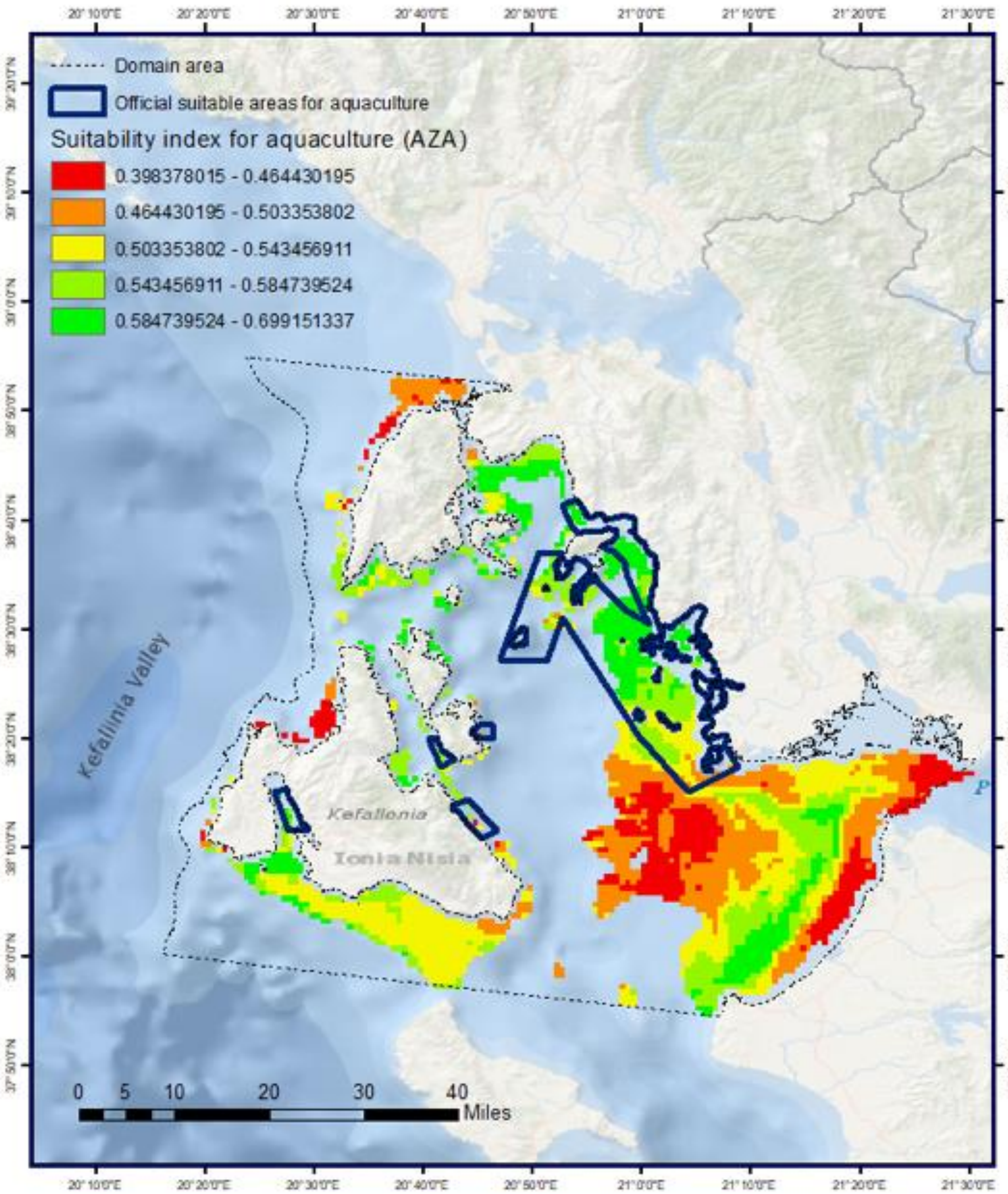


Figure 11 - Map of suitability index for aquaculture development based on the AZA module, and zones officially proposed as AZA by the Greek Framework for Common Spatial Planning for Aquaculture

4.4.3 Module for the analysis of the cumulative impacts of anthropogenic pressures on environmental components (CEA).

The Module for the analysis of the cumulative impacts of anthropogenic pressures on environmental components (CEA) was implemented by project partner n. 2 (CORILA). Within the Ionian Sea case study, the application of the CEA module was also tested (see DT1.7.3 and DT2.4.1 for more details),in order to elucidate the propagation of pressures generated by the activities taking place in the Greek study area and to assess the spatial distribution of impacts exerted by these pressures on the selected ecosystem components.

The module of CEA applied to the Greek case study has produced a number of outputs included in DT2.4.1, and selected outcomes are presented below (Figures 11 and 12).

