Marine Cadastre in Europe

a preliminary study

Brief edition
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Commissioned by:

Disclaimer

The study has been commissioned by the 5 Common Vision Partners[1] (PCC, EULIS, ELRA, CLGE, Eurogeographics) and authored by the members of a project team with experts engaged from the Common Vision Partners or volunteered to participate during the course of the project.

About the sponsors

CLGE is the leading organization representing the Surveying Profession in Europe.

ELRA is an International Association without lucrative purposes representing Land Registrars in Europe.

EULIS is a European Economic Interest Group (EEIG), responsible for the EULIS-portal and governed by members, providers of authoritative land and property information in its own country or region.

EuroGeographics is a European non – profit Association of the European cadastre, land registry and national mapping authorities.

PCC is an organization that joins together the Cadastral institutions of the EU countries.

[1] Hereinafter are referring as "Common Vision Partners" due to the Common Vision Agreement, signed in 2012 in Cyprus and renewed in Lithuania in 2014, to support all European countries to achieve full coverage and high – quality, transparent and accessible data on land.

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Foreword

Dear Reader,

Throughout human history considerable efforts and resources have been directed at effectively managing land whereas the marine environment has been given a lower priority. However over 70 percent of the planet's surface is covered by water, the majority of which is in the world's seas and oceans. It's also known that oceans, seas and marine resources support human well-being by contributing to poverty eradication, food security, the creation of sustainable livelihoods and jobs, human health and protection from natural disasters. Half of the world's population lives within 60 km of the sea and over 3 billion people depend on marine and coastal resources for their livelihoods while three-quarters of all large cities are located on the coast. At least 90% of the volume of global trade is seaborne and approximately 50% of all international tourists travel to coastal areas. The ocean is valued at more than US$24 trillion while the annual "gross marine product" totals at least US$2.5 trillion, which when ranked among national GDPs makes the ocean the world's seventh largest economy (WWF, 2015).

On the other hand, oceans and seas are also a valuable asset for the European Union (EU). Europe is a peninsula with 70 000 km of coastline, surrounded by many islands, by four[2] seas and two oceans[3]. This geographical feature means that over two thirds of the EU's borders are coastal[4] (EC,2006) while the EU Member States exercise collectively jurisdiction over the largest exclusive economic zone in the world comprising of more than 20 million km2. The impact of the maritime sector on the EU's economy is vital as well: the EU's maritime economy alone employs more than 5.4 million people, creates a gross added value of just under €500 billion per year, with a high potential for further growth. Europe is and will be increasingly dependent on oceans for the provision of fish protein, minerals and renewable energy. The EU's single market is the largest market for fisheries products in the world. 90% of the EU's external trade and 40% of internal trade is carried on sea routes.

The five leading European organizations dealing with Cadastre, Land Registry, Mapping and Surveying issues (CLGE, ELRA, EULIS, Eurogeographics, PCC) acknowledge the great potential of the Blue Economy in Europe as well as the impact of efficient planning and a better allocation of human activities in the sea and their interrelation to a sound registry system as a basis for legal certainty. These organizations decided in June 2014 in Athens, Greece to join forces to collectively better understand the Marine Cadastre concept and its role. In this regard, a project team consisting of experts either affiliated with the 5 Common Vision Partners or with universities and institutes in EU Member States, was founded to carry out a preliminary study, with an orientating character, aiming at reviewing the status of the Marine Cadastre across the European Union.

We hope you will find this report, within the context of its orienting character, informative and useful for the initiation of the discussion in the European continent about the potential benefits of the Marine Cadastre in boosting the EU's Blue Economy and we look forward to your feedback.

On behalf of the expert team[5]

Rik Wouters
Project Team Coordinator

Evangelia Balla
Lead Author-Editor of the Brief Edition

[2] the Mediterranean, the Baltic, the North Sea, and the Black Sea
[3] Atlantic and Artic
[4] 23 out of 28 EU countries have a coastline whereas the EU's coastline is 7 times as long as the US' and 4 times as long as Russia's
[5] See Annex for all the experts in the team

Study objective and approach

Objective

The objective of this preliminary study is to raise awareness about the topic of the Marine Cadastre and to trigger the discussion about its potential benefits for Europe's Blue Economy.

Approach

In order to meet the objective of raising awareness and stressing the need for action on investigating further the potential benefits of the Marine Cadastre in the Blue Economy, the project was based on primary and secondary research criteria and encompassed three major tasks. The first task included the design and dissemination of a questionnaire through communication channels of the 5 Common Vision partners to national experts. The second task included the documentation of the current legislative and policy framework of the European Union as well as of related EU's initiatives and tools to support maritime policies. The third task encompassed the analysis and synthesis of relevant research, data and information on the topic of the Marine Cadastre worldwide.

Desk-based research

In order to analyze the international and European context as well as to understand the conceptual boundaries and content of the Marine Cadastre, we performed a desk-based research. A complete reference list of sources is included at the end of this report. We reviewed various literature sources such as related academic articles, the FIG publication No 36 for Administering Marine Spaces, the UNCLOS Convention and multiple European Policy papers, Regulations, Recommendations and Directives related to the maritime domain.

Limitations

As with Land Cadastre, the development of a Marine Cadastre is inevitably a complex and challenging endeavor, which requires solid investigations and thorough planning. However, it was out of the scope of this study to provide definite recommendations and conclusions on the design and development of a Marine Cadastre or provide evidence on direct links between Marine Cadastre and the Blue Economy and solid documentation on its' economic effects. This kind of research requires inevitably a different methodological approach as well as organization and implementation of such a project. Instead the current study focused on the identification of the field area in Europe, reaching high level conclusions from the analysis of the current state and proposing initiatives that could provide further insights at a European and national level.

Introduction

Marine Cadastre: Definition and Scope

The concept of a "Marine Cadastre" and the need *to "build a marine regulatory system and a cadastre that underpins offshore rights and responsibilities and sensibly matches its onshore counterpart" (Robertson et al., 1999)* became apparent in in late nineties' when awareness of the importance of marine natural resources and the recognition of the actual and potential value of a marine environment as an economic resource, led to increased competition for its' management. Important drivers are considered the enforcement of the United Nations Convention on the Law of the Sea (UNCLOS) in 1994, the rise of the environmental movement after the Rio Summit in 1992 and the continuous development of Spatial Data Infrastructures (Balla, 2015).

In the above context, the concept of a Marine Cadastre has attracted interest from several researchers from the geomatics community, as a means to improving the administration of marine and coastal spaces through decision support systems, and lead to increased research efforts towards the development of marine cadastre in various jurisdictions (Sutherland M., 2011).

Following the rise of several research initiatives and pilot projects on the topic of Marine Cadastre, several definitions have been given in the attempt to conceptualize its notion and its content. In this regard, and according to one of several definitions that have been given to the topic. The **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.*" (Grant, 1999).

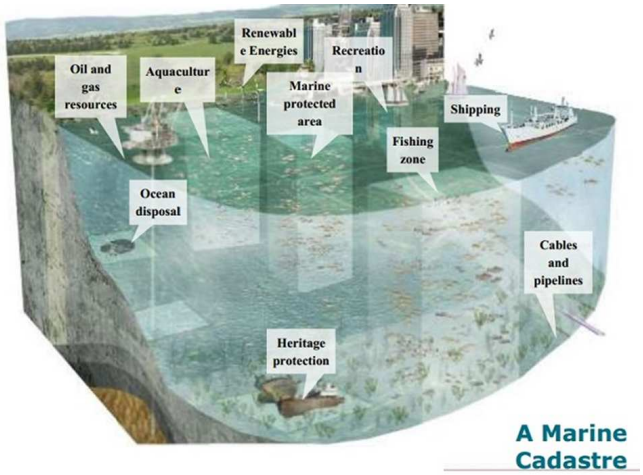


Figure 1: the concept of the Marine Cadastre
Source: http://coinatlantic.ca/index.php/indicators-and-icom/marine-spatial-planning

A second important term, along with the notion that a Marine Cadastre as with Land Cadastre, is the idea of the **marine** or **sea cadastre parcel** which is defined as (De Latte, 2016):

- The volumetric reality of every distinct marine zone (sea surface & water column & seabed or soil & subsoil) with: a) the rights and charges under UNCLOS b) the patrimonial rights which include rights in rem and
- A fourth dimension, meaning the temporary nature of many particular rights *(fixed terms licenses, concessions and leases for mining, production of energy, aquaculture, fishing, etc.).*

Introduction

Marine Cadastre and Land Cadastre: Is there an analogy?

A considerable portion of the conducted research on Marine Cadastre considered the similarities and differences between the Marine Cadastre and its counterpart on land. Most of them converge on the fact that the marine environment has unique features that does not apply in the case of the terrestrial environment and therefore to the Land Registry and Cadastre (Binns et.al, 2004, Collier et. al 2003, Widodo M., 2003) though many of the cadastral components such as adjudication, survey, owner rights have a parallel condition in the ocean (Neely, 1998).

Specifically, as regards the similarities, related research (Tamtomo, 2004), argues that as in the land cadastre, the marine cadastre has also been built based on three pillars or benchmarks, as follows:

a) the legal pillar (3R: rights, restrictions, and responsibilities); As a part of the legal system (legal cadastre), the marine cadastre provides legal certainty to sea-space development planning, sea parcel rights and leases, and public access to and from the seas.

b) the technical pillar (surveying, mapping, and spatial infrastructure). As regards the technical pillar, a marine cadastre is designed as a tool and mechanism for providing data and information as a resource for planning and the decision making process, and as legal evidence of a certain sea and marine rights and lease.

c) the institutional pillar (formal and informal institutions and human resources). The marine cadastre, as part of a public administration system, acts as a public service provider and sea-conflicts resolution.

The following differences between the Marine and the Land Cadastre are the most popular ones according to related academic papers (Collier et.al, 2001, Binns et.al. 2004, FIG, 2006):

- There are virtually no rights of full ownership or exclusive use in marine space
- Ordinary land demarcation techniques cannot apply in the marine environment: Marine boundaries are delimited, not demarcated, and generally there is no physical evidence of “offshore” boundary.
- In the marine environment is common the existence of multiple (overlapping) rights in a single area
- The marine environment is three dimensional – classical 2D simplifications will not suffice.
- Rights can vary with time, adding a fourth dimension to the spatial data.
- The baseline to which many maritime boundaries are related is ambulatory.

The above issues are influencing inevitably the design and development of a Marine Cadastre and are creating new challenges for the involved professionals and related stakeholders. Furthermore, it has been stressed that as with land administration systems which are strongly related to national laws and specific socioeconomic environments and institutional arrangements, it is impossible to adopt a marine cadastre model from one jurisdiction and apply it to another jurisdiction since the concept of a Marine Cadastre is unique for a specific jurisdiction regarding to its characteristics, stakeholders and legal institutional aspects (Collier et.al, 2001).

