



ARISTOTLE UNIVERSITY OF THESSALONIKI SCHOOL OF RURAL AND SURVEYING ENGINEERING
DEPARTMENT OF CADASTRE PHOTOGRAMMETRY AND CARTOGRAPHY



Marine Cadastre to Support Marine Spatial Planning



**COMMON VISION
CONFERENCE 2016**
MIGRATION TO A SMART WORLD

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Who we are

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Our Academic Work in Marine Cadastre and Marine Spatial Planning

OUR RESEARCH SINCE 2013

1. PILOT PROJECT ON MARINE CADASTRE IN GREECE (WESTERN GREECE – IONIAN SEA)

- Diploma thesis
- The research work of MSc Students 2013-2014

The results of this project have been presented in:

- PCC ATHENS 2014
- The National Congress of Rural and Surveying Engineers (2014) (Two presentations).

2. OTHER RESEARCH

- MSc Thesis "*Principles and Specifications of Marine Cadastre in Greece*"
- Research work of MSc Students 2014-2015: Marine Cadastre and Marine Spatial Planning.

The results of this work were presented in the 4th National Conference of Urban Planning and Regional Development, in Volos (2015), Greece.

The paper has been accepted for publication in the "Essays on Spatial Planning and Development" journal.

- Research work of MSc Students 2014-2015: Marine Cadastre and Marine Spatial Planning.
- Two MSc theses under elaboration (2015-16):
 - Marine Cadastre and MSP. Pilot implementation (Northern Aegean Sea).*
 - Design of a Data Base for Marine Cadastre and Marine Spatial Planning.*

The aim of this presentation is:

To underline and document the two-way relation between Marine Cadastre and Marine Spatial Planning

- The object of MC is the precise assignment of protection zones and areas where several activities are or aren't allowed to take place.
- Data that are recorded in the MC, regarding the space and the form of the rights, consist the base of Spatial Planning.
- Examination of the necessity of MC in the implementation of MSP – Step by step approach for the creation of MSP and the specific involvement of MC into this.

To examine the perspectives of the Marine Cadastre in order to support MSP

- The selection of the suitable form of MC for each Country is the first step.
- The relation between MC and existing Organizations is very important.
- The decision on the type and the procedures of the competent(s) authority(ies) is a crucial factor.



Brief History

- Planning of Marine Space, world widely, initiates at the 1980s. Gradually, several countries adopt Legislation regarding Marine Spatial Planning.
- The first proposals in the field of Marine Cadastre begun in the 1990s.
- After 2000, Marine Cadastres are implemented in USA, Canada and Australia.
- **July 2014:** European Government and Council approve a **Direction** for the creation of a **common frame for Marine Spatial Planning in Europe**. *Every country may form its own spatial planning frame and there are minimum common planning principles for interregional seas.*
- June 2014 (Athens): PCC initiative on Marine Cadastre.

Marine Spatial Planning

Procedure of analysis and planning of the allocation, in space and time, of human activities in marine areas, for the achievement of economic, environmental and social goals.

- It is necessary because of the existing conflicts and rivalry among the different uses and activities in marine space.
- Transparency, effective management and creation of synergies among different activities, are needed.

Basic aims of MSP:

The constrain of conflicts and the creation of synergies, the encouragement of investments and the development boost in several sectors (RES, Protected Areas, Networks, Oil/Gas, etc.), the reinforcement of trans-boundary cooperation (wires, marine routes, wind parks, etc.) and environmental protection.

Marine Spatial Planning, *why?*

- Marine Spatial Planning is necessary. Why?
- *Marine Space:*
 - *Several activities and functions co-exist.*
 - *The space is limited and ecologically vulnerable.*
 - *Intense use of space, conflicts between functions, elimination of vital space and degradation of ecosystems.*
- Need for the prevention of problems and non-reversible situations. Prerequisite is the scientific knowledge and concrete information.

Marine Spatial Planning

- Creation of MSP: Specific information, scientific knowledge, adaptive management.
- *European Commission's Tools*: EMODNET, European Atlas of Seas, Copernicus.
- MSP: a planning frame for balancing the rival human activities and for managing their effects in marine environment. Main aim is the sustainable management of marine resources according to EU strategic frame for sustainable development.
- MSP is three-dimensional: sea floor, water column, sea surface.
- Time should be also represent the fourth dimension. In time, the compatibility among different uses and activities can be changed, as well as, the need for the management of a specific marine area.

Benefits from the establishment and implementation of MSP

- Decrease of the conflicts among sectors and creation of synergies between several activities.
- Encouragement of investments with the reassurance of predictability, transparency and of specific rules aiming at the development of RES and networks, at the identification of Marine Protected Areas and the facilitation of investments in oil and gas sectors.
- Reinforcement of coordination among national authorities through the implementation of a unified mechanism for the balanced development of several marine activities that will lead to simplifications and cost decrease.
- Increase of the transnational cooperation among EU countries, in relation to networks, pipes, sea-routes, wind parks, etc.
- Environmental protection through the pre-estimation of the impact and the possibilities for the multiple use of marine space (EU Road Map).



Main target: integration between (Land) Spatial Planning and Marine Spatial Planning

Also, MSP shall relate to the Integrated Coastal Zone Management (ICZM).

Important issues:

- There are in general no private property rights in the sea as there are in land.
- Spatial Planning in the sea is different from that in the land.
- The transition from Spatial Planning in land to Marine Spatial Planning is of crucial importance and requires the integration between marine and land planning and strategy, as well as their cohesive implementation.
- Special attention must be paid to a spatial strategy planning for the intermediate space between land and sea, which comprises part of the procedure of the Integrated Coastal Zone Management (ICZM).

Marine Cadastre

- MC focuses on the identification of the areas where activities regarding the management and the utilization of marine goods take place.
- Rights that are registered in MC concern the activities that take place in marine space and have an effect on marine environment.
- Regions where these activities take place are the coast line, the coast, the sea surface, areas in the sea, at the sea floor and in the under-floor space.

Marine Environment, Development and MC

- Marine Environment and Modern Development: fishery, salt, marine minerals, transportation, commercial activities, waste disposal, energy, etc.
- Management and modeling of marine space (the off shore area) in the frame of sustainable development: need for the development of MC.
- Through the use of MC: Defining and Spatial Planning of Rights, Restrictions and Responsibilities, in the sea.
- Countries that have established MC: Australia, USA, Canada, N. Zealand. Modern technology application's contribution is important (telecommunications, surveying instruments, information systems, etc.).
- In marine space ownership belongs, mainly, to the State. Private rights: licenses of use, leases, servitudes. State intervenes to recall licenses if it is for the public benefit.

MARINE CADASTRE

Designing a marine cadastre raises definition and function issues: Robertson and others said that it is boundaries of maritime rights and interests. Better enforcement of restrictions and responsibilities is also a deliverable demanded of any cadastre. Nichols and others included “responsibilities” within the interests and property rights, and started with the concept of a marine information system. This broader definition is closer to the goal (Wallace, Williamson).

A marine cadastre is a system to enable the boundaries of maritime rights and interests to be recorded, spatially managed and physically defined in relationship to the boundaries of other neighboring or underlying rights and interests. (Robertson et al., 1999).

The Marine Cadastre is defined as a spatial information and registration system of the marine space. This includes overlying, imminent and underlying rights (mainly use and lease rights), restrictions and responsibilities, which are exercised on all the legal (spatial) entities into the sovereign space of a coastal state (based on a definition given by Zentelis 2011).