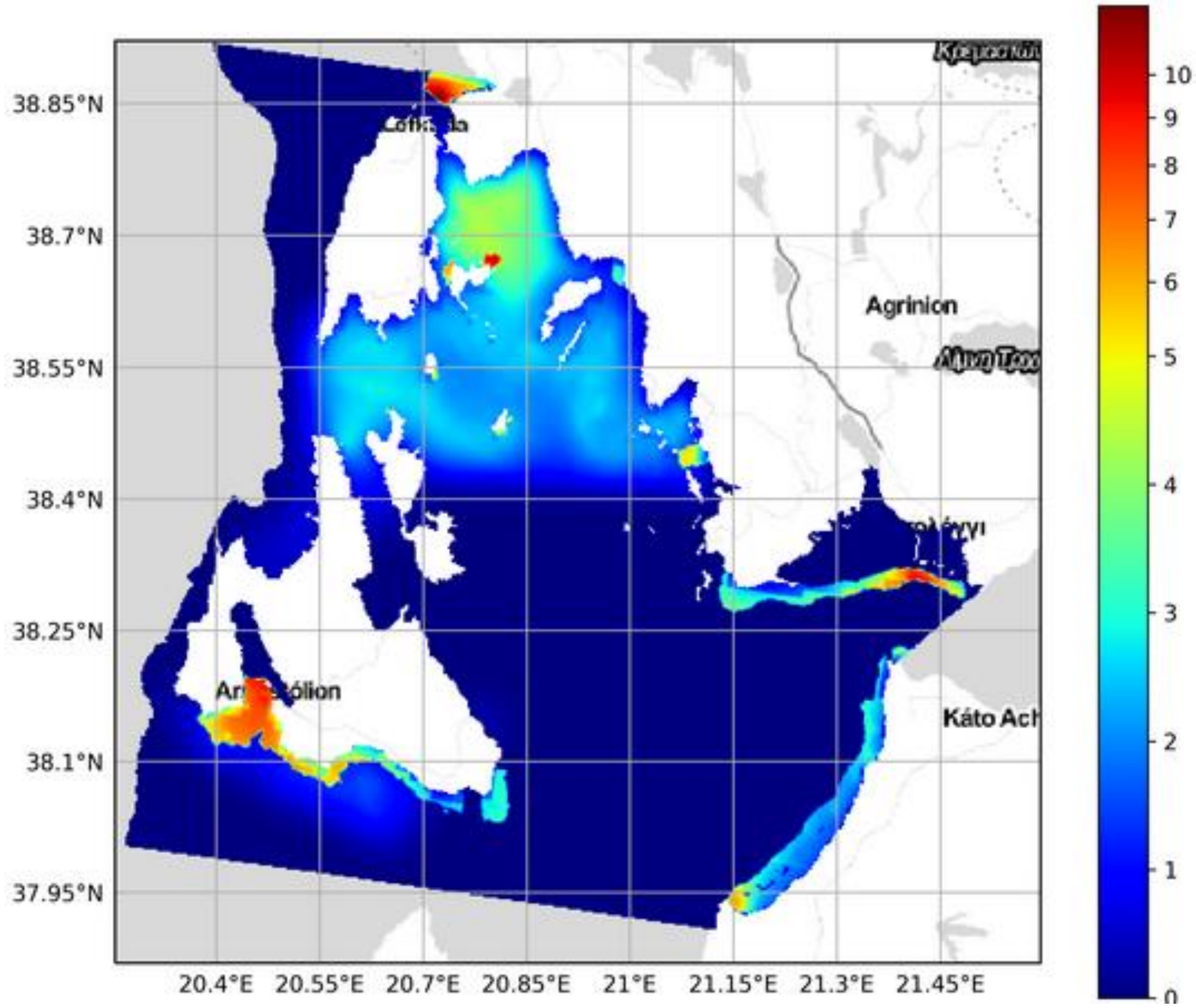


Figure 12 - Geospatial distribution of CEA scores in the Greek CS.

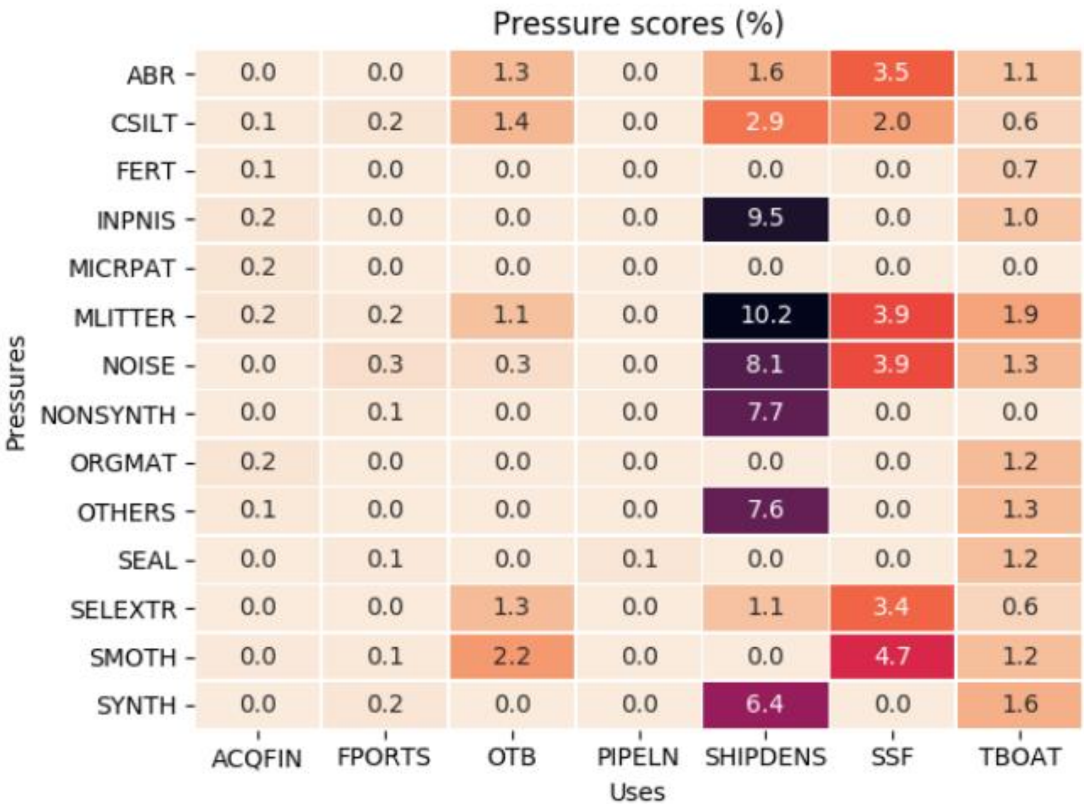


Figure 13 - Matrix representing the contribution of the single pairwise combination of human use and pressure to the total CEA score.

The CEA module run outputs suggested that there is high conflict between marine litter and marine mammals, particularly in areas with high shipping density, while noise and pollution generated by shipping activities seem also to exert important pressures, particularly on the dolphin populations present in the study area. Then, SSF appear to be the sector affecting mainly the status of sea grass meadows in the Greek CS mainly due to littering from abandoned fishing gears (nets, longlines).