Introduction

Marine Spatial Data Infrastructure (MSDI)

Closely related to the concept of the Marine Cadastre, is the notion of the **Marine Spatial Data Infrastructure (MSDI)**. According to the International Hydrographic Organization (IHO, 2011), *"Marine Spatial Data Infrastructure (MSDI) is the component of an SDI that encompasses marine geographic and business information in its widest sense. This would typically include seabed topography, geology, marine infrastructure, resources utilisation, administrative and legal boundaries, areas of conservation, marine habitats and oceanography" (IHO, 2011). MSDI places emphasis on the unlocking of hydrographic and all the other marine geospatial information".*

In fact, the **Marine Cadastre is considered as a base layer of a MSDI with fundamental information relating to maritime boundaries and associated rights and responsibilities**, regularly updated and maintained (FIG, 2006). The role of the Marine Cadastre as a data layer in a marine SDI has been addressed in the international workshop on Administering the Marine Environment held in Malaysia in 2004. The workshop recommended, in an analogy to a "Land Administration System", to adopt the term "**Marine Administration System**" for the *"administration of rights, restrictions and responsibilities in the marine environment with the spatial dimension facilitated by the Marine SDI.* The workshop further recommended that *"a Marine Cadastre is defined as a management tool which spatially describes, visualizes and realizes formally and informally defined boundaries and associated rights, restrictions and responsibilities in the marine environment as a data layer in a marine SDI, allowing them to be more effectively identified, administered and accessed (PCGIAP-WG3 2004)".* In order to avoid management gaps in the coastal zone, the workshop promoted the idea of a **seamless SDI** that includes data from land, coast and marine environments to enable the access and sharing of data between those environments to be improved.

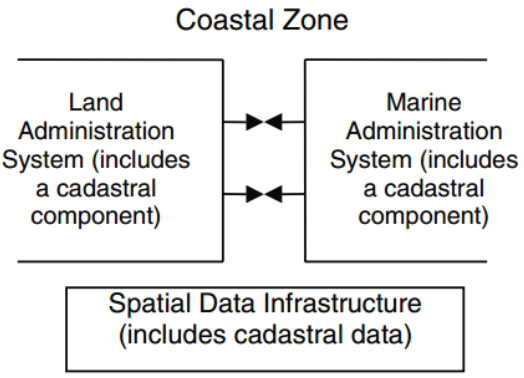


Figure 2: The spatial dimension in the marine environment (FIG, 2006)

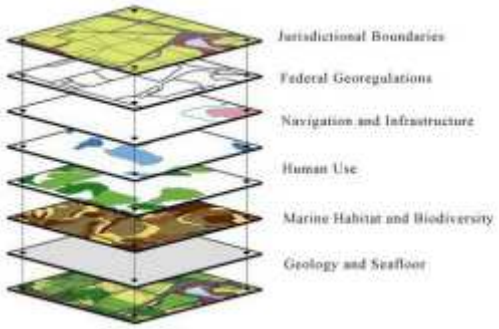


Figure 3: Marine Spatial Data infrastructure themes (Fowler et al., 2011)

As with Spatial Data Infrastructures, the field of the MSDI is very wide with a lot of related technological developments and applications. However compared to SDIs, the Marine SDI has not yet taken a stance nor the terrestrial SDI, because the subject of MSDI is still new (Tares M., 2013). Nevertheless, it has been argued further that even though the number of MSDI themes is currently relatively small in number, it's likely to increase as understanding and new activities evolve in the marine environment (Tares, M. 2013).

1

The International Context

1.The international context

The United Nations Convention on the Law of the Sea

As being said, the enforcement of the UNCLOS has inevitably influenced the evolution of the concept of the Marine Cadastre. It has been argued (Schlagintweit G.) that 25 among the 330 articles of the Convention are related to geomatics, whereas the provisions of the Convention for the subdivision of the oceans on Territorial Seas, Exclusive Economic Zones and Continental Shelves, each with its corresponding rights and responsibilities, has created a complex multidimensional mosaic of potential private and public interests (Ng'ang'a et al., 2002).

The UNCLOS convention which was signed at Montego Bay (Jamaica) in1982 and came into effect on 1994 defines the rights and responsibilities of nations with respect to their use of the world's oceans and seas, establishing guidelines for businesses, the environment, and the management of marine natural resources. The Convention introduced a number of provisions, among them the setting of marine areas and their respective limits, navigation, archipelagic status and transit regimes, exclusive economic zones (EEZs), continental shelf jurisdiction, deep seabed mining, the exploitation regime, protection of the marine environment, scientific research, and settlement of disputes.

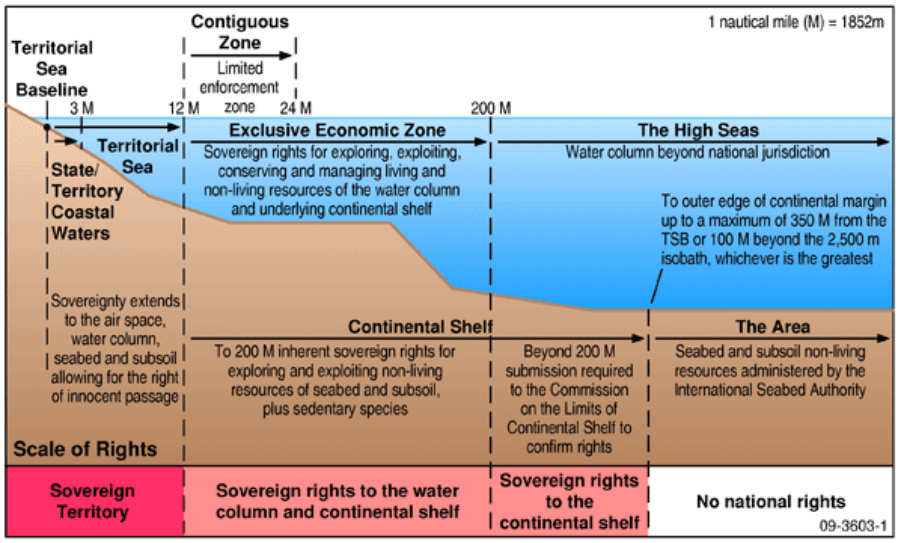


Figure 4. Maritime zones and rights under the 1982 United Nations Convention on the Law of the Sea (UNCLOS). (Source, Geoscience, Australia)

According to UNCLOS, the following distinct marine areas or zones, each with its own legal status and rights (assigned to the coastal state, other states and other stakeholders involved) and restrictions, are being measured from a carefully defined baseline:

- **territorial sea** : is the marine area, up to a limit not exceeding 12 nautical miles, measured from baselines determined in accordance with the Convention which encompasses air space & sea surface & water column superjacent to the seabed & soil or seabed & subsoil
- **contiguous zone** – encompasses the sea surface & water column & soil & subsoil – breadth of 12 nautical miles measured from the outer limit of the territorial sea
- **exclusive economic zone (EEZ)** – encompasses the sea surface & water column & soil & subsoil – breadth of 200 nautical miles measured from the outer limit of the territorial sea

1. The international context

The United Nations Convention on the Law of the Sea

- **continental shelf** – encompasses only the seabed and its subsoil – breadth of 200 nautical miles (maximum of 350 miles) measured from the outer limit of the territorial seabed
- **High Seas** – consists only of the sea surface and the water column subjacent to the surface – beyond the EEZ – beyond any national jurisdiction
- the **Area** encompassing only the seabed and its subsoil under the High Seas – beyond the outer limit of the continental shelf – beyond any national jurisdiction.

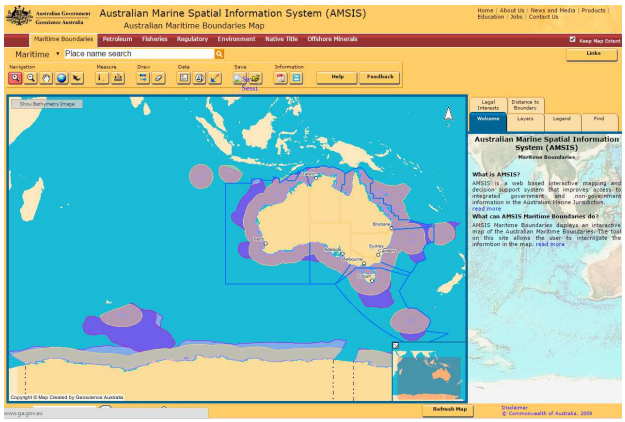
Considering that a Marine Cadastre is referring to areas under national jurisdiction, only the Territorial Sea and EEZ are relevant.

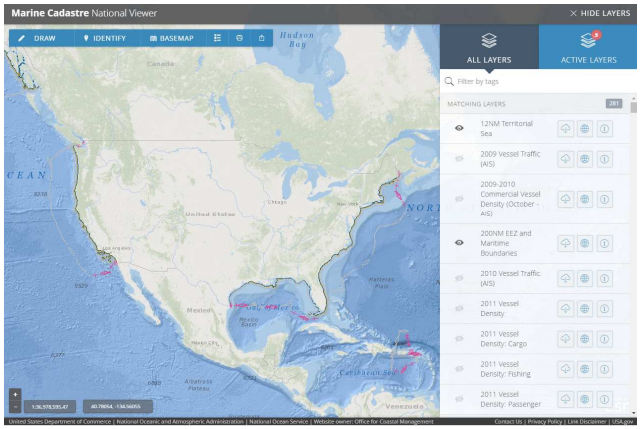
1.The international context

Marine Cadastre initiatives in the world

Australia is one of the countries where the surveying and geomatics community has demonstrated an increased interest for the issue of Marine Cadastre quite early. Early in 2000 a project regarding the delimitation of maritime zones (AMBIS[6]) was implemented while a few years later an information system known as Australian Marine Spatial Information System (AMSIS)[7] was developed. The latter is a web based interactive mapping and decision support system that improves access to integrated government and non-government information in the Australian Marine Jurisdiction and provides multipurpose cadastral information, among them about legal interests. AMSIS contains 80 layers of information displayed in themes on *Maritime Boundaries, Petroleum, Fisheries, Regulatory, Environment, Native Title and Offshore Minerals*. The data has been sourced from Geoscience Australia, other Australian government agencies and some industry sources.

The Marine Cadastre in the **United States** was created to comply with the Energy Policy Act of 2005 which provided for the development of an Outer Continental Shelf mapping initiative to assist in decision making related to the sitting of renewable energy facilities in the continental shelf. The Marine Boundary Working Group of the US Federal Geographic Data Committee (FGDC) developed an implementation plan called the "multipurpose marine cadastre". That was a project which started in 2001 with 10 agencies involved and the first version released in 2010 (FGDC, 2010). Even though the Marine Cadastre initiative was designed initially to support renewable energy siting on the U.S. Outer Continental Shelf, is also being used for other ocean-related efforts. The MarineCadastre.gov portal is now an integrated marine information system with 270 datasets and provides data, tools, and support not only to the offshore renewable energy but to marine planning communities as well. Another portal i.e. Data.gov/ocean is the national marine planning information system called for in the National Ocean Policy which is complementary to the Marine Cadastre. The latter is providing direct access to data for renewable energy and marine planning whereas the first provides access to metadata for ocean, coastal, and Great Lakes data from many federal agencies.





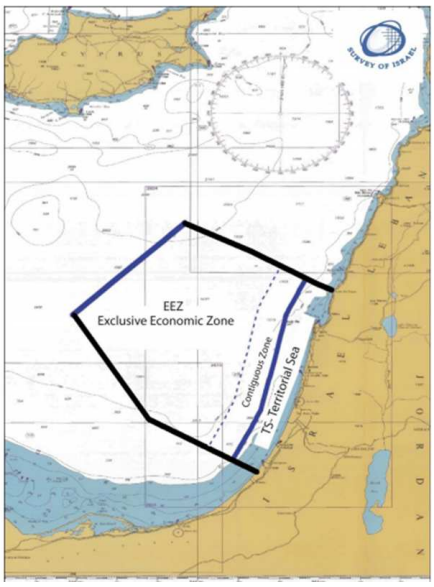
Figures 5,6: Samples of the Marine Information portals in Australia and U.S.A

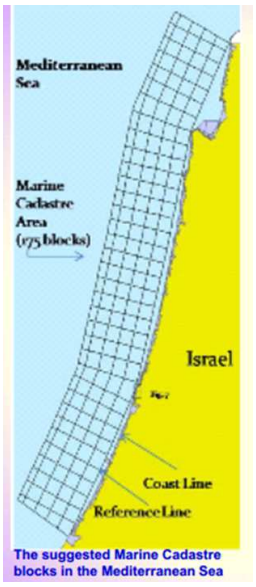
[6] Australian Maritime Boundaries Information System
[7] Australia's Marine Spatial Information System

1. The international context

Marine Cadastre initiatives in the world

The Marine Cadastre in **Israel** is a natural continuation of the Land Cadastre and it follows the same principles and methods of implementation. Initially they applied it to the territorial waters and at a second phase they plan to expand it to the Exclusive Economic Zone. The Survey of Israel and the Land Registry have already finished the process of settling 16 marine cadastral blocks and an additional 13 blocks awaited final approval. The process of implementation was smooth, fast, and at a low cost (Srebro, 2015).





