



# MERMAID

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<b>Contributors:</b>	<p>AUEB-RC; Names of Researchers: Prof. Phoebe Koundouri, Vasilis Babalos, Yannis Anastasiou, Antonis Antypas, Nikolaos Kourogenis, Aris ousoulides, Marianna ousoulidou, Mavra Stithou</p> <p>DLO; Names of Researchers: Dr. Marian Stuiwer, Sander van den Burg, Robert Jan Fonteijn, Thorbjørn Harkamp (Musholm), Lisbeth Jess Plesner (Dansk Akvakultur / The Danish Aquaculture Organisation)</p> <p>UniBO; Names of Researchers: Prof. Barbara Zanuttigh, Prof. Fabio Zagonari</p> <p>UC; Names of Researchers: Prof. Inigo Losada, Raul Guanche</p>

<b>Work Package Leader Responsible:</b>	Prof. P.Koundouri, AUEB-RC
<b>Reviewed by:</b>	All task partners

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# **Chapter 1: Introduction and scope of the deliverable**

## **1.1 Goals and objectives of the deliverable**

European oceans will undergo massive development of marine infrastructure in the near future. The most prominent of these events are the development of energy facilities e.g. offshore wind farms, exploitation of wave energy, expansion of electricity connections, and further development and implementation of marine aquaculture.

The feasibility of these economic development and type of projects is sensitive to the implicit and explicit costs of the development and installation of these infrastructures. Both for offshore renewable energies and for aquaculture a non-trivial part of the costs is the identification of the legislation and policies in site that regulate and sometimes limit the development of large-scale projects. This all implicates the need for smooth and simplified procedures for developers and all relevant end-users of the project.

The main objective of this document is to review the existing legislative framework & policies regarding offshore wind farms and aquaculture in EU. In particular, a very challenging task inherent to the development of, for instance, aquaculture is the identification of the strict environmental legislation pertaining to international, regional, national or local scale. Moreover, some important issues that might set constraints to the development of projects of this type would be related to Exclusive Economic Zone (EEZ) of involved countries, sea traffic and air traffic regulations or national defense and marine archaeology matters.

The EU energy strategy “Energy 2020” has the objective of reducing greenhouse gasses by at least 20 %. To reach this goal up to 140 GW of offshore wind are currently being planned by European utilities, developers and governments. To reach this ambitious high implementation, offshore wind will take up large areas of available ocean space; furthermore the development has to be optimized in order to minimize the cost of energy. Even though EU is well placed to profit on the global growth in aquaculture the European aquaculture industry has faced stagnation of production. In order to fulfil EU strategies (1) for reduction of fossil-based energy and (2) to become a major player in sustainable aquaculture, advances have to be made on:

- Project development and management
- Technological and scientific improvements for large scale implementation of offshore devices for energy extraction and aquaculture

- Socio economic and environmental impact shall be optimized for the benefit of industry and welfare.

In light of this, the MERMAID project, will develop concepts for a next generation offshore platforms for multi-use of ocean space for energy extraction, aquaculture and platform related transport. Different kind of concepts, such as a combination of structures or complete new structures will be examined under different conditions. No new platforms are going to be built during the project wherefore the concepts will be theoretically examined on typical realistic sites. Using the sites for virtual platforms various concepts for multi-use of the ocean space will be compared and the strengths and weaknesses related to the technical, operational, economical and environmental benefits and impacts will be assessed. Using test sites with contrasting environments specific challenges will be revealed covering the range of offshore environments in EU; such as economical challenges, technical challenges environmental challenges, and also challenges that are site-specific. Addressing the challenges will lead to optimized project development, best technical practices, a minimum of negative environmental impact, and improving the feasibility. In the MERMAID project, four offshore test study sites with typical environmental characteristics are considered:

1. The Mediterranean Sea - a typical sheltered deep water site.
2. The Atlantic Ocean - a typical deep water site
3. The North Sea-Wadden Sea - a typical active morphology site
4. The Baltic Sea - a typical estuarine area with fresh water from rivers and salt water.

The ultimate scope of MERMAID is to preserve the marine environment and facilitate the development of its vast potential, thus serving the European societies and its welfare. When dealing with such complex systems; it is crucial that decision making is based on sound scientific knowledge, provided by the European research community. MERMAID aims for the sustainable integration of multi-use offshore platforms. This implies the integration with stakeholders; the socio-economic viability of multi-use offshore platforms and moreover the environmental and ecological sustainability.

Large-scale projects on European oceans, like MERMAID, usually involve more than one country while project's benefits and costs might affect various aspects of social, economic and ecological aspects of life in the neighboring areas. To this end, anyone interested in financing or developing off-shore marine platforms for energy production or aquaculture should be aware beforehand and comply with all relevant rules and policies that are in force.

Developing off-shore platforms thus, should abide by various rules and policies regulating the use of the sea waters off the coasts of neighboring nations together with rules protecting the area below the surface, i.e. sea bed and above the sea surface that is air-space.

Some examples: developing offshore platforms requires the exploration of the sea-bed in order to ensure that there is no archaeological interest beneath the platform that might be endangered by the project. In a later phase of the project and in case that the platform will host wind turbines it must be equipped with proper lighting and be ensured that air-traffic rules are not violated. Finally national defense issues such as military facilities within the physical boundaries of the selected site might set additional constraints to the development of marine site platforms and should be accounted for.

Therefore it is necessary to draw the relation between the development of offshore wind farms and aquaculture and the key principles of an ecosystem based management (EBM). Even though EBM is universally acknowledged as an approach that accommodates the complete set of interactions within an ecosystem, including humans, rather than accounting for single issues, species, or ecosystem services in isolation its application is still insufficient. EBM could be bolstered by tools such as marine spatial planning (MSP) and Ocean Zoning (OZ). MSP is an integrated planning framework to manage human activities in space and time to deliver on defined planning objectives whereas OZ consists of a set of supervisory measures designed to enforce marine spatial plans. Theoretically, the fundamental components of monitoring, evaluation and adaptation are essential to ensure that marine management measures are both effective and efficient. Though, applying adaptive management still is confronted with a series of challenges such as policy constraints, difficulties in observing populations and their reactions to interventions, delays in system responses, limits in the ability to delineate all possible states of nature and institutional breach.

A major advantage of MSP is that it allows a swap between resource exploitation and stakeholder interests in an explicit manner (White et al, 2012). MSP has stemmed from the need of settling inter-sectoral and cross-border conflicts over maritime space for various purposes. Moreover, as Ehler & Douvère (2008) pointed out MSP could be considered as a way of enhancing decision making and promoting an ecosystem-based approach to supervising and managing human activities. To this end, the origins of MSP are dependent on land use (spatial) planning, and used as a beneficial planning framework to rationalize develop urban and rural areas, while preserving crucial environmental and cultural values (Douvère & Ehler, 2009) Recently, the EC through its Communication on maritime spatial

planning (COM (2008)791) defines some rather informative principles stipulating that the physical status of the ecosystem in stake is the driving force behind sustainable management of marine regions. Therefore the conservation of the ecosystem is a state-of-the-art objective and MSP serves exactly this purpose. It should also be noted that in the same vein Dolman & Simmonds, 2010 have highlighted the need of strong best environmental practice guidelines for developers of offshore renewable energy facilities. The issue of MSP and its interrelations to various projects has been analyzed extensively in the literature. Ehler and Douvere (2007) offered an elaborate description of MSP. In particular, they stated that MSP is a set of tools and actions of monitoring and distributing the spatial and temporal allocation of human activities in marine areas in order to accomplish ecological, economic, and social objectives that usually have been set through a political process. From the above, it is evident that MSP is the cornerstone of the legislation and policies that regulate and limit the development of human projects that are related to marine environment. It should be also noted that in Belgium the enactment of the Master Plan led to a more comprehensive zoning system for Belgium's marine space resulting in significant reduction in disputes in future planning applications (Douvere et al., 2007). In the same way, a sustainable ecosystem course of action that implemented to all spatial zones would help to balance the playing field among different current and future rival users and uses.

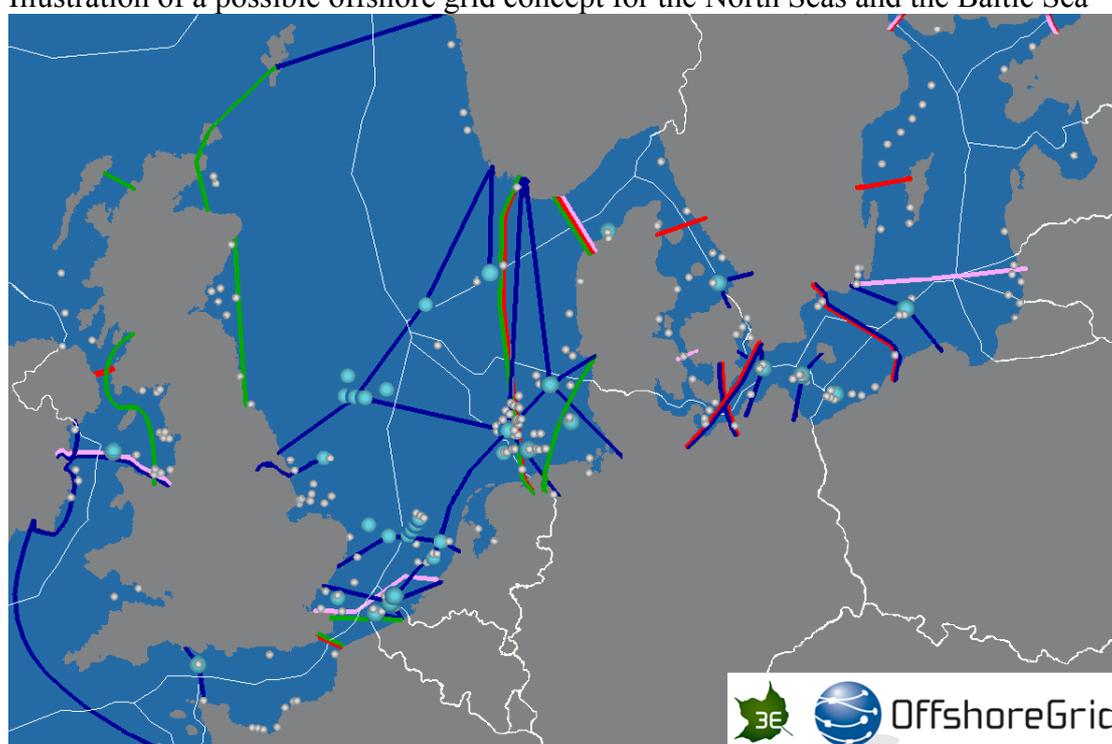
Marine spatial planning (MSP) is mainly determined by top quality objectives such as maintaining Good Environmental Status (GES) of the marine environment that are based on cultural and societal values. To this end, MSP strives to achieve these top quality objectives through the adoption of specific measures. Top-level goals and objectives need to be converted into more operational objectives before specific goals, limits and measures can be elaborated. In order to summarize top-level goals and objectives we have employed a layer approach. The first layer depicts international goals and objectives derived e.g. from United Nations Convention on the Law of the Sea (UNCLOS), Convention on Biological Diversity (CBD) or the United Nations Agenda 21. At the next level EU goals and objectives pertaining to the Marine Strategy Framework Directive (Directive 2008/56/EC, MSFD), Water Framework Directive (Directive 2000/60/EC, WFD), Habitats Directive (Directive 92/043/EEC, (HD), Wild Birds Directive (Directive 79/409/EEC, BD), Common Fisheries Policy (CFP), and Strategic Environmental Assessment Directive (Directive 2001/42/EC,SEA) are reviewed. Moving one level further we will review existing legislation and policies on a national level and in particular for the countries that are explicitly involved in each case study area. For example, for the Mediterranean site case

study we will opt for a review of any single-party or bilateral, trilateral treaties between the countries involved such as Italy, Slovenia, Albania, Croatia & Greece.

Related to our project, the OffshoreGrid (Intelligent Energy Europe programme) focus on the development of an offshore grid in Northern Europe based on a techno-economic analysis. This study evaluates the costs and benefits of such an offshore grid. Moreover, in 2010 the EC published a report titled the Priorities for 2020 and beyond — A Blueprint for an integrated European energy network that states explicitly the strategy for developing a viable and efficient transmission grid in the energy sector<sup>1</sup>. The offshore grid is central in the design of the aforementioned strategy. Figure 1 shows a possible offshore grid network for the North Seas and Baltic Sea.

**Figure 1**

Illustration of a possible offshore grid concept for the North Seas and the Baltic Sea



Source: EWEA

Figure 2 depicts the vision of the Friends of the Supergrid (FOSG) for a Supergrid development within the European physical boundaries by 2050. Friends of the Supergrid (FOSG) is a campaign launched by the prominent European companies engaged in the offshore wind energy that promotes the development of a paneuropean Supergrid. The objective of the Supergrid is to provide a connection between generation and consumption centres promoting market integration, the reliability and security of the European power

<sup>1</sup> For more information please consult [http://ec.europa.eu/energy/infrastructure/strategy/2020\\_en.htm](http://ec.europa.eu/energy/infrastructure/strategy/2020_en.htm)

system. We observe from the following figure that three out of four sites in the context of Mermaid project are included in the deployment of the Supergrid network.

**Figure 2**  
Development of Supergrid system by 2050



Source: Seanergy 2020, Offshore Renewable Energy and Maritime Spatial Planning

It should be also noted that the environmental implications of offshore renewable energy are only partially uncertain. Although, the production of energy through ‘green’, clean sources is desirable it is uncertain how environmental-friendly is this green energy anyway. Thus, while there are clear environmental principles and absolute requirements (as postulated in the EU by the relevant Directives) this does not necessarily mean we can derive an explicit set of recommendations for any potential developer. We can consider for example the case of wave energy converters (WECs) and tidal energy. The appropriate national authority (or authorities) should be able to provide guidance, but this guidance is only at a formative stage. However, it is plausible to infer many of the likely issues, either from the experience

of more well-established marine industries (including offshore wind), or from a theoretical understanding of environmental and ecological science in general.

This report does not constitute new research, rather this report combines a wide range of existing knowledge and information readily accessible from many providers; primarily European or national or regional within Europe, which we call the layered approach (see..). Henceforth, the purpose of the study is to cover the existing legislation and policies in the European continent and cross-sectoral with a specific intention to convey knowledge into relative underdeveloped sectors (e.g. wave, tide) and geographical areas with different sea levels (e.g. deep open-water of Atlantic, shallow waters of North Sea) from the experience of more mature sectors (offshore wind) and regions with longer experience (North Sea and Baltic Sea). Finally, it should be mentioned that the European Ocean Energy Association {Oceans of Energy} also recognizes other forms of marine energy: ocean currents, temperature gradients and salinity gradients (osmotic).

Following the previous lines it becomes evident that the regulatory framework and the relevant policies can have a significant impact on willingness from large developers and financial institutes to support the development of relevant projects. Stakeholders of the project must be in position to know a priori any conflict of interest caused by their planning or management strategy in terms of environmental concerns. Therefore, the scope of this deliverable is to make a distinctive inventory of the current legislation for offshore wind and aquaculture accounting for the interests of all kinds of stakeholders involved in this project. In particular, it shall identify limiting procedures due to policies, planning and management strategies as well as limiting legislation in EU. This in turn will lead to recommendations for smooth and simplified procedures for developers and various stakeholders of MUPs.

## 1.2 Definitions

**Aquaculture**= refers to growing freshwater and saltwater populations under controlled conditions, and is contrasted with commercial fishing, which is the process of harvesting of wild fish, seaweed, algae

**Common Fisheries Policy (CFP)**=a regulatory framework that guarantees utilization of living aquatic resources in a manner that offers sustainable economic, environmental and social conditions.

**Convention on Biological Diversity (CBD)**= the most inclusive and prominent global tool dealing with the threats to marine and coastal biodiversity, and safeguarding, understanding and employing marine resources in a reasonable and eco-friendly manner.

**FAO Code of Conduct for Fisheries** = sets out principles and international standards of behavior for responsible practices aiming at maintaining effective conservation, management and development of living aquatic resources with a respect for the ecosystem and biodiversity.

**Habitats Directive** (Directive 92/043/EEC, **HD**)=a EC directive that focus on the conservation of natural habitats and of wild fauna and flora

**Mariculture**= is a customized sector of aquaculture involving the cultivation of marine organisms for food and other products in the open ocean, an enclosed section of the ocean, or in tanks, ponds or raceways which are filled with seawater.

**Marine Spatial Planning (MSP)**= According to the United Nations Educational, Scientific, and Cultural Organization, marine spatial planning is a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that usually have been specified through a political process. Essentially, marine spatial planning is a planning tool that enables integrated, forward-looking and consistent decision making on the use of the sea. EU has set the following 10 key-principles on MSP aiming at a sustainable ecosystem approach:

- Using MSP according to area and type of activity
- Defining objectives to guide MSP
- Developing MSP in a transparent manner
- Stakeholder participation
- Coordination within Member States – simplifying decision processes
- Ensuring the legal effect of national MSP
- Cross-border cooperation and consultation
- Incorporating monitoring and evaluation in the planning process
- Achieving coherence between terrestrial and maritime spatial planning
- Strong data and knowledge base

**Multi-use offshore platforms (MUPs)**=constructions that are located off the marine coasts in varying sea levels that are used for various purposes: e.g. energy production, aquaculture etc

**Marine Strategy Framework Directive** (Directive 2008/56/EC, **MSFD**)= a set of rules and policies established by EC aiming at preserving good environmental status in the marine environment by all member countries.

## **Maritime Zones**

### **The Baseline (0 Nautical Miles)**

For purposes of both international and domestic law, the boundary line dividing the land from the ocean is called the baseline. The baseline is determined according to principles described in the 1958 United Nations Convention on the Territorial Sea and the Contiguous Zone and the 1982 United Nations Convention on the Law of the Sea (LOS Convention), and is normally the low water line along the coast, as marked on charts officially recognized by the coastal nation.

### **Internal Waters**

Internal waters are the waters (for example, bays and rivers) on the landward side of the baseline from which the breadth of the territorial sea is measured. Each coastal State has full sovereignty over its internal waters as if they were part of its land territory.

### **Coastal waters (0 to 3 Nautical Miles)**

Waters at the interface between terrestrial environments and the open ocean.

### **Territorial sea (0 to 12 Nautical Miles)**

Under international law, every coastal nation has sovereignty over the air space, water column, seabed, and subsoil of its territorial sea, subject to certain rights of passage for foreign vessels and, in more limited circumstances, foreign aircraft.

### **The Contiguous Zone (12 to 24 Nautical Miles)**

International law recognizes a contiguous zone outside the territorial sea of each coastal nation. Within its contiguous zone, a nation can assert limited authority related to customs, fiscal, immigration, and sanitary laws.

### **The Exclusive Economic Zone (12 to 200 Nautical Miles)**

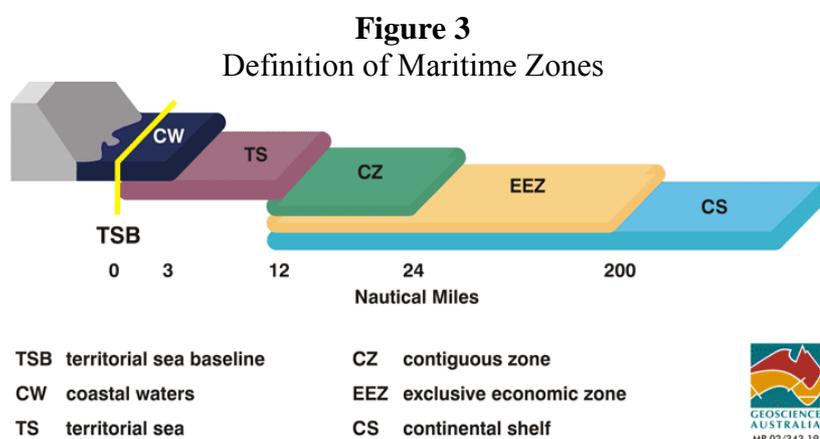
The LOS Convention allows each coastal nation to establish an exclusive economic zone (EEZ) adjacent to its territorial sea, extending a maximum of 200 miles seaward from the baseline. Within its EEZ, the coastal nation has sovereign rights for the purpose of exploring, exploiting, conserving, and managing living and nonliving resources, whether found in ocean waters, the seabed, or subsoil. It also has jurisdiction over artificial islands or other structures with economic purposes.

### **The Continental Shelf (12 to 200 Nautical Miles or Outer Edge of Continental Margin)**

The LOS Convention generally defines the continental shelf for purposes of international law as the seafloor and subsoil that extend beyond the territorial sea throughout the natural prolongation of a coastal nation's land mass to the outer edge of the

continental margin or to 200 miles from the baseline if the continental margin does not extend that far. The legal definition of the continental shelf thus overlaps geographically with the EEZ.

Source: NOAA Office of the General Counsel



Source: Australian Government, Geoscience Australia

**Multi-use offshore platforms (MUPs)**=constructions that are located off the marine coasts in varying sea levels that are used for various purposes: e.g. energy production, aquaculture etc

**Off-shore wind farms**= refers to the construction of wind farms in marine areas off the marine coasts in order to produce electricity from wind energy and exploit the stronger winds that blow away from coasts

**Strategic Environmental Assessment Directive (Directive 2001/42/EC, SEA)**= The SEA Directive stipulates that certain public plans and programmes (P&P) should be subject to an environmental evaluation in order to make sure that we can identify and quantify any environmental adverse effects of certain P&P during their preparatory stage and before their implementation.