It should be pointed out, however, that the analysis was based on non-standardized data sets, the main aim being to test the respective GAIR module (i.e.. the CEA), so outcomes from this exercise should be considered as preliminary and indicative. Indeed, the application of CEA should include comprehensive data and assessment of environmental impacts with the lowest possible uncertainty, to effectively visualize the complexities of how multiple pressures from different activities affect marine ecosystems, and provide robust scientific advice on how this impact can be altered by different planning solutions.

4.5 Integration of results from different modules

According to local stakeholders, the most evident spatial interactions between the human activities in the study area seem to exist between aquaculture and small-scale fisheries, and then between aquaculture and coastal tourism (Anonymous, 2018). For this reason, in the Greek case study of PORTODIMARE, the spatial distribution of aquaculture units and tourism-related facilities in the study area were combined with the outcomes of the SSF module, in order to visualize the existing spatial conflicts.

In Figure 14, the officially designated zones for aquaculture development are indicated, along with the spatial distribution of SSF operations, highlighting spatial conflicts between SSF traditional fishing grounds and existing aquaculture units, which in fact will be further enhanced due to the potential future expansion of units. Then, in two sites of the Ionian Islands region identified as suitable for aquaculture by the AZA module run, conflicts would be intense with both tourism and fishery related activities in case fish farming was considered for development there (Fig. 14). The above underline the need to communicate scientific results while analysing existing and future conditions in the frame of the MSP process, to all key stakeholders that may be impacted by planning decisions, to discuss trade-offs, and proceed with the selection of the planning scenario that would minimize spatial conflicts between sectors.

Indeed, the **development of synergetic multi-uses** pertinent for example to combining fishing tourism-aquaculture activities may be promoted in areas suitable for aquaculture development, which are also considered as appropriate for milder/alternative types of tourism, according to the provisions for the development of tourism activity that may exist in the Regional Spatial Frameworks. In particular, in coastal areas of the Region of western Greece, the provision of incentives to small scale fishers for diversifying their activities and be engaged in fishing tourism, appeared to be a promising alternative, as it may compensate them for the loss of fishing grounds due to aquaculture development (Liontakis & Vassilopoulou, in press). The same was also verified in the frame of the AMAre project[2] case study conducted in the Alonissos Marine Protected Area, as it revealed the importance of participatory approaches to gather information on social-ecological systems of the MPA, and then adapting the MPA management plan in order to integrate sustainable development opportunities of the local communities (e.g. fishing tourism) making them allies to environmental protection and conservation goals (Vassilopoulou, 2021).

In fact, the cooperation between the Ministries of Rural Development and Tourism in the coming years focuses on the development of an integrated strategy proposal for fishing-tourism activities, suggesting the importance of exploring the potential of alternative types of tourism in the country to support rural/fishing communities[3]. Thus, the strategy on the development of fishing tourism should be integrated in the national MSP strategy, but also in the planning at small/local scales, where the scope of MSP should be to resolve conflicts and promote synergies between existing marine uses (Stefani *et al.*, 2019). The characteristics of the social-ecological systems at regional/local scales, as indicated by the findings of ARIEL and PORTODIMARE in the area of western Greece, are of crucial importance in this process. Indeed, spatial efficiency in a socially sustainable way that should avoid exclusive rights of certain activities (e.g. aquaculture -promoted by the AZA zoning mechanism) and support inclusive sharing of resources by one or multiple users and “co-location” or “co-existence” of different uses (Papageorgiou & Kyvelou, 2021), should be considered while developing the MSP National Spatial Strategy and the Maritime Spatial Frameworks (L.4685/2020)

Furthermore, the outcomes from the AZA module were also included in the CEA module run, in order to identify areas where future conflicts with conservation objectives related to the selected ecosystem

[2] https://amare.interreg-med.eu/
[3] https://www.ypaithros.gr/synergasia-ypourgeion-agrotikis-anaptyksis-tourismou-anaptyksi-enallaktikon-morfon-tourismou/

components may arise due to the possible expansion of aquaculture activities. The outcomes of this integrated analysis indicated that the area proposed by the Aquaculture Framework particularly in the marine territory of the Region of Western Greece, although it may have low conflicts with *Posidonia oceanica* meadows, it overlaps with the Inner Ionian Archipelago Important Marine Mammal Area (IMMA), and may enhance interactions between cetaceans and aquaculture units, particularly in case the latter are expanded according to the official provisions. Indeed, fish farms in the inner Ionian Sea Archipelago, being an oligotrophic and overfished area, seem to play an important trophic role, attracting bottlenose dolphins, while common dolphins seemed to decline, but there was no evidence if the latter may be linked to an existing competition mechanism over the feeding area (Piroddi *et al*., 2011). Thus, the optimal planning scenario should not only receive the widest possible acceptance by stakeholders, but also ensure the minimum negative interactions with the marine environment and particularly with species of high conservation importance.

The above constitute a preliminary effort to integrate the outcomes from different modules, and the spatially explicit information hosted in the GAIR, aiming at contributing to the better understanding of the prevailing conditions in the study area, as they constitute elements that can be used in the planning process. The testing activity highlighted the potentiality of the tool as a concrete support to spatial planning, if the modules run can be based on more robust data and assessments, as well as on the engagement of key stakeholders in the process (Coccossis *et al*., 2020). In this vein, such an effort may provide valuable advice for effective planning decisions, taking into account place-based characteristics of the social ecological systems linked to competitive strategic potential and smart specialization strategies (RIS3) at the regional level/local, which should be key ingredients of the MSP process at the smaller (i.e. regional/local) scales.