Figures 7, 8: The maritime zones of Israel and the suggested marine cadastre blocks of Israel (Srebro, 2015)

Canada has developed a Marine Spatial Data Infrastructure (MSDI) which comprises one important component of the Canadian Geospatial Infrastructure known as "Geoconnections". Another initiative inside CGDI is the Coastal and Ocean Information Network for Atlantic Canada (COINAtlantic), which has implemented a coastal and ocean information network for the western North Atlantic. The initiative aims at the provision of open access to spatial data to support integrated coastal and ocean management (ICOM) by adopting all standards of and complying with the architecture of the CGDI (Rüh C., Bill R., 2012a). In 2008 the COINAtlantic, developed a search utility that locates marine and coastal datasets and offers the user the option to add and display found datasets in a graphic map interface. A sub-component of the COINAtlantic initiative was a prototype marine cadastre, using St. Margaret's Bay, Nova Scotia, as the case study area (Sutherland M., 2011). However Canada is still in progress with a Marine and Coastal Rights Registry (MC) as a component of an Integrated Marine and Coastal Information System despite that between 2001 and 2008 there has been a major research interest in the marine cadastre. In addition the extension of the CGDI to the Artic with the Canadian Arctic SDI initiative is including the development of a marine cadastre in the Artic area.

1. The international context

Marine Cadastre initiatives in the world

Related initiatives have been taken in **Indonesia** (Abdulharis et.al, 2008, Tamtomo, 2004, Widodo, 2002) and in **Malaysia** (Abdullah, 2014). In particular these initiatives are following a key resolution that has been adopted in the framework of the international workshop in Malaysia in 2004 from the Committee of Cadastre in Asia and Pacific region. According to this resolution, all countries in the Asia and Pacific region with an extensive marine jurisdiction and administrative responsibility are encouraged to include a marine dimension in their NSDI as part of their obligation to meeting their responsibilities under the United Nations Convention on the Law of the Sea (UNCLOS) (FIG, 2006).

Resume

From the macroscopic examination of the above case studies we could deduce the conclusion that in most of them we observe a descriptive system focusing on physical, biological and economical aspects of the marine environment. Only in Israel and Canada we see an (first) attempt to register facts that could be seen as elements of a marine cadaster.

2

EU’s policy and regulatory framework

2. EU's policy and regulatory framework

The EU reaffirms its maritime identity: the path from Integrated Maritime Policy to Blue Growth

On April 1st 1998 the European Union acceded to the UNCLOS, a fact which has inevitably amplified its interest in maritime governance as well as in the administration of marine spaces under its jurisdiction. In 2005 the European Commission included in its strategic objectives for the next five years (2005-2009), the need for an all-embracing maritime policy (EC, 2005). The concept of an **Integrated Maritime Policy** (IMP) of the European Union became officially apparent in the European policy in 2006 with the Green Paper *"Towards a future Maritime Policy for the Union: A European Vision for the oceans and seas"* (EC, 2006). It was the first time that the land based mentality of EU Policies was reversed symbolizing that Europe is and has always been above all a maritime nation (EESC, 2007). The Green Paper examined factors influencing EU's competitiveness: *the state of the marine environment*, *scientific knowledge in all areas relating to the oceans, innovation and the expertise of the workforce* and inaugurated a consultation process which lasted one year. Building on this valuable input and the conclusions of the consultation (EC, 2007a), the European Commission presented on 10 October 2007, its vision for an Integrated Maritime Policy for the European Union, also known as the **Blue Book** (EC, 2007b).

The Integrated Maritime Policy aspires to bring a holistic approach for the coordination of the EU sea-related policies which have been developed separately without taking into account the broader links among them.

The Blue Book (or Blue Paper) laid the foundation for the governance framework and cross-sector tools necessary for an **EU Integrated Maritime Policy**. As regards the tools for integrated policy-making, the Blue Book distinguished three horizontal planning tools of major importance that cut across sea-related sector policies and support joined up policy making:

- **maritime surveillance** which is critical for the safe and secure use of marine space;
- **maritime spatial planning** which is a key planning tool for sustainable decision-making;
- and a **comprehensive** and **accessible** source of **data and information**.

The Blue Book highlighted the inefficiency of existing planning frameworks that address the emerging challenges from the growing competing uses of the sea[8]. The Commission proposed to set up a **maritime spatial planning**, as a fundamental tool for the sustainable development of marine areas and coastal regions, and for stronger use of **Integrated Coastal Zone Management (ICZM)**, following the 2002 EU's Recommendation[9].

Moreover, the Commission recognized that the establishment of an appropriate **marine data and information infrastructure**, as a basis for strategic decision making on maritime policy, is of utmost importance, given the vast majority of data collected and stored all over Europe for a wide variety of purposes. This data should be compiled in a comprehensive and compatible system, and made accessible as

[8] i.e. maritime transport, fishing, aquaculture, leisure activities, off-shore energy production and other forms of sea bed exploitation
[9] 2002/413/EC

2. EU's policy and regulatory framework

The EU reaffirms its maritime identity: the path from Integrated Maritime Policy to Blue Growth

a tool for better governance, expansion of value-added services and sustainable maritime development. Having awareness of such a significant undertaking that would need to be developed over a period of years, according to a clear and coherent plan, the Commission committed to proceed, in 2008, towards **a European Marine Observation and Data Network (EMODNet)** and further to promote the multi-dimensional mapping of Member States' waters, in order to improve access to high quality data.

The notion of the **Blue Growth** appeared in 2012 and is considered as the extension or the 2nd phase of the IMP so as to contribute to the achievement of Europe's 2020 strategy goals for smart, sustainable and inclusive growth (EC, 2012b). The EU's blue economy represents roughly 5, 4 million jobs and generates a gross added value of almost a €500billion per year whereas further growth is possible in a number of areas. The sectors of the EU's Blue Economy identified with high potential for growth are the following: 1) **Blue** energy, 2) **Aquaculture**, 3) **Maritime**, **coastal and cruise tourism** 4) **Marine mineral resources** and 5) Blue **biotechnology**

Blue Growth is the long term strategy to support sustainable growth in the marine and maritime sectors as a whole having regard that seas and oceans are drivers for the European economy and have great potential for innovation and growth. It is the maritime contribution to achieving the goals of the Europe 2020 strategy for smart, sustainable and inclusive growth.

Among the initiatives designed to reinforce the efforts of Member States for a successful blue economy, the Blue Growth policy indicated the **maritime spatial planning**, the "**Marine Knowledge"** initiative, and the Common Information Sharing Environment for the surveillance of the EU maritime domain.

These initiatives, which have been developed under the EU's Integrated Maritime Policy and constitute hereinafter the essential components of the Blue Growth strategy, will provide **knowledge, legal certainty** and security in the blue economy and underpin and reinforce other existing instruments at a sea-basin and EU scale.

2. EU's policy and regulatory framework

EU's initiatives to support Blue Growth

Maritime Spatial Planning[10] and Integrated Coastal Zone Management

Coastal areas[11] play a vital role in the European economy while they concentrate on a significant part of the EU's population, the majority of the main urban centers, a large variety of human activities *(e.g. tourism, recreation, holiday housing, fisheries and aquaculture)* and most transport and communication infrastructure facilities. The intensive pressures resulting from the concentration of the abovementioned activities and infrastructures often create threats for coastal ecosystems and natural resources while they also generate conflicts of incompatible uses in the same or adjacent coastal areas.

In this regard, the EU has promoted variously the concept of **Integrated Coastal Zone Management** (ICZM) to be implemented by Member States as a tool for the integrated management of all policy processes affecting the coastal zone, and to further address land-sea interactions of coastal activities in a coordinated way with a view to ensuring the sustainable development of coastal and marine areas. In 2002 the European Commission issued a **Recommendation** (**2002/413/EC**) which laid down specific principles that the Member States should follow to ensure sound coastal zone management. In 2010 the European Union (Decision 2010/631/EU) ratified the Protocol on Integrated Coastal Zone Management in the Mediterranean to the Barcelona Convention (the ICZM Protocol). The Protocol, which entered into force in 2011 as a mixed agreement, covers issues that fall within both EU competence and the national competence of the Member States. The ICZM is predicted also diversely in other Regional Sea Conventions such as the Helsinki Convention for the Baltic Sea Region (HELCOM) or the Bucharest Convention for the Black Sea.

The **Maritime Spatial Planning** (MSP) aims to address the increasing competition between sectoral maritime interests (*e.g. shipping and maritime transport, offshore energy, ports development, fisheries and aquaculture*) and environmental concerns, providing a framework for arbitrating between competing human activities and managing their impact on the marine environment and thus enhancing decision making. Therefore, the use of MSP would enhance the competitiveness of the EU's maritime economy, promoting growth and jobs in line with the Lisbon agenda and would provide a basis for simplified permit systems and reduce costs of regulatory and administrative procedures. It would also provide a transparent and reliable planning framework (EC, 2008).

Maritime Spatial Planning is about planning when and where human activities take place at sea – to ensure these are as efficient and sustainable as possible.

A proposal for a Directive[13] to establish a framework for MSP and ICZM was circulated on March 2013 (EC, 2013). However the text of the **Directive** (2014/89/EU) adopted by the European Parliament on 23 July 2014 contained only the MSP component, along with a *general stipulation* which states that maritime spatial

[10] In this section only the most related, i.e. Marine Knowledge and Maritime Spatial Planning, with the concept of the Marine Cadastre, EU's initiatives are being presented.

[11] The estimated length of the EU's coastline is almost 70,000 km including the four French overseas departments (French Guiana, Guadeloupe, Martinique, Réunion) which are an integral part of the European Union, but excluding the French overseas collectivities and territories, which are not part of the European Union.

planning *"should take into account land-sea interactions."* The inclusion of the **Integrated Coastal Zone Management in the relevant Directive 2014/89/EC** even though initially perceived, along with Maritime Spatial Planning as a cornerstone of Blue Growth and Integrated Maritime Policy **has been hindered due to competency issues among EU and Member States.**

According to the relevant Directive (Article 3) 'maritime spatial planning' means a process by which the relevant Member State's authorities analyse and organise human activities in marine areas to achieve ecological, economic and social objectives. The maritime spatial plans shall identify the spatial and temporal distribution of relevant existing and future activities and uses in the Member States marine waters such as aquaculture and fishing areas, installations and infrastructures for the exploration, exploitation and extraction of oil, gas and other energy resources, minerals and aggregates, maritime transport routes and traffic flows, military training areas, submarine cable and pipeline routes, underwater cultural heritage etc. (Article 8).

With a view to ensuring that maritime spatial plans are based on reliable data and to avoid additional administrative burdens, the **Member States are recommended** to make use of the best available data and information by encouraging the relevant stakeholders to share information and by **making use of existing instruments and tools for data** collection, such as those developed in the context of the **Marine Knowledge** 2020 initiative and the **Inspire Directive** (2007/2/EC) (*Preamble, point (24), Directive 2014/89/EU*).