Main activities



Aquacultures

Main
activities

Installation for
hydrocarbon research



Main
activities

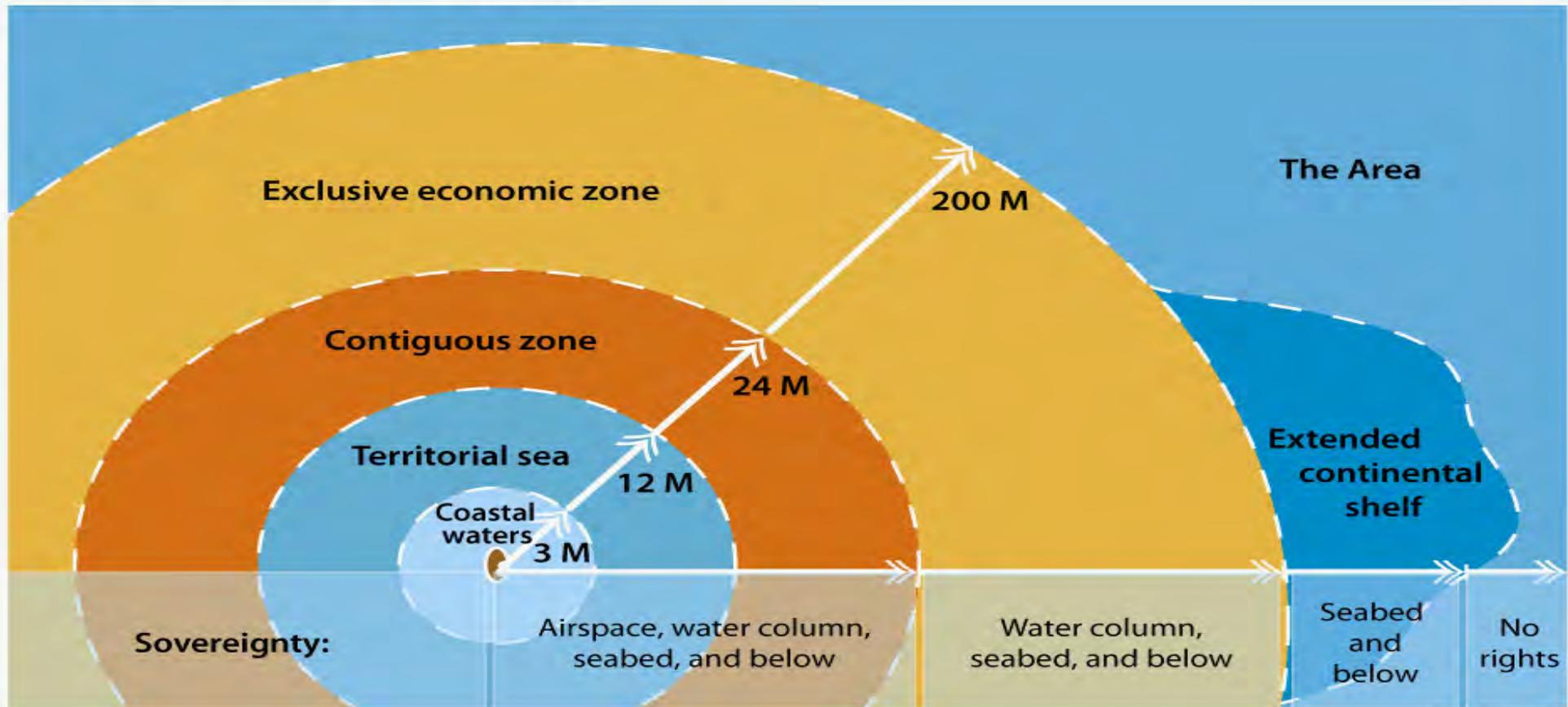


Port Marine Zone

Maritime sovereignty (UNCLOS)

(Source: GRID-Arendal) http://www.grida.no/graphicslib/detail/maritime-sovereignty_2dd8

Maritime sovereignty



GRID-Arendal

Connecting Marine Cadastre with Marine Spatial Planning

How Marine Cadastre is involved in every step of the UNESCO's step-by-step approach

2009: International Marine Conservation Congress. UNESCO presents a guide entitled:

A STEP-BY-STEP APPROACH FOR MARINE SPATIAL PLANNING

- Step 1: Identifying need and establishing authority
- Step 2: Obtaining financial support
- Step 3: Organizing the process through pre-planning
- Step 4: Organizing stakeholder participation
- Step 5: Defining and analyzing existing conditions
- Step 6: Defining and analyzing future conditions
- Step 7: Preparing and approving the spatial management plan
- Step 8: Implementing and enforcing the spatial management plan
- Step 9: Monitoring and evaluating performance
- Step 10: Adapting the spatial management process

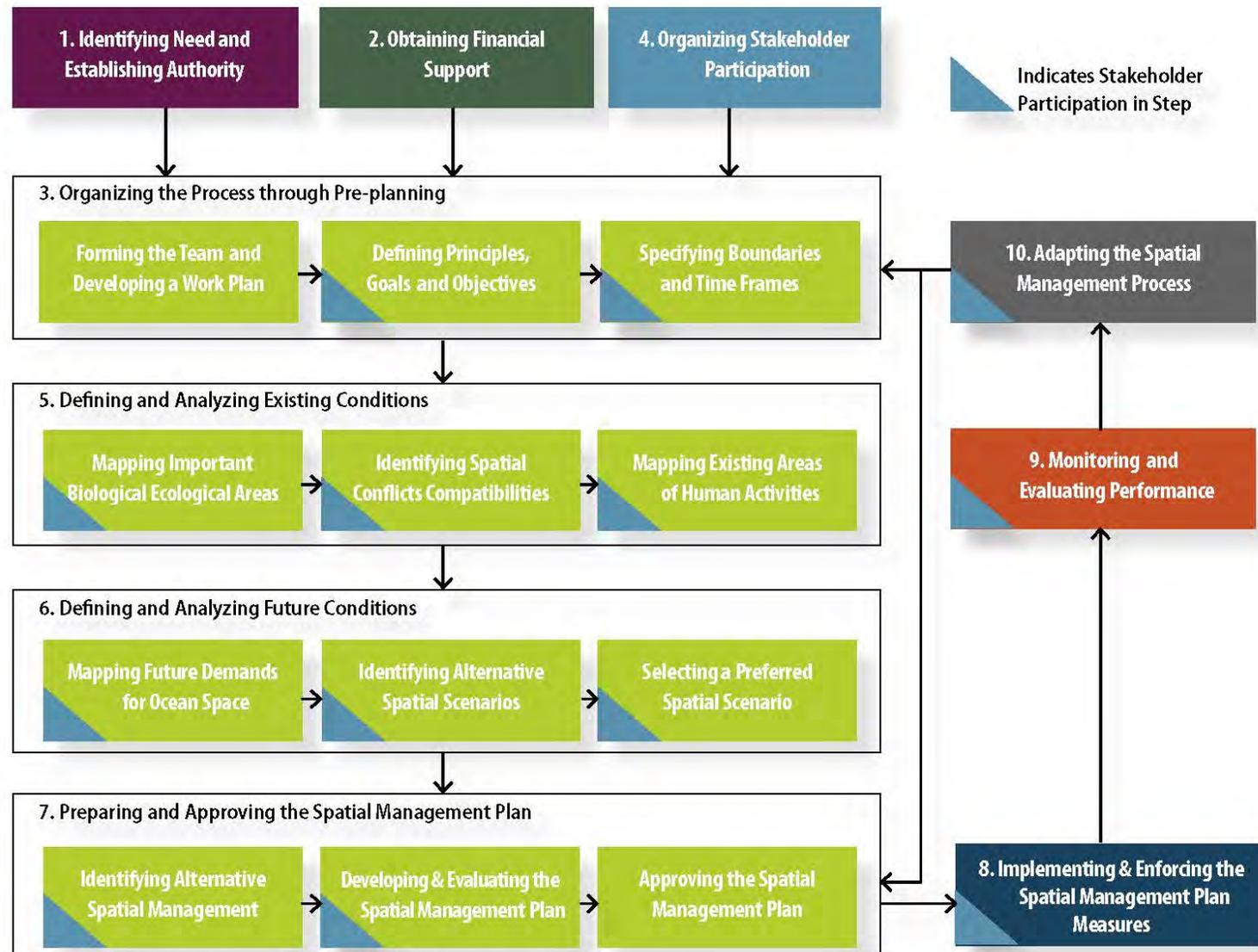


Fig. 1. A Step-by-Step Approach to Marine Spatial Planning

STEP 1

IDENTIFYING **NEED** AND ESTABLISHING **AUTHORITY**

What outputs should be delivered from this step?