**Water Framework Directive (Directive 2000/60/EC, WFD)**= a regulatory set of rules that elucidates and updates current water legislation by introducing common objectives within the EU for water (inland surface waters, transitional waters, coastal waters and groundwater) and establishes a combined approach to water management in Europe.

**Wild Birds Directive (Directive 79/409/EEC, BD)**= a set of rules that defines that all EU member states should take necessary actions in order to maintain the population of the natural wild birds at a level which complies with ecological, scientific and cultural

requirements, while accounting for economic and recreational requirements, or to adjust the population of these species to that level

**United Nations Convention on the Law of the Sea (UNCLOS)**= a universal system of laws and rules for the world's oceans and seas, covering extensively the use of the oceans and their natural resources. UNCLOS stipulates that all issues of ocean areas are intimately associated and need to be addressed in a concise and uniform manner.

**United Nations Agenda 21**= a universal set of actions to be adopted by countries all over the world in order to protect the environment from the adverse effects of human intervention.

### **1.3 Relationship to overall project objectives**

The scope of this deliverable is to build an inventory of the legislation and policies that are related explicitly or implicitly to the development and adoption of offshore wind farms and aquaculture projects. It is agreed that a significant obstacle faced by developers interested in large scale projects is strict environmental legislation. The identification of limiting procedures within the EU concerning offshore wind farms and aquaculture is of vital importance for the success of the MERMAID project. One of the major challenges of MERMAID project is to provide recommendations and guidelines for the development, operation and exploitation of multi-use platforms (MUPs) in each case study and in the EU in general. This inventory combined with the results from the other WPs will form a solid basis for the identification and the assessment of perceived obstacles by different stakeholders such as the public, the authorities, the industries etc for each case study. The declaration of potential selection areas in the European seas as it is required by the project objectives relies heavily on the identification of the legislation and policies on planning and designing MUPs. In other words, the inventory of the legislation and policies that will be developed here must enter as a critical input in every socio-economic analysis performed within the context of MERMAID regarding offshore windfarms and aquaculture.

### **1.4 Outline for the reader**

The document is divided in 9 different sections/chapters. Chapter 2 reviews the employed methodology and provides a short description of each case study area justifying the choice of case study areas and their spatial boundaries. International & EU legislation and policies

on wind farms and aquaculture on coastal & offshore areas is the topic of Chapter 3. Chapters 4 to 7 outline the most influential legislative framework for each case study separately. Chapter 8 summarizes the analysis of perceived obstacles by different groups of stakeholders for the development of MUPs for each case study. Finally, chapter 9 offers some concluding remarks and first recommendations.

## **Chapter 2: Methodology**

### **General Framework of Analysis and Method of Analysis**

The development of multi use platforms requires first of all the identification of relevant legislation and policies that are mainly dictated by environmental and social concerns. The unique characteristics of the different places across the globe has led to the development of a ‘legislative grid’ concerning marine spatial management that needs to be decoded and clarified. Moreover, we should bear in mind that our subject of analysis covers the important topics of renewable energy usage and aquaculture that have been in the heart of policy-makers actions.

The Layered Approach employed here is based on a stratified model that distinguishes the relevant legislation in a concise and explicit manner into four distinct strata. However, a central point of the model is the allowance of possible interconnections between the different layers of the model as in cases of multi-level governance that is used in political science. (von Homeyer & Knoblauch 2008). This multi-layered structure reflects the pluralism in the legislation ruling the development of offshore multi-use platforms (MUPs) much better than any approach that seeks to find general principles of limiting legislation in the context of off-shore MUPs. Layered approach has many applications in social sciences and informatics with the most prominent of all its use in governance issues, information modeling and in networking protocol modeling.

Our methodological approach has been borrowed from a well-known notion of multi-level governance (MLG, hereafter) that has been developed by Marks and Hooghe in the early 1990s. Their approach was rooted in European integration research. An early definition assigned by Marks & Hooghe to MLG was the following: “multi level governance can be thought of as a system of continuous negotiation among nested governments at several territorial tiers – supranational, national, regional, and local – as the result of a broad process of institutional creation and decisional reallocation” (Marks 1993: 392). A refinement of the previous definition did not take too long to appear. According to Marks/Hooghe (2003: 1) multi-level governance implies the “reallocation of authority upwards, downwards and sideways from central states” Consequently, governance is distributed among multiple centers of authority.

Related to governance issues, environmental legislation and policies exhibit strong multi-level features. With respect to the European continent, although the national and EU

policies exert in general the highest influence there is also a significant number of multilateral environmental agreements (MEAs), regional international and local conventions. Cross-border environmental concerns are partially reflected by the MLG characteristics of environmental policy. Cost considerations and issues of economic competitiveness might be responsible to a higher degree for the allocation of control over different layers.

Multi-level governance is characterized by three prominent features. First, there is a growing exchange of administrative ideas and expertise between bodies which operate at different levels of government. Second, various types of interactions, grids and partnerships arise with respect to governance within, between, and across the different levels of governance. Third, a confusion in the allocation between the various levels of government may be the result of the rising multiplicity of different levels and bodies engaged in governance issues (cf. Watson/Bulkeley/Hudson 2004: 4). With respect to the first two characteristics, some researchers make the distinction between vertical and horizontal multi-level governance. Vertical MLG pinpoints the shift of political power away from the nation-state to other levels of governance. Still, according to Eckerberg/Joas 2004: 407 “the nation-state still retains a leading role and can, up to some critical level, steer the development”. On the other hand, a “shift of responsibilities from administrative bodies/authorities towards non-governmental bodies” could be the focus of horizontal MLG.

A key issue in the process of recording relevant legislation and policies is acknowledging the existence of different strata of the current regulatory framework. Thus, in the context of the present review we will consider four different strata. The relevant legislation can thus be thought of as being composed of four different conceptual layers; from the top down these are: the *international*, *regional*, *national* and *site-specific* legislation. Figure 4 describes explicitly layered approach in a form of common center circles. In particular, this method decomposes the subject of the analysis into 4 different components each of them corresponds to a path of going from a wider perspective to a narrower one. We observe that the international legislation is placed in the outer circle indicating a general framework and as we proceed inside the layers legislation becomes more specific in its area of application. In other words, in the context of the current analysis we must first identify laws and policies that like a huge umbrella accommodates the targets of environmental protection globally such as United Nations Convention on the Law of the Sea (UNCLOS), then we must analyze regional policies that have been set to regulate environmental issues within the boundaries of a continent or a group of countries such as EU-policies e.g. Marine Strategy

Framework Directive. The third level of analysis corresponds to analyzing nation-wide rules and policies that are important for the countries that are involved in the project. An example of this type of legislation could be the Exclusive Economic Zone (EEZ) of a country. To this end, we will locate and analyze single country, bilateral or trilateral treaties and agreements that are relevant to this project. Finally, the inner circle of Figure 4 depicts site-specific legislation that applies to selected areas near or off the shore that must be identified and accounted for e.g. Natura 2000. For example, in the Mediterranean site except for the international rules, EU-wide rules it is possible to have some pacts between neighboring countries such as Italy and Slovenia with respect to the marine environment that should be accounted for when analyzing the specific case study area.

However, it should be noted that we will build the legislation inventory focusing on two different usages of multi-purpose off-shore platforms: aquaculture and wave energy converters. Next, we will divide our interest on each usage in 4 different strata. Henceforth, employing a two-way layered approach we are going to pinpoint relevant legislation and policies governing the 4 different layers of aquaculture and wave energy converters. Table 1 presents the four distinct topics that are of particular interest in each of the cases. For example, in the case of aquaculture we are concerned with recording all relevant legislation and policies internationally, regionally, nationally or locally defining the types and sizes of aquatic resources i.e. concessions that can be grown and the incentives and subsidies/investments that are inherent in respective projects.

**Table 1**

Usages of multi-use platforms and relevant layers

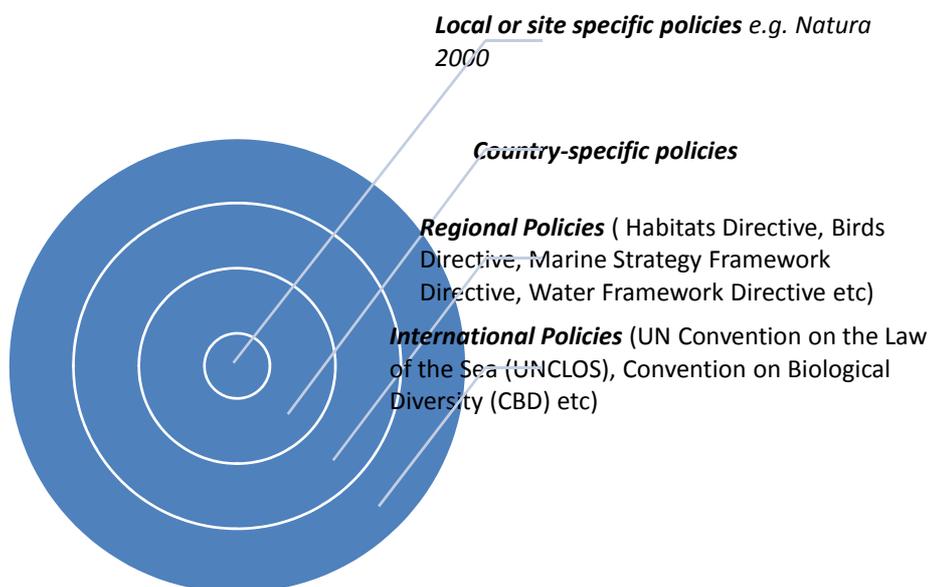
<b>Layer</b>	<b>Aquaculture</b>
1	Types
2	Size
3	Incentives
4	Subsidies
<b>Layer</b>	<b>Offshore wind</b>
1	Locations
2	Sizes
3	Incentives
4	Subsidies

Layered approach has some important advantages that should be mentioned. Firstly, method's simplicity allows explicit decomposition of the complex juridical system into

separate, and in some cases overlapping layers allowing the reader to obtain a clear picture of the analyzed situation. Next, it provides all necessary information in a fast and concise manner facilitating any decision-making process. Because each layer is processed separately, the researcher gets enough time to devote, thus leading to fewer errors.

Therefore, employing layered approach described previously we will set out recording the international legislation and policies on offshore wind including wave energy converters and aquaculture (shell-culture, algae-culture) for offshore multi-use platforms and then we will describe relevant legislation within the EU boundaries. Next, considering the special characteristics of each case study area that is involved in our project i.e. Atlantic Ocean, Mediterranean Sea, North Sea and Baltic Sea we will focus on national or even site-specific legislation on the aforementioned subjects.

**Figure 4**  
A description of layered approach



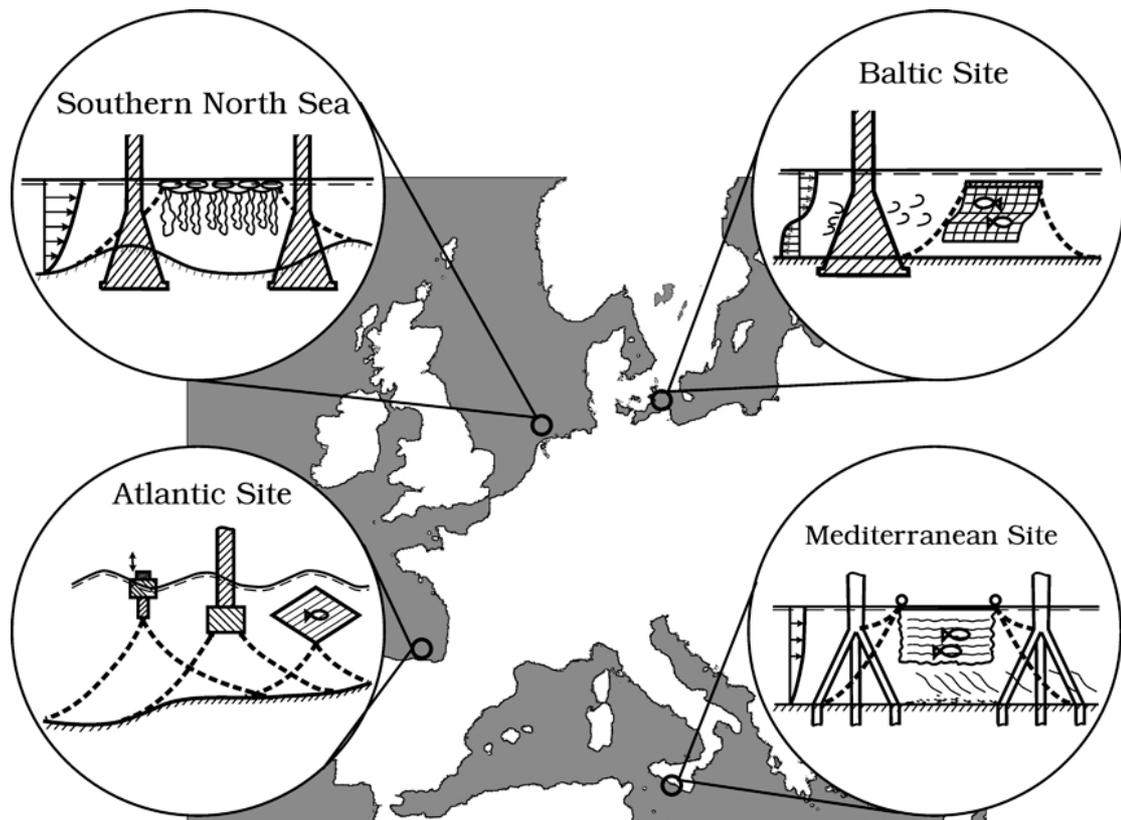
## **2.1 Short introduction of case studies areas. Explain the choice of case study areas and their spatial boundaries.**

MERMAID has chosen to focus on four regional seas: (1) Baltic Sea, (2) North Sea and the Wadden Sea, (3) Atlantic coast and (4) Mediterranean. These are prime representatives of regional waters where there are requirements for sustainable and profitable activity for a large number of EU Member States and their governments through multiple sectors

including transport, fisheries, renewable energy, tourists, commerce and local stakeholders. The four regions have both common as well as unique drivers of change that impact ecosystem services. The regional case studies are designed to operationalize geographically the integrated understanding developed through the MERMAID project.

**Figure 5**

Map of Europe with close-up at the four sites, with focus on local challenges



Therefore, novel innovative design approaches should address many different physical conditions in order to make the best use of the ocean space. Going from deep water (north of Spain) to shallow water with high morphological activity (the Wadden sea) and further to inner waters like the inner Danish/Baltic areas and the Adriatic sea changes the focus from a strong physical aspect to environmental impact on a very delicate marine environment. This will make it possible to develop, test and integrate different technologies through innovative coupling of various activities and services

**Table 2**  
Characteristics of Study sites (based on project's Description of Work)

<b>Site, Sea</b>	<b>Environmental characteristics</b>	<b>Design type</b>	<b>Specific issues</b>
Krieger flaks, Estuarine site, Baltic sea	<ul style="list-style-type: none"> <li>• cold brackish waters with optimum salinities for temperate fish</li> <li>• location on the pathway for exchange flow between Baltic proper and the North Sea</li> <li>• high wind energy potential</li> </ul>	<ul style="list-style-type: none"> <li>• gravity based turbine foundations</li> <li>• extensive mariculture</li> </ul>	<ul style="list-style-type: none"> <li>• Dredging</li> <li>• Mariculture spills</li> </ul>
North Sea	<ul style="list-style-type: none"> <li>• Waters with optimum salinities, temperate and nutrients for seaweed</li> <li>• Area where there is exchange of sediment between the North Sea and the Wadden Sea</li> <li>• high wind energy potential</li> </ul>	<ul style="list-style-type: none"> <li>• gravity based turbine foundations</li> <li>• extensive aquaculture</li> </ul>	<ul style="list-style-type: none"> <li>• Economic feasibility</li> <li>• Scour and backfilling processes</li> <li>• Environmental impact</li> </ul>
Ubiarco and Santoña, Far Offshore area, Atlantic Ocean	<ul style="list-style-type: none"> <li>• Very high wind energy potential</li> <li>• Very high wave energy potential</li> </ul>	<ul style="list-style-type: none"> <li>• floating platform (100 m depth)</li> <li>• multiple energy converters, i.e. wind and waves</li> </ul>	<ul style="list-style-type: none"> <li>• grid connections</li> <li>• mooring systems</li> </ul>
Acqua Alta platform, Venice, Mediterranean Sea	<ul style="list-style-type: none"> <li>• moderate wind energy potential</li> <li>• moderate wave energy potential</li> </ul>	<ul style="list-style-type: none"> <li>• gravity based foundations (16 m depth)</li> <li>• multiple energy converters, , i.e. wind and waves</li> <li>• algae culture</li> </ul>	<ul style="list-style-type: none"> <li>• Grid connections</li> <li>• Mooring systems</li> <li>• Environmental impact</li> <li>• Biodiversity</li> <li>• Economic feasibility</li> </ul>

### **Mediterranean Site**

The activities in the Mediterranean will be tentatively performed at an existing platform usually adopted for monitoring purposes in the Adriatic Sea (off-shore Venice). The "Acqua Alta" research tower was installed on January 1970 off the Gulf of Venice, Italy, by Micoperi for the CNR. The tower is located in the Northern Adriatic Sea, East of Italy, 16

km off the coastline of Venice, on 16 m of depth. The bottom is a mixture of sand and mud, deepening gently towards the southeast with a 1/1000 slope.

Its basic structure is a four leg, framed template extending 4 m above the sea surface. The template is firmly fixed on the bottom, the poles penetrating 22 m inside the sediments. The housing structure (three floors plus the top terrace) is firmly joined to the upper end of the template. The submerged part is protected by zinc anodes. The splash zone (+3, -2 m) is covered with a fully protective layer of epoxy resin. The three floors are at 4.5, 6.7, 9.3 m above the mean sea level. The terrace floor is at 12.3 m. Starting from the second floor, a large platform extends horizontally 7 m in the southeast direction. Two smaller platforms protrude towards the southwest and northeast.

**Figure 6**

Views of the Acqua Alta platform. (Lat = 45° 18' 83" N, Lon = 12° 30' 53" E)



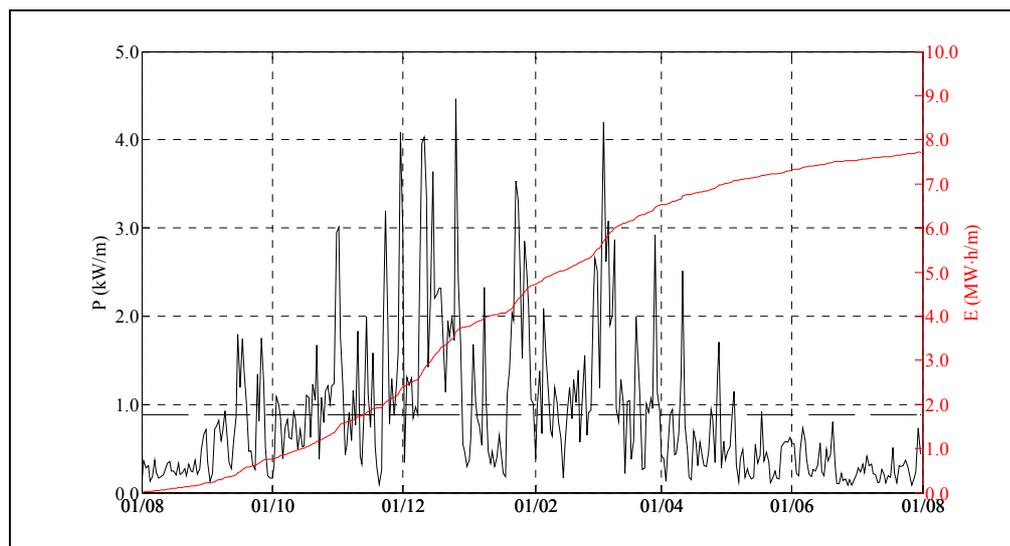
The tower is equipped with 380, 220, 125 VAC 50 Hz, available when personnel are on board. A large set of batteries provides 12 and 24 VDC for occasional measurements and for some basic regular needs. The tower is not continuously manned. People move on board either for specific needs or for maintenance (if so, on a fortnight basis). The living quarters are on the third floor. They include a 5x5 m living room, a 1x2 m bath, a 2x3 m

kitchen, and a 2x2 m room devoted to on board instruments. Cooking and sleeping facilities, taken care by devoted personnel, allow four persons on board for an unlimited period of time. The tower is equipped with a meteo-oceanographic station. The data are recorded on board and also telemetered to land. The station includes measurements of:

- atmosphere: wind (two levels), temperature, humidity, solar radiation, rain.
- sea: waves (directional), tide, temperature (two levels).
- A number of host instrumental sets record and transmit various data to land.

On top of the regular activities, the tower is used for devoted time-limited campaigns. These have included:

- vertical profile of water characteristics,
- water quality,
- kinematics of water particles under stormy conditions,
- Reynolds stresses within the water,
- tidal high frequency spectrum,
- currents,
- waves breaking,
- suspension of sediments by waves and current,
- atmospheric turbulence,
- vertical wind profile,
- Reynolds stresses in the atmosphere,
- surface ripples and wind by scatterometer,
- sea truth for satellite radiometers,
- sea truth for the calibration of the ERS-1 altimeter.



Average wave power per day along one year; values reconstructed on the basis of the statistics of the measurements carried out in the period 2004-2011. The platform will in

principle include multiple energy converters, i.e. floating and submerged wave energy converters and will be also used as a pilot experimental site for farming target species of invertebrates or seaweeds of commercial, conservation or research interest. Ecological experiments will focus on identifying physical conditions and/or structure configuration that are most likely to facilitate good levels of natural recruitment in the field. Engineering activities will include: reconstruction of wave and wind climate, modeling of the hydrodynamic conditions at the platform, monitoring and optimization of wave energy converters, evaluation of the possible inclusion of wind energy converters, modeling of mooring systems and interactions with the sea-bed. Connection of the energy converters and/or local storage techniques will be also examined. Cost-benefit analysis of the multi-purpose platform will be performed.