According to the provisions of the new Directive, the Member States must transpose the new rules into their national laws by 18 September 2016, and draw up national **maritime spatial plans** by 31 March 2021.

Marine Knowledge 2020

Central to the Marine Knowledge strategy stands the **European Marine Observation and Data Network (EMODnet)**, which is a single entry point for accessing and retrieving marine data maintained by agencies, public authorities, research institutions and universities throughout the EU and embraces the full cycle, from initial observation through interpretation, processing and dissemination. The development of the EMODnet aims to cover the **huge gaps in marine data collection and management across Europe** and provide a functional tool for marine spatial planning and better maritime surveillance.

Marine Knowledge enshrines **basic principles** such as ***"collect data once and use them for many purposes"*** and "***data should be interoperable, accessible and free of restrictions on use"***

The design of the development of EMODnet data infrastructure follows a stepwise approach in three major phases. Currently EMODnet is in the 2nd phase of development (2013-2016) with **8 sub-portals** in operation that provide access to marine data from the following themes: **bathymetry, geology, physics, chemistry, biology, seabed habitats, human activities and** last coastal Mapping as a new thematic area still in its early

development phase. In the last phase of EMODNET is envisioned to deliver sustainable **digital mapping of European sea-beds by 2020**.

The most relevant data related to a Marine Cadastre are recorded under the theme of "Human Activities" in the EMODnet portal. The main objective of EMODnet Human Activities is to make information available on the geographical position, spatial extent and attributes of a wide array of marine and maritime human activities[12] throughout Europe. The portal allows users to view, query and download data and metadata from public and private sources – from throughout Europe - via a single entry portal.

The **Copernicus Marine Environment Monitoring Service (CMEMS)** which provides regular and systematic reference **information** on the **physical state, variability and dynamics of the ocean and marine ecosystems** for the global ocean and the European regional seas can be regarded as complementary to the EMODnet for the attainment of the Marine Knowledge objectives.

INSPIRE

The INSPIRE Directive (2007/2/EC) which entered into force on May 2007 establishes an infrastructure for spatial information in Europe to support Community environmental policies, and policies or activities which may have an impact on the environment. The INSPIRE is based on the infrastructures for spatial information established and operated by the Member States. The Directive includes three annexes that list 34 data themes that define the scope of INSPIRE. Examples of data themes of relevance to the marine community include - but are not limited to - Coordinate reference systems, geographical grid system, Hydrography, Protected sites, Area Management/Restriction/Regulation Zones and Reporting Units, Bio-geographical Regions, Elevation (which includes bathymetry and shorelines), Environmental monitoring facilities, Habitats and Biotopes, Sea regions, and Oceanographic geographical features (JRC, 2015). Even though that differences have been tracked between INSPIRE and EMODnet in terms of scope, policy frameworks and technologies, it seems that the "Human Activities" portal of the EMODNet is relevant to the INSPIRE themes (INSPIRE cluster) "Topographic and Cadastral Reference" and "Facilities, utilities and public services" according to a draft conceptual mapping between INSPIRE themes and EMODNet topics made by the Working Group Data Information and Knowledge Exchange (DIKE) (JRC, 2015). The closer alignment and interoperability between EMODnet and INSPIRE is currently an issue of discussion among the experts working on these two initiatives at European level.

[12] Covers geographical information on aggregate extraction, dredging, fish catches, hydrocarbon extraction, major ports, mariculture, ocean energy facilities, telecommunication cables, protected areas, waste disposal (solids, including dredge material, dumped munitions, marine constructions), wind farms, and other forms of area management/designation. Additional information that is anticipated to be added soon includes the status of bathing waters, offshore installations, and hydrocarbon licenses and bidding blocks

2. EU's policy and regulatory framework

EU's initiatives to support Blue Growth

European Atlas of the Seas

Another portal related to marine data is the European Atlas of the Seas[13] which disseminates cartographic information related to EU's coasts and seas both as maps and open data. The portal is maintained and enriched by JRC with the support of DG MARE. It offers an up-to-date and diverse range of information about Europe's seas, such as *sea depth, underwater features, coastal regions geography and statistics, blue energies, maritime resources, tide amplitude, coastal erosion, fishing stocks, quotas and catches, European fishing fleet, aquaculture, maritime transport and traffic, ports' statistics, maritime protected areas, tourism, maritime policies and initiatives, outermost regions, etc*. However the information is of a general nature, not necessarily comprehensive, complete, accurate or up to date, nor appropriate for legal advice as it is referred specifically to its disclaimer.

Resume

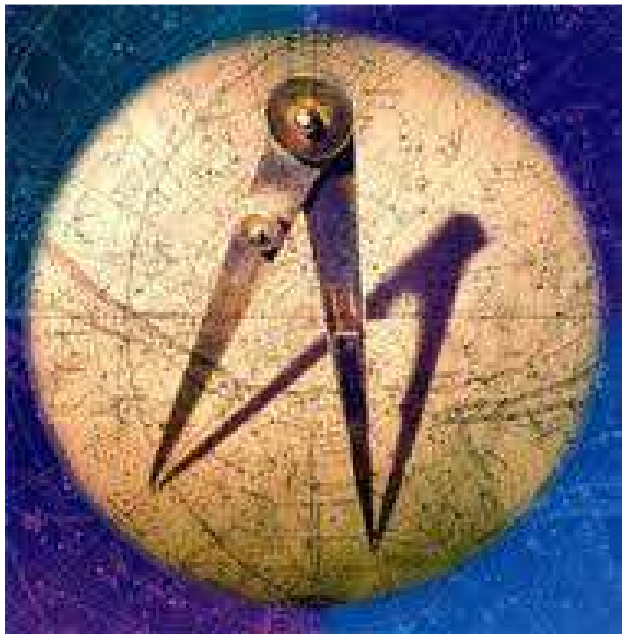
Whether we consider the design of EMODnet, the outline of INSPIRE, or the set-up of the European Atlas of the seas, striking is that no (clear) reference is made to the Marine Cadastre and the registration of rights, titles, restrictions in a structured way.

[13] http://ec.europa.eu/maritimeaffairs/atlas/maritime_atlas

3

The State of Play

Where do the EU and the Member States stand against the Marine Cadastre?



3. The State of Play of Marine Cadastre in EU's Member States

Where do the EU and the Member States stand against the Marine Cadastre?

In 2015 a questionnaire intended to gather information on the state of play of Marine Cadastre in Europe was disseminated through the communication channels of the 5 Common Vision partners to all Member States. Answers were provided by representatives of 18 European countries: Austria, Belgium, Croatia, Denmark, Estonia, Finland, France, Germany, Greece, Italy, Latvia, Netherlands, Portugal, Romania, Slovenia, Spain, Sweden, and the United Kingdom.

The analysis showed that approximately one third of the responded countries have no initiatives concerning marine cadastre, marine spatial planning or other related marine spatial data infrastructure. The other countries have some sort of information portals concerning sea and coast or are establishing a registry only on the coastal part. According to the answers in the questionnaire **none of the countries have a full-fledged established marine cadastre.**

As regards specifically the existing Marine Data information portals in EU Member States, these are either operative or are pilot projects. The websites providing these data are often unknown to the public and the range of the available data is quite limited. The available marine data often concerns Seabed maps (Bathymetry), Navigation information, Fishing rights and Coastline cartography.

One of the countries which seem to have a quite developed Marine Spatial Data Infrastructure is Germany. It was developed as a supranational network for the integration of marine data from all relevant data sources (Federal or State Institutions, Research organizations). The project was funded by the German Ministry of Education and Research and a cooperation agreement between the partners for permanent operation was made (Melles J., 2015). The portal (https://www.mdi-de.org) provides access, visualization and search capabilities to marine data on several themes like Human Activities, Wind Parks, Reserves, Federal Waterways, Bathymetry, Geology etc. and is INSPIRE compliant. In Germany there is another website(https://www.geoseaportal.de/gdi-bsh-portal/ui) which provides marine data on complementary themes such as Spatial Planning, Shipping, Water Pollution, Marine Environment, Navigation etc. and is operating from the Federal Hydrographic Agency of Germany (Rüh C., Bill R., 2012b).

Figures 9,10: View of the Start page of the Marine Data Infrastructure of Germany and the GeoSeaPortal

3. The State of Play of Marine Cadastre in EU's Member States

Where do the EU and the Member States stand against the Marine Cadastre?

The French National Hydrographic Service web site www.shom.fr provides bathymetry, tides and currents data. Interesting aspects of this website are that It fulfils INSPIRE directive requirements and that it can also display data from other portals due to standardized flows.

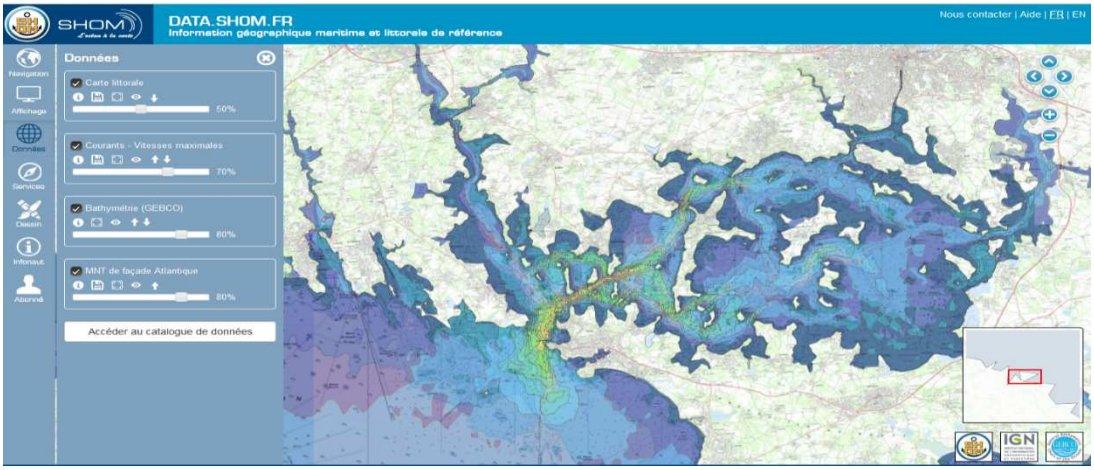


Figure 11: Example of display from the portal developed by the French National Hydrographic Service showing the Morbihan Gulf with map of the coastal area, the currents and the Bathymetry

Additionally the questionnaire revealed that *the existing Marine Data information portals have been developed in most of the cases without active involvement of the national Land Registry and Cadastre Organizations***.** Exceptions to this are the cases of Denmark and Estonia. In particular the MSDI of Denmark is being developed from the Danish Geodata Agency. In fact Denmark is demonstrating a rapid pace towards the development of a MSDI and "expansion" of the land cadastre to the sea territory. Specifically with regard to the MSDI, in 2015, together with 10 other agencies, the Danish Geodata Agency initiated the implementation of a Danish MSDI. The aim of establishing a Danish MSDI is to make marine spatial data easily accessible and available for comparison and exchange across the maritime authorities for various purposes. In addition, the idea is that the MSDI will be able to provide information on the data in question (metadata), e.g. when the data was collected and updated, how the data can be accessed, the quality hereof and so on. The MSDI will be implemented and authoritative data and associated services will be made available during the period 2015-2016 (http://eng.gst.dk/danish-hydrographic-office/msdi/). The Danish Geodata Agency is also responsible for collecting, managing and publishing hydrographic data, including nautical charts and nautical publications and as of 2016, will also have responsibility for registering buildings on the sea territory in the Danish cadastre. These will be registered as simple polygons, at sea mostly in relation to offshore wind turbines and similar structures.