- preliminary list of specific problems you want to solve through marine spatial planning
- decision about what kind of authority you need for developing marine spatial planning

Two points in particular need consideration before you get underway:

- Define clearly why you want to develop MSP. This will enable you to stay on track throughout the process; and
- Define whether you have appropriate authority to develop and implement MSP. If not, your efforts might be wasted if implementation is not possible later on.

According to the Article 13 of the 2014/89/EU Directive

Competent authorities

- Each Member State shall designate the authority or authorities competent for the implementation of this Directive.
- Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by 18 September 2016. They shall immediately inform the Commission thereof.
- When Member States adopt those measures, they shall contain a reference to this Directive or shall be accompanied by such reference on the occasion of their official publication. The methods of making such reference shall be laid down by Member States.
- The authority or authorities referred to in Article 13(1) shall be designated by 18 September 2016.

What Kind of Authorities we need in Europe ? **NATIONAL AUTHORITIES -> MSP INTERNATIONAL AUTHORITY FOR EACH SEA**

NETHERLANDS OCEAN GOVERNANCE STRUCTURES

(Barry, Elema, Van der Molen, 2003)

Ministry of Transport, Public Works & Water Management

Ministry of Defence

Ministry of Economic Affairs

Ministry of Agriculture, Nature Management & Fisheries

Ministry of Foreign Affairs

Ministry of Housing, Spatial Planning & Environment

GREEK COMPETENT AUTHORITIES / MINISTRIES

Ministry of Rural Development and Food

Ministry of National Defense

Ministry of Foreign Affairs

Ministry of Education, Lifelong Learning and

Religious Affairs

Ministry for the Environment and Energy

Ministry of Culture and Sports

Ministry of Economy, Development and Tourism

Ministry of Infrastructure, Transport and Networks

Ministry of Shipping and Island Policy

STEP 2

OBTAINING FINANCIAL SUPPORT

What outputs should be delivered from this step?

A financial plan that:

- Estimates the costs of your MSP activities; And
- Identifies alternative means to obtain financing for those MSP activities

POSSIBLE FINANCING IN EUROPE

- National Funding
- EU Funding
- Taxes and fees from the Stakeholders because of the Economic Benefits deriving after the MSP Implementation

THE CONTRIBUTION OF THE MARINE CADASTRE

Taxes and fees from the beneficiaries of the licenses

- Standard fees
- Taxes based on the valuation of the installation

STEP 5 DEFINING AND ANALYZING **EXISTING CONDITIONS**

What outputs should be delivered from this step?

- An **inventory and maps of important biological and ecological areas** in the marine management area;
- An **inventory and maps of current human activities** (and pressures) in the marine management area;
- An assessment of possible **conflicts and compatibilities among existing human uses**; and
- An assessment of possible **conflicts and compatibilities between existing human uses and the environment**.

Contribution of MC: The existence of the MC will give to the process of the MSP all the appropriate information.

MAPS - ATLASES - GIS

Maps and Atlas are a usual way for the presentation of the data

- Marine atlas have been used for over 100 years.
- 1980: NOAA (National Oceanic and Atmospheric Administration) presents atlases for the Exclusive Economic Zones in USA .
- Also, the government of Canada presents the Marine Atlas: *The Scotian Shelf: An Atlas of Human Activities (2005)*, Available at: <http://www.mar.dfo-mpo.gc.ca/oceans/e/essim/atlas/essim-atlas-e.html>
- In: http://mpa.gov/pdf/helpful-resources/factsheet_atlasdec08.pdf there is an atlas regarding human activities in California waters.

GIS και Geodatabases – Tools for the documentation / visualization / management of data

- The Ecosystem-based Management Tools Network (www.ebmtools.org)
- Advancing Ecosystem-based Management: A Decision Support Toolkit for Marine Managers (www.marineebm.org)

Marine Cadastre also offers appropriate data as four questions arise:

- What kind of rights are there in the marine space under management?
- What laws define these rights?
- Which is the priorities' hierarchy of these rights?
- How these rights interact with each other?

Identifying Compatible and Incompatible Uses

- Comparing maps showing important biological areas with maps showing areas important to human activities and no spatial overlaps (conflicts or compatibilities) are apparent, a marine spatial management plan is not needed. This situation, however, is rarely the case. Usually, especially in intensely used areas, even a cursory analysis will indicate potential spatial overlaps among human activities and between human activities and important natural areas.
- Time is also a factor. A potential spatial conflict may not arise if two human uses occur in different time periods.

The operation of the MC as an integrated 4D Information System is the better solution in order to record and visualize all these areas and uses.

What outputs should be delivered from this step?

- An identification and evaluation of **alterative management measures for the spatial management plan**;
- Identification of **criteria** for selecting alternative management measures; and
- A **comprehensive management plan**, including if needed, a **zoning plan**.

The contribution of MC is important in this Step – This offers complete information about the rights which exercised in marine space and their spatial identification.

STEP 9 MONITORING AND EVALUATING PERFORMANCE

What outputs should be delivered from this step?

- A **monitoring system** designed to measure indicators of the performance of marine spatial management measures;
- **Information on the performance of marine spatial management measures** that will be used for evaluation; and
- **Periodic reports** to decision makers, stakeholders, and the public about the performance of the marine spatial management plan.

The maintenance and the continuous update of the Marine Cadastre spatial and non spatial (descriptive) data offers important and reliable information in order to establish such a monitoring system.



Two-way relationship between MSP and MC

- MSP and MC: Important tools for the Blue Growth.
- **Both of them function independently.** However, MSP will be designed and implemented safely and at a lower cost if it utilizes data from MC and MC will register and control the different rights and licenses in marine areas based on ecological environment when defined zoning from MSP exist.
- **MSP and MC are based on stable principles and design and implementation methodology.** In proportion to land planning and management there are many common principles and methods, as well as there are different ones since their objects don't coincide but are inter-supportive and re-fed. For example, MSP and MC are based on the registration of descriptive and spatial information, but MSP uses it in order to reorganize the marine use zoning, while MC uses it in order to legally document the rights (mainly leases and easements) which exercised in a marine area and to accurately define them in the marine space.



The two-way relationship between MSP and MC is documented with the following example:

Lets assume that in MSP, a zone in marine space needs to be specified, that will enable the vest of marine space for the development of aquacultures. This zone will be defined in a more safe way and without legal or economic conflicts with investors who exercise this right in a specific space, before the completion of MSP, if MC would provide the boundaries and the duration of this right. Correspondingly, MC would not permit the registration and legalization of such a right if, during its spatial definition procedure it would be entailed in a prohibitive for such activities zone, according to MSP.

MARINE CADASTRE TO SUPPORT MARINE SPATIAL PLANNING

Marine Cadastre to support Marine Spatial Planning

Cadastral Systems (Land Administration Systems) provide, in general, reliable information on:

- Exercise of the rights (Beneficiaries, type of right, duration)
- Spatial reference of the rights (boundary coordinates, area)
- Land Valuation (Optional)
- Land Use

Marine Cadastres may provide, at least, reliable information on:

- Exercise of the rights (Beneficiaries, type of right, duration)
- Spatial reference of the rights (boundary coordinates, area, depth)
- Valuation of Installations (Optional)
- Use

Perspectives of the marine cadastre concept (Ng'ang'a 2006)

System for interest management : A system for managing the complex array of political, social, environmental and commercial interests in the marine environment (an Australian perspective advanced by Fraser [2001]; Williamson et al. [2001]).

Cadastral information system: An information system encompassing both the nature and spatial extent of interests in property, value, and use of marine areas (a USA perspective advanced by Fowler and Trembl (2001)).