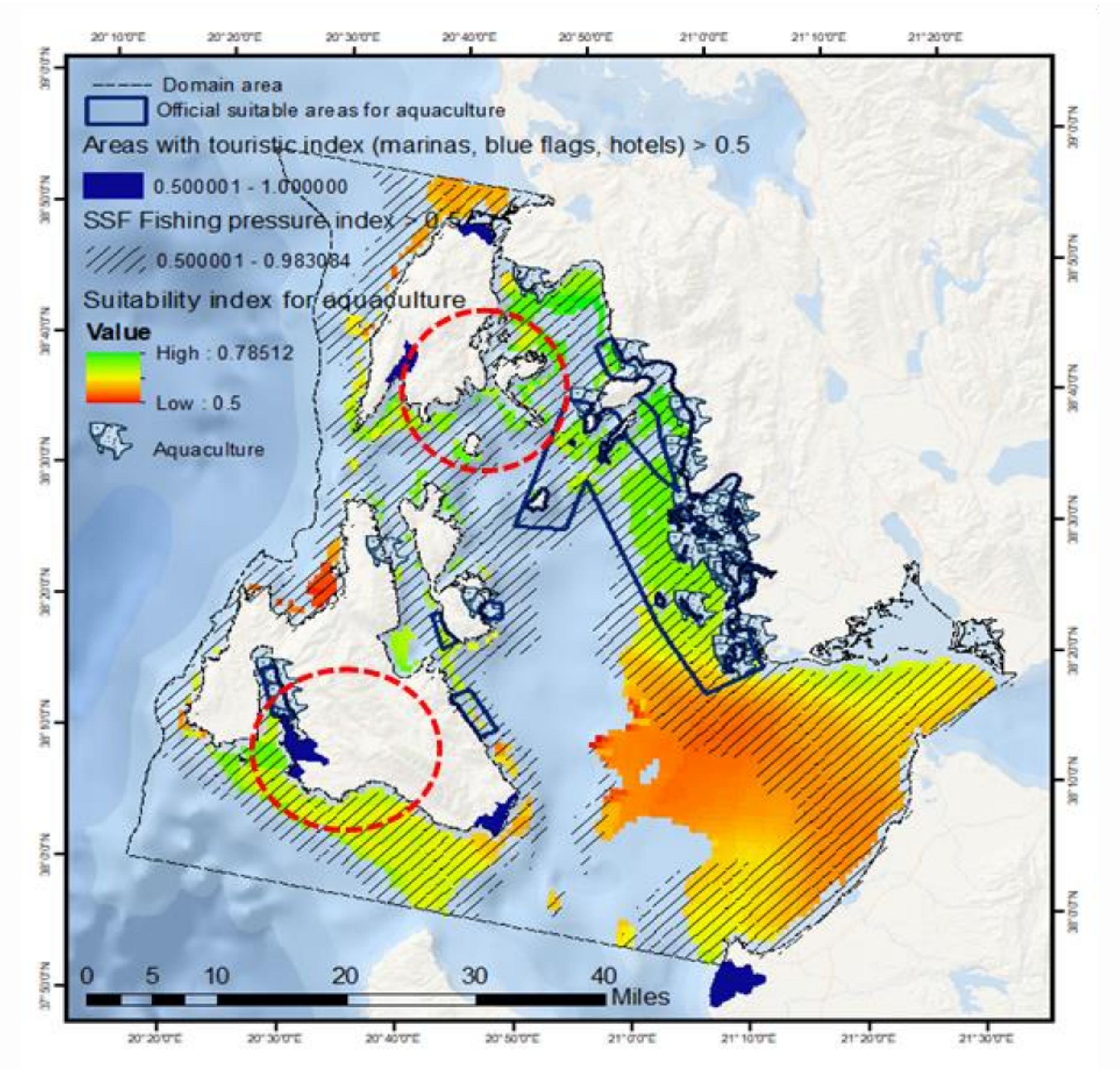


Figure 14 - Map highlighting conflicting hotspots with coastal tourism and SSF in areas identified as suitable by the AZA module. The officially designated zones for aquaculture development are indicated, highlighting spatial conflicts mainly with the SSF sector.

5 ACTION PLAN FOR MARITIME SPATIAL PLANNING IN GREEK WATERS BASED ON THE TESTING EXERCISE

The GAIR constitutes an 'all-in-one toolbox', that may provide significant feedback to be used by planners in the Adriatic-Ionian Region for MSP implementation, as demonstrated in the various testing activities performed by PORTODIMARE partners. Indeed, a number of tools assisting with the analysis of existing and future conditions that provide advice during the MSP process have been used in the Greek case study.

As appropriate MSP management units are still to be identified in Greece, and as the definition of a clear national policy for the spatial management of marine areas is not available yet (Papageorgiou *et al.*, 2020), the Greek case study area was selected because it was part of the area interested by one of the two pilots studied in the frame of the SUPREME project[4]. The aim of the latter project was to support MSP implementation in eastern Mediterranean countries, and it identified a number of issues/challenges related to marine habitat conservation, exploitation of living resources (commercial fisheries), farming of living resources (aquaculture) (Papageorgiou *et al.*, 2020), that were addressed in the frame of the Greek case study to contribute towards providing further proposals and recommendations that may be useful in planning purposes.

What is more, in the case study area the outcomes derived from the interactions with a stakeholder platform, including mainly fishers and representatives from aquaculture units in the Region of Western Greece and established in the framework of the ADRION ARIEL project[5], were also capitalized, providing important insights of the stakeholder perspectives, and particularly their visions, expectations and concerns that could be linked to spatial planning challenges at the regional/local level (Anonymous, 2018). According to findings of the MSP-MED project[6], the analysis of existing and future conditions is imperative not only for the implementation of the planning process, but it should also be considered in relevant consultations by all stakeholders to determine and evaluate possible scenarios and their implications (Coccossis *et al*. 2020).

Thus, following the above, the Greek case study focused on testing the GAIR modules/tools that were related to fisheries and aquaculture sectors in the study area, considering the need to shed further light on spatial conflicts mainly related to small scale fishers operations and aquaculture units, as revealed during the aforementioned stakeholder consultations. In fact, such conflicts are expected to increase in the future due to the potential expansion of aquaculture zones based on the provisions of the Special Spatial Framework for Aquaculture (SSFA), that has become legally binding, without however involving users who may be affected by these decisions. Hence, this effort contributes particularly to Regional/local planning processes, as according to what has already been mentioned in Chapter 3.2, in small spatial scales, the character of MSP should focus on resolving conflicts and promoting synergies between marine uses (Stefani *et al*., 2019), providing strategic planning guidelines that can be amended whenever this is indicated by a special type of Plan (Coccossis *et al*. 2020).