In Estonia the "Geoportal" of the Estonian Land Board hosts a specific "Marine Areas Application"

(http://xgis.maaamet.ee/xGIS/XGis) which encompasses data for the whole Estonian marine area in Baltic Sea. The available datasets include everything important for marine navigation: Sea depths, Lights, harbor information, buoys, beacons, submarine cables and networks, obstructions, wrecks etc. The lead organisation is the Estonian Land Board which provides the relevant interactive maps while attribute data are coming from the Estonian Maritime Administration.

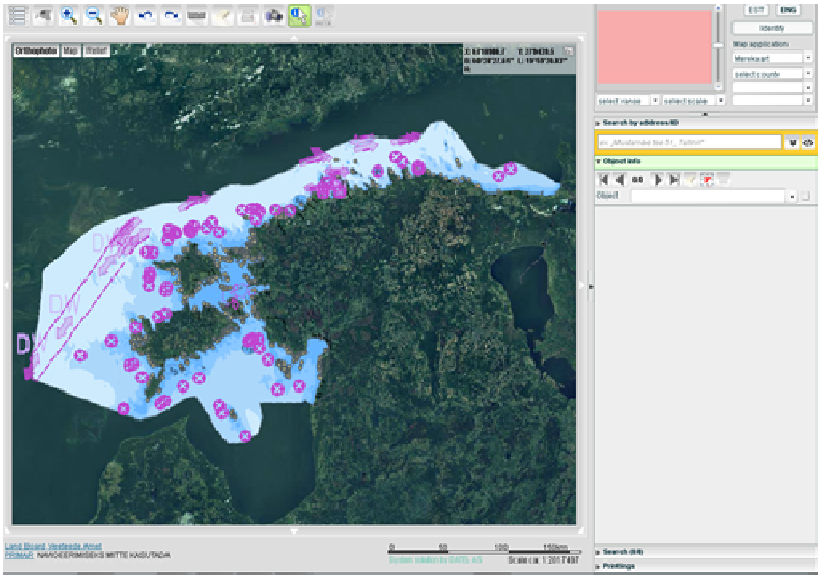


Figure 12: The Estonian Marine Areas application in Estonia's Geoportal

Examples of portals with marine data which have been developed in the context of pilot Maritime Spatial Planning projects are the ADRIPLAN Data portal (data.adriplan.eu) which shows 71 layers of data on the Adriatic-Ionian Sea of the Mediterranean Sea and the THAL-XOR portal (http://www.mspcygr.info/thal-xor/) which is a result of a cross boarder cooperation between Cyprus and Greece (Balla, 2016). Another project that is still under development is the initiative of the French OGE (Land Surveyors Order) for a Coastal and Sea Portal which is to be integrated to the GEOLAND portal which will therefore become a unique tool to display land, coastal and marine 3D data (Smith, 2016).

Resume

It's important to note that the answers from the questionnaire verified that the production, collection, maintenance and dissemination of marine data are dispersed to a wide array of actors and there are restrictions on their access. Overall, the experience gained from the questionnaire reveals that *the development of marine cadastre and marine spatial data infrastructure in Europe is at an early stage and only a few respondents were familiar with the term of a Marine Cadastre*. It is anticipated however that in ***the context of the implementation of the Maritime Spatial Planning Directive, more information systems will be developed in the Member States and therefore the need for authoritative data will increase in the near future.***

4

Main conclusions and way forward

4. Main conclusions and way forward

Main conclusions

1	**Several jurisdictions outside of the European continent, with strong ocean and sea interests, have shown a rapid pace towards the development of the Marine Cadastre since 1994, when the UNCLOS came into effect.** Our review of the existing literature and implemented projects revealed that the geomatics community (state agencies, professionals and academia) have demonstrated an intense interest to apply land administration techniques to the marine environment in several regions (i.e. Australia, USA, Canada etc.) quite earlier than Europe. Following this interest, several sophisticated web mapping services have been developed based on open and re-use data policies and the concept of the Multipurpose Cadastre. However the majority of the existing projects present a lack of a real marine cadastral registration component appropriate for secure process for transfer of titles, establishment of mortgages etc.
2	**Land cadastre is partially a good analogy to the Marine Cadastre.** Tough principles of the land cadastre might be similar to that of the marine cadastre however we do see differences. We have surely seen and we can use the analogy with the land cadastre, if it comes to the system for registration. On the other hand the legal framework differs and the dynamics are entirely different: limited amount of sea parcels and limited amount of transactions. This affects the solution and appearance of the marine cadastre.
3	**The Marine Cadastre is a base layer of the Marine Spatial Data Infrastructure offering fundamental information relating to maritime boundaries and associated rights and responsibilities, regularly updated and maintained.** However the study identified that the MSDI is at an early phase in Europe. It is anticipated though that as the need for boosting the 5 sectors of the Blue Economy gains increased focus at the EU level, more information systems will be developed in the Member States. Subsequently, the need for authoritative data relating to boundaries and spatial extents of rights associated with human activities in the sea will increase in the near future.
4	**Marine Cadastre is not Maritime Spatial Planning but it's the most important underpinning data sources to enable its implementation.** The growing emerging concept of Maritime Spatial Planning since mid-2000 both in academic research as in implemented projects has created misconceptions with Marine Cadastre. As we have seen from our survey, many people refer to Marine Cadastre when they have MSP in their minds. Therefore conceptual clarifications are needed: Marine Cadastre is not Maritime Spatial Planning. MSP is a process determining where and when human activities happen in the sea. The Marine Registry and Cadastre is a system providing all the necessary information (who, how, where) about the 3R's (rights, restrictions, responsibilities) associated with human activities on the marine environment. In fact the Marine Cadastre provides the most important underpinning data sources to enable MSP implementation since the process of planning requires the knowledge of boundaries and related cadastre information. Therefore Marine Cadastre can facilitate decisively the process of MSP.

4. Main conclusions and way forward

Main conclusions

5	**The EU relevant policy framework recognizes the necessity to attain "legal certainty" in the marine environment.** However it is the cross cutting tool of the Maritime Spatial Planning which has been identified as the most appropriate to achieve legal certainty for all stakeholders in the maritime arena, to enhance the investment climate in Blue Economy Sector and to reduce transaction costs. The study identified further that there is no kind of reference to the notion of "Marine Cadastre" in the EU's legal framework. Instead, the "spatial dimension" on the administration of the marine environment is being reflected in the 2014/89 EC Directive (MSP), though without any explicit link to the rights which are associated with the human activities in marine areas. The same applies to national legal frameworks where only a few cases were identified with specific reference to registrations in the sea environment.
6	**The most relevant data to a Marine Cadastre are recorded under the theme of "Human Activities" in the EMODNET portal.** However the study identified that the information provided through EMODNET portal is of a static nature, more suitable for other purposes (e.g. statistics, planning, research), whereas the "legal" component (validated and authoritative information about associated rights) does not seem to be fully nor properly developed to support the "offshore property" market. The same also applies to the "spatial" component where authoritative and updated data are needed to secure interests, restrictions and responsibilities of Member States, industry and citizens.
7	**A wide array of actors and stakeholders are involved in the management of the marine environment and production of marine data, though the competent national Land Registry and Cadastre organizations have been scarcely so far engaged.** The study revealed that responsibilities and jurisdictions in the marine environment (demarcation of coastline, delimitation of marine areas, granting of rights and permits, concessions, planning, protection) are scattered and shared over a diverse and multiple range of actors (national authorities, institutes, organizations). The same complicated pattern exists in the production, collection, maintenance and dissemination of marine data while restrictions on access have been detected.
8	**Existing Marine Information Systems (either operative or on pilot basis) are developed either on the concept of EMODNET or to serve other needs (ICZM strategy, MSP, marine areas' delimitation) but not a Marine Cadastre.** The currently developed (IT) systems and information portals have a rather statistical and descriptive nature. Apart from the fact that typical cadastral information on (ownership) rights and restrictions is lacking, the process of actively maintaining data is not present. The registration is a dynamic process that induces a constant updating (adding, changing, deletion) of the registered data. The quick and easy retrieval of data is an important aspect of the IT-system, and that is not a strong point either in EMODnet and various national portals studies.

4. Main conclusions and way forward

Way forward: Indicative areas for further action

The current study is considered as preliminary and is aiming among others at detecting the extent of interest in the topic of Marine Cadastre by the national Land Registry and Cadastre organisations, other competent national authorities and/or European institutional bodies and administrative organs. Therefore any follow up initiative on behalf of the 5 Common Vision Partners should be inter-related with feedback and interest that may be expressed by national or European authorities.

Thus, a number of follow up studies that could be undertaken in a next phase is presented here:

Develop a blue print for the marine cadastre

For the preparation of a blue print, the main technical, legal, institutional and operational aspects of a Marine Registry and Cadastre would be identified including business processes and information supply. The issues to be investigated further include the optimal spatial boundaries (landward/seaward) of a Marine Cadastre, the best wise approach for the design and development of a Marine Cadastre, the type of data that should be registered, the issue of 4D rights in marine space as well as other legal aspects dealing with multiple interests for the same space at the same time etc. and lastly the institutional aspects for the best organisation of a Marine Cadastre within the administrative system of a country.

Carry out market study and perform user need assessment

If we have a look at the conclusions we must admit that to some extent we made assumptions on what users really need in terms of a marine cadastre. Starting from the ideal-typical set of arguments, we need to check what outspoken needs for a marine cadastre really exist. We need to check whether the blue economy is indeed supported by better registration of rights and that the propose solution will work.

Prepare proposals for improvement of the EU-framework

The EU legal framework should be more directive regarding the provision of registration of rights, licenses, concessions and all kind of restrictions. Basis for the framework should be the UNCLOS and relevant EU Directives. In this study elements for the framework are proposed.

Prepare positioning paper for national authorities

Based on the results of this study and with additional findings from further studies we will draft a white paper to unfold our recommendations. Whether that can be a paper that has a more general character or that we will be able to draft a country-specific one is to be seen, and is depending on available information, resources and time.

Epilogue: Rationale and contours of Marine Cadastre

I. Why a Marine Cadastre in Europe?

The relevance of a Marine Cadastre originates from:

- **The need to implement the UNCLOS thus guaranteeing and securing sovereign state rights in the sea area**: A Marine Cadastre that records obligations and restrictions deriving from the delimitation of marine areas according to the Convention will inform all persons concerned and contribute without any doubt to their enforcement, guaranteeing decisively the sovereign state rights. The information contained in a Marine Cadastre relating to the patrimonial rights that exist in the territorial sea and the EEZ waters and the soil and subsoil of these areas, will also prove very useful in that it will inform the authorities and all other stakeholders about the legal holders (owners, lessors, users, license holders, etc.) and exact content and location of these rights.

- **The need of publicity and legal certainty in the marine environment to reduce conflicts on the overlapping rights, interests and responsibilities:** Registration is the recording of deeds relating to the creation or transfer of rights in rem in immovable goods (or ships) or relating to charges or restrictions encumbering immovable goods (or ships) on specific registers kept at public land or ship registries. Registration is a legally acknowledged proof that the rights of the registered owner, beneficiary, transferee, mortgagee etc., are protected against third parties (deed system) or that the registered person is really legally entitled to the right (title system). Publicity and legal certainty resulting from registration are of paramount importance for a sound real estate market and a performing credit sector, and ultimately for a thriving economy as such. This means that the establishment of a marine cadastre that identifies and describes the physical parcel and its boundaries, should have to be flanked by registration in the registers of the deed creating or transferring the rights, charges or restrictions with respect to the marine cadastral parcel.