### *Synthesis*

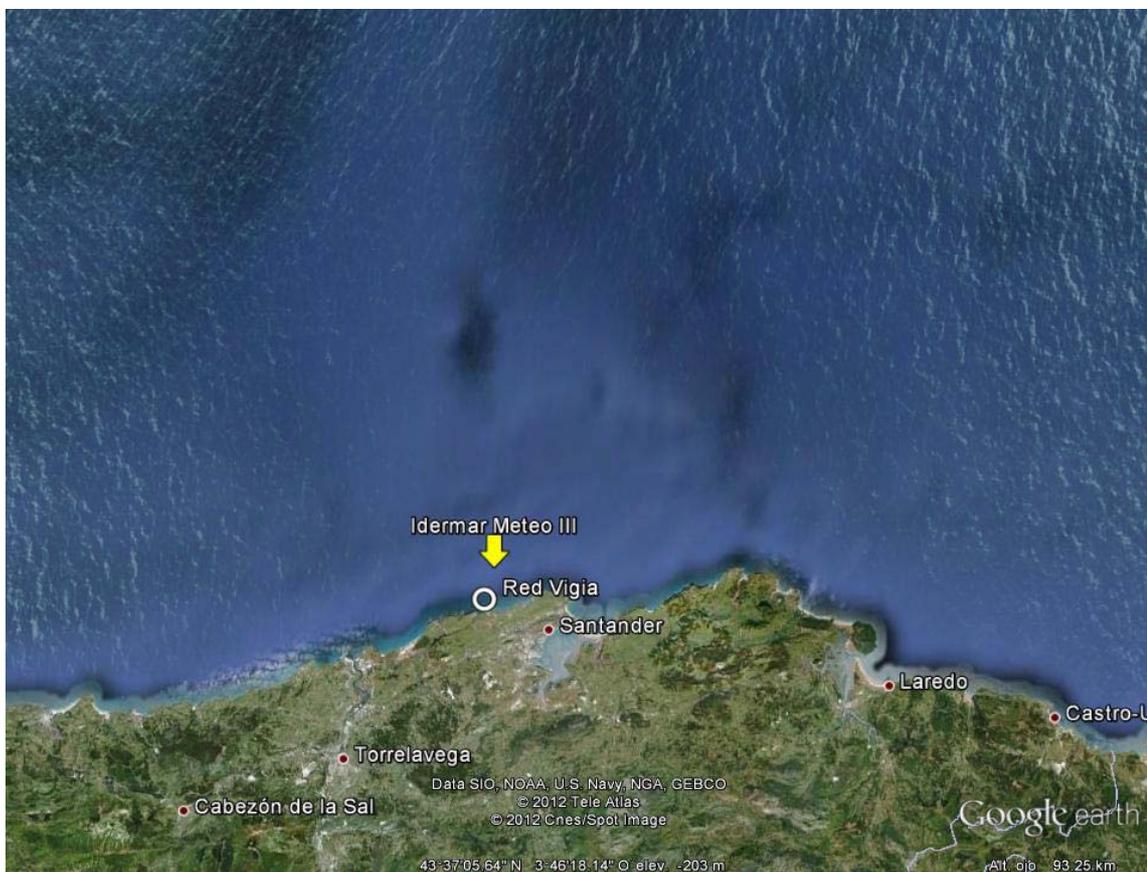
Site	Acqua Alta platform, Mediterranean Sea
Size	Tens of km <sup>2</sup>
Cross-border	No, Italian waters (bottom depth 16 m, out of sight due to bottom slope)
Design type	Fixed platform Wind and waves energy converters
Challenges	Algae culture Environmental impact Legislation and policies Economic feasibility Social perception
Stakeholders	To be selected based on an agreed methodology to be representative of the site conditions, for instance: 2 local governmental bodies, such as Venice Municipality and Regione Veneto 2 research-governative institutes such as ARPA energia and ENEA/CNR 2 investors (1 developer, 1 industry) such as Dexa wave energy, DK or WEMPOWER, IT, and Tozzi Holding Ravenna, IT 1 or 2 energy company nationally responsible for transferring energy and/or energy inventory and feeding, such as: TERNA, GSE, ENI 1 fishery representative 1 marine yachting/cruise representative 1 representative from local economic more relevant activities, hotel/industry 1 representative from environmental agencies and association such as WWF, LGA

### **Atlantic Site**

The Cantabria Offshore Site (COS) is located in Spain, offshore the region of Cantabria (see figure 7). The Cantabria Offshore Site (COS) is well suited to explore floating wind

turbines and wave energy concepts. One of the main strength of the site is its monitoring system. Wind conditions at COS will be assessed thanks to a meteorological mast located 5 km offshore, deployed at 50 m water depth by IDERMAR, a spin-off of UC (see figure 8). Wave and current conditions will be assessed by a wave rider located at 40 m water depth, 3 km offshore. This device has been deployed by the Regional Ministry for Environmental and Water and data management is carried out by UC. Instrumental information will be combined with numerical models to determine metocean conditions in the site. COS will be fully monitored thanks to existing operational systems for wind, waves and currents. Due to the water depth range, in this test site only floating concepts will be considered. These concepts are especially relevant in some countries like Spain where the continental shelf is narrow and offsite MUPs are only possible at large water depths. COS is in particular challenging because of the very rough wave and wind conditions. Among other reasons, COS is of high interest because its close location to large port facilities, as well as shipyards and other industries. Information on environmental issues, as well as, socio-economic aspects is already in available.

**Figure 7**  
Localization of Cantabrian Offshore Site



**Figure 8**

Idermar meteo floating met mast. Localization: Cantabrian Offshore Site

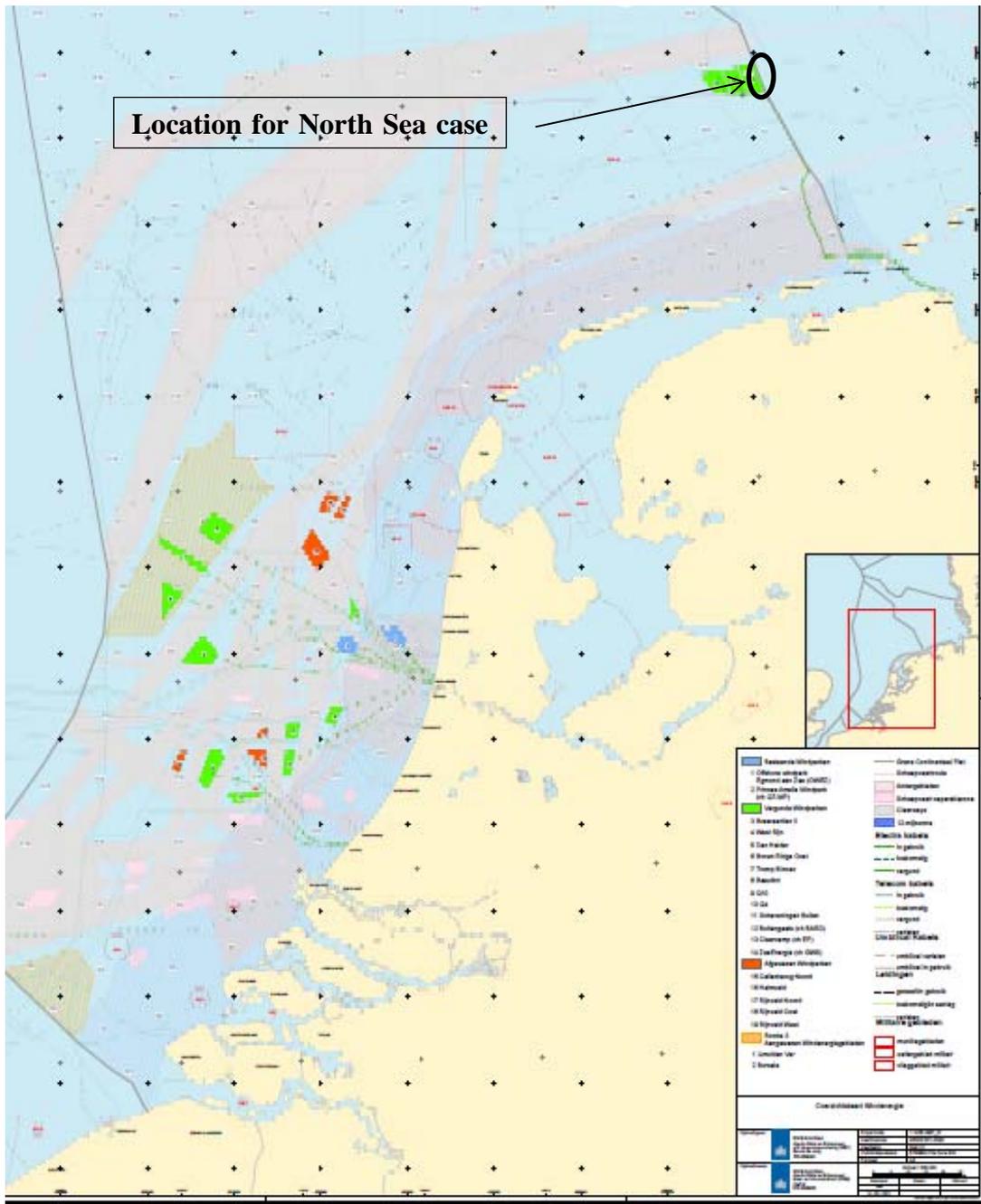


### **North Sea Site**

The North Sea case-study is located North of the Dutch Wadden isle Schiermonnikoog (latitude 54,036', longitude 5,964'). Total area size is 68 km<sup>2</sup> and the distance to the nearest shore is 70.2 km. At this location, an offshore wind energy park is envisioned with a total capacity of 600 MW. It is expected that a total of 150 wind turbines with a capacity in the range of 3.6 -4 MW each will be built. Water depth at this location ranges between 32 and 34 m. On figure 9, nr 12 refers to the area where the North Sea case-study will take place.

**Figure 9**

Map of realised and permitted offshore wind energy parks in the Dutch North Sea



### Baltic Sea Site

A first prototype site is suggested to be Kriegers flak, off-shore located in the shallow intersection between Danish, German and Swedish waters. The site may constitute a primary site for massive development of wind turbine farms and with its location on the pathway for exchange flow between Baltic proper and the North Sea the site is ideally

suitable for aquaculture, potentially with ample synergies between energy and food production.

Building on this site's unique physical and natural advantages a test system combining gravity based turbine foundations with extensive mariculture, may provide an efficient platform for harnessing natural resources of the Baltic in a sustainable manner. However any man-made construction in the sea potentially may have adverse effects on the vulnerable environment, so part of this basic study will be to investigate, quantify and possibly mitigate such impacts. Special attention will be given to changes due to obstruction of the estuarine exchange flow, adverse effects of spills from mariculture, but also to the potential positive synergies such as increased local bio-diversity due to introduction of hard substrate.

#### *Detailed description of the activities*

Site Kriegers Flak, Baltic Sea

Size 50 km<sup>2</sup>

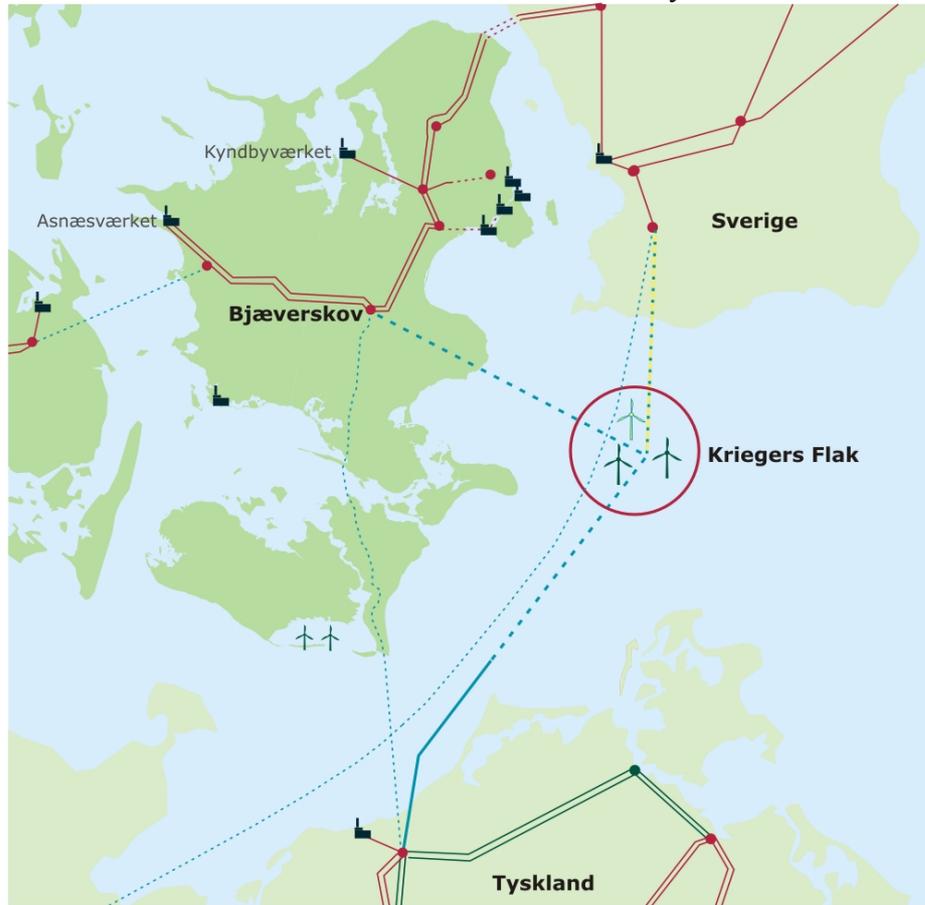
Cross-border Kriegers Flak is situated in the triangle where German, Swedish and Danish economic zones meet and covers all three. The MERMAID site is situated in the Danish economic zone only

Design type Fixed platform wind turbines with gravity based foundations combined with mariculture of trout

Challenges Environmental impacts and social acceptance  
Economic feasibility

Stakeholders Local governmental bodies such as Energistyrelsen and Farvandsvæsenet  
Research-governative institutes NN  
Investors such as PFA  
Energy company such as DONG, Vattenfall, Energinet.dk  
Aquaculture representative such as Musholm Lax  
Marine representative such as NN  
Local industry such as Visit Bornholm  
Environmental agency as DMU

**Figure 10**  
Location of Baltic Sea case study



## **Chapter 3**

### **International & EU legislation and policies on wind farms and aquaculture on coastal & offshore areas**

#### **3.1 International (wider than EU) off-shore wind farms**

The development of large-scale off-shore wind farms is heavily dependent to effective use of ocean waters. Therefore, finding new areas for the location of offshore wind farms highlights the need for a strategic planning at Sea and at the same time the importance of international Sea Law.

##### **3.1.1 United Nations Convention on the Law of the Sea (UNCLOS)**

The United Nations Convention on the Law of the Sea (UNCLOS; UN 1983) is a universal system of laws and rules for the world's oceans and seas, covering extensively the use of the oceans and their natural resources. UNCLOS stipulates that all issues of ocean areas are intimately associated and need to be addressed in a concise and uniform manner. Consisting of more than 300 articles and nine annexes, the Law of the Sea governs all aspects of ocean space, such as physical boundaries, environmental control, marine scientific research, economic and commercial activities, conveying technology and the settlement of conflicts relating to ocean matters. Moreover, UNCLOS regulates maritime transport and plays a central role to the declaration of shipping lanes, free passing etc. UNCLOS also is central to the definition of the exclusive economic zones. Countries with coasts own sovereign rights in a 200-nautical mile exclusive economic zone (EEZ) with respect to natural resources and specific economic activities, and exercise authority over marine science research and environmental protection. All other States are free to navigate through and in the EEZ, as well as to place submarine cables and pipelines. It should be noted though that these maritime zones do not coincide with ecosystem boundaries. A series of other provisions are included in UNCLOS concerning the marine environment in relation to e.g.:

- contamination or misuse of the marine environment
- alien species
- global and regional cooperation
- marine scientific research
- highly transient species

UNCLOS allows, under Part V Art. 76, Coastal states to declare an Exclusive Economic Zone (EEZ) for a variety of economic purposes.

### **3.1.1.1 Rights and duties in the Exclusive Economic Zone**

Wind farms in the EEZ have to compete with other sea uses, including navigation. In the EEZ the coastal state has sovereign rights. These rights, jurisdiction and duties of the coastal state in the EEZ are defined as follows: Sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the waters superjacent to the sea-bed and of the sea-bed and its subsoil, and with regard to other activities for the economic exploitation and exploration of the zone, such as the production of energy from the water, currents and winds. On the one hand wind farms beyond territorial waters must be erected and operated with 'due regard' for third States' freedoms there.

On the other hand, the coastal state has in its EEZ, the exclusive rights, to exploit its renewable resources and to construct and to authorize and regulate the construction, operation and use of artificial islands and of installation and structures to exploit those resources. It also has exclusive jurisdiction over those platforms.(Art 60 (1) and (2) UNCLOS).

The coastal state shall give due notice of offshore wind installations, as a warning to others of their presence at sea (Art. 60, 3, UNCLOS). Notification must also be given with respect to their related safety zones.

### **3.1.1.2 Navigation<sup>2</sup>**

The regime of transit passage retains the international status of the straits and gives the naval powers the right to unimpeded navigation and overflight. Ships and vessels in transit passage, however, must observe international regulations on navigational safety, civilian air-traffic control and prohibition of vessel-source pollution and the conditions that ships and aircraft proceed without delay and without stopping except in distress. In all matters

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<sup>2</sup> The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) and International Civil Aviation Organisation (ICAO) have established international rules and standards for precautionary lighting of offshore wind farms in order to avoid accidents from navigation and aviation activities in the area surrounding wind farms.

other than such transient navigation, straits are to be considered part of the territorial sea of the coastal State.

The potential of wind farms to interfere with navigation is greater in the EEZ than in territorial waters because wind farms there are likely to be both larger and erected in deeper waters. The freedom of navigation enjoyed by ships of third states extends to submerged navigation and is a broad freedom in fact. A ship is free, for example to move, stop or anchor at will as long as she does so with reasonable regard for third states' communications rights and for the coastal states' economic and other rights. Her freedom comprehends, indeed, other internationally lawful uses of the sea related to it, such as those associated with the operation of the ships. She remains, moreover, subject to the jurisdiction of her flag State, with the exception of limited coastal State jurisdiction over merchant vessel-source pollution.

### **3.1.1.3 Safety zones**

According to the UNCLOS, the coastal state may in its EEZ or above its continental shelf, where necessary, establish reasonable safety zones around the artificial islands, installations and structures, in which it may take appropriate measures to ensure the safety of navigation and of the artificial islands, installations and structures. The breadth of these safety zones shall be determined by the coastal state, taking into account applicable international standards. The designation of such zones must be reasonably related to the nature and function of the artificial islands, installations or structures. Furthermore, they are not to exceed a distance of 500 meters around them, measured from each point of their outer edge, except where authorized by generally accepted international standards or where recommended by the IMO.

### **3.1.1.4 Removal of Offshore Installations**

Once the offshore wind energy production has ceased, the installations must be removed from the seabed (art. 60, 3, UNCLOS). Article 60 UNCLOS allows for partial removal as far as the safety of navigation and of fishing is ensured. However, to ensure safety of navigation the IMO is empowered by article 60 to establish generally accepted standards in relation to removal requirements. The issue of toppling off and removal for the purpose of

safety of navigation is regulated by IMO Resolution A.672 (16) of 6 December 1989 “Guidelines and Standards for the Removal of Offshore Installations on the Continental Shelf and in the Exclusive Economic Zone”.

### **3.1.2 IMO Conventions on Maritime Safety**

#### **3.1.2.1 Convention on the International Regulations for Preventing Collisions at Sea (COLREG)**

This is the main convention for regulating international maritime traffic. It specifies the "rules of the road" for particular traffic situations and organizes the traffic flow by means of “traffic separation schemes” (TSS) (Rule 10), the aim of which is to separate opposite-going traffic in high traffic density areas such as the Kadet Trench, etc. The area between land and a traffic separation scheme is called an “inshore traffic zone”. A vessel of more than 20 meters in length, except fishing vessels, shall not use an “inshore traffic zone” when it can safely use a traffic lane within the adjacent traffic separation scheme, except when on route to or from a port. The delineation of shipping routes is important for ensuring the safety of marine traffic. In straits used for international navigation between one part of the EEZ and another part of the EEZ, all ships enjoy the right of transit passage. Bordering states designating sea-lanes and prescribing traffic separation schemes in those straits shall submit their proposal to the IMO with a view to their adoption. In the EEZ, all ships enjoy the freedom of navigation. Proposed traffic lanes have to be adopted within the IMO

#### **3.1.2.2 International Convention for the Safety of Life at Sea (SOLAS)**

The SOLAS Convention introduces (Chapter V, regulation 8) the possibility to establish “areas to be avoided” and other routing measures. These ships’ routing systems contribute to the safety of life, safety and efficiency of navigation and/or the protection of the marine environment. “Ships’ routing systems are recommended for use by, and may be made mandatory for, all ships, certain categories of ships or ships carrying certain cargoes, when adopted and implemented in accordance with the guidelines and criteria developed by the IMO. An “area to be avoided” is a routing measure comprising an area with defined limits in which navigation is particularly hazardous or it is exceptionally important to avoid casualties and which should be avoided by all ships or certain classes of ships.”