Tool for managing property rights in marine zones: Has the following qualities: (1) deals with multiple types of interests;(2) has participation from many stakeholders and from many levels of Government;(3) is based on an Information Custodian Model and will need a champion; (4) not wait until all marine claims/issues are settled; (5) is a central part of any Marine Geospatial Infrastructure;(6) is built on “good base data” and use visualization tools;(7) is rights-driven rather than boundary driven (a Canadian perspective advanced by Monahan and Nichols [2003]).

Visual information system: An information system that facilitates the visualisation of the effect of a jurisdiction's public laws on the marine environment e.g. spatial extents and their associated rights, responsibilities, restrictions, and administration (a Canadian perspective advanced by Ng'ang'a et al. [2004]).

Perspectives of the marine cadastre concept (Ng'ang'a 2006)

Registration system: A means of recording the various rights and responsibilities of those with an interest in the marine jurisdiction (a New Zealand perspective advanced by Hoogsteden and Robertson [1998]; Hirst and Robertson [2001]).

Authoritative data portal: A data portal where land surveyors, lawyers, or researchers can obtain clear information on the location of these rights and interests and their impact on other proposed developments (a Canadian perspective advanced by Stewart and Stewart and Hartley [2003]).

Integrated Information system: An integrated rights and information system that has land information focus rather than a land development focus (a Canadian perspective advanced by Tétreault [2001] and Gagnon [2003]).

Depending on spatial information requirements: A work in progress requiring an appreciation of legal regimes as well as business practices associated with the exploration, exploitation, conservation, and management of the maritime environment (an Australian perspective advanced by Todd [2001]).

Information infrastructure: A working Pilot Cooperative Ocean Information Infrastructure that will link users of ocean information to the sources (a Canadian perspective advanced by Kucera [2004]).

Industry specific: A tool for managing the wide range of data that is currently being maintained within the oil and gas industry (a Canadian perspective advanced by Thomas [2004]).

Recent perspectives of the marine cadastre concept

Multipurpose Marine Cadastre (USA marinecadastre.gov) A Tool for Planning & Decision Making in the Marine Environment
Marine Administration – Spatial Data Infrastructure (SDI) (Strain L., Rajabifard A., Williamson I., 2006)

Web GIS: Modern social and technological requirement is the direct access to the cadastral data of the marine environment, by all concerned and stakeholders, without bureaucracy and delays. This possibility is offered by up to date Web GIS applications.

3 D system: A key feature of the marine space is the third dimension, depth. The existence of overlapping and coexisting rights in the same place but at different depths (surface, water column, sea floor) requires three-dimensional recording and presentation of marine space. 3d information for the marine space facilitates and allows 3d planning.

4 D system: The rights exercised in the maritime space, alter as time goes by. Therefore their registration system should be dynamic, that is to include time and be updated directly in relation to these changes. The duration of the existing maritime space licenses affects (delays) the planning procedure.

Future perspectives

Fit for Purpose Marine Cadastre (based on Bell, Enemark et al, 2014)

ISO 19xxx MADM: The MC's system and database should follow a new standard. The ultimate objective is the creation of a Marine Administration Data Model (MADM) and the adoption of a new ISO standard or an extension of the international standard ISO 19152 - Land Administration Domain Model (LADM). The LADM supports three-dimensional data structures, but there hasn't a general category concerning the maritime space objects until now.

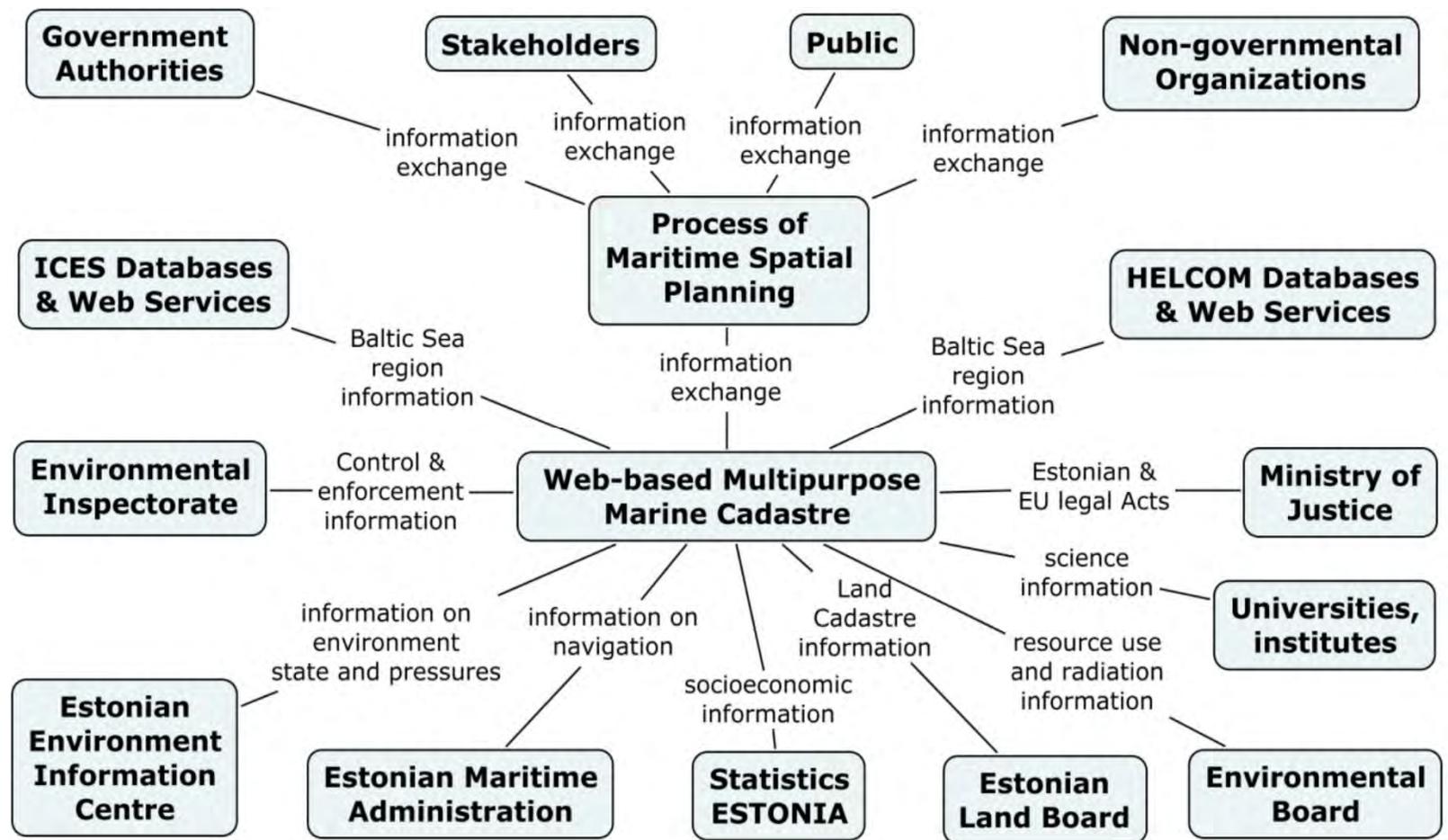
Marine Cadastre to support Marine Spatial Planning

Marine Spatial Planning requires:

- Integrated Information system - Information infrastructure - SDI
- Visual information system - Authoritative data portal - Web GIS based System
- System for interest management
- Tool for managing property rights in marine zones - Cadastral information system - Registration system
- System depending on spatial information requirements
- Industry specific system
- 3 D – 4D system

FINALLY MSP REQUIRES AN INTEGRATED MARINE INFORMATION SYSTEM.
IS A MULTIPURPOSE MARINE CADASTRE THE ANSWER?

Marine Cadastre to support Marine Spatial Planning



Information exchange

Concept of Estonian Web-based Multipurpose Marine Cadastre (Kopti M. et al 2002)

Multipurpose Marine Cadastre (USA - Canada) versus Traditional Cadastre (Israel)

The US Maritime Cadastre is an information system that supplies web services, based on authoritative data sources, integrating legal, physical, ecological, and cultural data and information in a common GIS, as well as rights, restrictions, and responsibilities (Fulmer, 2007).