- **The need to enhance public revenues deriving from the taxation of marine patrimonial rights and exploitation of marine resources**: As with the land-based cadastre which was primarily established for taxation purposes, likewise, a marine cadastre would lay the foundation for a fair taxation system allowing to tax both sea-related property and sea-generated incomes. In the Exclusive Economic Zone (EEZ), taxation on property and incomes would obviously only be possible following prior registration of the offshore units under a national flag, ideally pursuant to international conventions concluded at the initiative of the International Maritime Organisation (IMO) and/or of the Comité Maritime International (CMI).

- **The need to implement binding legal provisions for maritime spatial planning**: The European Commission attaches much importance to the establishment and implementation of maritime spatial plans by Member States, with the aim of promoting sustainable growth of maritime economies, sustainable development of marine areas and sustainable use of marine resources. A marine cadastre that records general marine spatial planning restrictions, such as shipping routes, fishing and aquaculture zones, disposal sites, energy atolls, corridors for cables and pipelines, nature reserves, etc.

will inform all persons concerned and will certainly contribute to their enforcement.

- **Ultimately it is anticipated that a Marine Cadastre will benefit the development and growth of a sustainable Blue Economy.**

  From the study is becomes more and more clear that a Marine Cadastre can support the Blue Economy. As we have seen with security of land tenure and/or land rights, they foster in general economic development, especially in those sectors where large investments in constructions are required to do business. For the priority sectors as defined in the Blue Growth programme, this will focus on aquaculture and energy production, where large investments are needed and financial risks are manifest.

Epilogue: Rationale and contours of Marine Cadastre

II. What inside a Marine Cadastre?

As being said, it was out of the scope of this study to outline the features of an ideal Marine Cadastre or to develop a blue print. However, as a hint to the debate about the contents of a Marine Cadastre, this section aims to describe briefly the short of rights and restrictions to be encompassed in a Marine Cadastre. A public registration needs to be based upon a cadastre[14] that locates, delimits and describes the cadastral object and records and indicates its use as well as all relevant public and private rights, restrictions (including inter alia the planning restrictions) and charges on that cadastral object. Likewise, an effective registration system regarding marine patrimonial rights, charges and restrictions can only be effective if an accurate Marine Cadastre is established and updated according to the latest state of the art technology. To this end, actual spatial data regarding the location and description of the maritime boundaries (the basic cadastral information) is to be completed by the following information regarding UNCLOS rights, charges and restrictions and the national patrimonial rights that a Marine Cadastre would take into account (De Latte, 2016b):

Table 1: Rights and restrictions in the Territorial Sea to be registered in a Marine Cadastre

1. the sovereignty exercised by the coastal state
2. the public rights, responsibilities and restrictions that define the sovereignty of the coastal state according to the UNCLOS i.e.:
▪ **the paramount right of innocent passage;** ▪ **the fishing rights in favour of other states ;** ▪ **the general marine spatial planning restrictions** *(e.g. shipping routes, protected sandbanks, special fishing and aquaculture zones, areas for sand and gravel exploitation, energy atolls, areas for wind farms, corridors for cables and pipelines, disposal sites for dredged material, extension zones for ports, sites for coastal protection, zones for military exercises, protected wrecks and underground cultural heritage)****;** ▪ **protection and preservation of the marine environment ;** ▪ **conservation of living and non-living resources;** ▪ **marine scientific research;** ▪ **protection of archaeological and historical objects found at sea;** ▪ **private rights in personam based on licenses, concessions or leases granted by the coastal state to companies for exploration and exploitation of the territorial sea** *(e.g. sand and gravel extraction, crude oil and natural gas extraction, mining, fishing, aquaculture, energy production, dumping of dredging material etc.)* **– these rights are temporary in that they only last for the duration of the licenses, concessions or leases;**
3. public and private rights in rem (patrimonial rights)
▪ **the overall public property of the soil and subsoil and its resources *('public domain' of the coastal state);*** ▪ **the private property rights and other rights in rem owned by the holders of licenses and concessions with regard to:** – **immovable goods** ***(****offshore units fixed to the seabed & pipelines and cables if fixed to the seabed or embedded in the subsoil*) **–** the property rights to these goods are temporary in that they only last for the duration of the licenses, concessions or leases**;** – **movable goods** *(mobile offshore units & pipelines and cables lying on the seabed without being fixed to it & living and non-living resources appropriated pursuant to the licences, concessions or leases but only for the* – *duration of these licenses, concessions or leases*).

[14] In this context a 'cadastral object' means: a cadastral parcel on the seabed of the territorial sea or a delimited and geographically described part of the seabed of the EEZ where the foundations of fixed offshore units (such as wind farm turbines, platforms for drilling, elevating and other activities, aquaculture installations, energy production and stockage facilities, scientific research installations) are imbedded; this 'cadastral object' would also include an accurate description of the fixed offshore units concerned.

Epilogue: Rationale and contours of Marine Cadastre

II. What inside a Marine Cadastre?

Table 2: Rights and restrictions in the Exclusive Economic Zone to be registered in a Marine Cadastre

1. the sovereign economic rights granted under UNCLOS to the coastal state;
2. the rights, responsibilities and restrictions that define the sovereign rights of the coastal state i.e.:
▪ ***the paramount right of free navigation and overflight ;***
▪ ***the right of other states to lay and maintain cables and pipelines;***
▪ ***the fishing rights in favor of other states (pursuant to European or international law or bilateral agreements);***
▪ ***general marine spatial planning restrictions (****shipping routes & protected sandbanks & special fishing and aquaculture zones & areas for sand and gravel exploitation & energy atolls & areas for wind farms & corridors for cables and pipelines & disposal sites for dredged material & extension zones for ports & sites for coastal protection & zones for military exercises & protected wrecks and underground cultural heritage****);***
▪ ***protection and preservation of the marine environment;***
▪ ***conservation of living and non-living resources;***
▪ ***marine scientific research;***
▪ ***protection of archaeological and historical objects found at sea;***
▪ ***private rights in personam*** *based on licences, concessions or leases granted by the coastal state to companies for exploration and exploitation of the EEZ (e.g. sand and gravel extraction, crude oil and natural gas extraction mining, fishing, aquaculture, energy production, dumping of dredging material etc.) - these rights are temporary in that they only last for the duration of the licenses, concessions or leases****;***
3. private rights in rem (i.e. the private property rights and other rights in rem owned by the holders of licenses, concessions or leases. Those property rights and rights in rem or patrimonial rights exist with regard to following goods which are to be considered as 'movables'):
▪ ***fixed and mobile offshore units (****artificial islands, installations and structures) – the rights to fixed offshore units are temporary in that they only last for the duration of the licenses, concessions or leases involved. The licenses, concessions or leases having allowed for their construction;*
▪ ***pipelines and cables lying on the seabed or embedded into the seabed;***
▪ ***living and non-living resources appropriated pursuant to the licences, concessions or leases but only for the duration of the licences, concessions or leases involved.***

It is obvious that Marine Cadastre is a topic of high interest to many countries in the world, in terms of guaranteeing and securing their national interests from an economic, environmental and social point of view. The experience gained through this study and the fact that the land cadastre in many countries is extending to include the coastline while much of the technology that is used in land surveying is applicable to the marine environment as well, showed us that **the effective management of the marine environment requires a multidisciplinary approach** while further **we understand that land and sea should be treated in a holistic and integrated manner**. To this end, we have the perception that the **experience and expertise of the 5 Common Vision partners** in the fields of Cadastre, Registry, Surveying, Mapping and Spatial Data Infrastructures **should be taken into account to the new topic on the exploitation and sustainable management of the oceans and seas of the European Union**. This is a challenge for both land surveyors and for marine industries as well, to embrace the role of surveyors as not just 'land' related, but having the expertise to help spatially define and administer the marine environment l (Williamson et.al., 2005).

Annex: The project team

The following experts participated in and contributed variously to the elaboration of this preliminary study for on the Marine Cadastre in Europe (listed in alphabetical order):

- **Magdalena Andersson**, Sweden, Business developer, Lantmäteriet
- **Evangelia Balla**, Greece, Member of the Scientific Council, NCMA S.A., PCC
- **Maurice Barbieri**, Switzerland, President CLGE
- **Guido De Latte**, Belgium, Ship Registrar, ELRA
- **Gordon Johnston**, UK, RICS surveyor expert
- **Gerard Leenders**, Netherlands, Expert EULIS / Kadaster
- **Ivana Racetin**, Croatia, Associate Prof, University of Split/Chamber of Chartered Surveyors
- **Enrico Rispoli**, Italy, Board member Consiglio Nazionale Geometri e Geometri Laureat
- **Maria Scorza**, Italy, staff member Consiglio Nazionale Geometri e Geometri Laureat
- **Per Sörbom**, Sweden, Head of section, property information management, Lantmäteriet
- **Karen Schweigler**, Netherlands, Management Assistant Kadaster
- **Nicolas Smith**, France, Vice-President CLGE
- **Haico van der Vegt**, Netherlands, NSDI-expert Kadaster
- **Rik Wouters**, Netherlands, Managing Director EULIS
- **Marjana Zelic**, Croatia, Expert EuroGeographics

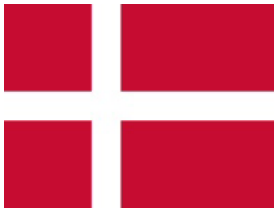
Appendices

Appendix 1 : Status by country[1)]

Austria 	Not a Marine Cadastre or a Marine Data information system.
Belgium 	No Marine Cadastre exists. However there is: a) a maritime spatial plan for the Belgian part of the North Sea and b) a Belgian coastal atlas covering the EEZ of Belgium and the coastal municipalities. The Maritime Spatial Plan was officially approved in 2014 (Royal Decree of 20th March 2014) from the coordinating authority which is the Ministry for health, food chain safety and environment. Another important organization is the Ministry of Finance (General Patrimonial Documentation Administration AGDP/AAPD) which is responsible for cadastre and land registration in Belgium). *(The MSP is freely available here http://www.health.belgium.be/en/marine-spatial-planning).* The Belgian coastal atlas was published as a response to the European Recommendation in ICZM, to Provide an overview of the key topics for the Belgian Coast. The atlas provides interactive and downloadable maps and data, GIS. As of 2010 has included 33 datasets of general categories (such as geography and spatial structure, the physical environment, integrated coastal zone management, use of sea areas, nature and environment, tourism and recreation, industry and companies, fisheries and agriculture, architectural patrimony and culture, living at the coast, coastal defense) Planned improvements to the Atlas include: Updating the atlas, Providing more interactive maps, besides the static (and easy to use) maps, Integrating sustainability indicators into the atlas, Including more marine information.
Croatia 	At the moment there is no Marine Cadastre project active in Croatia, but in the past there were two such projects *(pilot project in partnership with Norway and National Real Property Registration and Cadastre Program, known as « Organised Land »*). There is an existing system for determination of the Marine Cadastre, especially its land border (legislative and technical protocols). Its lead organization is Ministry of Maritime Affairs which is responsible for the marine protection in the country. There is no public web site. For the moment is not INSPIRE compliant. It concerns the marine area of the whole Adriatic east coast of the Republic of Croatia.
Cyprus 	No Marine Cadastre exists. However preparations for the implementation of the MSP Directive are already in place. In particular, a Committee for Maritime Spatial Planning and Integrated Coastal Zone Management has been established by the Ministerial Council since 25/07/2012. Its role is to give its proposals about Maritime Spatial Planning (zoning all maritime activities) to decision makers. The Cyprus Lands and Survey Department is a member of this committee and its role is to give the spatial infrastructure for maritime planning. In order to gain experience in Maritime Spatial Planning in 2013 a program was awarded to a partnership from Cyprus and Greece. The program's (THAL-CHOR) objective is to develop Maritime Spatial Plans for a pilot area. The program ended in September 2015. It is under the auspices of the INTERREG GRECE – CYPRUS. In Cyprus the lead organization for Maritime Spatial Planning is the Department of Merchant Shipping and for Integrated Coastal Zone Management the leader organization is the Department of Environment. All marine data are freely available except from classified which are referring mainly to the marine archaeological sites. The marine data are being collected by the Department of Lands and Surveys while the Oceanographic Centre of the University of Cyprus is another stakeholder. There are multiple actors exercising responsibilities on marine protection such as the Department of Environment, the Department of Merchant Shipping and the Department of Fisheries and Marine Research.