## **3.2 Off-Shore Wind Policies & Legislation within the EU**

Currently, the integration of electricity producing renewable energies, including wind, is regulated by the EC Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market. The 2001 Directive was replaced by the recently agreed Renewable Energy Directive during 2010 and 2011.

In particular, the framework governing maritime wind energy has been supplemented by the third “internal energy market package” of October 2007 and by the “energy and climate” package introduced in January 2008. It is expected that the prompt adoption and application of these two packages will become EU’s main contribution to promoting offshore wind energy.

However, it should be mentioned that the lack of integrated strategic planning and cross-country coordination between member states has been recognized as one of the key challenges to the implementation of offshore power generation by the recent European Commission Communications. Below, we review the basic laws and rules that apply to EU region.

### **3.2.1 Marine Environmental considerations**

Offshore wind farm development must satisfy two ‘assessment’ processes required under EC law: An Environmental Impact Assessment (EIA) and in addition the Directive 2001/42/EC on the assessment of the affects of certain plans and programmes on the environment (SEA Directive) require the governments to conduct strategic environmental assessment at the planning and programme level of offshore wind farm development.

#### **Strategic Environmental Assessment Directive (SEA)**

The ‘Strategic Environmental Assessment’, (hereafter the 'SEA Directive) was introduced in July 2001 and it is also known as the European Directive 2001/42/EC (EC 2001) dealing with the assessment of the effects of certain actions and programmes on the environment. The SEA Directive stipulates that certain public plans and programmes (P&P) should be subject to an environmental evaluation in order to make sure that we can identify and

quantify any environmental adverse effects of certain P&P during their preparatory stage and before their implementation.

The top quality goal of the SEA Directive is stated explicitly in its Article 1, which introduces two important aspects: 1. to provide for a high level of protection of the environment and 2. to promote the consolidation of environmental concerns into the preparation and implementation of certain plans and programmes aiming to enhance sustainable development.

Article1: ‘The objective of this Directive is to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development, by ensuring that, in accordance with this Directive, an environmental assessment is carried out of certain plans and programmes which are likely to have significant effects on the environment.’

The top level goals of the SEA Directive are guaranteed by the developed basic framework for the evaluation of environmental implications of certain P&P. Relevant to the Directive P&P must undergo an environmental evaluation during their preparation, and before their implementation. The process of evaluation consists of writing an environmental report where the most probable and significant effects on the environment are documented, any plausible alternatives are identified, and finally any consultation with all the relevant stakeholders is recorded. Next, the prepared environmental report and the results of the consultations are evaluated before proceeding to the implementation of the project. When a P&P has passed the evaluation phase, all the relevant stakeholders such as the environmental authorities, the industry and the public are notified and relevant information is made available to them. In order to prevent any adverse effects at an early stage, substantial environmental effects of the P&P should be closely scrutinized.

According to SEA, developing a detailed procedure within the basic framework of the SEA Directive is a responsibility assigned to Member States. The spirit of the Directive is to be either incorporated into current practices, or new procedures must be built to conform to the Directive. Moreover, the SEA Directive is strongly related to the Habitat and EIA Directives, as such the environmental information to be gathered and evaluated under the SEA Directive also applies to the guidelines required by the Habitat Directive.

To sum up the main goal of the SEA Directive is to guarantee that environmental implications of specific P&P are recognized and evaluated in the preparatory stage and before their implementation. Thus, the SEA Directive offers a fundamental framework and

systematic tools of recognizing, describing, assessing and reporting on the environmental effects of P&P. Member States are obliged to make up procedures that will in turn define clear environmental protection objectives, indicators and monitoring measures in order to reach the goal of sustainable development.

### **3.2.2 Participation**

When it comes to maritime safety in the context of offshore wind farms, the public is usually very concerned about the possible effects on the environment in the case of a collision between ship and wind turbine. Therefore public participation plays a central role in the development process of offshore wind farms. Public participation above the project level is required by two international legal instruments: Articles 7 and 8 of the Aarhus Convention and the Protocol on Strategic Environmental Assessment under the Espoo EIA-Convention<sup>3</sup>.

#### **3.2.2.1 Aarhus Convention**

The Aarhus Convention links environmental rights and human rights and acknowledges that people owe an obligation to future generations. It establishes that sustainable development can be achieved only through the involvement of all stakeholders. It links government accountability and environmental protection. It goes to the heart of the relationship between people and governments. The Convention is therefore not only an environmental agreement; it is also a Convention about government accountability, transparency and responsiveness.

Articles 7 and 8 of the Aarhus Convention demand even more in terms of public participation than the SEA Protocol, and apply also to matters not covered by the SEA Protocol. Therefore it is useful to compare them to see what is covered in terms of public participation in strategic decisions. The scope of the SEA Protocol is narrower than Articles 7 and 8 of the Aarhus Convention. Article 7 of the Aarhus Convention requires: “each Party shall make appropriate practical and/or other provisions for the public to participate during the preparation of plans and programs relating to the environment, within a transparent and fair framework, having provided the necessary information to the public... To the extent appropriate, each Party shall endeavor to provide opportunities for public

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<sup>3</sup> Countries involved in these conventions are Denmark, Sweden & Germany

participation in the preparation of policies relating to the environment.” Article 7 of the Aarhus Convention covers all plans and programs “relating to the environment.” These might be plans or programs having either adverse or positive effect on environment. Article 7 is not limited to ones with “significant” effects.

### **3.2.2.2 Espoo-Convention**

This convention obliges parties to assess, at an early stage of planning, the environmental impact of certain projects entailing possible transboundary impacts. It also lays down the general obligation of states to notify and consult each other on all major projects under consideration that are likely to have a significant adverse environmental impact on a transboundary level.

Even where a wind farm development is not deemed a ‘major installation’ it still may be subject to an EIA by virtue of its size, location or effect. For the purposes of this analysis, the proximity of a project to an international border should be taken into consideration. While environmental impact assessments are to be applied at the project level, parties should endeavor to apply the same measures to policies, plans and programmes.

## **3.3 Coastal Wind Energy Legislation & Policies within the EU**

While wind energy may partially mitigate the effects fossil fuels have on global warming, onshore wind farms introduce a new menace to specific bird and bat populations of the relevant area. Many of the potential impacts of wind farms, however, can be significantly reduced through proper siting and mitigation measures. Therefore, EU addressing the challenge of preserving environment from the potential adverse effects of wind farms has recently established explicit rules mainly through two channels (Birds Directive and Habitats Directive) that are presented below.

### **3.3.1 Birds Directive (BD)**

According to the Birds Directive [EU 2009] Article 2 member states should ‘maintain the population of the species referred to in Article 1 [natural wild birds] at a level which

complies with ecological, scientific and cultural requirements, while accounting for economic and recreational requirements, or to adjust the population of these species to that level' and (article 3.1) :

'preserve, maintain or re-establish a sufficient diversity and area of habitats for all the species ...'and (article 3.2) : 'The preservation, maintenance and re-establishment of biotopes and habitats shall include primarily the following measures:

- (a) creation of protected areas;
- (b) upkeep and management in accordance with the ecological needs of habitats inside and outside the protected zones;
- (c) re-establishment of destroyed biotopes;
- (d) creation of biotopes.'

### **3.3.2 Habitats Directive (HD)**

Introduced in 1992 by the European Community, the Habitats Directive that is officially known as Council Directive 92/43/EEC focus on the conservation of natural habitats and of wild fauna and flora (European Council 1992). The HD was enforced in June 1994 and embodies the provision that member states must fulfill their obligations as part of the Convention on the Conservation of European Wildlife and Natural Habitats (European Council 1979) approved in 1982, otherwise known as the Bern Convention.

A prominent role within the context of the directive is assigned to Special Protected Areas known as Special Areas of Conservation (SACs) within the context of the Habitats Directive. In particular, the aforementioned objectives of the HD are pursued by the selection, declaration and protection of a network of areas across Europe that is Special Areas of Conservation (SACs). Candidate SACs were selected on the guidelines of a list contained in Annex I habitats, which covers 189 habitats of preservation importance, and Annex II species of which there were 788 species. These annexes have been updated and as of 2006 there are 218 Annex I habitats and 887 Annex II species classified as of Community importance. Next, Member States were asked to make up their national lists of Sites of Community Importance (SCIs) and the sites were then declared SACs within 6 years. These SACs are then incorporated to t

### **3.4 International (wider than EU) legislation & policies on marine Aquaculture**

The international maritime legislative framework has evolved widely during the past decade. International conventions, such as United Nations Convention on the Law of the Sea (UNCLOS ), Convention on Biological Diversity(CBD)or FAO Code of Conduct for Fisheries include regulations for installations and structures, but do not specifically identify or mention the term aquaculture or mariculture<sup>4</sup>.

The following section outlines the international framework for marine aquaculture.

#### **3.4.1. Law of the sea**

International law of the sea is primarily determined by the provisions of the United Nations Convention on the Law of the Sea (UNCLOS) of 1982, which became effective in 1994.

##### ***3.4.1.1 Maritime jurisdiction***

When discussing regulation of aquaculture in ocean waters we have to distinguish between the varying areas operations can take place. The convention divides the oceans in several jurisdictional zones, which are subject to different legal regimes: the territorial sea, the exclusive economic zone, the continental shelf and the high seas.

##### ***3.4.1.2 Territorial sea***

Primarily, marine aquaculture sites are constructed in coastal regions, thus in the twelve mile zone of the territorial sea where the coastal state has sovereignty. Legislation concerning aquaculture is therefore mainly national law.

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<sup>4</sup> Mariculture is a customized sector of aquaculture involving the cultivation of marine organisms for food and other products in the open ocean, an enclosed section of the ocean, or in tanks, ponds or raceways which are filled with seawater.

### **3.4.1.3. Exclusive economic zone**

However, as mentioned above, we can expect a higher amount of fish farms to be situated in offshore waters, i.e. in the EEZ or in the high seas. The EEZ was originally introduced to cope with the increasing claims of exclusive rights in respect of fisheries which more and more states have raised in the second half of the 20th century. The EEZ extends from the outer limit of the territorial sea to a maximum of 200 nautical miles from the territorial sea baseline. It is optional for a state to establish its EEZ, and several states have not made use of that possibility. However, 104 signatories to UNCLOS and the US have declared an EEZ. The rights of the coastal state in that zone do not amount to complete sovereignty, but to control and exploit all natural resources in and of the seabed and superjacent waters. Thus UNCLOS only gives a coastal state jurisdiction and sovereign rights over economic activity, marine scientific research and environmental matters in the EEZ

### **3.4.1.4 Continental shelf**

The extended continental shelf is the zone beyond the 200 nautical mile limit, stretching out to 350 nautical miles of the baseline or 100 nautical miles from the 2 500 metre isobath.

The exclusive rights to exploit the natural resources in this zone refer solely to ‘non-living resources of the seabed and subsoil together with living organisms belonging to sedentary species.’ Thus, beyond the EEZ, the coastal state only has an exclusive right to the resources contained within the seabed in the area of the continental shelf.

When aquaculture takes place in the water bodies above the seabed - as is the common farming method for finfish - one could opine that a state cannot derive any rights from the provisions regarding the continental shelf. However, Article 80 of UNCLOS provides that ‘Article 60 applies mutatis mutandis to ... installations and structures on the continental shelf’. Since mutatis mutandis means ‘with the necessary changes’, the provisions on the continental shelf are of major relevance if a state has not established an EEZ. In that case, it can basically exercise the same rights concerning artificial structures and operations on its continental shelf. In conclusion, the coastal state is not granted the exclusive right to build structures in its continental shelf zone, and has no accompanying exclusive jurisdiction. Other states may erect aquaculture sites without the coastal states consent.

### **3.4.1.5 High seas**

The term ‘high seas’ applies to all parts of the sea which are not included in the internal waters, the territorial sea or in the EEZ of a state. In this area, the ‘freedom of the high seas’ can be enjoyed. This concept is recognised in Article 87 of UNCLOS; Thus the construction of installations such as aquaculture sites constitutes a part of the freedom of the high seas. However, it does not in any way subject the used part of the seas to state sovereignty.

This freedom, however, must comply with the requirement of Article 116 that due regard shall be paid to the interest of other states. Moreover, Article 117 determines:

‘All States have the duty to take, or to cooperate with other States in taking, such measures for their respective nationals as may be necessary for the conservation of the living resources of the high seas.’

Considering marine aquaculture, this provision can be interpreted such that operations in the high seas have to be carried out without harming wild stocks.

### **3.4.2. Environmental control**

UNCLOS not only deals with legal regimes of the oceans but also addresses aspects related to environmental law which also are of importance to mariculture. It is intended to conserve the seas as a source of food and to secure them from pollution. With the adoption of UNCLOS, the freedom of polluting the oceans has expired. Article 118 can be interpreted in a way that it requires states to ensure that their farming practices do not threaten wild stocks or interfere with their conservation.

#### **3.4.2.1 Stockholm Declaration**

The 1972 Declaration of the United Nations Conference on the Human Environment – better known as the Stockholm Declaration – states the two opposing objectives that environmental law has to cope with:

Principle 21

States have ... the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

This provision is considered the ‘cornerstone of international environmental law’. Environmental law before the Stockholm Declaration left unprotected gaps: for example, protection of the high seas presented a special problem. Since the high seas are not the territory of any state, harming them did not mean a breach of state responsibility. Hence, Principle 21 brought a fundamental change

### **3.4.2.2 Rio Declaration**

The Rio Declaration on Environment and Development of 1992, produced at the 1992 United Nations ‘Earth Summit’ comprises of 27 principles intended to promote sustainable development around the world. It expressly adopts the precautionary principle and includes the customary obligation not to cause transboundary harm.

During this meeting the Convention on Biological Diversity (CBD) was introduced, being the most inclusive and prominent global tool dealing with the threats to marine and coastal biodiversity, and safeguarding, understanding and employing marine resources in a reasonable and eco-friendly manner. The Convention stipulates that all member nations develop a network of protected areas and establish guidelines for the selection, declaration and management of protected areas. According to the Convention preserved areas are not the only means for protecting biodiversity but that they constitute a fundamental element of the whole approach. The strategic plan of the Convention was founded on the goal of accomplishing a significant abatement in the rate of biodiversity loss by 2010. This goal was affirmed in the scheme of implementation adopted during the World Summit on Sustainable Development (WSSD 2002) in Johannesburg in 2002. CBD has three overarching objectives:

- the protection of biological diversity
- the sustainable use of its components
- the equal and objective allocation of benefits resulting from the use of genetic resources.

These objectives are to be fulfilled by the adoption of a number of measures including:

- establishing nation-wide strategies
- incorporating biodiversity concerns into sectoral and cross-sectoral projects
- developing controlling programmes
- thorough measures for in-situ and ex-situ preservation (e.g. declaring protected areas, curtailing alien organisms, reconstruct degraded ecosystems)

It should also be noted that a useful component of the implementation of the Convention on Biological Diversity is The Jakarta Mandate on Marine and Coastal Biodiversity (1995) which emphasizes on the interrelationships between conservation, the use of biological diversity and fishing activities.

As a whole, the Convention on Biological Diversity aims at a substantial abatement in the current rate of biodiversity loss by 2010 which is expected to stem from four operational mandates; 1. the establishment of nation-wide planning, 2. the integration of biodiversity concerns into sectoral and cross-sectoral plans, 3. The development of monitoring plans and 4. Thorough means for in-situ and ex-situ preservation.

### **3.4.2.3 FAO Code of Conduct for Fisheries**

The FAO Code of Conduct for Fisheries (1995) sets out principles and international standards of behavior for responsible practices aiming at maintaining effective conservation, management and development of living aquatic resources with a respect for the ecosystem and biodiversity. The Code also governs the catch, processing and trade of fish and fishery products, fishing operations, aquaculture, fisheries research and the integration of fisheries into coastal area management. Objectives of the Code include aim to e.g.:

- set criteria, in agreement with the governing rules of international law, for environment-conscious fishing and fisheries activities, accounting for the interests of all relevant stakeholders;
- set guidelines and criteria for the ramification and adoption of national policies for responsible maintenance of aquatic resources and fisheries management and development;
- sets out as a benchmark to assist countries to develop or to ameliorate the necessary legal and institutional framework for a responsible conduct in terms of fisheries and in the establishment and adoption of suitable norms;
- provide assistance which may be used where appropriate in the establishment and adoption of international treaties and other legal instruments, both binding and voluntary;
- reinforce and promote technical, financial and other cooperation in preservation of aquatic resources and fisheries management and development;
- enhance the role of fisheries to food security and food quality, highlighting the nutritional needs of local communities;

#### **3.4.2.4 United Nations Agenda 21**

Established in 1992, during the United Nations Conference on Environment and Development in Brazil, the Agenda 21 plan is a universal set of actions to be adopted by countries all over the world in order to protect the environment from the adverse effects of human intervention. Full implementation of the plan was confirmed during the World Summit on Sustainable Development in 2002, where countries also pledged themselves to promote the sustainable development of marine ecosystems through the application of the ecosystem approach by 2010, and promoted a nation-wide consolidated, multisectoral, coastal and ocean management. Some of the programme's key objectives are consolidated management and sustainable development of coastal areas; marine environmental conservation; viable use and protection of marine living resources under national authority and reinforcing cooperation and coordination on an international and regional level.

### **3.5 EU Policies & Legislation on Aquaculture**

Within the European Union, the legislative framework has been established around European law supplemented by specific laws that are managed by each individual European Union member country. The most important European laws relevant to aquaculture are the following: Rules 1263/1999 and 2792/1999 related to funding and Rule 1685/2000 related to the selection of acceptable projects as well as various decrees and circulars associated with the processing of structural funds and specialized grants for aquaculture sector development including peripheral areas.

As part of the common fisheries policy (CFP) reform, Regulations (EC) No 1263/1999 and (EC) No 2792/1999, laying down the detailed rules and arrangements regarding Community structural assistance in the fisheries sector, were replaced by Regulations (EC) No 2371/2002, (EC) No 2369/2002, (EC) No 179/2002, (EC) No 1421/2004 and (EC) No 485/2005.

#### **Common Fisheries Policy (CFP)**

The main pillars of the Common Fishery Policy CFP, defined in 2002, are the following:

CFP-O1 - Overcapacity reduction

CFP-O2 - Long term management plans

CFP-O3 - Ecosystem based approach to fishery

CFP-O4 - Stakeholders involvement in management processes

CFP-O5- Selective uses of public funds for activities coherent with CFP

CFP-O6- Two-parties fisheries agreements

CFP-O7 - Consolidation of CFP in a wider maritime context

However, the Commission has embarked on a CFP reform process (Green Paper, 2009) since the targets agreed in 2002 to reach sustainable fisheries that have not been fulfilled. In particular, the reform states that the Common Fisheries Policy shall guarantee utilization of living aquatic resources that offers sustainable economic, environmental and social conditions. In the absence of priorities for these objectives and despite the explicit suggestions of adopting a precautionary and an ecosystem conscious approach, it is not evident how this could be associated with economic and social conditions. Moreover, a lack of clear indicators and yardsticks is observed that otherwise could provide more robust guidance in terms of quantifying policy achievements.

In 2008 the Commission released a working document titled ‘Reflections on further reform of the Common Fisheries Policy’ which highlighted the conflicting objectives and stakeholders views that ultimately could result in a bias during the decision-making process. It was a common belief that the long term ecological sustainability of fisheries ought to rank first because the past development of the CFP has highlighted that healthy fish stocks and healthy marine ecosystems are the indisputable component of an economically and socially healthy fisheries sector. Finally, the Commission published a working document on the results of the CFP consultation in April 2010 (EU 2010) that contained a detailed reference on the ranking of CFP targets.

### **3.5.1 Off-Shore Aquaculture within the EU**

Many stakeholders have moved or plan to move “offshore” into the Exclusive Economic Zone (EEZ) with the aim of avoiding the ever rising spatial competition and strict regulations in the coastal area (Buck et al 2004). An ongoing debate within the EU is whether directives regarding to the protection of birds and habitats (Birds Directive & Habitats Directive respectively), should apply beyond the 12-mile zone though, at present, these regulations are juristically not relevant to the EEZ. However, apart from that, the

structure and implementation of the EU Water Framework Directive (WFD) , which is presently under development by all EU countries, will be of particular relevance.

### **3.5.2 Coastal Aquaculture within the EU**

#### **Marine Strategy Framework Directive (MSFD)**

The Marine Strategy Framework Directive (MSFD) came into force in June 2008 aiming at ‘establishing a framework for community action in the field of marine environmental policy’. The MSFD passes as a top level document as it is revealed by the words ‘framework’, ‘policy’, and requires further elaboration and specification before it can be employed to specific case studies. In other words, MSFD needs to be ‘operationalised’, become tailor-made for the needs of each case study before gets applied.

The third paragraph of MSFD states its most decisive goal : ‘The marine environment is a precious heritage that must be protected, preserved and, where practicable, restored with the ultimate aim of maintaining biodiversity and providing diverse and dynamic oceans and seas which are clean, healthy and productive. In that respect, this Directive should, inter alia, promote the integration of environmental considerations into all relevant policy areas and deliver the environmental pillar of the future maritime policy for the European Union.’