The Canadian approach also refers to the multipurpose nature of the marine cadastre and supports it by a marine geospatial data infrastructure as part of the Canadian Geospatial Data Infrastructure (Sutherland, 2003). This trend was also adopted by the International Hydrographic Organization, which decided in 2007 to establish a Marine Spatial Data Infrastructure Working Group (MSDIWG) and prepared in 2009 a guidance publication for Hydrographic Offices (IHO Publication C-17 – Edition 1.1.0 February 2011) regarding the marine dimension of National Spatial Data Infrastructure (NSDI) (Srebro 2015)

The Israeli approach until now, as practiced in the Sea of Galilee, the Dead Sea, the Red Sea, and the Mediterranean Sea is to adopt the limited scope of a marine cadastre, referring to the boundaries of property rights and the rights of use to be registered. Thus, the marine cadastre in Israel is actually a natural continuation of the land cadastre; it follows the same principles and methods of implementation (Srebro 2015).



Marine Cadastre to support Marine Spatial Planning

Sources of marine information in Europe

- EMODNET
- INSPIRE
- Copernicus (ex GMES - Global Monitoring for Environment and Security)
- European Atlas of Seas
- Marine GIS developed by different Organizations in each Country or Sea.

However, there is absence of information in the above sources on descriptive data, location and spatial extend of Rights, Restrictions and Responsibilities.

Main organizations related with the marine research and information management in Greece

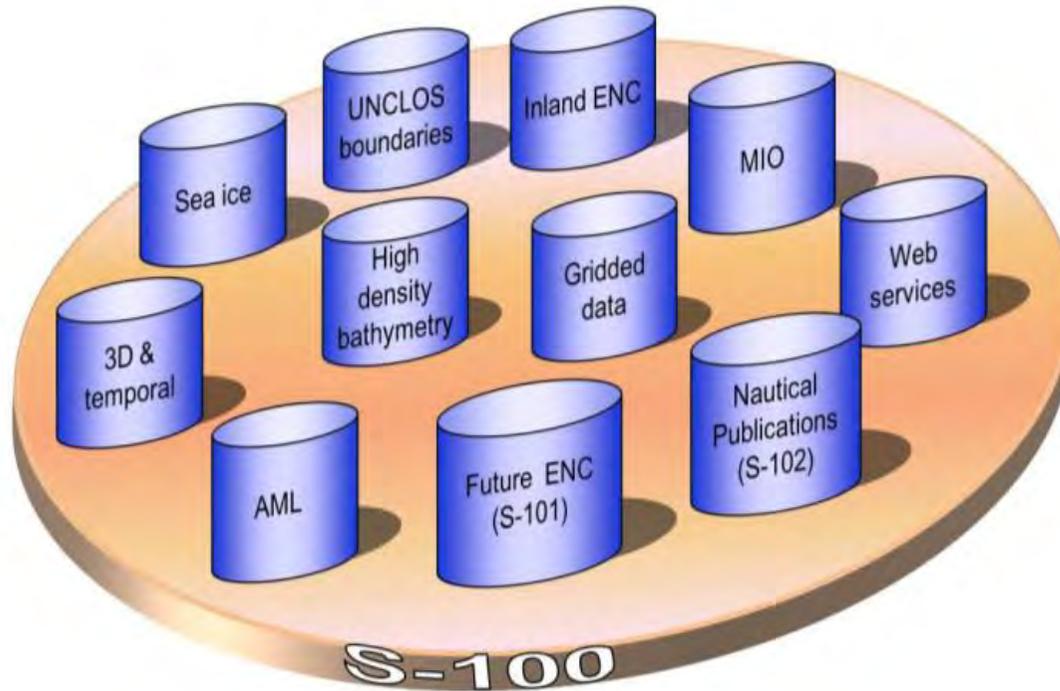
- **Hellenic Centre for Marine Research**

The Hellenic Centre for Marine Research is a governmental research organization operating under the supervision of the General Secretariat for Research and Technology (GSRT) of the Ministry of Culture, Education and Religious Affairs. The HCMR comprises three Research Institutes: the Institute of Marine Biology, Biotechnology and Aquaculture (IMBBC), the Institute of Marine Biological Resources and Inland Waters (IMBRIW) and the Institute of Oceanography (IO) (<http://www.hcmr.gr/en/>)

- **Hellenic Navy Hydrographic Service**

Hellenic Navy Hydrographic Service is responsible for the monitoring and cartography of Greek seas. All sea charts containing sea areas, are based on the HNHS's data. The service is also responsible for purchasing the charts. (<http://www.hellenicnavy.gr/en/organization/independent-services>)

IHO S-100 The Universal Hydrographic Data Model (Ward and Greenslade, 2011)



S-100 will support a far greater variety of data sources, products and services

S-100 supports a wider variety of hydrographic-related digital data sources, products, and customers. This includes new spatial models to support imagery and gridded data, 3-D and time-varying data (x, y, z, and time), and new applications that go beyond the scope of traditional hydrography (for example, high-density bathymetry, seafloor classification, marine GIS, etc.).

Marine Cadastre Perspectives and Marine Spatial Planning

System for interest management : *MSP is a regulated interest management action concerning a large maritime area. Interests turn into new planned activities*

Cadastral information system - Registration system - Tool for managing property rights in marine zones: *The marine space belongs mainly to the state. However the owners of the licenses exercise rights on them. They should agree and act in order to implement the MS plans, so their personal details are required.*

Visual information system - Authoritative data portal - Integrated Information system: *MSP requires and ends to a visual information system*

Depending on spatial information requirements: *MSP is actually an integrated proposal of development for the marine space.*

Information infrastructure: *The total of the gathered and recorded information is needed to be taken into account at every MSP step*

Industry specific: *A major aspect MSP is oil and gas existence. Data concerning their management is of great importance to the MSP process.*

Recent perspectives of the marine cadastre concept and Spatial Planning

Multipurpose Marine Cadastre (MMC): *A Tool for Planning & Decision Making in the Marine Environment*

Web GIS: *Modern social and technological requirement is the direct access to the cadastral data of the marine environment, by all concerned and stakeholders, without bureaucracy and delays. This possibility is offered by up to date Web GIS applications.*

3 D System: *3d information for the maritime space facilitates and allows 3d planning*

4 D System: *The duration of the existing maritime space licenses affects (or affected by) the planning procedure*

Marine Cadastre to support Marine Spatial Planning

“In general, the Netherlands Cadastre plays a passive role in North Sea governance. Based on boundaries determined by the Navy’s Hydrographic Service, the Netherlands territorial sea has been divided up into a series of parcels. Parcels that are within 1 km of the shoreline are registered in ownership in the name of local authorities. Parcels extending from this 1km line to the 12 nm boundary of the territorial sea have been registered in State ownership. However, these State owned parcels of ocean are not used in the processes to govern the territorial sea. (Barry et al 2003).

The Netherlands Cadastre as an institution plays a minimal role in this system other than to divide the territorial sea into parcels and register them in ownership in the name of the State or local authority. In terms of the Law of the Sea, the State is not empowered to own parcels of ocean in the EEZ. Moreover, other than the State owned parcels in the territorial sea, parcel boundaries are determined according to usage only (e.g. minerals, aquaculture). There is not a market in ocean parcels where parcels are subdivided and consolidated and sold off, nor is the system designed to support this. (Barry et al 2003)”.

Questions to be answered in order to help each Country decision about the kind of the Marine Cadastre:

- Perspective of Marine Cadastre
- Marine Cadastre and Existing Institutions
- National or International Body
- Legalization and Implementation of UNCLOS Zones
- Land Administration institutions and “Cadastral Experience”
- Coast areas management

Marine Cadastre to support Marine Spatial Planning

What kind of Marine Cadastre?