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[4] https//www.msp-supreme.eu/

[5] https//ariel.adrioninterreg.eu/

[6] https//mspmed.eu/

In this vein, using multicriteria decision analysis, analytical modelling and mapping of the SSF, MSF, AZA modules, the geographical distribution of existing marine uses, with special focus on fisheries and aquaculture, has been visualized, indicating areas where spatial interactions exist. What is more, in relation to aquaculture, the AZA module run has proposed suitable sites for the further development of the sector that were in accordance to the provisions of the SSFA. Then, as planning efforts should adopt an ecosystem based approach, by adopting the objectives of the Marine Strategy Framework Directive according to which environmental assessments should be implemented that should be then integrated in the preparation of MSP projects (Coccossis *et al.*, 2020), an effort to apply the cumulative impact assessment (CEA) module/tool was made, to evaluate the combined impact of multiple pressures from anthropogenic activities on selected marine ecosystem components of conservation importance (*Posidonia oceanica*, *Monachus monachus*, *Delphinus delphis*). Indeed, the latter species are elements of MSFD assessments in Greek waters, exhibiting different vulnerability to different pressures, highlighting the direct link between the MSFD and the MSPD. The sustainability and ecosystem-based approach goals of the latter Directive may be achieved only if the MSPD is based on MSFD aspirations (Paramana *et al.*, 2021). Integration of outcomes from the tested modules suggested, as already mentioned in chapter 4.5, that the optimal planning scenario should thus reflect two basic elements: the minimum negative interactions with the marine environment and the minimization of conflicts and promotion of synergy between uses.

The testing exercise conducted by HCMR within PORTODIMARE project highlighted however some considerable gaps in the datasets available for the case study area, that significantly limited the reliability and quality of the modules outcomes, which can be therefore considered as only indicative, at this stage. The scarcity and fragmentation of the compiled spatial data, especially regarding the ecological and economic parameters, with few exceptions (e.g., data on commercial fisheries derived from the IMBRIW HCMR data base), is in accordance with the fact that geospatial data management and updating existing datasets have been mentioned among the key challenges that need to be addressed to accelerate MSP implementation in Greece (Papageorgiou *et al.*, 2020), suggesting that important efforts should be exerted towards this direction.

Another point of significant importance to planning efforts is related to the need for adopting transparent participatory approaches. The fact that the results of the AZA module testing in the Greek case study are coherent with the provisions of the SSFA suggests that the latter resulted only basing on criteria related to the suitability of the areas for aquaculture activities, just like in the AZA module, without any further interaction with stakeholders who may be impacted (e.g. small scale fishers who may lose their fishing grounds). The latter corroborated the outcomes of the interactions conducted within ARIEL, when during the consultations fishers stated that they were not involved in decision making. Indeed, the SSFA came into force a decade ago, when interactions with stakeholders were rather limited; nevertheless, the implementation of the MSPD, based on the adoption of participatory approaches -a cross cutting element in the different MSP steps- provides a real opportunity for all users to voice their concerns. The latter is also corroborated by the planners of the MSP competent authority in the country (i.e. The Ministry of Environment), who have highlighted the need for close cooperation between the competent authority and the co-competent bodies which implement sectorial policies (e.g. the Ministry of Rural Development being in charge for the management of Fishery and Aquaculture), stating that a key factor for resolving problems and effective MSP implementation is the consultation between the political governance and administration bodies for national and regional spatial levels, and the participatory processes by involving the stakeholders and local users for local level (Stefani et al., 2019).

According to Coccossis *et al.* (2020), any MSP procedure that would be followed in Greece should be based on the principles of equality, equity, transparency and representativeness, in order to substantially enhance the involvement of stakeholders in the preparation, implementation and monitoring of MSP policies and identify possible synergies. The latter is of particular importance to coastal communities across the country that have a strong sense of place and distinct socio-cultural characteristics, which also constitute essential elements for their sustainable development and resilience, and should be incorporated into the management and planning efforts (Stithou *et al.*, in press).

Following the above, in this section a proposed 'Action Plan' has been compiled basing on the synthesis of the outcomes and experiences gained through the application of the GAIR modules in the PORTODIMARE Greek case study, as well as the knowledge stemming from other research activities (e.g. the ARIEL project). As a first step, key actions that may further address challenges identified in the framework of the Testing activity of the PORTODIMARE Greek CS are provided (Textbox 1). These refer to the need for *improving the analysis of existing and future conditions in a planning area*, being one of the key actions of the MSP process, and are mainly linked to spatial data quality issues, to effectively support decision making under relevant policy requirements. What is more, the need for developing participatory planning processes in order to build trust, engage stakeholders in co-designing activities, and ensure their compliance to the different decisions/measures has become evident. Indeed, considering the current situation of the legal framework related to MSP in Greece (described in Chapter 3), and the existing institutional fragmentation between competent authorities for the management of different maritime sectors that need to be addressed to enable effective MSP implementation at national/regional/local level, *proposed actions that refer to governance and stakeholder issues* are also included (Text Box 2). Then, selected legal instruments linked to the elements (human uses and ecosystem components studied/tested in the framework of the PORTODIMARE Greek case study) are presented in Table 2, where particular reference is made to the contribution of the GAIR modules to providing scientific advice, that if based on high quality data can concretely support inclusive and informed decision making.

Finally, it is important to underline that the 'Action Plan' and related proposed actions/recommendations contained herein reflect the views of the authors, and although it may be potentially useful in the elaboration of MSP at regional/local scales in Greek waters, it has not been endorsed by the MSP competent authority of the Country.