Key aspects of the previous paragraph are that seas must be preserved clean, healthy and productive and that the MSFD should combine any other available policy in the marine environment to fulfill that. In the context of operationalisation the Directive focus on what is known as ‘Good Environmental Status’ (GES) and that ‘member states shall take the necessary steps to achieve or preserve good environmental status in the marine environment by the year 2020 at the latest.’ (Article 1). Moreover, Annex 1 of the MSFD offers 12 qualitative measures of Good Environmental Status which can be thought of the start for the directives high level objectives:

**Table 3**  
**List of Qualitative Measures of Good Environmental Status**

1	Biological diversity
2	Non-indigenous species
3	Commercial fish
4	Foodwebs
5	Eutrophication
6	Sea floor integrity
7	Hydrography
8	Contaminants
9	Contaminants in food
10	Marine litter
11	Energy including noise

Next, it is responsibility of the Member States to determine for their marine waters a combination of characteristics for GES. Within this context, it is suitable to set the standards for the development of rules and methodological guidelines to ensure consistency and to allow for comparison between marine regions or sub-regions with the view of maintaining a good environmental status.

### **Water Framework Directive (WFD)**

The key idea behind the WFD is integration, which is considered as crucial ingredient of the water protection management within the river basins. Although mainly focusing on coastal and inland waters, derivative effects to more unprotected (“offshore”) areas are obvious as these are always interrelated with coastal activities.

The EU Water Framework Directive (WFD) was adopted in December 2000. The formal title of the WFD is “Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy”. The WFD is a regulatory set of rules that elucidates and updates current water legislation by introducing common objectives within the EU for water (inland surface waters, transitional waters, coastal waters and groundwater) and establishes an integrated and coordinated approach to water management in Europe.

The overarching aim of the WFD is long-term sustainable water management based on a high level of protection of the aquatic environment as expressed in its 19th paragraph ‘This

directive aims at maintaining and improving the aquatic environment in the Community. This purpose is primarily concerned with the quality of the waters concerned. Control of quantity is a subordinate element in securing good water quality and therefore measures on quantity, serving the objective of ensuring good quality, should also be established.’ Looking towards achieving a decent quality status, the WFD sets the grounds of a coordinated elaboration of River Basin Management Plans (RBMPs). A RBMP consists of a general description of the river basin district, a summary of all significant pressures and anthropogenic impacts, mapping of the protected areas, maps of the monitoring networks for the water bodies, including protected areas (inter alia Natura 2000 sites), a list of environmental objectives for the water use, a summary of all measures and programs of measures adopted, a list of the competent authorities, and a summary of public information and consultations measures.

To meet the high level goal the principal aim of the WFD is to uphold and restore clean water throughout Europe and ensure its long-term, sustainable use. This main aim is described in Article 1(a): The WFD “prevents further deterioration and protects and enhances the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystem” For making operational the programmes of measures specified in River Basin Management Plans, the environmental objectives to be achieved by the Member States are defined in Article 4. The main environmental objectives are to achieve and maintain ‘good ecological status’ for all surface waters by 2015. This is to be accomplished by implementing the measures necessary to

- prevent degradation of the quality of waters,
- protect, improve and restore all bodies of surface waters and ground waters.
- contribute to a viable water use (through effective pricing of water services),
- progressively reduce discharges of priority substances and cease or phase discharges of priority hazardous substances for surface waters
- drastic reduction of groundwater pollution,
- alleviate the ramifications of floods and droughts,
- guarantee a sufficient flow of water,
- preserve the marine environment.

To sum up the overarching aim of the WFD is long-term viable water management defined on the basis of a quality level of protection of the aquatic resources within the boundaries of EU. Upgrading water quality by 2015 requires, among other things, the assessment of the ecological status and setting of practical management targets for the environmental objectives of the directive. The WFD dictates the basic guidelines and puts forward a solid description of what is a good ecological status. Member States formulate these norms into distinct quantitative measures and proceed with setting operational quality objectives.

## **Chapter 4 Mediterranean Site**

### **4.1 Introduction and Scope (explicit identification of the geographical boundaries of the case study refer to section 2 point 3)**

The relevant legislation for offshore WECs in Italy consists of regulations for offshore installations, standards on project developments, and procedures to be applied in developing an Environmental Impact Assessment or a Strategic Environmental Assessment, together with Italian and EU guidelines, recommendations, protocols and other technical specifications for assessment and modeling WECs.

The relevant legislation for offshore fish farms in Italy refer to basic legislation, main guidelines, national fisheries and aquaculture plans, essential authorization systems, access to water, procedures for Environmental Impact Assessment, together with EU, national and regional regulations on wastewater, fish movement, disease control, drugs, fish feed and other issues such as financial support or food safety.

### **4.2 The context of the Italian case study**

The focus is on off-shore multi-purpose plants. The Italian case study is characterized by an insufficient wind (4.68 meter/second on yearly average) for developing wind energy converters. We will refer to aquaculture and wave energy converters (WEC).

Moreover, within the European framework (in particular, about social and environmental issues) and the National framework (in particular, about incentives and subsidies), the Legislative Decree No. 112 of 1998 on Regional responsibility for maritime State property (Conferimento di funzioni e compiti amministrativi dello Stato alle regioni ed agli enti locali) transfers to peripheral regional agencies all functions related to maritime State property (i.e. within 12 Maritime Miles). The Italian off-shore case study is nearby the CNR platform in the Adriatic Sea in front of Venice, within 12 Maritime Miles: we will refer to legislation of the Veneto Region, where the Regional Law No.11 of 2001 implements the Legislative Decree No.112 del 1998, and the Deliberation of the Regional Government (Giunta Regionale del Veneto) No. 454 of 2002 on Responsibilities assigned to central and peripheral regional agencies about the maritime State property (Definizioni dei compiti assegnati alle strutture regionali centrali e periferiche nel settore del demanio marittimo)

specifies to refer to peripheral offices of Genio Civile for concession demands for using the maritime State property.

Finally, the Italian case study is characterized by an insufficient sea depth (16 meters), for developing a fish farm. We will refer to shell-culture or algae-culture and WEC. In particular, for both shell-culture or algae-culture and WEC, we will analyze existing legislation with respect to concessions (i.e. types and sizes of plants) and funds (i.e. incentives and subsidies) in Sections 4 and 5, by discussing (possibly) future legislation in Section 6.

Note that within 250 meters around the CNR center, no permissions are required for research activities, because the CNR institution is responsible for this maritime State property. However, we are interested in (potentially) marketable activities: since important trade and tourist maritime ways are identified to the South of the CNR platform, we will consider a plant location to the North of the CNR platform.

### **4.3.Shell-culture or algae-culture**

#### **4.3.1Concessions**

As for types, Legislative Decree No.154 of 2004, Art. 12 (7) on Modernization of the fisheries and aquaculture sectors (Modernizzazione del settore pesca e acquacoltura – Misure di conservazione e gestione delle risorse ittiche) states that “As for marine aquaculture carried out in coastal areas with essential ecological relevance for the conservation of biodiversity and of biological resources, with impacts on the maritime fishery such as ponds, lagoons, marshes (Comacchio, Delta del Po, Venice lagoon, Marano lagoon and Grado lagoon), peculiar dispositions are set up to control for environmental impact and to avoid water pollution”.

Next, Legislative Decree No.11954 of 2010, Art. 4 (1) on Production of marine animals and algae by biological aquaculture (Produzione di animali e di alghe marine dell’acquacoltura biologica) states that “... in order to reduce impacts on the sea bed and on rounding sea water, current must be greater than 2 cm/second on average per year and sea depth must be greater than 20 m ... These conditions do not apply to shell-culture”. Our case study is characterized by a sea depth of 16 m and a current of 30 cm/second.

Therefore, our multi-purpose plant could develop either non-biological algae-culture or biological and non-biological shell-culture. However, Legislative Decree No.154 of 2004,

Art. 10 (1) on Modernization of the fisheries and aquaculture sectors (Modernizzazione del settore pesca e acquacoltura – Commissioni consultive locali per la pesca e l’acquacoltura) states that “Regions set up consulting local commissions ...”. Next, Legislative Decree No.11954 of 2010, Art. 2 (1) on Production of marine animals and algae by biological aquaculture (Produzione di animali e di alghe marine dell’acquacoltura biologica) states that “Regions are in charge of authorization for aquaculture activities ...”

Therefore, as for types of aquaculture, our multi-purpose plant could develop either non-biological algae-culture or biological and non-biological shell-culture with similar ex-ante and ex-post controls on environmental issues by the peripheral offices of Genio Civile, together with the Consulting Regional Commissions. Indeed, both types of aquaculture will refer to the same EU legislation (710/2009; 1005/2008; 889/2008; 834/2007), to the same control agencies (i.e. regional authorities for sustainable management) and to the same EU principles implemented by national legislation (Legislative Decree No.11954 of 2010, Art. 1 (1) on Production of marine animals and algae by biological aquaculture; Legislative Decree No. 226 of 2001 on Guidelines and organization of fisheries and aquaculture sectors):

- a. Environmental monitoring, with focus on water quality and nutrient discharges, ...
- b. Protocols for production phases
- c. Production capacity
- d. Assessment of wild biomass
- e. Data on yearly nutrient discharges per production plant
- f. Regeneration of marine algae
- g. Multi-culture systems
- h. Maintenance and repair of technical equipment
- i. Waste reduction
- j. Document keeping

As regards sizes, the Deliberation of the Regional Government (Giunta Regionale del Veneto) No.412 of 2009 eliminates the maximum increase (10% of the extension of 2600 ha) specified by the Deliberation of the Regional Government No. 1754 of 2008, which increased the maximum increase (3% of the extension of 2600 ha) specified by the Deliberation of the Regional Government No.2948 of 2007 on Integrative dispositions about maritime state property concession release for fish and aquaculture activities

(Disposizioni concernenti il rilascio delle concessioni demaniali marittime per attività di pesca e acquacoltura), by introducing ex-ante assessments at macro-system level such as:

- Environmental sustainability of impacts on marine ecosystems, by taking into account the fishery relying on coastal resources
- Optimal location of plants, by considering the alternative uses of the maritime State property (e.g. production activities, infrastructure, services, environmental protection, ...) within a planning approach involving the whole coastal areas
- Impacts of increased production on prices, employment and profitability of aquaculture activities

Therefore, as for sizes of aquaculture, our multi-purpose plant could now face quite a weak competition by other firms. Note that the Legislative Decree No. 4 of 2012, Art.7 (1) on Dispositions for reorganization of normative framework on fisheries and aquaculture (Misure per il riassetto della normative in materia di pesca e acquacoltura) introduces fines and temporary suspension up to permanent withdraw of concessions in order to preserve marine biological resources as well as to prevent, discourage and eliminate illegal, undeclared or unregulated fishery. The main procedures, with demands to the peripheral offices of Genio Civile and Dogana as well as to Financial and Maritime authorities, are detailed in the Appendix I, where sentences about tourist activities are deleted.

### **4.3.2 Funds**

As for incentives, for insurance, within EU Regulation No.1263 of 1999 on the Financial instrument for fisheries guidance, the Legislative Decree No.100 of 2005 on Further provisions for the modernization of the fisheries and aquaculture sectors (Ulteriori disposizioni per la modernizzazione dei settori della pesca e dell'acquacoltura), in order to favor insurance contracts covering structural risks linked to natural events, meteorological conditions and prices fluctuations, states that “up to 80% of insurance premium can be refunded by the State ...”, by specifying conditions to be met.

As for subsidies, for investments, within EU Regulation No.2792 of 1999 on Community structural assistance in the fisheries sector, the Deliberation of the Regional Government (Giunta Regionale del Veneto) No. 3316 of 2007 on Subsidies for fish and aquaculture

activities (Interventi nel settore della pesca e dell'acquacoltura, complemento di programmazione regionale cofinanziato dallo SFOP) states that “up to 50% of expenditures can be reimbursed by the Region ...”, by specifying conditions to be met.

#### **4.4 Wave energy converters**

Unlike other energy sectors, wave energy generation is in an early stage of development and there is no established industry consensus on codes and standards. However, the API, ISO and NORSOK offshore structural standards (DNV, 2012), together with ABS, CIRIA, DNV, EMEC, HMRC, IALA, IEA OES, IEC, IMCA OADC (PCCI, 2009), seem to be the most applicable. Note that these standards can be grouped according to the adopted design approach (i.e. Working Stress Design WSL and Load and Resistance Factor Design/Limit State Design LRFD/LSD), with the LRFD/LSD approach appearing the methodology that will eventually prevail.

In particular, the following 10 tasks can be identified: environmental loads; loading conditions; structural steel design; connections; fatigue; foundation design; in-service inspection and maintenance; assessment of existing platforms and floaters; fire, blast and accidental loadings; installation and temporary conditions.

There are no regional, national or EU legislation specifically addressed to wave energy projects. However, as for design of WEC devices put on the market, the following EU Directives seem to be relevant (DNV, 2005): Pressure Equipment Directive (PED), Electromagnetic Compatibility (EMC), Low Voltage Directive (LVD), Machinery Directive (MD), Marine Equipment Directive (MED), ATEX Directive.

Next, as for environmental impacts, wave projects could be considered within Annex II of the Environmental Impact Assessment Directive No.337 of 1985 (and subsequent No. 11 of 1997 and No. 35 of 2003), covering activities from construction through the operational phase to final decommissioning, under the category “Energy industry: a) Industrial installations for the production of electricity (...)”. In particular, the Directive No.35 of 2003, Art. 4(2), suggests that wave projects could be subject to an Environmental Impact Assessment depending on their nature, size, location either in accordance with (nationally) pre-determined thresholds or on case-by-case basis. Note that our case study is not close to the coast nor to a site designated under an EU Directive on Wild Birds of Habitats, while the Legislative Decree No.4 of 2008 on Further provisions on environmental issues

(Ulteriori disposizioni correttive ed integrative del decreto legislativo 3 aprile 2006, n. 152, recante norme in materia ambientale) introduces the Environmental Impact Assessment and the Strategic Impact Assessment, but it refers to other sectors.

**Table 4**

**Annex III, with respect to the selection criteria referred in article 4(3) of the EIA Directive**

Topics	Criteria
1. Characteristics of projects The characteristics of projects must be considered having regard, in particular, to:	<ul style="list-style-type: none"> <li>- The size of the project</li> <li>- The cumulation with other projects</li> <li>- The use of natural resources</li> <li>- The production of waste</li> <li>- Pollution and nuisances</li> <li>- The risk of accidents, having regard in particular to substances or technologies used</li> </ul>
2. Location of projects The environmental sensitivity of geographical areas likely to be affected by projects must be considered, having regard, in particular, to:	<ul style="list-style-type: none"> <li>- The existing land use</li> <li>- The relative abundance, quality and regenerative capacity of natural resources in the area</li> <li>- The absorption capacity of the natural environment, paying particular attention to the following areas:               <ul style="list-style-type: none"> <li>(a) Wetlands</li> <li>(b) Coastal zones</li> <li>(c) Mountain and forest areas</li> <li>(d) Nature reserves and parks</li> <li>(e) Areas classified or protected under Member States's legislation; special protection areas designated by Member States pursuant to Directive 79/409/EEC and 92/43/EEC</li> <li>(f) Areas in which the environment quality standards laid down in community legislation have already been exceeded;</li> <li>(g) Densely populated areas;</li> <li>(h) Landscapes of historical, cultural or archaeological significance.</li> </ul> </li> </ul>
3. Characteristics of the potential impact The potential significant effects of projects must be considered in relation to criteria set out 1 and 2 above, and having regard in particular to:	<ul style="list-style-type: none"> <li>- The extent of the impact (geographical area and size of the affected population)</li> <li>- The trans-frontier nature of the impact</li> <li>- The probability of the impact</li> <li>- The duration, frequency and reversibility of the impact</li> </ul>

Source. D6.1.1, Equimar project

Therefore, an Environmental Impact Assessment could be applied on case-by-case basis, due to the characteristics of WEC projects specified in Table 4, by referring to criteria identified in Table 5, together with a factual implementation of a public participation process, by providing a time and decision framework for the subsequent phases which allow to inform the public about, and to involve the public in, decision-making: public awareness of marine energy based on accurate information is important in order to limit negative

misperceptions of environmental impacts, which could be raised by the population when limited information is available.

**Table 5**

**Annex IV, with respect to the selection criteria referred in article 5(1) of the EIA Directive**

Topics	Information to be supplied by the developer
1. Description of the project including	<ul style="list-style-type: none"> <li>- A description of the physical characteristics of the whole project and the land-use requirements during the construction and operational phases</li> <li>- A description of the main characteristics of the main production processes, for instance, nature and quantity of the materials used,</li> <li>- An estimate by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc) resulting from the operation of the proposed project.</li> </ul>
2. An outline of the main alternatives studied by the developer and an indication of the main reasons for this choice, taking into account the environmental effects	
3. A description of the aspects of the environment likely to be significantly affected by the proposed project, including in particular:	<ul style="list-style-type: none"> <li>- Population</li> <li>- Fauna</li> <li>- Flora</li> <li>- Soil</li> <li>- Water</li> <li>- Air</li> <li>- Climatic factors</li> <li>- Material assets including the architectural and archaeological heritage</li> <li>- Landscape</li> <li>- Inter-relationship between the above factors</li> </ul>
4. A description of the likely significant effects of the proposed project on the environment resulting from:	<ul style="list-style-type: none"> <li>- The existence of the project</li> <li>- The use of natural resources</li> <li>- The emission of pollutants</li> <li>- The creation of nuisances</li> <li>- The elimination of waste and</li> <li>- The description by the developer of the forecasting methods used to assess the effects on the environment</li> </ul>
5. A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment	
6. A non-technical summary of the information provided under the above headings	

Source. D6.1.1, Equimar project

Note that the Strategic Impact Assessment aims at ensuring that significant environmental impacts of plans and programs are identified and taken into account during their preparation and before their adoptions. The Strategic Impact Assessment objectives and principles are disregarded, since our focus is on projects rather than plans or programs.

#### **4.4.1 Concessions**

As for sizes and locations, the Circular Letter No. 40 of 2012 by the General Direction of the Ministry of Infrastructures and Transports on off-shore plants for energy production

from renewable resources (Razionalizzazione e semplificazione delle procedure autorizzative fonti energetiche rinnovabili), actually focused on wind plants, states that authorisations for construction and operation is issued by the Ministry of Infrastructures and Transports, once consulted the Ministry of Economic Development and the Ministry of the Environment, ... provided concessions of the maritime State property use by the peripheral offices of Genio Civile (Law No. 244 of 2007, which modifies the Legislative Decree No.387 of 2003).

The main procedures, with demands to the Ministry of Infrastructures and Transports, Ministry of Environment and Maritime authorities, are detailed in the Appendix II, where sentences about non-maritime activities are deleted.

#### **4.4.2 Funds**

As for incentives, Legislative Decree No. 28 of 2011 on Incentives for energy from renewable sources, which implements the Directive No. 28 of 2009 on the Promotion of the use of energy from renewable sources, ensures 0.34 € per kWh for all plants smaller than 5 MW producing energy from marine renewable sources. Note that the unique working plant in Italy is of 50 kW. As for subsidies, there is no national or regional legislation on that.

#### **4.5 Discussion**

Two main EU legal instruments to be implemented by Member States in the future seem to be relevant for shell-culture or algae-culture and wave energy converters: the Water Framework Directive and the Marine Strategy Framework Directive. Indeed, the Maritime Spatial Planning can be considered a tool for improved decision-making in order to achieve an optimal use of marine space, based on a participatory process involving all parties in order to balance competing human activities and marine environment impacts. The Marine Strategy Framework Directive will be disregarded, since our focus is on projects rather than plans or programs.

In particular, the Water Framework Directive (No. 60 of 2000) introduces the following principles: Public participation in planning; The integration of economic approaches; The recovery of the cost of water services; The good ecological status of transitional and coastal surface waters, by highlighting chemical pollution and morphological changes.

**Table 6****Qualitative descriptors for determining good environmental status of marine waters established in Annex I of the Marine Strategy Framework Directive**

Topics	Description
1	Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions.
2	Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems.
3	Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock.
4	All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity
5	Human-induced eutrophication is minimized, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters.
6	Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.
7	Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems.
8	Concentrations of contaminants are at levels not giving rise to pollution effects.
9	Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards.
10	Properties and quantities of marine litter do not cause harm to the coastal and marine environment.
11	Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.

Source. D6.1.1, Equimar project

Next, the Water Framework Directive provides the following guidelines: Toxicity and quantity of the chemical compounds released by plants; The natural (abiotic and biotic) responses by receptors and the routes followed by chemical compounds; The monitoring of chemical releases during the installation and operating phases.

However, the Water Framework Directive refers to coastal waters, while the Marine Strategy Framework Directive (No. 56 of 2008), consistent with the Water Framework Directive, represents the environmental pillar of the EU Integrated Maritime Policy, to achieve the full economic potential of oceans and seas in harmony with the marine environment, and refers to territorial waters (i.e. the area where Member States has and/or exercise jurisdiction rights”, Art. 3).

In particular, the Marine Strategy Framework Directive introduces the following principles: the good environmental status (Table 6) should be established on the basis of geographical and environmental criteria (i.e. clean, healthy and productive waters depend on intrinsic conditions related to different status and dynamics of oceans and seas); the use of the marine environment should be at a level that is sustainable (i.e. safeguarding the potential uses and activities by current and future generations and maintaining ecosystem resilience to human-induced environmental changes).

Next, the Marine Strategy Framework Directive provides the following guidelines: Adaptive management should be adopted to attain good environmental status; cost-effective measures should be assessed and then implemented, by tailoring to each specific context. Note that a lack of official guidelines and administrative experiences might lead to conflicts between authorities both in concessions and supervisions activities.

## **4.6 Conclusion**

The focus was on off-shore multi-purpose plants. The analysis of the Italian case study lead to refer to shell-culture or algae-culture and to wave energy converters.