- System for interest management
- Cadastral information system
- Registration system
- Tool for managing property rights in marine zones
- Integrated Information system
- Multipurpose Marine Cadastre
- Marine Administration System
- Visual information system
- Authoritative data portal
- Depending on spatial information requirements
- Information infrastructure
- Industry specific
- Fit for Purpose Marine Cadastre
- SDI
- Web GIS
- 3 D – 4D system
- System database following the ISO 19xxx MADM

OUR PROPOSAL:
FIT FOR EACH COUNTRY
MARINE CADASTRAL
INFORMATION SYSTEM

Questions to be answered

How MC supports MSP?

- Provision of data regarding the rights exercised in the sea.
- Definition of the boundaries of the different MSP zones.
- Provision of comprehensive legal, administrative and spatial information.
- MSP's creation and implementation, in Europe, doesn't require MC.

MSP has specific deadlines according to the EU Directive. How MC would follow these deadlines?

- Each country should incorporate MC development's deadlines in its MSP national legislation.
- A new EU directive should be established entailing different deadlines for MC.
- Organizations / Institutions involved in MC should decide on deadlines. Change of law is unnecessary.

Questions to be answered

European seas belong to different countries. How MC and MSP authorities face this situation?

- Establishment of National Bodies/Institutions.
- Establishment of International / Transboundary Bodies.

“It has been necessary to adjudicate and determine the continental shelf boundaries with Netherlands’ adjacent and opposite states. Based on this international boundary parcel, the EEZ and parts of the territorial sea have been divided up into parcels for the purpose of exploring and mining oil and gas.

Rights of passage in the shipping lanes that overlap these parcels are servitotal in nature and superior to those of mining and mineral exploration. Other rights that are servitotal in nature pertain to cables and pipelines, albeit that their duration is limited to the useful lifespan of the cable or pipe. However, similar to many arrangements of mining and mineral exploration on land, holders of North Sea mining and exploration rights are limited to performing these activities.

Holders of fishing rights are not impeded by mineral parcel boundaries, providing they do not interfere with mining and exploration operations. (Barry et al 2003)”.

Questions to be answered

Different organizations are involved in the mapping and the recording of data regarding the sea environment, in each country. How the MC development will confront this problem in order to support MSP?

- Development of a new unified organization for all Marine spatial activities.
- Cooperation among existing, different organizations.
- Incorporation of all these activities under the National Cadastre Body.
- Other.

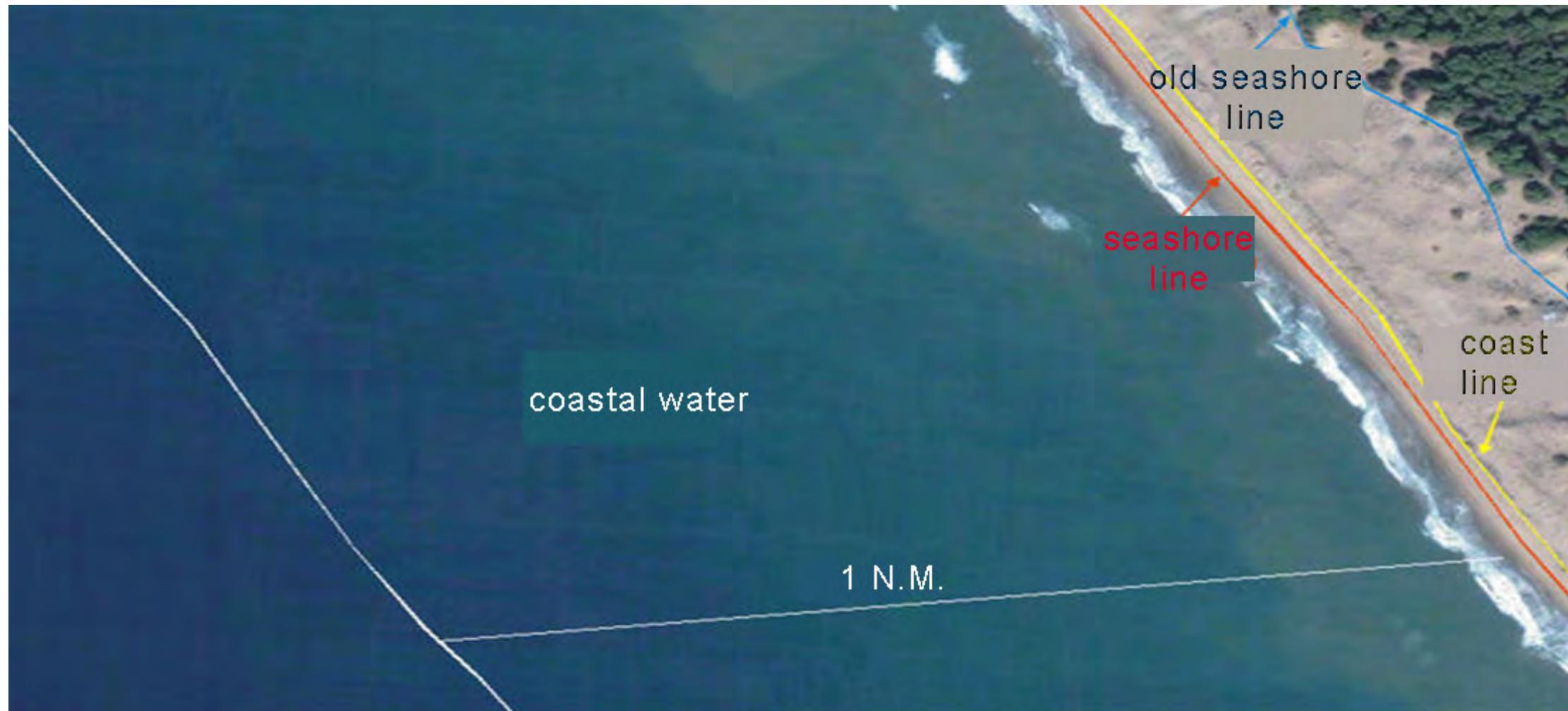
“In conclusion, the system of governance in the Netherlands North Sea is based on cooperation. It is a system of permits, leases and servitudes of limited duration, where the State retains substantial power. Specialists in different ministries allocate permits. Coordination is done through legislation and policy and institutions such as IDON and CONSSU. Rights are not allocated to third parties on the basis of ownership. Moreover, they are of limited duration. This allows flexibility, which is sensible given the environmental sensitivity of the oceans and our lack of knowledge of the effects of intervention and other factors that affect renewable marine stocks. (Barry et al 2003).”

THE GREEK CASE

Marine Zones – Greece

(Athanasίου 2014)

Continent



Territorial Sea



6 Nautical Miles



12 Nautical Miles

ΕΕΖ



The Main Characteristics of the Pilot Project on Marine Cadastre in Greece

- The aim of this pilot project is the design of a Marine Cadastre and its implementation for a selected area of study in Greece.
- The content of this system is the entirety of the rights to be exercised and the area of application, which will then be organized by their characteristics and will form the layers in the GIS.
- Simultaneously with this descriptive database a spatial one was developed, where, on a properly formed background, the rights to be exercised located, digitized and visualized, as well as any other physical spatial characteristic.
- Next, the reference unit of the marine parcel and the system of geodetic reference defined.
- In accordance to these prerequisites, the information that is gathered, is then archived in the system and digitized, forming a prototype marine cadastral system for the area of study.