Text Box 1. Recommendations linked to the MSP steps on 'Defining and analysing existing and future conditions' stemming from the planning exercise in western Greek waters, including suggested actions and relevant actors.

MSP steps	GAIR support	Recommendations
Defining and analyzing existing and future conditions	Module engines -fisheries module - AZA module - CEA module	**- Operational objectives** integrating national strategies with regional/local needs reflecting practical **socio-economic and environmental existing and future demands, the latter** emerging during stakeholder consultations, need to be identified. **- Spatial information on ecosystem components and human activities linked to the objectives should be collected.** **- Data** format, resolution, timeframe, attributes, as the **quality** of data upon which the analysis/application of tools will be based **is crucial for restricting uncertainty and improving the robustness of results.**

Suggested Actions	Relevant Actors
• MSP plans should consider **environmental impact assessments based on optimal data aggregations** and sound scientific interpretations, including confidence intervals /approaches to **evaluate uncertainty** of the model outputs.	✓ Research institutions
• **Monitoring efforts are needed to fill the important data gaps** particularly in areas that seem to constitute hot spots of conflicts with conservation priority species as well as between uses competing for the limited marine space.	✓ Research institutions
• Further research should be streamlined towards **improved understanding of the links between ecosystem pressures, impacts, status and the capacity of the ecosystem to deliver ecosystem services, and such efforts should be linked particularly with WFD and MSFD ones.**	✓ Research institutions
• **Joint monitoring** activities should be pursued adapting existing monitoring (WFD, MSFD, CFP) **to provide relevant and cost-effective input to MSPD requirements**	✓ Competent authorities & research institutions

Text Box 2. Recommendations linked to the adoption of participatory approaches and integrated governance practices in planning efforts, stemming from the planning exercise in western Greek water, including suggested actions and relevant actors.

MSP steps	GAIR support	Recommendations
Stakeholder Participation to promote **tailor-made MSP** based on **regional social-ecological systems (SES)** through **integrated governance approaches**	Data management, data analysis, visualisation of outcomes on maps, tables and charts	- Horizontally and vertically **integrated governance approaches** should be further strengthened, and the **establishment of key stakeholder platforms** should emerge for the **development of effective, transparent and inclusive MSP** - **The support of GAIR** in stakeholder consultations **is crucial for the visualization of existing information, providing their local ecological knowledge and facilitating effective interactions during the whole MSP process**

Suggested Actions	Relevant Actors
• **Effective horizontal and vertical integration of governance** approaches need to be adopted as there is a number of different authorities and at different government levels (national, regional, local) dealing with the management of the coastal and marine space.	✓ Competent authorities
• Promote **tailor-made MSP taking into account the characteristics of the different marine/coastal social-ecological systems** streamlined with smart specialization strategies (RIS3) at regional/local scales.	✓ Competent authorities
• **Establishment of key stakeholder platforms** and development of an effective stakeholder engagement strategy mainstreaming efforts and outcomes of relevant stakeholder working groups under different policy agendas which feed into the MSP process	✓ Competent authorities
• **Enhancement of knowledge, skills and capacity of key MSP actors with relevant concepts and tools** (e.g. the GAIR), to deliver truly participatory multi-sector planning scenarios supporting ecosystem-based decision-making.	✓ Competent authorities & research institutions

Table 2. Key national policies (including the harmonization of high level EU ones) that are linked to the MSP process and to which the GAIR modules may provide crucial advice as indicated by the relevant elements considered in the PORTODIMARE Greek case study

Policy tool	Ref number	General objectives	Case Study elements
Ministerial Decision on the protection of *Posidonia oceanica*	MD2886/142447/ 26.2.2019	Designation of marine areas, with vegetation in particular from *Posidonia oceanica*, in which fishing with certain gears is prohibited	**Application of the CEA Module** on *Posidonia* meadows spatial data and integration with fishing footprint results from the **fishery modules.**
Law on Biodiversity conservation and other provisions.	Law 3937/11	Effective application of EU and International Laws for the conservation of biodiversity; acquisition of sufficient knowledge about the state of species and ecosystems, as a main tool for the effective conservation and management of biodiversity.	**Application of the CEA** Module on *Posidonia* meadows, monk seals, dolphins, to identify conflicting human activities and contribute to the protection of these conservation priority species.
Ministerial Decision on the establishment of a Management Plan for fishing with the bottom trawl fishing gear	MD 271/2576/2014	Legislative provisions relating to bottom trawl fishing gears	**Application of the MSF module** to visualize the footprint of trawl fisheries and evaluate possible deviations from legal provisions.
Ministerial Decision on the Special Spatial Plan for Aquaculture (SSPA)	MD31722/4-11-2011	Establishment of Integrated Aquaculture Development Areas	**Application of the AZA Module** to compare outcomes on suitable areas for the development of aquaculture with those included in the (SSPA)
National Strategy for the Protection and Management of the Marine Environment - Harmonization with Directive 2008/56 / EC of the European Parliament	Law 3983/2011	Protect and preserve the marine environment, prevent its deterioration or, where practicable, restore marine ecosystems in areas where they have been adversely affected, so as to ensure that there are no significant impacts on or risks to marine biodiversity, marine ecosystems, human health or legitimate uses of the sea	**Applications of the SSF, MSF AZA GAIR modules** providing the footprint of two maritime sectors (fisheries and aquaculture) that induce important pressures in the Greek seas, provide feedback to the implementation of the MSFD.

Policy tool	Ref number	General objectives	Case Study elements
Transposition of Directive 2014/89 / EU "on the establishment of a framework for maritime spatial planning" and other provisions.	Law No 4546/2018	The first legal document fully dedicated to MSP including preparation, implementation and evaluation of spatial planning in all marine areas as well as the coastal zone (both its terrestrial and marine parts), and including (a) the national spatial strategy; and (b) the Maritime Spatial Plans	**Application of the SSF, MSF, AZA, CEA GAIR modules** tested in the case study and integration of the outcomes contribute to the better understanding of the prevailing conditions at the sub-regional/local level, and provide useful elements that may provide feedback to the Maritime Spatial Frameworks.
Modernization of Spatial and Urban Planning Legislation and other provisions.	Law No 4759/2020 - Amendment of article 5 of law 4546/2018	The amendment introduced two major changes: - the geographical scope of MSP was limited to the marine parts of the country excluding the coastal zone - Maritime Spatial Plans are renamed to Maritime Spatial Frameworks that do not have regulatory force, and their main aim is to provide strategic planning guidelines.	