The discussion of relevant national and regional legislation for shell-culture or algae-culture suggested types and sizes of an aquaculture farm, respectively: Regional and National legislation aims at implementing EU legislation to a different extent, while a crucial role is played by the Consulting Regional Commission with respect to environmental issues and the peripheral offices of Genio Civile with respect to the use of maritime State property.

The discussion of relevant international standards and national legislation for wave energy converters suggested characteristics as well sizes and locations of plants, respectively: there are no Regional and National legislation aiming at implementing EU legislation, while a crucial role is played by the Ministry of Environment with respect to environmental issues and the Ministry of Infrastructures and Transports with respect to the production of energy.

Note that the Legislative Decree No.152 of 2006 on Provisions on environmental issues (Norme in materia ambientale) and the Legislative Decree No.4 of 2008 on Further provisions on environmental issues (Ulteriori disposizioni correttive ed integrative del decreto legislativo 3 aprile 2006, n. 152, recante norme in materia ambientale) introduce the obligatory opinion from the competent Environmental Impact Assessment or Strategic Impact Assessment Commission for each plan and program, according to the EU legislation, although this is not specific to projects of shell-culture or algae-culture or wave energy converters.

Therefore, the implementation of the Water Framework Directive and the Marine Strategy Framework Directive within these sectors seem to be implicitly in charge of the Consulting Regional Commission and the Ministry of Environment. Note that the establishment of a common future legislation at European level could avoid that some countries could benefit from a more permissive (environmentally and technically) legislative framework to deploy multi-purpose projects.

## **Chapter 5 Atlantic Site**

### **5.0 Regulatory Framework for the development of Marine Energy in Spain**

1. Renewable Energies in Spain: General Framework.
2. Royal Decree No. 661/2007
3. Royal Decree No. 1028/2007.
4. Administrative Procedures.

#### **5.1. Renewable Energies in Spain: General framework**

##### **5.1.1 Renewable Energies Plan 2011-2020 (PER)**

The Spanish Renewable Energies Plan (PER) has been approved the 11th of November of 2011. The main objective of this plan is to establish a set of guidelines and policies to meet European objectives by 2020 given by the EU Directive 2009/28/CE. This directive has been approved the 23rd of April of 2009. The PER promotes the production of renewable energies according to the Royal Decree 661/207 and the Sustainable Economy Law 2/2011 approved the 4th of March of 2011.

The PER establishes the available power of each marine energy. By 2020, Offshore wind energy goals 750MW while wave energy power goal is 100MW.

##### **5.1.2 Renewable energies moratorium: New power plants developments**

The 27th of January of 2012, because of the new economic perspectives of Spain, the Government approved the Royal Decree 1/2012. It sets a renewable energies moratorium which paralyzes the feed in tariff framework given by the PER for new renewable technologies.

#### **5.2. Royal Decree No. 661/2007, Special Regime**

##### **5.2.1 Objectives**

Previously to PER 2011-2020 there was a renewable energies plan (PER 2005-2010), which was developed to promote and regulate renewable energies development. The Royal

Decree 661/2007 was approved to meet PER 2005-2010 renewable energies objectives. It establishes a regular and legal framework in order to give stability and certainty and a sufficient return to the society.

One of its main aims is to try to promote an efficient operation of the electrical system as well as integrates and maximizes renewable energies in the electrical system.

Finally, it establishes some mechanism and incentives for market participation.

### **5.2.2 Classification of installations.**

The Royal Decree 661/2007 classifies the renewable installations in the following groups:

Category a) cogeneration and residual energies

Group a.1. Cogeneration: (4 subgroups)

Group a.2. Residual energy installations.

Category b) renewables

Group b.1. Solar

Group b.2. Wind

Group b.3. Geothermal, hot rock, wave, tide, ocean-thermal, current.

Group b.4. Mini-hydro, power < 10 MW.

Group b.5. Hydro, power >10 MW.

Group b.6. Biomass

Group b.7. Biogas and others

Group b.8. Industrial biomass

Category c) energy recovery from waste

Group c.1. SUW.

Group c.2. Waste not previously considered.

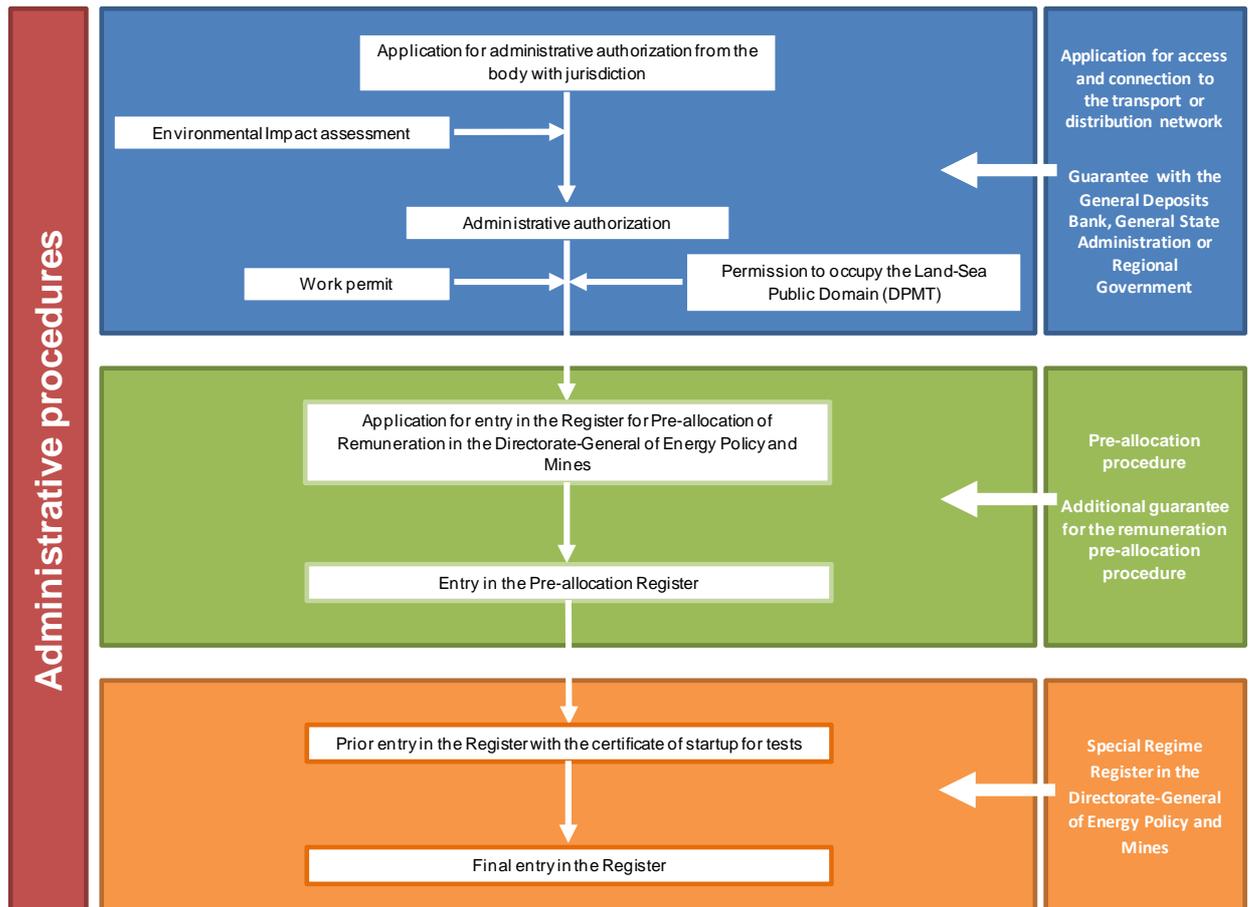
Group c.3. Waste accounting for at least 50% of Primary Energy used, measured by NCV.

Group c.4. Plants pursuant to Royal Decree No. 2366/1994 of waste from mining operations.

Marine energies, including wind and waves, are included on the Category b). Therefore, they are considered special regime energy resources. They must be included in the special regime following the procedure explained on figure 2.

Authority for inclusion in the special regime and the administrative authorization from the Regional Government or General State Administration (Directorate-General of Energy Policy and Mines) when the installation is located in territorial waters.

**Figure 11**  
Royal Decree No. 661/2007, Special Regime. Administrative procedure.



### 5.2.3 Rights and obligations of energy producers in the Special Regime

Once the administrative procedure is successfully finished, the wind/wave energy producer has the following rights and obligations:

Rights:

- To connect to the network of the distributor or carrier electricity utility.
- To transfer its net electrical energy production to the system.
- From total or partial sale, to receive the remuneration provided for in the financial regime of this Royal Decree.
- To sell all or part of the energy through their own networks.

- e) Priority in access and connection to the network.

Obligations:

- a) To deliver and receive the energy in adequate technical conditions.
- b) Entry in the Special Regime Administrative Register.
- c) To associate with a generation control center which will act as interlocutor with the Transmission System Operator (TSO) for installations with power greater than 10 MW.
- d) To send an annual report-summary to the body with jurisdiction.

#### 5.2.4 Mechanisms for remuneration of the energy produced in the special regime

- a) A **single regulated** list of charges for all programming periods.

Sale of energy by charge list will take place through a system of bids managed by the market operator and made at zero price for the amounts of energy the generator wishes to sell.

- b) **Market sale** through the system of bids managed by the market operator, the bilateral contracting system or by installment, or a combination of all these. For periods of not less than one year.

In addition, Reactive power supplement. A discount or penalty depending on the power factor and the time slot.

#### 5.2.5 Remuneration year 2011

Group	Period	Regulated charge c€/kWh	Premium c€/kWh	Upper limit	Lower limit
b3	First 20 years	7.6467	4.2667	no limits	
	Later than 20 years	7.2249	3.3960	no limits	

#### Remuneration updates and revisions

**Updates:** Renewables: annual according to the CPI -0.25 and CPI-0.50

In 2010 for application in 2012 and subsequently every 4 years. Regulated charge for new installations only. There will be feed-in tariff and supplements for all installations.

**Possibility of additional feed-in tariff.**

Notwithstanding the remuneration figures established in Royal Decree No. 661/2007: The right may be assigned to receive a charge or premium specific to each installation during the first fifteen years following startup. Application for a specific charge or premium is made to the Directorate-General of Energy Policy and Mines.

**5.3. Royal Decree No. 1028/2007 on marine installations for electricity production**

**5.3.1 Purpose and scope of application**

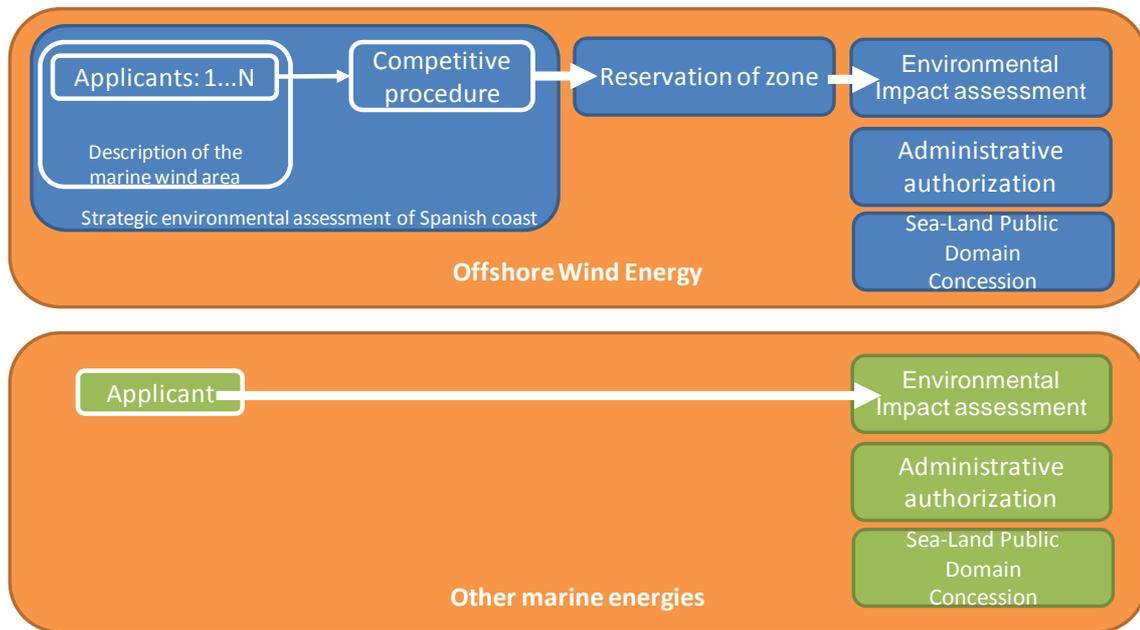
The objective of the present royal decree is to set a procedure for the authorization of electrical generating installations in territorial waters. It provides differentiated competitive procedure for wind installations of more than 50 MW power.

The procedure begins with application for an administrative authorization for marine non-wind facilities. Therefore, it distinguishes between wind offshore energy and other marine renewable energies.

A subsidiary procedure contained in Royal Decree No. 1955/2000 of December 1 regulating transport, distribution, commercialization, supply and authorization procedures for electrical energy installations must be fulfilled.

Figure 12 shows Royal Decree 1028/2007 administrative procedure.

**Figure 12**  
Royal Decree 1028/2007 procedure



### 5.3.2 Administrative Jurisdictions

The following administrations are involved and have jurisdiction on this procedure:

- Ministry of Industry, Energy and Tourism. (Directorate-General of Energy Policy and Mines). The decision-making body. Administrative authorization of installations.
- Ministry of Agriculture, Food, and the Environment (Directorate-General of Coast and Sea Sustainability). Grants authorizations and concessions to occupy the sea-land public domain.
- Ministry of Agriculture, Food, and the Environment. (Directorate-General of Environmental Quality and Assessment and Natural Affairs). An environmental body.
- Ministry of Agriculture, Food, and the Environment. (Secretariat-General for the Sea). Passes measures to protect and regenerate fishery resources.
- Ministry of Development, (Directorate-General of the Merchant Marine). Passes measures for maritime security, navigation and human life at sea.
- Port authority. Grants authorizations and concessions to occupy the port public domain.

These jurisdictions apply even though they may be legally assigned to other bodies in the Administration.

### 5.3.3 Orientation documentation (Government documentation):

#### 1. Strategic Environmental Assessment for the installation of marine wind farms.

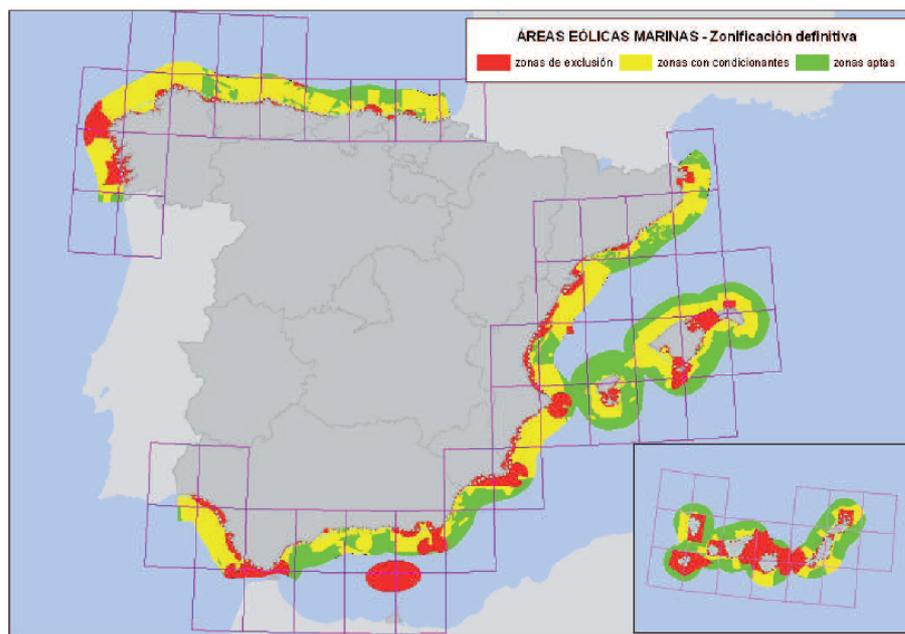
This document has been developed by some of the agencies and ministries with jurisdiction:

- Ministry of Industry, Energy and Tourism.
- Ministry of Agriculture, Food, and the Environment

It establishes a definition of the areas of the Sea-Land Public Domain where the environmental conditions are favorable for the installation of marine wind farms. As well as apt zones where no incompatibility has been detected (see figure 4). Zones with limitations, conditioned by some factor and Exclusion zones, incompatible with the uses or activities.

**Figure 13**

Strategic Environmental Assessment for the installation of marine wind farms. Spanish coast zoning.



#### 2. Documents categorizing Marine Wind Areas for marine wind farms.

It is a compilation of reports from Institutions/Administrations which may be affected by the installation of a wind farm, indicative in nature.

The effects on fishing activity, flora, fauna, birdlife, sea and air navigation, tourism, the historical and archeological heritage, landscape, geomorphology and biological communities on the sea-bed, beaches, the coastal dynamic, spaces subject to environmental

protection, exploitation of mineral resources, defense and security, underwater cables and piping.

## 5.4. Administrative procedures<sup>5</sup>

The administrative procedures have to fulfill the criteria established by Part VII of Royal Decree No. 1955/2000. A summary of the articles and sections that must be accomplished is given next:

Chapter II. Authorizations for the construction, modification, enlargement and operation of installations.

Article 115. The authorization requirement.

Article 120. Application for authorization.

Article 121. Applicant's capacity.

Section I. Administrative authorization.

Article 122. Filing the application for administrative authorization.

Article 123. Content of the application for administrative authorization.

Article 124. Formalities for assessment of the environmental impact.

Article 125. Public consultation.

Article 126. Pleas.

Article 127. Informing other Public Administrations.

Article 128. Resolution.

Article 129. Occupation of the sea-land public domain.

Section II. Approval of the project.

Article 130. Application.

Article 131. Conditioning factors and project approval.

Section III. Authorization to operate.

Article 132. Certificate of startup.

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<sup>5</sup> A complete diagram of the administrative procedure is available at:  
<http://www.minetur.gob.es/energia/electricidad/TramitacionInstalaciones/Documents/CuadroProcedimientoAutorizacionesrevOct08.pdf>

#### 5.4.1. Administrative Authorization

The authorization procedure is set by the Royal Decree No. 1955/2000 of 1 December regulating transport, distribution, commercialization, supply and procedures for the authorization of electrical energy installations.

Documentation which must be included, set by this decree is:

1. Accreditation of applicant's capacity.
2. Design of the marine wind generation installation: offshore wind farm
  - Report
  - Installation plans at minimum scale of 1:50,000, including the planned evacuation lines.
  - Estimated project budget.
  - An off-print for Public Administrations, bodies and, as applicable, public service enterprises or those of general interest which are affected.
  - Other data the Administration responsible for processing the file considers appropriate to request.
3. The Environmental Impact Study.

#### 5.4.2. Environmental Impact Assessment of the Project

Legislative Royal Decree No. 1/2008 of January 11 passing the Reform Act for the Environmental Impact Assessment of projects. This LRD was modified by the Law 6/2010 of March 24.

This involves the following actions:

**Initiative:** Application carried out by the developer to submit the project to an assessment of the potential environmental impact, accompanied by the initial project document.

**Screening** (Ministry of the Environment): reviewing of the initial project document, identification of the corresponding Annexes (I, II, no annexes). Case by case screening is made by the Ministry of Environment with consultation to Regional Environmental Authorities, other Institutions or Authorities concerned and NGOs.

**Scoping** (Ministry of the Environment): Determination of the scope of the

environmental impact study by the environmental body following consultation to Regional Environmental Authorities, other Institutions or Authorities concerned, NGOs and any interested individuals.

**Environmental impact Study (Developer):**

Preparation of the environmental impact report by the project's promoter. The developer drafts the Environmental Impact Report taking into consideration the requirements of the EIA directive and the results of the scoping phase.

**Public Information** (Competent Authority). The project and the environmental impact report is made available to the public before the approval. The public is allowed to comment on the environmental issues of the project.

**Environmental review. Decision making** (Ministry of the Environment): Before the project approval, the Ministry of Environment makes an Environmental Review on the results of the EIA process and the significant impacts on the environment.

This ends with the issue of the Environmental Impact Declaration (DIA) by the environmental body, and which will be made public.

### **5.4.3. Environmental Assessment of the Project. The Environmental Impact Study**

The scope and the level of detail is defined in advance by the environmental body.

Minimum content of the Study:

- General description of the proposed project, including information on its site, design, size, use of the land and other natural resources. An estimate by type and quantity of the expected residues and emissions (including water, air and soil pollution, noise, vibration, light, heat and radiation) resulting from the operation of the proposed development.
- The data required to identify and assess the main effects that the proposed development is likely to have on the environment,

- An outline of the main alternatives studied by the developer and an indication of the main reasons for his or her choice taking into account the effects on the environment,
- A description of the aspects of the environment likely to be particularly affected by the proposed development including:
  - o i. Human beings, fauna and flora,
  - o ii. Soil, water, air, climatic factors and the landscape,
  - o iii. Material assets including the architectural, archaeological and cultural heritage,

A description of the likely significant effects, (direct, indirect, secondary, cumulative, short medium and long term, permanent and temporary, positive and negative) of the proposed development resulting from (a) its existence, (b) the use of natural resources and (c) the emission of pollutants, creation of nuisances and elimination of waste and the forecasting methods used to assess the impact on the environment.

- A description of measures envisaged in order to reduce, avoid and eliminate any adverse affects of development,
- An environmental monitoring program.
- An indication of any difficulties encountered by the developer in compiling the required information. A summary of the study and conclusions.