[1)] The Appendix includes not all EU Member States, but only those for which information has been gathered through the Questionnaire. For more country information you may refer to the contact persons listed in appendix 2.

Appendix 1 : Status by country[1)]

Denmark 	Denmark is demonstrating a rapid pace towards the development of a MSDI and "expansion" of the land cadastre to the sea territory. Specifically with regard to the MSDI, in 2015, together with 10 other agencies, the Danish Geodata Agency initiated the implementation of a Danish MSDI. The aim of establishing a Danish MSDI is to make marine spatial data easily accessible and available for comparison and exchange across the maritime authorities for various purposes. In addition, the idea is that the MSDI will be able to provide information on the data in question (metadata), e.g. when the data was collected and updated, how the data can be accessed, the quality hereof and so on. The MSDI will be implemented and authoritative data and associated services will be made available during the period 2015-2016 (see here http://eng.gst.dk/danish-hydrographic-office/msdi/). The Danish Geodata Agency is responsible for collecting, managing and publishing hydrographic data, including nautical charts and nautical publications. As of 2016, will also have responsibility for registering buildings on the sea territory in the Danish cadastre, in conjunction with new responsibility for registering buildings on rented property. These will be registered as simple polygons, at sea mostly in relation to offshore wind turbines and similar structures. The Danish Nature Agency under the Ministry of the Environment has lead responsibility, but a range of other public bodies hold responsibilities as well for elements of marine protection (ie. coastal planning, dredging and depth maintenance, monitoring maritime air emissions, etc.) As regards the Open Data strategy in Denmark, the "Basic Data Programme" is an initiative under Denmark's Government Strategy which makes a range of public sector data freely available for public use. The programme came into effect in January 2013 and encompasses a range of Geodata but it doesn't include hydrographic data. Denmark's Ministry of Finance is responsible for the programme and the related strategy.
Estonia 	In Estonia there is not such a Marine Cadastre but there is a specific "Marine Areas Application" which operates within the context of the "Geoportal" of the Estonian Land Board (see here http://geoportaal.maaamet.ee/eng/ and here http://xgis.maaamet.ee/xGIS/XGis?app_id=PRIM01&user_id=at&bbox=270365,6326119.04648526,741174,6705114.95351474&LANG=2). The lead organization is the Estonian Land Board which provides the relevant interactive maps while attribute data are coming from the Estonian Maritime Administration. It is INSPIRE compliant and it encompasses data for the whole Estonian marine area in Baltic Sea. The available datasets are including everything important for marine navigation: Sea depths, Lights, harbor information, buoys, beacons, submarine cables and networks, obstructions, wrecks etc. The competent national authority for marine protection is the Estonian Maritime Administration.
Finland 	Paikkatietoikkuna (www.paikkatietoikkuna.fi) is the finnish SDI. Unfortunately, an MSDI is not available probably due major organizational changes of breaking down the Finnish Maritime Administration in to private companies in 2010 and the Finnish Maritime Research Center between the Finnish Environment Institute and Meteorologial Instutute a few year earlier. The governmental Traffic Agency has however promised that marine products will be opened "little by little" (Traffic Agency web page, 2013). The SDI has in any case been a success, with over 40,000,000 service requests monthly in 2012 . The Finnish Transport Agency's Hydrographic Office is responsible for the hydrographic operations in Finland. The Hydrographic Office publishes electronic and printed charts of the Finnish coastal areas and inland waterways, and maintains a chart updating service. It also maintains a hydrographic data service and publishes information related to nautical charts. The following web-sites provide relevant information: http://www.liikennevirasto.fi/web/en/merchant-shipping/paper-charts#.V5es6_mLTIU http://www.bshc.pro/services/ http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11FIv12%200.pdf http://www.paikkatietoikkuna.fi/web/en/sdi-in-finland http://www.syke.fi/en-us/Research__Development/Sustainable_management_of_the_Baltic_Sea_and_freshwater_resources/Information_and_data_systems http://www.ymparisto.fi/en-US/Sea http://www.helcom.fi.

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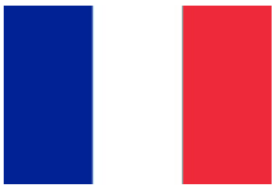
France 	With over 11 million km2 of marine waters, including its overseas territories, France has the second largest exclusive economic zone in the world. France has declared an EEZ off its coasts in the North Sea, the English Channel, and the Atlantic Ocean—but not the Mediterranean. In France exists a Sea and Coastline portal (Portail du littoral et de la mer) which has been developed by the "Ordre des Geometres-experts" (Smith, 2016). The portal addresses all the marine and coastal data as well as the conflicts of "use" rights (overlapping uses, granted rights) and is INSPIRE compliant. It's a tool to collect all the cartographic and regulatory (zoning and associated texts) data concerning the coastal area and the maritime public area; the sea boundaries are the territorial waters and at the current stage of development the portal targets 2 pilot areas: one near Marseille and one near Sete (at the Mediterranean Sea). In France it has been reported the existence of restrictions on access to marine data and a diversity of actors which collect, manage and publish marine data or hold responsibilities on the marine environment such as the State, Water Agencies, Nature Reserves, IFREMER. The French National Hydrographic Service web site www.shom.fr provides bathymetry, tides and currents data.
Germany 	Marine Spatial Data Infrastructure (MDI-DE) exists already in Germany (https://www.mdi-de.org) It has been developed as a supranational network of for the integration of marine data from all relevant data sources (Federal or State Institutions, Research organizations). The project was funded by the German Ministry of Education and Research and a cooperation agreement between the partners for permanent operation was made (Melles J., 2015). The portal (https://www.mdi-de.org) provides access, visualization and search capabilities to marine data on several themes like Human Activities, Wind Parks, Reserves, Federal Waterways, Bathymetry, Geology etc. and is INSPIRE compliant. There is another website (https://www.geoseaportal.de/gdi-bsh-portal/ui) which provides marine data on complementary themes such as Spatial Planning, Shipping, Water Pollution, Marine Environment, Navigation etc. and is operating from the Federal Hydrographic Agency of Germany.
Greece 	Greece has not developed yet a Marine Cadastre, though there is a growing awareness about the benefits of an integrated Marine Information System which could support decisively the objectives of the EU's Integrated Maritime Policy in the sea basins around Greece and boost further Greece's Blue Economy the latter which contributes to a great part on the overall GDP of the country. In particular there are a few research initiatives that have been taken lately towards this direction which aimed at the development of a pilot Marine Cadastre project in the Ionian Sea (Arvanitis, Parri, 2014) and the drafting of principles and technical specifications of a Marine Cadastral System according to the "fit-for-purpose" theory and the specifications of the Hellenic Land Cadastre (Dimitrouli M., 2015). On the other hand, Greece has been involved in the implementation of two Maritime Spatial Planning transboundary Projects (ADRIPLAN and THALHOR) aimed at the preparation of the country to the implementation of the EU Directive 2014/89 on Maritime Spatial Planning. Responsibilities over the protection and management of the marine environment and coastal areas and therefore to the collection, production and management of relevant marine datasets are spreading into the scope of several ministries and governmental agencies, among them the Ministry of Environment and Energy (YPEN), the Ministry of Shipping and Insular Policy, the Ministry of Finance, the Hellenic Navy Hydrographic Service etc. (Balla, 2016a).
Italy 	Italy has a detailed marine cadastre in telematic connection with the international infrastructure of interchange of geographic, spatial and census data. This information concerns the Marine Areas in Italy that extend for 7500 linear km and occupy a coastal area of over 550,000 square kilometres. The coasts and the territorial sea are "public goods for navigation". The Coastal Territory constitutes a particular category of public goods within the larger variety of "state property", that is, state-owned assets. The coastal area is composed of the Maritime Domain and the Territorial Sea. In Italy, the cartographic representation of the national territory is entrusted to the Istituto Geografico Militare of Firenze while the cartographic representation of the sea (maritime cartography) is entrusted to the Istituto Idrografico della Marina Militare of Genova. The update of cadastral data and the specific use of the maritime domain are represented in the portal SID (Information System of the coastal area) managed by the Ministry of Infrastructure and Transport. The Italian Territory, including the Maritime one, is represented geographically by the Military Geographical Institute (IGM) which has the task of providing a topographic support to Italian Units and Army Commands. All information is available through the link: http://www.agenziaentrate.gov.it/wps/content/nsilib/nsi/home/servizi+online/sid

Latvia 	According to the information obtained from the Questionnaire there isn't any Marine Cadastre or Marine Data information system in Latvia. It has been reported that Marine Data are currently scarcely available. On state level, the competent organization is the State Environmental Service (www.vvd.gov.lv).
Portugal 	No information regarding the existence of a MC or an MSDI provided through the Questionnaire. However additional desk research revealed that a partnership (National Land Survey from Iceland, the Norwegian Mapping Authority, and the Portuguese Sea and Atmosphere Institute) has undertaken a project to develop a Marine Spatial Data Infrastructure (MSDI) database to collate and harmonize marine data spread over institutions and connect the data to geographical information, ensuring better coordination and information sharing. MSDI will integrate technology, methodology and scientific standards with policy and serve as a basis for decision-making.
Romania 	It has been reported the absence of a Marine Cadastre or a Marine Data information system. The competent national organization for collecting, managing and publishing hydrographic data and nautical charts or conducting hydrographic surveys is the Maritime Hydrographic Directorate (MHD) which is member of the IHO (International Hydrographic Organization). The MHD in addition to supporting the safe navigation at the Black sea, underpins almost every other activity associated with the sea, including the resource exploitation, fishing, minerals, maritime boundaries delimitation, national marine spatial data infrastructure, coastal zone management, marine science etc.
Slovenia 	In Slovenia Marine Cadastre has been established with the Water Act and covers Territorial sea waters of Slovenia. Data (land parcel and cadastral community) are registered within land cadastre data base at Surveying and Mapping Authority of the Republic of Slovenia (www.gu.gov.si). With the Decree on designation of the sea fishing area of the Republic of Slovenia fishing zones were established. The Maritime Code of the Republic of Slovenia defines internal and territorial waters and Slovenian ecological protection zone and High Seas in Adriatic Sea. The competent national authorities for marine protection are the Ministry of Infrastructure (Slovenian Maritime Administration, www.up.gov.si/en) and the National Institute of Biology (Marine Biology station Piran, www.mbss.org). Ministry of Infrastructure is also responsible for hydrographic activities and safety of navigation. Geodetic institute of Slovenia is responsible for collecting, processing and publishing of hydrographic data and information, including nautical charts and publications. Ministry of the Environment and Spatial Planning is responsible for maritime planning in the coastal area and sea under Slovenian jurisdiction.
Spain 	As regards the coastal zone, any real estate in this area is being surveyed by the Coastal Demarcation office from Ministry of Environment, registered in the land register and being depicted on the cadastral map. The coastal boundaries of the public maritime areas are available online on the Environment Ministry's website, and also from there link with the Virtual office of cadastre. An SDI with geographic information about the marine areas exists. The available Information is related to bathymetry, nature of the seabed, administrative, legal and marine limits, fishing areas (shoals), artificial reefs, proposed Protected Marine Areas, marine bioregions and other environmental parameters. The Spanish SDI initiative about land data has reached a very high level of development and outreach, but it is necessary to make an effort to extend SDI paradigm to marine and coastal information. The Spanish NSDI (www.idee.es) http://www.iho.int/mtg_docs/com_wg/IRCC/EC_IHO/EC-IHO-04/Documents/7%204th%20IHM_MSDI.pdf has a data layer about Hydrography however it seems that the available data are related to inland waters. The Spanish Hydrographic Institute as of 2013 was planning to provide Web Mapping Services on electronic Navigational Charts, the Spanish coastline (scale 1:50,000), Baselines (from which maritime boundaries are defined) and maritime boundaries. As regards the maritime spatial planning, a number of initiatives related to MSP (i.e. MPAs, Natura2000, renewable energy) are underway, but so far, no multi-sector MSP initiatives have been developed (source http://www.unesco-ioc-marinesp.be/msp_around_the_world/spain)