General Principles

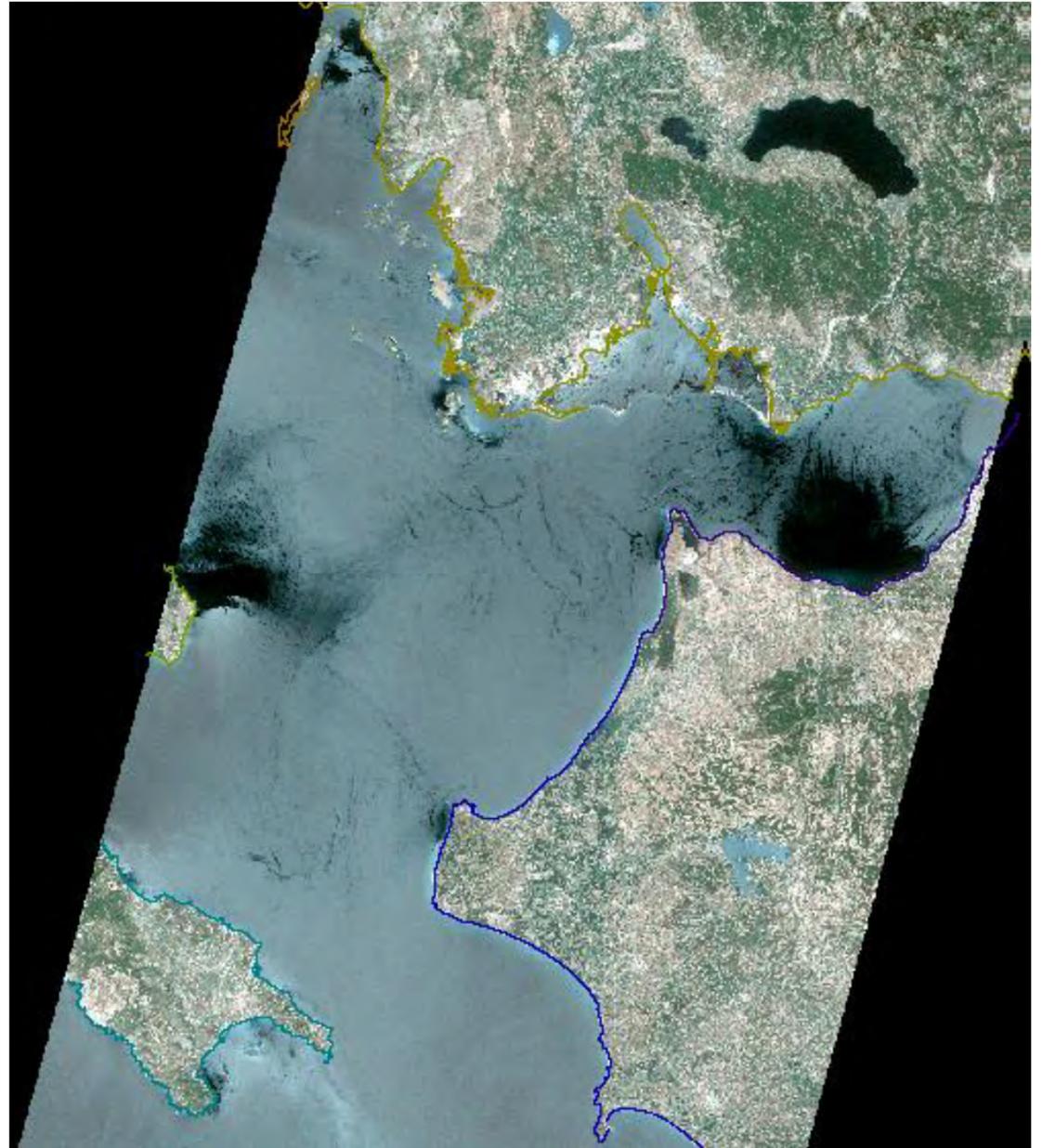
- Location and definition of rights (ownership, use), restrictions and responsibilities in the maritime environment
- Regulation and supervision of these rights
- Supervising and ensuring the application of regulations from the corresponding authority
- Provisioning of all required information in order to facilitate the communication and interaction of all interested parties and their activities (e.g. definition, visual representation on maps or in digital forms, implementation in the water).

Stages of Design and Implementation

- Study of the Greek and international law, guidelines, ministerial decisions
- Initial recording of rights, restrictions and responsibilities
- Conclusion and finalization of all the required information to be logged.
- Data collection from ministries, departments and port authorities
- Marine Cadastre pilot Design and Implementation

PILOT AREA: WESTERN GREECE
(PART OF IONIAN SEA AND GULF
OF PATRAS)

The pilot area lies at a place with plenty of
marine activities

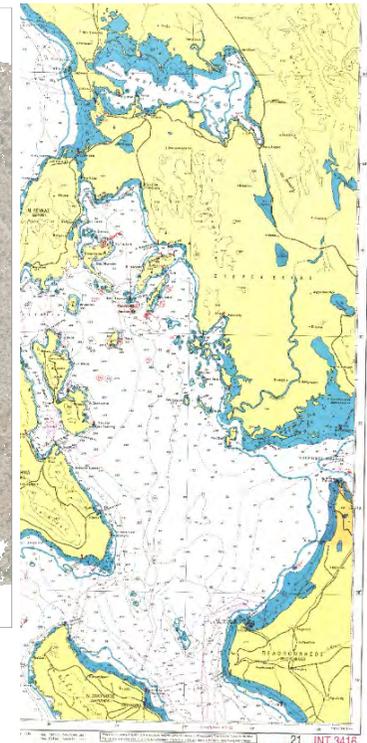
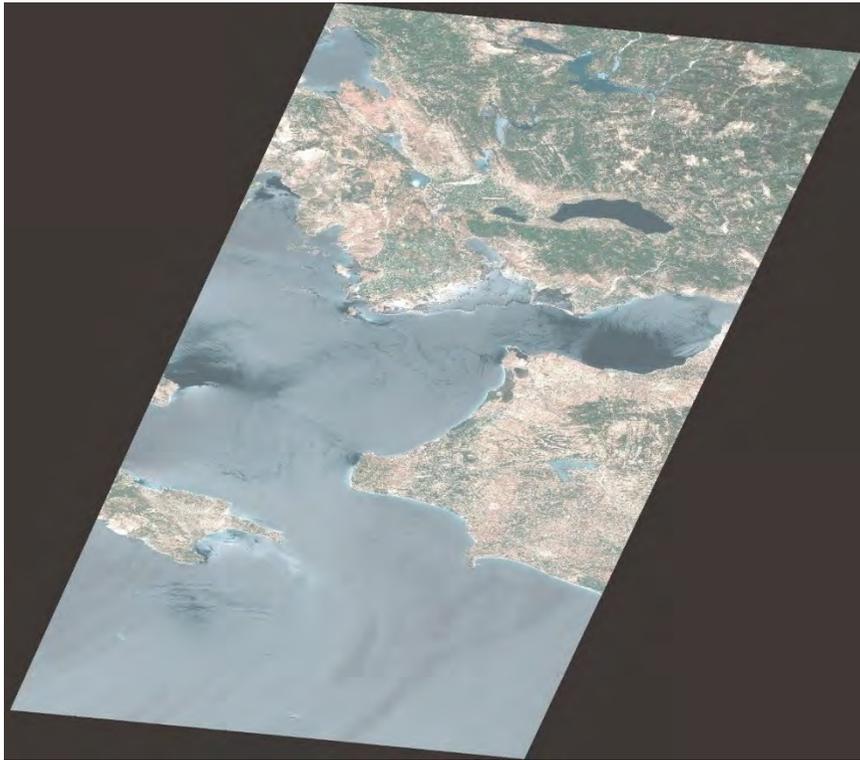