#### **5.4.4 Occupation of the Sea-Land Public Domain**

Article 146 and the following articles of Royal Decree No. 1471/1989 of December 1 passing the General Regulation for Development and Implementation of the Coasts Act, Act No. 22/1988 of July 28.

Documentation required:

- Identification of the Sea-Land Public Domain to be occupied.
- Justification of the need to occupy the Sea-Land Public Domain.
- The basic design or construction project.

- An economic-financial study.
- A receipt for payment of the provisional bond.
- A basic study of the coastal dynamic (with the content established in Article 92 of the Coasts Act Regulations).
- An environmental impact study.

Maximum term, 30 years.

#### **5.4.5. Approval of the construction project**

Application to the Division or as applicable the Office of Industry and Energy of the Government Delegations or Sub-Delegations in the provinces affected, accompanied by the construction project and the offprints of those parts of the project which affect other Administrations.

Delivery of the off-prints to the Administrations, to establish the technical conditions.

Delivery of the file and report to the Directorate-General of Energy Policy and Mines, for Resolution.

#### **5.4.6 Startup certificate (APS)**

Application along with the end of work certificate in the Division or as applicable in the Industry and Energy Office in each Government Delegation or Sub-Delegation.

The Startup Certificate is drawn up by the provincial authority following the necessary technical checks.

A Startup Certificate may be drawn up for tests, at the request of the installation's owner.

## **Chapter 6 North Sea Site**

### **6.1 Introduction and Scope (explicit identification of the geographical boundaries of the case study, refer to section 2 point 3)**

A potential offshore site characterized by active morphology is proposed, North of the the Wadden Sea. The planned windpark is called Gemini. Located 55 km northeast of the barrier island Schiermonnikoog, the wind farm will consist of 150 3.6 MW Siemens turbines.

The North Sea case-study is located North of the Dutch Wadden isle Schiermonnikoog (latitude 54,036', longitude 5,964'). Total area size is 68 km<sup>2</sup> and the distance to the nearest shore is 70.2 km. At this location, an offshore wind energy park is envisioned with a total capacity of 600 MW. It is expected that a total of 150 wind turbines with a capacity in the range of 3.6 -4 MW each will be built. Water depth at this location ranges between 32 and 34 m. On figure 14, nr 12 refers to the area where the North Sea case-study will take place.



- Aquaculture

### **Challenges**

- Technical feasibility
- Environmental impact
- Legislation and policies
- Economic feasibility
- Social perception

### **Stakeholders**

To be selected based on an agreed methodology to be representative of the site conditions, for instance:

- local governmental bodies, such as
- 2 research-governmental institutes such as
- 2 investors (1 developer, 1 industry) such as
- 1 or 2 energy company nationally responsible for transferring energy and/or energy inventory and feeding,
- 1 aquaculture seaweed representative
- 1 marine yachting/cruise representative
- 1 representative from local economic more relevant activities, hotel/industry
- 1 representative from environmental agencies and association

## **6.2 Specific Legislation and Policies on Aqua-Culture**

It is argued that there are opportunities for growth in aquaculture in the European Union EU, to play an important role in the supply of aquatic seafood for human consumption. In 2009 the EU published a communication to give new input for the sustainable development of European Aquaculture (SEC 453/454). The three main objectives where

1. to increase competition,
2. securing its sustainability
3. improving governance and ensuring a business-friendly environment in all governance levels (local, national and EU).

In the Netherlands sustainable development and realization of policy for aquaculture is stimulated through the aquaculture innovation platform.

Policies for aquaculture can be divided into coastal aquaculture and off-shore. In the Dutch EEZ, wind energy parks will be placed in off-shore areas where, in the current situation, no aquaculture activities take place. The Dutch aquaculture sector is dominated by shellfish cultivation in the coastal areas. In this context the Waddensea, Oosterschelde, Westerschelde and the Voordelta are considered the most important areas.

In the next paragraph we will look at possibilities of aquaculture activities in off-shore wind energy parks looking at the current policy.

### **6.2.1 Off-Shore Aquaculture (Agreement between Countries and Country Specific Agreement)**

In 2011 Rijkswaterstaat stated that smart uses of space could be a solution to the shortage of space on the North sea (Verhaeghe et al, 2011). Aquaculture inside off-shore wind energy parks was mentioned as a possible smart use of space, providing opportunities for clever entrepreneurship. However, in the Integral Management plan for the North sea (Integraal Beheerplan Noordzee, 2006) there is no space allocated to off-shore aquaculture for the Dutch part of the North sea. This means that aquaculture activities in wind energy parks need to be applied for through permits. In addition to these permits there is an integral balancing framework aiming to help managers in coordinating permit restricted activities with efficient use of space and nature protection values).

This framework consists of five tests: 1. Defining spatial claim, 2. Precaution, 3. Usefulness and need, 4. Location choice and spatial use and 5. Reducing the effect and compensation. For new activities this means that they have to reduce or prevent negative effects on the environment, which is tested using precautionary test. They have to address why it is important that this activity takes place in the North Sea using a social cost-benefit analysis. The space needed for the activity must be carefully chosen and sufficiently used and when the activity compromises important natural values these need to be compensated in another area.

In case of off-shore wind energy parks there is a safety zone of 500 meter around static objects such as turbines (IBN) all countries can designate such a safety zone (cf. UNCLOS). This means no shipping activities can take place within 500 meter of the turbine. However exemptions on this rule could be made through permit application (IBN).

The Integral Management plan for the North Sea states that it is unlikely that fish cultivation on open sea is to happen. Open systems are economically attractive but environmentally unfavorable against closed systems. Furthermore, scientist question whether the environment in the Dutch parts of the North Sea allows for fish aquaculture (Reijs et al, 2008). Mari culture on open sea is more positively advocated when floating mussel docks become successful (IBN).

France and Belgium have a similar attitude towards aquaculture activities in wind energy parks as the Netherlands. They have designated a 500 meter safety zone round the turbines and do not allow shipping inside the area. Denmark and England have another attitude towards activities inside wind energy parks. Denmark and the United Kingdom expect fishery and shipping activities to continue as before and when fishery activities are disrupted because of the turbines , claims can be expected. In Denmark the right to fish is recorded in the constitution and the United Kingdom only applies a safety zone with maintenance and building activities (ILVO).

### **6.3 Specific Legislation and Policies Wind energy**

In the “Roadmap for moving to a competitive low-carbon economy in 2050” (COM(2011) 112 final) the European Commission set an ambitious long-term target; the reduction of greenhouse gas emissions in 2050 by 80-95% compared to 1990. The roadmap, part of the “Europe 2020 flagship initiative for a resource-efficient Europe” states that in 2020, EU member states should have reduced greenhouse gas emissions by 20%, by increasing the share of renewables in the EU’s energy mix by 20% and improving energy efficiency by 20%.

These EU wide ambitions underlie Dutch energy policy. To understand the essence of Dutch energy policy, is important to identify the three “perspectives” on energy policy as formulated in the “Energierapport 2011”. First, and building upon the EU targets, there is the ambition to move towards a cleaner energy supply. Second is the perspective that identifies the energy sector as an important economic sector to be stimulated. Third, there is concern about the reliability of energy supply. The identification of these three perspectives signify a changing focus in energy policies where sustainability now goes hand in hand with economic performance. Consequently, five priorities for Dutch energy policy are identified:

1. A modern industrial policy is required to improve the performance, and international position, of the Dutch energy sector.

2. The supply of renewable energy needs to be enlarged. This is a long and short-term objective. In the long run, emphasis is on improving the competitiveness of renewables. In the short run, focus lies on improving the impact of the existing subsidy program SDE+ and on mandatory use of biofuels in power generation.
3. All energy-options need to be kept open towards 2050. This means the Dutch policy does not include any technology (for example nuclear, CCS). All are deemed necessary to achieve the long-term objectives.
4. Green deals are formulated in which government and society (profit and non-profit) make arrangements to invest innovation that contributes to the achievement of policy objectives.
5. Investments in a well-functioning European energy market are required, This requires mutual adjustment between countries, investment in transport capacity and reservation of sufficient space for energy production.

These are the general priorities of Dutch energy policy. When it comes to policies and legislation for off-shore and coastal wind, the following aspects require attention;

- Specific policy objectives in place to enable off-shore and coastal wind;
- Existing subsidy programs to support wind energy;
- Spatial policies that regulate wind energy;
- Requires permits to develop wind energy projects;
- Innovation agenda for future development of wind generation.

### **6.3.1 Off-Shore Wind (Agreement between Countries and Country Specific Agreement)**

#### *Policy objectives for off-shore wind*

In current Dutch energy policy, a clear policy for off-shore wind energy is lacking. This is caused by a reorientation in energy policy on the one hand, moving away from off-shore wind energy and the development marine spatial plans on the other, moving towards off-shore wind.

In earlier energy policy, off-shore wind energy was identified as an important sector, required to achieve formulated objectives. These objectives were laid down in for example

the 2007 “Werkprogramma Schoon en Zuinig” in which a growth of off-shore wind energy capacity of ca. 500 MW/year was foreseen. At that time, reservation of sufficient space in marine spatial planning was considered the main bottleneck for development of off-shore wind energy. In following marine spatial plans, these problems were addressed (see below). In 2008, the Dutch government formulated the objective to reach 6000 MW production capacity for off-shore wind energy. In 2010, the Minister appointed the Taskforce Windenergie op Zee with the objective to identify bottlenecks for achieving the 6000 MW target. The Taskforce identified a number of bottlenecks, including for example problems in supply – and investment chains and lacking capacity at the government to deal with the topic (Taskforce Wind op Zee, 2010) Until 2010, off-shore wind energy was subsidized under the SDE program (Stimulerend Duurzame Energie). The Taskforce plead for optimisation of the SDE program – from an off-shore wind perspective. However, as illustrated in the next paragraph, the new 2012 SDE+ program excluded off-shore wind energy.

An important issue concerning the production and transport of renewable energy is the integration of new production capacity in national grid. It is the responsibility of national grid owner Tennet to avoid congestion and secure safe transport and supply. Under EU legislation (2009/28/EC), Member States are required to give renewable energy priority on the national grid. This requirement was implemented through an adjustment of the Dutch Electricity Law but pending a discussion on the allocation of the cost of congestion management, the Law is not yet approved. A different discussion issue on grid integration concern the costs for connection of off-shore wind energy parks to the national grid. Under current Dutch law, these costs are to be made by the project developer.

#### *Subsidies to stimulate renewable energy*

The two existing off-shore wind energy parks in the Netherlands are financed through the MEP-program (Milieukwaliteit Elektriciteitsproductie) which has come to an end. In May 2010, two other developments received subsidy under the 2009 SDE-program; Buitengaats C.V. en ZeeEnergie C.V. Both are located in the area of study, above Schiermonnikoog and together allow for the realization of 600 MW of off-shore wind energy production. Both are now owned by Typhoon Off-shore . In November 2011, the remainder of the budget was allocated to Dutch energy company Eneco for the (to be realized) Q10 off-shore wind energy park.

The main current subsidy program that targets the production of renewable energy is the SDE+ program (Stimulerend Duurzame Energie). The rationale behind SDE+ is that renewable energy is more costly to produce but need stimulation to development markets and more efficient technologies. Hence the government subsidizes part of the production costs of renewable energy.

In 2012, the following production methods are eligible for subsidy;

- Waste incineration;
- Biomass (Digestion, direct burning or fermentation);
- Direct burning of biomass;
- Solar energy;
- Biogas from wastewater treatment plants;
- Wind energy;
- Hydropower;
- Geothermal energy.

There are a number of limitations to the subsidy program. First of all, there is a budget cap. Every year, the Minister decides what is available for the program. In 2012, € 1,7 billion is available. Secondly, the program prioritizes cheap renewables over more expensive production methods. The available budget is allocated to different production methods based on the subsidy required per unit of energy production (€/kWh). The cheaper renewable energy production, the more budget is available.

From 2012 onwards, off-shore windenergy is no longer eligible for subsidy under the SDE+ program. It is argued that it is too expensive – compared to other production methods – and focus should first be on innovation, reducing cost price.

For clarification, existing off-shore wind parks in the Netherlands are subsidized under different programs that are longer open for new applications (MEP, SDE Tender Wind op Zee, 2009).

### *Off-shore wind energy in Dutch marine spatial planning*

The first two off-shore wind energy parks in the Dutch territory of the North Sea were realized in a period of time in which there was no specific marine spatial planning strategy for off-shore wind energy parks. Applicants had to use Environmental Impact Assessment to assess the impact of construction and operation on the environment. Although a large

number of permits were requested, only two parks were permitted. Up to this day, these so-called Round 1 parks are the only two realized Dutch off-shore wind energy parks.

Permits for the so-called Round 2 parks were also asked prior to the development of a marine spatial plan for off-shore wind parks. In Round 2, 12 permits were issued for off-shore wind energy parks. Final permission was given in between 2009 and 2010. Out of these 12, only 3 parks received SDE subsidy; the Q10 park and two parks North of Schiermonnikoog. On April 1, 2008 a moratorium on new permits for off-shore wind energy parks was announced. Until further notice, request for new permits will not be taken into account.

In 2007, the Dutch government presented their vision on how the Netherlands should deal with water issues. Sustainable, climate-proof, and strengthening the economy were key words. The vision was important because it provided input and direction to the first Dutch National Waterplan (Nationaal Waterplan 2009-2015). Is For the North Sea area, the objective is to “make the North Sea more sustainable”, whilst keeping in mind the first priority: safety and protection from floods.

Accepted on December 22, 2009, The National Waterplan integrated all areas water, from off-shore and coastal to rivers and inland water. Based on the Waterwet and the law on spatial planning (*Wet ruimtelijke ordening/Wro*), the National Waterplan was also the Structure Plan (*Structuurvisie*), describing the rough outline of spatial planning of future water-related developments. The National Waterplan follows an area-oriented approach, for each water basin, specific objectives are formulated and a spatial plan is made to accommodate developments.

One of the ways to make the North Sea more sustainable is to reserve sufficient space for off-shore wind energy parks. Informed by the 6000 MW ambition, it was envisioned that at least 1000 km<sup>2</sup> needed to be reserved for wind park development. Future developments (after 2020) might require more space. Other developments, such as Carbon Capture and Storage (CCS) are also envisioned and the need for mutual adjustment between functions is emphasized. In the National Waterplan, the options for multiple uses of space are explicitly mentioned.

In the Policy Note North Sea 2009-2015 (Beleidsnota Noordzee 2009-2015), North Sea policies are further elaborated. After a first identification of areas where off-shore wind energy could be developed, a second step was to balance the interests of the various users of the North Sea . This exercise resulted in the identification of two areas for off-shore wind development and two so-called “zoekgebieden” (search areas) for future developments. In

this policy document, it is explicitly mentioned that co-use off-shore wind energy parks, for example for recreation, fisheries and aquaculture, should be allowed as much as possible and needs to be discussed with the involved parties as the policy is implemented.

In 2012, the Minister decided that the permits for the 9 remaining park are valid until 2020, to give more time for realization.

Dutch off-shore wind: Three “Rounds”
Round 1: Two off-shore windenergy parks realised: the (1) “Prinses Amaliawindpark” off coast of de kust van IJmuiden and (2) the Off-shore Windpark Egmond aan Zee (OWEZ) off coast of Egmond aan Zee. Together they have a capacity of 228 MW. Both are realised drawing upon MEP-subsidy.
Round 2: Twelve permits are granted to develop new off-shore wind parks. Three parks are eligible for subsidy under the SDE program: two parks North of Schiermonnikoog (600MW) and the Q10 park (150MW). The remaining permits are valid until 2020.
Round 3: A new system for granting concessions is developed and expected to be in place ultimo 2015.

Box 6.1: current situation for off-shore wind energy in the Netherlands

*From designated area to project development: regulations and permits*

An off-shore wind energy park requires a permit, based on the “Wet beheer rijkswaterstaatwerken” (Wbr). Before such a permit can be granted, project developers have to go through the environmental impacts assessment procedure. When applying for a permit, they are obliged to deliver a “SIA” (strategic impact assessment) which assesses the environmental impact of their envisioned project. Before realization of the project, a “MER” is required to assess the environmental impact of the definitive project.

Dutch legislation differentiates between two EIA procedures, the ‘full’ and ‘simplified’ procedure. Applications for off-shore wind energy follow the normal procedure. This following table describes the procedure for EIA in the Netherlands:

procedure	step-by-step
- proponent notifies competent authorities (EIA)	
- public announcement, start of procedure	
- consultation designated authorities	
- public consultation	
- optional: scoping advice NCEA (Netherlands Commission for Environmental Assessment)	
- write and publish SEA/EIA report, including description of alternatives	
- competent authority publishes SEA/ EIA report and concept decision	
- public consultation SEA/EIA report	

- consultation EIA report designated authorities
- review advice NCEA mandatory
- competent authority publishes decision and justification
- evaluation

Box 6.2; EIA procedure (www.ncea.nl)

In this procedure, the project developer can receive feedback from the NCEA, stating which subject are to be addressed in the assessment. In 2007 the NCEA required the project developers to fulfill the following criteria for impact assessment of off-shore wind energy parks:

- To check how the proposed project fits into spatial policies in place
- To make an “appropriate assessment” conform Article 6, paragraph 3 from the Habitat Directive
- To describe if further analysis of the balance between nature’s interest and society’s interest is necessary
- To describe various alternative to the project plan
- To describe possible mitigating measures
- To quantify the effects where possible
- To use the most up-to-date information available.

The procedure of environmental impact assessment also includes public consultation in which the results are made publicly available and the public has the opportunity to react. In total, the procedure can take more than a year.

If a project developer has gone through the procedures for EIA and permitting successfully, a 20 year concession is granted to build a windenergy park. The system of concessions stems from the Mining Act and grants the developer the possibility to build permanent structures and extract resource. In the concession, additional requirements can be included. For Dutch windenergy parks, restrictions for co-use stem from the concession in which the competent authorities have included “restricted” areas surrounding the windenergy constructions where no ships are allowed.

*Top-sector Energy and the Innovation Contract “Wind op Zee”*

In 2011, the Dutch government changed the funding structure for applied research. It now focused on 9 so-called “Topsectors” which are considered of crucial importance for the Dutch economy. In these sectors, the Netherlands has a strong international position, to

which further applied research is to contribute. Energy is one of these sectors. Effectively, this means that budget is made available for applied research. This budget is allocated in cooperation with the companies who also have to match by contributing financially.

Off-shore windenergy is seen as one of the promising future technologies, to benefit the Dutch economy. It is argued that under current conditions, cost prices are too high and for that reason emphasis is put on cost price reduction. Research institutes, companies and government together discuss the allocation of money to the different research project in so called innovation contracts. The innovation contract for off-shore windenergy is currently elaborated. At information day in June 2012, the outlines of the contract were presented and companies and research institutes were asked to submit research proposals aimed to cost price reduction. Multi-use platforms were discussed by various participants and it is expected that proposal are submitted.

#### *Timeline*

The following table illustrates the development off-shore windenergy in the Dutch North Sea.

**Table 7**

A timeline of the development of off-shore windenergy in the Netherlands

<b>Year</b>	<b>Policy and legislation for off-shore wind</b>	<b>Project development</b>
<b>1998</b>		First initiative to develop off-shore wind parks
<b>2002</b>	Permits for first off-shore wind energy parks granted.	
<b>2006</b>		Start of construction first off-shore wind energy park “Prinses Amalia”
<b>2007</b>	Policy objective formulated to realize 6000 MW off-shore wind energy by 2020	
<b>2008</b>		Realization of the first two off-shore wind parks
<b>2008</b>	Moratorium; request for new permits are not accepted until further notice	
<b>2009</b>	National Waterplan formalized in which space for off-shore wind energy is reserved	Permits provided to 12 to be developed off-shore wind parks
	National Waterplan: options for combinations of functions need to be kept open	
<b>2010</b>	SDE subsidy granted to two off-shore wind parks (North of Schiermonnikoog)	
<b>2011</b>	SDE subsidy granted to Q10 off-shore wind park	

<b>2012</b>	Validity of permits extended	Procedure for realization of Q10 wind park started
<b>2012</b>	Off-shore wind no longer eligible for subsidy under SDE+ program	Gemini parks await further action from project developer
<b>2012</b>	Formalization of Green Deal off-shore wind and subsequent innovation agenda	

### **6.3.2 Coastal Wind (Agreement between Countries and Country Specific Agreement)**

Coastal wind is no issue in Dutch policies and regulations. Up to this day, it is not mentioned in energy policy. Coastal wind has different competent authorities than off-shore windenergy, the first kilometer out of the coast falls under the jurisdiction of the municipalities.

Up to now, no municipality has granted permission for a near shore windenergy park. Attempts to realise windenergy production at sea (far off-shore and near shore) face resistance from coastal communities. For this reason, the National Waterplan states that no windenergy production is allowed within the 12

## Chapter 7 Baltic Sea Site

### 7.1 Introduction and Scope (explicit identification of the geographical boundaries of the case study, refer to section 2 point 3)

Kriegers flak, off-shore located in the shallow intersection between Danish, German and Swedish waters. The site may constitute a primary site for massive development of wind turbine farms and with its location on the pathway for exchange flow between Baltic proper and the North Sea the site is ideally suited for aquaculture, potentially with ample synergies between energy and food production. Building on this sites unique physical and natural advantages a test system combining gravity based turbine foundations with extensive mariculture, may provide an efficient platform for harnessing natural resources of the Baltic in a sustainable manner. However any man made construction in the sea potentially may have adverse effects on the vulnerable environment, so part of this basic study will be to investigate, quantify and possibly mitigate such impacts. Special attention will be given to changes due to obstruction of the estuarine exchange flow, adverse effects of spills from mariculture, but also to the potential positive synergies such as increased local bio-diversity due to introduction of hard substrate.