5.1 Concluding remarks

Summing up, in the final section of this Action Plan an effort to **synthesize the key actions and recommendations made above, highlighting also potential ways forward**, is provided with the aim to contribute towards adopting an integrated approach for 'analysing existing and future conditions' and enhancing participatory processes, which can be used in practical MSP implementation and real planning efforts.

Main **ecosystem components** and **human activities** that are relevant to the operational objectives defined in the beginning of the MSP process under the responsibility of the MSP competent authority, need to be identified, and information regarding their **spatial distribution** should be collected. As the process of spatial data visualization is considered crucial for the implementation of the planning procedures, a **robust methodological process should guide the appropriate scale and cell size selection**. Following this, a detailed description of **data sources and data quality** should be provided. Compiling spatial data into a Geographic Information System (GIS) database is the most effective way to store, analyse and map relevant information (e.g. human uses and conservation priority ecosystem components).

Then, the assessment of **potential conflicts and compatibilities between existing human uses as well as with the selected ecosystem components** should take place **using appropriate analysis tools, such as those included in the GAIR**, to identify possible issues and constraints, that should be tackled using the MSP process. An important point related to the analysis phase deals with the need to **address and communicate uncertainty and risks issues**, not only related to data and knowledge used to analyse existing conditions, but mainly for future ones, as only assumptions or possibilities can be explored while forecasting future conditions. The latter phase of the analysis should aim to **balance multiple objectives through appropriate trade-offs, and key stakeholders should play a crucial role** by providing spatial data and information on a wide range of expectations, opportunities and conflicts that take place in a specific area, which will advise on the **special characteristics of the different marine/coastal social-ecological systems and considering also efforts on RIS3 at regional/local scales**.

Monitoring efforts are needed **to fill the important data gaps** and **further research** should be streamlined towards improved understanding of the links between pressures, impacts and environmental status, considering also **climate change effects** under the implementation of **climate-smart MSP** (Vassilopoulou, 2021); such **monitoring and research efforts should be linked with those already taking place under the implementation of other policies** (e.g. HD, WFD, MSFD, CFP, Green Deal) identifying synergies with MSP data and knowledge needs. The latter is also linked with the fact that **the MSP process should be based on integrated governance approaches**, as there is a number of **different authorities** dealing with the management of coastal and marine space, which **are responsible for the implementation of the aforementioned policies**.

Integrated governance will also promote enhanced **cooperation between sectors and with research centers/academia** and will enable the **establishment of key stakeholder platforms**. Indeed, the development of an effective stakeholder engagement strategy, promoting at the same time **their capacity building with MSP tools** is crucial in order to deliver **truly participatory multi-sector planning**, however, a successful participatory approach can be guaranteed only if it is properly organized by the national (or regional) competent authority in the country/region. Finally, the competent authority should facilitate **transfer of good practices** from other countries, and **provide funding for interdisciplinary research**, tackling environmental, economic, socio-cultural, policy issues, **to ensure credible advice supporting inclusive and integrated MSP**.

6 REFERENCES

Anonymous, 2018. ARIEL Deliverable 1.2.4. Small Scale Fisheries Framework Analysis in the ADRION Region, 25pp.

Beriatos, E., & M. Papageorgiou, 2011. Maritime and coastal spatial planning: the case of Greece and the Mediterranean. WIT Transactions on Ecology and the Environment, Vol 150, doi:10.2495/SDP110011

CAMP Italy Project, 2017. Significance of the CAMP Italy Project regarding Maritime Spatial Planning (MSP) – Integrated Coastal Zone Management (ICZM) – Land-Sea Interactions (LSI).

Casimiro, D. and Guerreiro, J. (2019) Trends in Maritime Spatial Planning in Europe: An Approach to Governance Models. Journal of Environmental Protection, 10, 1677-1698. doi: 10.4236/jep.2019.1012100.

Caputo, I., L. Natrella. 2018. "Module for Oil-spill coastal vulnerability assessment." presented at the PORTODIMARE International Conference on ICZM & MSP 2018, Budva, November, 14-15.

Coccossis, H., F. Stefani, E. Lagiou, E. Asprogerakas & E. Lalou, 2020. Development of a governance scheme and monitoring mechanism in Greece. MSP-MED Deliverable 13, 40pp.

Depellegrin, D., S. Menegon, A. Fadini, E. Gissi, E. Manea, A. Sarretta, and A. Barbanti. 2018. "Maritime Use Synergy & Conflict Module MUSC." presented at the PORTODIMARE International Conference on ICZM & MSP 2018, Budva, November, 14-15.

Directive 2014/89/EU of the European Parliament and of the Council, 2014. Establishing a framework for maritime spatial planning.

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32014L0089.

EC DG MARE, 2017. Maritime Spatial Planning Conference: Addressing Land-Sea Interactions – Conference Report. 15-16 June 2017, St. Julian's Malta. Available at: http://msp-platform.eu/events/msp-conference-addressing-land- sea-interactions; accessed in September 2018.

Ehler, C.N., Douvere, F., 2009. Marine Spatial Planning: A Step-by-Step Approach Toward Ecosystem-Based Management January, UNESCO IOC.

Fraschetti, S., C. Pipitone, A. D. Mazaris, G. Rilov,.., and S. Katsanevakis, 2018. Light and Shade in Marine Conservation Across European and Contiguous Seas. Front. Mar. Sci., https://doi.org/10.3389/fmars.2018.00420

Ghezzo, M., C. Ferrarin, D. Depellegrin, S. Menegon, S. Carniel, and A. Barbanti. 2018. "Module for particle contaminants dispersion." presented at the PORTODIMARE International Conference on ICZM & MSP 2018, Budva, November, 14-15.