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Sweden 	The rights as to the Sea are based on international law; Law of the Sea, as well as on national law and agreements between nations. The concept of rights may differ between countries. In Sweden the Law (1950:595) on Boundary to Public Water defines the context of public water. "A water area in the sea is public (public water) if not included in a real property (private water)". Sweden has public water along the coastline, the islands of Öland and Gotland and the following four lakes; Vänern, Vättern, Hjälmaren and Storsjön. A real property in Sweden consists of land and can also include water (e.g. in the sea, lakes, rivers and wetlands). The Law on Boundary to Public Water also defines the area in the sea that are included in the real properties. The Land Code (1970:994) refers to the regulations on boundaries to public water. Public water in the territorial sea is managed by the state within the context of national and international legislation. The government could be seen as having a right to provide a "disposition right" in its territorial water. This right is a non-exclusive right but is a requisite for e.g. environmental impact assessment in Sweden. The fact that it is more of an "entitlement" and not an "exclusive right" puts the issue of different tenure systems in the spotlight and how to manage different types of tenure systems.
The Netherlands 	Over the years an information infrastructure is in place in the Netherland's EEZ which is basically operated on a cooperation base among several agencies. The Dutch Kadaster itself extends to the national boundaries. This information infrastructure is covering the territorial waters and EEZ of the Netherlands and is partly compliant with INSPIRE. Responsibilities over the marine protection are falling under the Ministry of Infrastructure and the Environment (along with its competent agencies) and the Ministry of Economic Affairs which is responsible for most of the marine resources. It has been reported as well that the "built-up' area at sea expands most notably related to wind parks and cables and pipelines. Indeed, the Dutch part of the North Sea, covering an area of about 58,000 km2 (one and a half the land mass of the Netherlands), is one of the most intensely used marine areas in the world. This fact has created the need for integrated spatial planning which became particularly urgent because of new uses requiring ocean space (primarily offshore wind farms and marine protected areas). While some ocean uses will remain at their current level, considerable growth is forecast for mineral extraction, water sport recreation, offshore wind farms, nature protection and possibly also mariculture. Therefore a North Sea Policy Document 2016 – 2021 that summarizes the Netherlands long term vision (2050) and incorporates a maritime spatial plan which complies with the new EU Directive on Maritime Spatial Planning (Directive 2014/89/EU of July 2014) has been incorporated in the National Water Plan which was updated in 2015 and approved on 12th December 2015 by the Cabinet. It can be found here https://www.noordzeeloket.nl/en/projects/north-sea-policy-in-the-national-water-plan/ . (source http://www.unesco-ioc-marinesp.be/spatial_management_practice/the_netherlands)
United Kingdom 	The concept of marine spatial planning has been developed in the UK with the aim to respond to the need for better access to information to manage the complex and conflicting rights and interests. The concept was tested through a pilot project in the Irish Sea involving England, Ireland, Northern Ireland, Scotland, Wales and the Isle of Man. There are Marine SDI initiatives underway in Ireland and the UK, but these are currently still at a relatively early stage but see below. In 2003 the United Kingdom Hydrographic Office (UKHO) launched the Marine Geospatial Data Infrastructure (MGDI). Yet, the current situation does not fully meet the needs of government, data users or data providers. In order to implement the MGDI, the UKHO was to evaluate the then currently available and existing data and then develop mechanisms for exchange of marine and coastal spatial data. The development of the MGDI was designed to support marine spatial planning (Strain, 2006). The Marine Management Organisation (MMO) was established to develop planning processes and to manage the marine areas for the UK government. This is now developed and includes a Marine Information System which is an interactive GIS spatial planning tool that provides guidance on the planning process. See: http://mis.marinemanagement.org.uk/. Nevertheless it appears to be quite separate from the EMODnet initiative with no mention of this important resource. Rather the MMO site is focused on the process of submitting a plan and the legislation around this. In 2009 the UK Parliament passed the Marine and Coastal Access Act, which created a marine planning system for UK waters and a new body, the Marine Management Organisation (MMO), to administer the system. Scotland is served by the Marine (Scotland) Act 2010, with marine planning for Scotland run via 'Marine Scotland'. The United Kingdom Hydrographic Office (UKHO) makes relevant data sets available in compliance with the (INSPIRE) initiative

Appendix 2: Acknowledgements

Respondents to the Questionnaire

Country	Name	Organization
Austria	Julius Ernst	BEV- Federal Office for Metrology and Surveying
Belgium	Guido de Latte	Ship Registrar, ELRA
Croatia	Ivana Racetin	University of Split, Faculty of Civil Engineering, Architecture and Geodesy, Split, Croatia
Cyprus	Georgios Kokkosis	Department of Land and Surveys
Denmark	Suzanne Dael	Danish Geodata Agency
Estonia	Mairolt Kakko	Association of Estonian Surveyor
Finland	Pekka Halme	National Land Survey (NLS)
France	Mazuyer François	Ordre des géomètres-experts
Germany	Clemens Kiepke	BDVI
Greece	Evangelia Balla	National Cadastre and Mapping Agency S.A.
Italy	Enrico Rispoli	Consiglio Nazionale Geometri e Geometri Laureat
Latvia	Jānis Dreimanis	Court administration
Portugal	Madalena Grade	Instituto dos Registos e do Notariado,IP (IRN,IP)
Romania	Lucian Dumitrache	Direcția Hidrografică Maritimă
Scotland	Alastair Reid	Registers of Scotland
Slovenia	Igor Karnicnik Tomaž Petek	Geodetic institute of Slovenia Surveying and Mapping Authority of the Republic of Slovenia
Spain	Amalia Velasco	Spanish Directorate General for Cadastre
Sweden	Per Sörbom	Lantmäteriet
The Netherlands	Martin Salzmann	Cadastre, Land Registry and Mapping Agency of the Netherlands (Kadaster)
United Kingdom	Gordon Johnston	RICS (UK), Venture Geomatics Ltd (UK)

Appendix 3: Glossary of Terms

The following list contains the terms and description/definitions in the report. The most frequently used abbreviations are also listed in a separate table.

List of Terms and descriptions

Term	Generic description
Blue Economy	The sum of all economic activity that takes place on, in or associated with the oceans, seas, ports, harbours and coastal zones.
Blue Growth	the long term strategy to support sustainable growth in the marine and maritime sectors as a whole having regard that seas and oceans are drivers for the European economy and have great potential for innovation and growth. It is the maritime contribution to achieving the goals of the Europe 2020 strategy for smart, sustainable and inclusive growth.
Copernicus Marine Environment Monitoring Service (CMEMS)	Providing Products and Services for all marine applications
Coastal Mapping	Goal is to survey and thus to provide an accurate, consistent, up-to-date national shoreline. The national shoreline provides the baseline data for making nautical charts and defining the marine territorial limits, as well as the geographic reference needed to manage coastal resources, and for many other uses.
Concession	A (temporary) contractual right to carry on a certain kind of business or activity in an area, such as to explore or develop its natural resources or to operate a “concession stand” within a venue.
Contiguous zone	An area of at most 12 nautical miles next to the territorial zone. The coastal state can monitor it in order to suppress violations of its customs, fiscal, health or immigration regulations. In some countries it does not exist.
Continental shelf	An area of 188 nautical miles next to the territorial zone (to max. 350 nautical miles to the Territorial Sea Baseline or 100 nm beyond the 2,500 isobath, whichever is greatest) having inherent sovereign rights for exploring, exploiting non-living resources of seabed and subsoil plus sedentary species up to 200 nm; beyond the 200 nm submission is required to the Commission on the limits of the continental shelf to confirm rights.
Exclusive Economic Zone (EEZ)	An area of 188 nautical miles next to the territorial zone with sovereign rights for exploring, exploiting conserving and managing living and non-living resources of the water column and underlying continental shelf

Appendix 3: Glossary of Terms

European Marine Observation and Data network (EMODnet)	More than 100 organisations assembling marine data, products and metadata to make these fragmented resources more available to public and private users relying on quality-assured, standardised and harmonised marine data which are interoperable and free of restrictions on use.
Integrated Coastal Zone Management/Integrated coastal management	A process for the management of the coast using an integrated approach, regarding all aspects of the coastal zone, including geographical and political boundaries, in an attempt to achieve sustainability.
Integrated Maritime Policy (IMP)	Policy for the EU, based on the clear recognition that **all matters relating to Europe's oceans and seas are interlinked**, and that sea-related policies must develop in a joined-up way if we are to reap the desired results.
Marine Area	One or more marine cadastral parcels dorming an area with the same owner, and or rights.
Marine cadastre parcel	unit or parcel that reflects: 1. The volumetric reality of every distinct marine zone (sea surface & water column & seabed or soil & subsoil) with: a) the rights and charges under UNCLOS b) the patrimonial rights which include rights in rem and 2. A fourth dimension, meaning the temporary nature of many particular rights because of the time aspect of most sea-linked activities (fixed terms licences, concessions and leases for mining, production of energy, aquaculture, fishing, etc…).
Marine Cadastre	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 neighbouring or underlying rights and interests. (Robertson et al., 1999).
Marine environment	The oceans, seas, bays, estuaries, and other major water bodies, including their surface interface and interaction, with the atmosphere and with the land seaward of the mean high water mark.
Marine Protection	Protection of all living and non-living resources in the marine environment.
Marine zones	All zones related to maritime rights e.g. coastal zone, EEZ, contiguous zone, territorial coastal waters, continental shelf.
Maritime interests	Interests related to the maritime cadastre e.g. fishing rights, shipping routes, renewable energy
Maritime rights	Rights related to the maritime cadastre e.g. fishing rights, shipping routes, renewable energy
Maritime spatial planning	A maritime spatial plan is intended to regulate the use of the marine area/areas it covers. Process which has the aim of establishing a binding plan which organizes all economic and ecological activities in a given geographical sea area.
Territorial sea / Territorial waters / Territorial Zone	An area of 12 nautical miles starting from the baseline (the mean low water mark) at the coast

Appendix 4: Abbreviations

List of abbreviations

CMEMS	Copernicus Marine Environment Monitoring Service
EC	European Commission
EESC	European Economic and Social Committee
EEZ	Exclusive Economic Zone
EMODnet	European Marine Observation and Data network
JRC	Joint Research Centre
LADM	Land Administration Domain Model
ICZM	Integrated Coastal Zone Management
IMP	Integrated Maritime Policy
MSP	Marine spatial planning
UNCLOS	United Nations Convention for Law on Seas

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***"μέγα γὰρ τὸ τῆς θαλάσσης κράτος"*, Περικλής**

(*"Great is the might of the Sea"*, Pericles)