Cartographic Background

Satellite images from RAPIDEYE, 5 channels, 5m accuracy

Colored ortho-imagery, 25 cm accuracy, from N.C.M.A. SA

Nautical Maps of the Hellenic Navy Hydrographic Service



System Content

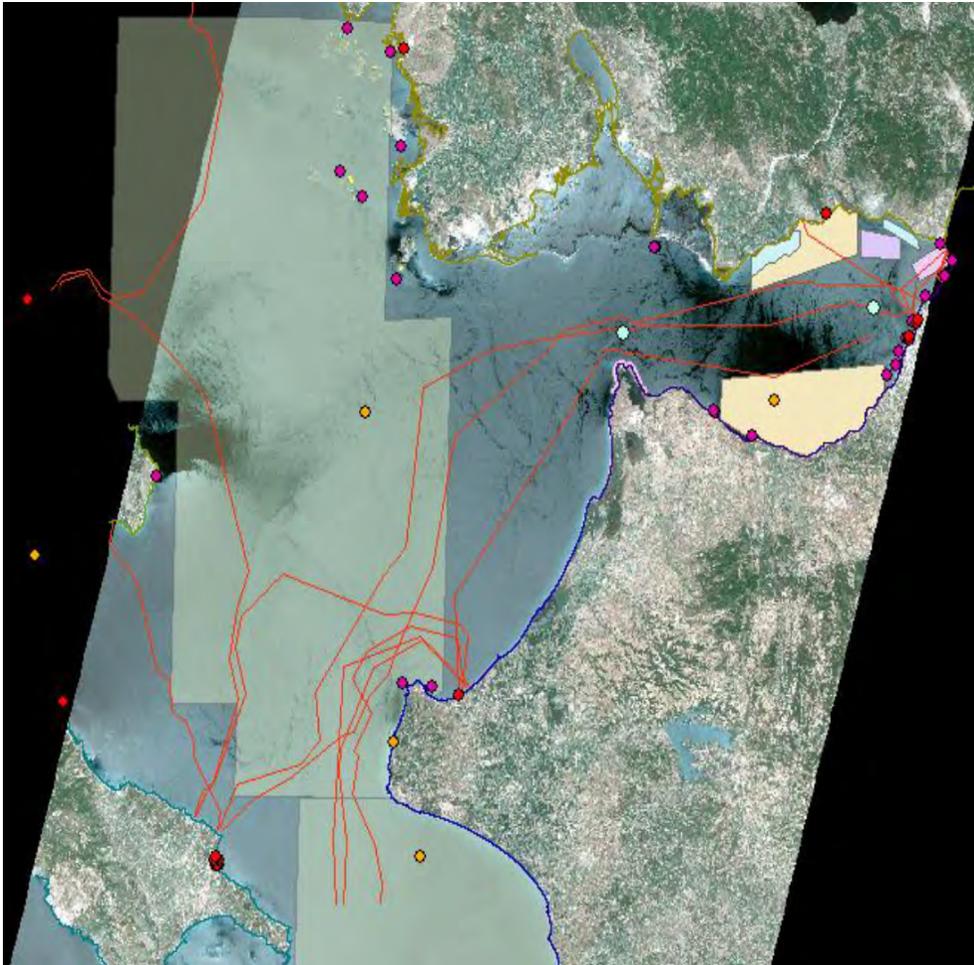
- Layers and zones which are defined by international and national law
- Layers defined in Spatial separation by administrative decisions
- Layers of Protected Zones
- Layers of Areas of Special Use
- Layers of Leased Areas
- Layers of Areas of Special Characteristics

Marine Cadastre Unit of Reference (Marine parcel)

- Specific areas with common characteristics for the entirety of their points.
- 12-unit code, based on the legislated zone, the Sea, the Greek Prefecture, the Head Office of the Port Authority Jurisdiction / Municipality, the use and number of the marine parcel.

Required for:

- Location of the area where the phenomenon takes place.
- Categorization and separation from respective neighboring areas.
- Determination of the administration unit in which the phenomenon takes place.



PILOT IMPLEMENTATION OF THE MARINE CADASTRE

Collected data and their respective sources

- Aquacultures, from the Ministry of Agriculture
 - Projects at Port Authorities and seashores–coasts, from the Ministry of Mercantile Marine
 - Lights and lighthouses, from the Department of Lighthouses of the Navy
 - Shipwrecks, from the local Port Authorities
 - Drill sites, from M.M.E.E.C.C.
 - Seaplane Airports
 - Underwater pipelines
 - Wind parks
 - Anchorages (harbours)
 - Military Areas, from the Port authorities
 - Areas of research for fossil fuel, from M.E.E.C.C.
-
- About 150 entries of Marine Units of Reference of various uses have been entered
 - The collection process is very difficult and time consuming
 - The existing descriptive information was often incomplete and wrong

Leases and Licenses

AA	Operation	Spatial attribute	Duration (over 9 years)
1	Establishment of coastal cargo center	✓	≥ 25 years
2	Seaplane Airport	✓	Over 10 years
3	Oil, fossil fuel	✓	Research – 8 years Harvesting – 25 years
4	Marine wind-energy park	✓	25 years

Leases and Licenses

AA	Operation	Spatial attribute	Duration (over 1 year)
1	Building license for tourism facilities	✓	4 years
2	Loading and unloading of bulk liquids category 4		1 year
3	Oil, fossil fuel	✓	Quest – 18 monts
4	Establishment of marine and underwater park	✓	Over 2 years
5	Fishing license		2 years
6	Voyages working out		2 years
7	Installation of prototype aquatic animal farming form	✓	5 years
8	Taxi / aquaculture boat		5 years

OVER 90 USES/ACTIVITIES WITH NO EXPLICIT TIME DURATION OR WITH DURATION UNDER 1 YEAR

Problems encountered – Lessons Learnt

- The phenomenon of bureaucracy is a great problem, especially in Greece, since it turns data collection into a difficult and time consuming process
- The large number of institutions responsible for providing data made their collection even more difficult
- The existing collected data, i.e. the descriptive information, was often incomplete and wrong, as they hadn't been recorded in an integrated way
- The matter of personal data is/was a hindrance in acquiring the required data

Proposals for the development of a MC in Greece in order to support MSP

The design of a cadastral system for the data management and mapping of marine space should not be an utopia for Greece. On the contrary, aiming at more efficient and rational use of marine space and its economical, ecological and social benefits, there is a need to promote the process of creating a Marine Cadastre.

- Initially, the purpose and the aim of the implementation of such a project may be defined according to the current Greek and International law.
- The application of the theory "Fit-For-Purpose" to the Marine Cadastre could be considered as interesting.
- National Cadastre and Mapping Agency will be the competent institution for the supervision, implementation and operation of the Marine Cadastre
- Finally the sources of the necessary financial funds for the implementation of the project should be searched.

Proposals for the development of a Marine Cadastre in Greece in order to support MSP

- Furthermore, the possibility of applying the principles of the National Land Cadastre to the Marine Cadastre may be examined, in order to exploit the experience of the development of the National Land Cadastre and due to the direct relationship between land and sea. The process of implementing the Marine Cadastre will follow stages similar to those of the National Cadastre.
- The extensive legislation on the licensing process of each activity identified in Greek seas, intensifies the need for the implementation of a Marine Cadastre as a means of facilitating the licensing process and for the best use of the possibilities offered by the sea.
- As a final step of the project, detailed technical specifications for the design of the Marine Cadastre, similar to those of the National Land Cadastre, are suggested.

COMPETENT SUPERVISION - IMPLEMENTATION - OPERATION AUTHORITY for the MARINE CADASTRE (NCMA)

- As NCMA is the agency responsible for the National Land Cadastre, is deemed to have the necessary expertise to create a similar project for the marine space.
- Land and sea area, regarding cartographic part are within NCMA 's competence.
- Is designated as responsible for the design, development and operation of the National Portal of Geospatial Information according to Inspire Directive.
- As the agency responsible for land recording to the seashore line, can precisely connect National Land Cadastre with National Marine Cadastre.



Conclusions

- Implementation procedure of MSP: an ecosystem-based approach based on a Multipurpose (or Fit for Purpose) Marine Cadastre
- Special characteristics of each region and the kind of the different activities (size, density and kind of marine uses, environmental vulnerability, administrative and political structures) shall define the implementation frame of MSP. In accordance with it, management areas are defined.
- MC and Spatial Data Infrastructure for the sea: a broad interdisciplinary field with employment opportunities.
- As a result: scientific documentation of the European politics of Blue Economy, of Blue Growth, of Sea Strategy, Marine Strategy and of Marine Spatial Planning.

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