Hammar, L., Molander, S., Palsson, J., … & J. H.Andersen, 2020. Cumulative impact assessment for ecosystem-based marine spatial planning. Science of the Total Environment, 734, 139024 https://doi.org/10.1016/j.scitotenv.2020.139024

Kavadas, S., D. Politikos, M. Kikeri, I. Maina, and C. Vasilopoulou. 2018. “T1.11: Module on small scale fisheries (SSF) footprint.” presented at the PORTODIMARE International Conference on ICZM & MSP 2018, Budva, November, 14-15.

Kelly, C., Ellis, G. and Flannery, W. (2018) Conceptualising Change in Marine Governance: Learning from Transition Management. Marine Policy, 95, 24-35.

Kyvelou S. & D. Ierapetritis, 2019. How to make blue growth operational? A local and regional stakeholders perspective in Greece. WMU Journal of Maritime Affairs, 18:249–280.

Liontakis, A. & V. Vassilopoulou (in press). Fishing Tourism in north-eastern Mediterranean EU waters: an opportunity for the few or a sustainable solution for the coastal communities? Ocean and Coastal Management.

Menegon, S., D. Depellegrin, A. Fadini, E. Gissi, E. Manea, A. Sarretta, and A. Barbanti. 2018. “Cumulative Effects Assessment Module (CEA).” presented at the PORTODIMARE International Conference on ICZM & MSP 2018, Budva, November, 14-15.

PAP/RAC 2012. The ICZM Process: A Roadmap towards Coastal Sustainability, Split, Croatia. https://www.pap-thecoastcentre.org/pdfs/ICZM%20Process.pdf

Papageorgiou, M and S. Kyvelou, 2018. Aspects of marine spatial planning and governance: adapting to the transboundary nature and the special conditions of the sea. European Journal of Environmental Sciences 8 (1), 31-37

Papageorgiou, M., E. Beriatos, O. Christopoulou, M.-N. Duquenne, D. Kallioras, Th. Kostopoulou, A. Sfougaris, E. Mente, I. Karapanagiotidis, S. S. Kyvelou, S. Sakellariou, E. Tzannatos, A. Papachatzi, 2020. Implementation challenges of maritime spatial planning (MSP) in Greece under a place-based approach. Euro-Mediterranean Journal for Environmental Integration, 5:39 https://doi.org/10.1007/s41207-020-00172-0

Papageorgiou, M. & S. Kyvelou, 2021. Considering Land-Sea interaction (LSI) in Maritime Spatial Planning (MSP) in Greece: updates and challenges. 17th International Conference on Environmental Science and Technology Athens, Greece, 1 to 4 September 2021

Paramana, T., A. Karditsa, N. Milatou, S. Petrakis, P. Megalofonou, S. Poulos & M. Dassenakis, 2021. MSFD In-Depth Knowledge of the Marine Environment as the Stepping Stone to Perform Marine Spatial Planning in Greece. Water 2021, 13(15), 2084; https://doi.org/10.3390/w13152084

Piroddi, C., G. Bearzi and V. Christensen, 2011. Marine open cage aquaculture in the eastern Mediterranean Sea: a new trophic resource for bottlenose dolphins. Marine Ecology Progress Series, 440:255-266. https://doi.org/10.3354/meps09319

Ramieri, E., Bocci, M., Marković, M., 2019. Land Sea Interactions in the framework of ICZM and MSP, PAP/RAC, Split, Croatia.

Seaenergy project, 2012. Final project report - Delivering offshore electricity to the EU: spatial planning of offshore renewable energies and electricity grid infrastructures in an integrated EU maritime policy.

Simboura, N., Maragou, P., Paximadis, G., Kapiris, K., Papadopoulos, V.P., Sakellariou, D., Pavlidou, A., Hatzianestis, I. ,Salomidi, M., Arvanitidis, C.,Panayotidis, P. 2018. World Seas. An Environmental Evaluation, vol.1 Europe, The Americas and West Africa, Elsevier Academic Press, Chapter 9 –

Greece.UN Environment/MAP, 2018. Conceptual framework for marine spatial planning in the Mediterranean, Athens, Greece.

Stefani, E., Gourgiotis A. & G. Tsilimigkas, 2019. Marine Spatial Planning Framework Integration: Synergies, Compatibility and Incompatibility Issues. Evidence from Greece. Maritime safety and security Law journal, 4, 103-119.

Stithou, M., Kourantidou, M. & V. Vassilopoulou (in press). "Sociocultural ecosystem services of small-scale fisheries: challenges, insights and perspectives for marine resource management and planning. *In*: "Social, cultural & economic ecosystem services of fish and fisheries: A global overview." Aquatic Ecosystem Health & Management.

UNEP/MAP/PAP, 2008. Protocol on Integrated Coastal Zone Management in the Mediterranean, Priority Actions Programme, Split, Croatia. http://iczmplatform.org//storage/documents/sewmrXIR9gTwfvBgjJ4SAjhvqsLrBF6qB0B89xK8.pdf

Vassilopoulou, V., 2021. Integrating stakeholders perceptions in the development of spatial planning scenarios: lessons learned from participatory planning efforts in the Alonissos MPA (Greece). The 2020 FORUM of Marine Protected Areas in the Mediterranean, DS15 session 'Marine Spatial Planing - a way forward for MPAs and economic stakeholders to accelerate and implement actions to scale-up protection efforts', Monaco 29 November – 1 December 2021.

Vassilopoulou, V., 2021. MSP global Policy Brief: Climate Change and Marine Spatial Planning. Paris, UNESCO. (IOC Policy Brief no 3). https://unesdoc.unesco.org/ark:/48223/pf0000375721

WWF, 2017. Preventing paper parks: how to make the EU nature laws work., 68pp.