#### *Detailed description of the activities*

Site Kriegers Flak, Baltic Sea Size 50 km<sup>2</sup>. Cross-border Kriegers Flak is situated in the triangle where German, Swedish and Danish economic zones meet and covers all three. The MERMAID site is situated in the Danish economic zone only.

#### *Design type*

Fixed platform wind turbines with gravity based foundations combined with mariculture of trout.

#### *Challenges*

Environmental impacts and social acceptance  
Economic feasibility

#### *Stakeholders*

Local governmental bodies such as Energistyrelsen and Farvandsvæsenet  
Research-governative institutes NN  
Investors such as PFA

Energy company such as DONG, Vattenfall, Energinet.dk

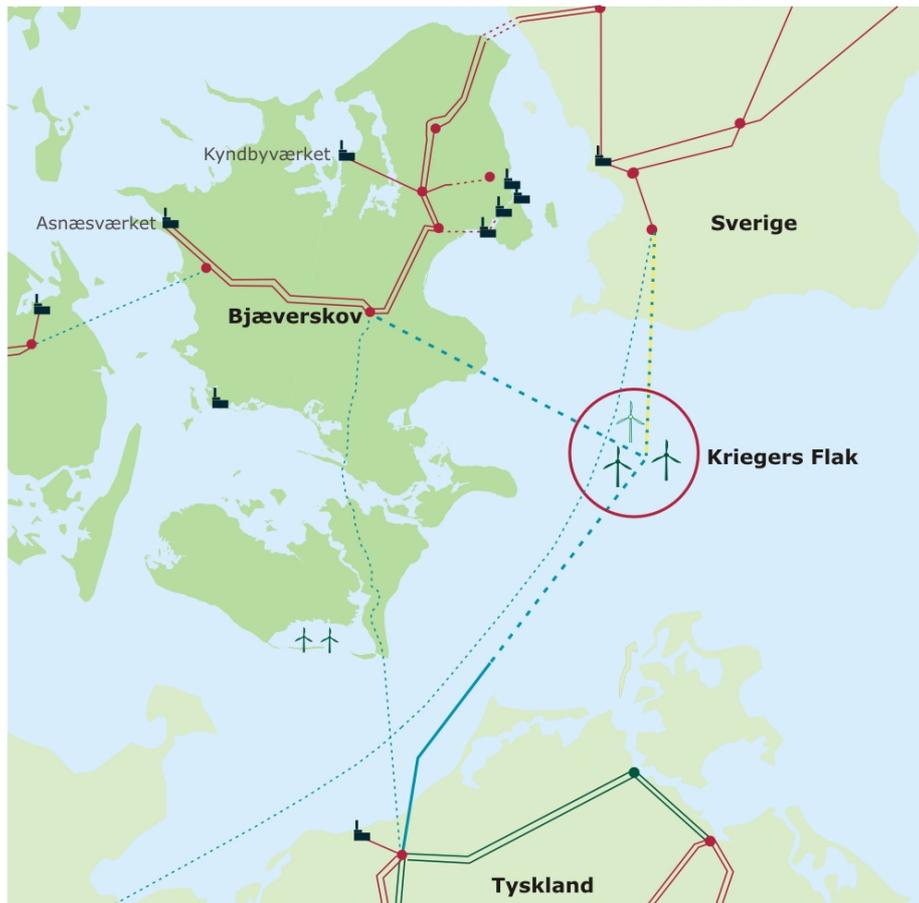
Aquaculture representative such as Musholm Lax

Marine representative such as NN

Local industry such as Visit Bornholm

Environmental agency as DMU

**Figure 15**  
Location of the Baltic site



## 7.2 Specific Legislation and Policies on Aqua-Culture

### *Policy objectives and background*

Denmark has a strong position and tradition in off-shore aquaculture. The main product that is produced in Denmark is rainbow trout from freshwater ponds and mariculture units, the latter also producing roe as an important by-product. Eel is farmed in recirculated freshwater tank systems. Mussels and oysters are produced in minor quantities and turbot fry is exported for further on growing. A variety of other species are raised primarily for

restocking which represents an increasing share of total turnover (Food and Agriculture Organization of the United Nations, and <http://www.akvakultur.dk/>).

Total annual aquaculture production in Denmark was around 36 000 tons in 2003, 3.3 percent of the total fish production in Denmark, worth 20 percent of the total value of fish produced. Earnings from the aquaculture sector were about US\$ 200 million, making it worth more than the economically important Danish cod fisheries; about 90 percent of production goes for export. More than 800 people are directly employed in production (just above 600 being full-time employees), mainly in traditional fish farming. In addition, a significant number of people are employed in associated industries such as processing and smoking. ([http://www.fao.org/index\\_en.htm](http://www.fao.org/index_en.htm))

Marine fish farms have existed since 1970. Currently there are 18 marine fish farms in Denmark, and in 2010 they produced approximately 10 000 ton fish ([www.mst.dk](http://www.mst.dk)).

### **7.2.1 Off-Shore Aquaculture (Agreement between Countries and Country Specific Agreement)**

#### *Legislation on Off-shore aquaculture*

According to the Danish Aquaculture Organisation (2012), the environmental legislation on aquaculture exists on two levels. (1) General legal acts that all types of economic activity have to comply with and (2) legal acts for various form of aquaculture.

There is no specific law on aquaculture in Denmark. Danish aquaculture is strictly regulated by environmental rules, with the exception of full recirculation eel farms, all Danish fish farms have to be officially approved in accordance with the Danish Environmental Protection Act Ord. n0. 122 of March 1st 1991 (Danish Aquaculture Organisation, 2012). A fixed feed quota is assigned to each individual farm in addition to specific requirements including feed conversion ratios, water use and treatment, effluents, removal of waste and offal, etc. In Denmark, aquaculture is being an integrated part of the Danish fisheries sector and as such it is mainly covered by the Fisheries Act under the Ministry of Food, Agriculture en Fisheries.

The overarching legal framework for marine farming is the environmental frame directive, implemented in Danish legislation as consolidated act. No. 932 issued April 24<sup>th</sup> 2009 (Danish Aquaculture Organisation, 2012). Marine farming is only partly covered by this

directive. The ecological status applies for coastal waters up to 1 nautical mile whereas the chemical status applies for coastal waters up to 12 nautical miles. The most critical issue in this directive is the discharge of nitrogen. In the programme of measures for marine farming stands that there must be no overall reduction in the current discharge of nitrogen approved marine farms, but also that new permits must not lead to increased discharge. It is impossible for farms to increase the production without an increase of nitrogen load. On the longer term farms could possibly compensate for such increase. If marine farms want to increase their production it can apply for a part of the total nitrogen quota. But the permit is only granted under the condition that the increase in the discharge of nitrogen is eliminated by compensatory farming. However, it is not clear if the compensation should eliminate the discharge of nitrogen fully or only partly. It is still being discussed.

The management, control and development of fisheries and aquatic resources, like aquaculture, in Denmark are regulated by the Fisheries act (2004) ([http://www.fao.org/fishery/legalframework/nalo\\_denmark/en](http://www.fao.org/fishery/legalframework/nalo_denmark/en)). Chapter 13 of this act addresses offshore ocean farming and establishes a licensing system governing the of mariculture facilities. Besides the fisheries act, the regulation on the establishment and operation of ocean farms contains more detailed rules on the licensing system of mariculture facilities. There is no general definition of aquaculture in the Fisheries Act (2004) [http://www.fao.org/fishery/legalframework/nalo\\_denmark/en](http://www.fao.org/fishery/legalframework/nalo_denmark/en). The Regulation relative to the establishment and operation of ocean farms (1991), adopted under the Act, has, however, the following definition of ocean farming: "With ocean farming is understood fish farms consisting of cages and the like, placed in marine waters which requires the use of feed for its operation".

However, for aquaculture facilities that are placed on land taking in marine water and for fish farming of mussels, oysters etc. no regulations have been issued pursuant to the Fisheries act (2004) ([http://www.fao.org/fishery/legalframework/nalo\\_denmark/en](http://www.fao.org/fishery/legalframework/nalo_denmark/en) concerning licensing). For fish farming that requires feed an approval according to the Environmental Act is required.

The authorities and the set of regulations for farming marine fish in Denmark depend on a category to which a farm belongs. Three categories are defined (Pedersen, 2000)

- Category 1: land-based sea water farms. These are defined as land-based farms taking in or pumping in sea water, including cooling-water from e.g. power plants. The operation of the farm is dependent on the use of feed.

- Category 2: farms with net cages placed in sea water. These are defined as farms consisting of net cages, netted boxes or the like placed in marine waters. The operation of the farm is dependent on the use of feed.
- Category 3: Farms in seawater without the use of feed.

### *Helsinki Convention*

The Helsinki convention has the central aim to protect the marine environment of the Baltic Sea from all sources of pollution. The convention aims to prevent and eliminate pollution in order to restore the ecological damage in the Baltic Sea. The Helsinki commission (HELCOM) is the governing body of the convention. Helcom works to protect the marine environment of the Baltic Sea from all sources of pollution through intergovernmental co-operation between Denmark, Estonia, the European Community, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden. HELCOM works as ([www.helcom.fi](http://www.helcom.fi)).

- an environmental policy maker for the Baltic Sea area by developing common environmental objectives and actions;
- an environmental focal point providing information about (i) the state of/trends in the marine environment; (ii) the efficiency of measures to protect it and (iii) common initiatives and positions which can form the basis for decision-making in other international fora;
- a body for developing, according to the specific needs of the Baltic Sea, Recommendations of its own and Recommendations supplementary to measures imposed by other international organizations;
- a supervisory body dedicated to ensuring that HELCOM environmental standards are fully implemented by all parties throughout the Baltic Sea and its catchment area; and
- A coordinating body, ascertaining multilateral response in case of major maritime incidents.

The Commission unanimously adopts recommendations for the protection of the marine environment, which the governments of the contracting parties must act on in their respective national programs and legislation.

### *Spatial policy*

According to the act relative to planning, regional plans that are prepared by regional counties are important documents. The plans include guidelines for the use of water ways, lakes and waters and accordingly establish aquaculture zones.

### *Permits and procedures*

All marine farms must have an environmental permit no later than 2014. The Environmental Protection act (no. 1757 issued December 22<sup>th</sup> 2006) sets the overall framework for issuing such permits. At this time only a few marine farms have permits under this act (The Danish Aquaculture Organisation, 2012).

Marine farms also have to comply with the requirements for discharge of residues of medicines (Order no. 1022 issues August 25<sup>th</sup> 2010) and protected habitats (Protection of Nature Act no. 933 issued September 24<sup>th</sup> 2009) (The Danish Aquaculture Organisation, 2012).

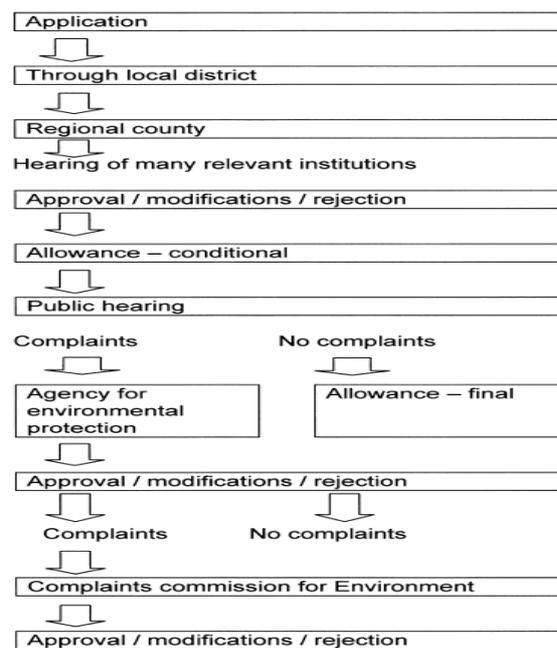
For development of aqua culture activities an Environmental Impact Assessment (EIA) is necessary. These are found in the Planning act (order number 1510 issued December 15<sup>th</sup> 2010). For marine farms situated up to one nautical mile for the coast will require a full EIA. This is a general rule. To some extent it is decided by the local government in the area and they can administer this rule in different ways. For farms outside the nautical mile zone only a screening is required. This has been done as a result of a political compromise between government, farmers and environmental organizations.

The regulation on supplementary rules contains requirements regarding the contents of the EIA. The Regulation provide that when establishing a new marine water fish farm outside a zone designated for aquaculture in the Regional Plan, or when changing such a facility considerably, an EIA shall be worked out. If the aquaculture facility in question is designated for intensive fish farming or has an intake of fresh water, an EIA shall be worked out as far as the facility it is likely to have a considerable impact on the environment, even when it is to be established in an aquaculture zone. The Regulation lists the different criteria that shall be used when considering whether a facility is likely to have such an impact, i.e. the size of the facility, waste production, the vulnerability of the

surrounding environment etc. When it comes to the contents of the EIA, the Regulation states that the EIA shall include a description of the planned facility, a summary of the most important alternative sites that has been examined, the reasons for the choice of alternatives, a description of the environment that can be considerably influenced by facility, as well as an account of the short term and long term influence on the environment. As to ocean farms outside the County Council planning area, the Coastal Directorate decides whether an EIA shall be carried out in relation with an application for the setting up of a facility ([http://www.fao.org/fishery/legalframework/nalo\\_denmark/en](http://www.fao.org/fishery/legalframework/nalo_denmark/en)).

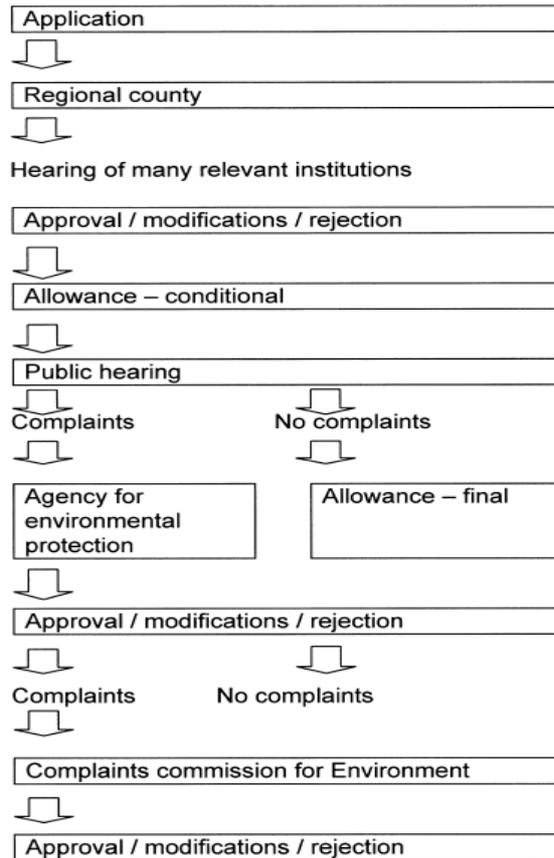
Procedures category 1: land-based sea water farms

A permit must be obtained before establishing or extending a farm. Quite lot information is required according to a set of regulations for polluting industries. Pedersen (2000) describes the stages before an application can be approved.



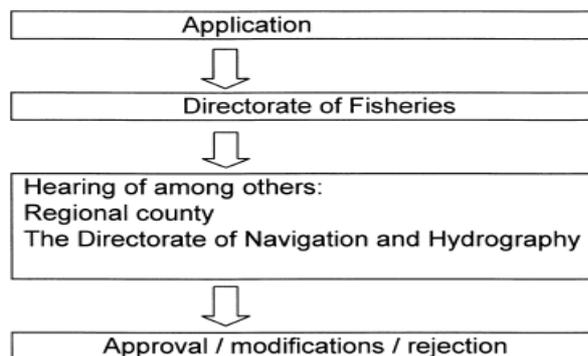
Procedures category 2: Farms with net cages placed in sea water

For these kinds of farms an application must be submitted to the regional county and the Directorate of Fisheries, who are both competent authorities able to issue a permit



Procedures category 3: Farms in seawater without the use of feed

The authority that is able to approve an application for category 3 farms is the Fisheries Directorate. They collect statements about the environmental form the county and the Royal Danish Directorate of Navigation and Hydrography before issuing a license.



## 7.3 Specific Legislation and Policies Off Shore Wind Energy

### *Policy objectives and background*

Denmark has a long tradition on energy policy. When oil prices accelerated in 1973 Denmark was among the OECD countries which were most dependent on oil in its energy supply (Danish Energy Agency, 2012). After the oil crises Denmark launched an active energy policy to ensure the security of supply of energy and to reduce its dependency on imported oil.

Denmark chose early on to prioritise energy savings and a diversified energy supply that concentrate on increased use of renewable energy. A broad array of notable energy-policy initiatives were launched, including a focus on combined electricity and heat production, municipal heat planning and on establishing a more or less nation-wide natural gas grid. Furthermore, Denmark extensively improved efficiency of the building mass, and launched support for renewable energy, research and development of new environmentally friendly energy technologies as well as ambitious use of green taxes (Danish Energy Agency, 2012).

Nowadays the main objectives of the Danish energy policy are (Danish Energy Agency, 2012):

#### Vision:

- 100% independence of fossil fuels
- Internationally committing targets
- 30% renewable energy in final energy consumption in 2020
- 10% renewable energy in transport
- 20% reduction in 2020 for greenhouse gas emissions not covered by allowances
- 21% reduction of greenhouse gas emissions on average in the period 2008-2012 compared with 1990 (Kyoto)

#### National targets

- 20% renewable energy in gross energy consumption in 2011
- Annual energy savings of 1.5% of final energy consumption in 2006

- Reduction in gross energy consumption of 4% in 2020 compared with 2006. In order to realize these goals various policies are being followed by the Government. One policy is to develop as well as utilize new energy technologies. A further objective when supporting development and demonstration of new energy technologies is to focus on technologies that may be produced and exported by Danish companies.

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Danish government has set a goal of running the entire country on renewables by 2050.

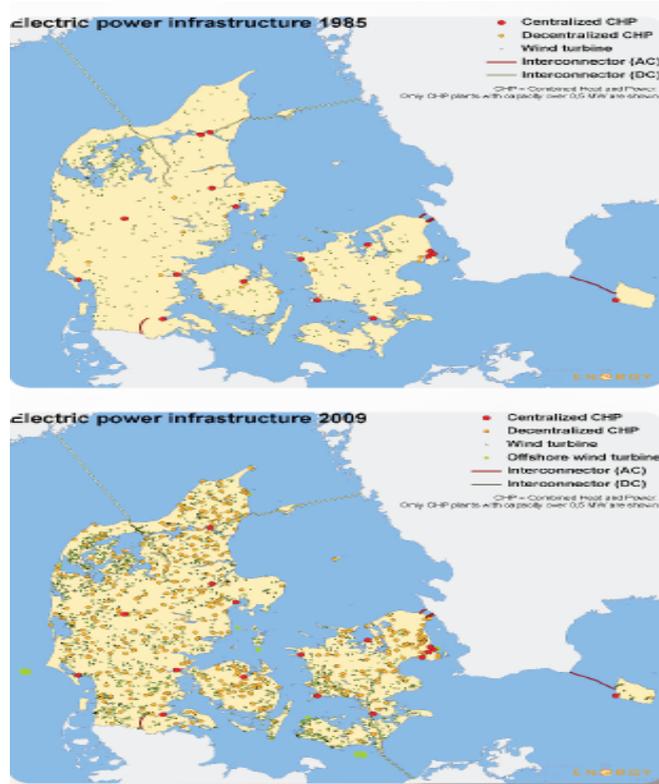
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Development and implementation of wind energy have been included in all Danish energy strategies. Policy instruments – such as taxation, production subsidies, local ownership, agreements with utilities, regulation on grid connection and spatial planning procedure and technology-push policy instruments, such as R&D programmes, test station for wind turbines as well as approval and certification schemes, have been tools in the strategies. According to the Danish Energy Agency, the most important incentive to promote wind turbines were an obligation for the Danish Transmission System Operator (TSO) and the consumers to buy renewable electricity at a fixed price (Ryland, 2010).

In the spring of 1999, an electricity reform was introduced that unbundled the utilities and laid down the principles for the future promotion of renewable energy. The current policy aims to strengthen the use of market based instruments to increase competition in the energy sector and encourage cost-efficiency for renewables. Looking at electricity supply alone, renewable energy accounts for about 28%, which is chiefly due to the incorporation of wind energy in electricity production both in the form of large offshore wind farms and onshore wind turbines.

**Figure 16**

Development of electric power infrastructure 1985-2009



### 7.3.1 Off-Shore Wind (Agreement between Countries and Country Specific Agreement)

#### *Legislation on off-shore wind parks*

In the Promotion of Renewable Energy Act (Act no 1392 27<sup>th</sup> December 2008) and the Danish Electricity Act, the Danish Government gives the main conditions for offshore wind parks (Danish Energy Policy, 2012). Chapter 3 is mainly relevant for off-shore wind parks. That chapter regulates the access to exploiting energy from water and wind offshore. Most import condition is that the right to exploit energy from water and wind within the territorial waters and the exclusive economic zone (up to 200 nautical miles) around Denmark belongs to the Danish State. The act also lays down the procedures for the approval of electricity production from water and wind and pre-investigation. Permission will be given for a specific area.

Important sections of the Renewable Energy act (2008) (Danish Energy Agency, 2012):

- Approval for preliminary investigations shall be granted either after an invitation for applications in a tendering procedure or after receipt of an application.
- Approval for preliminary investigations shall be granted for areas in which the Minister for Climate and Energy considers energy exploitation may be relevant. Approval shall be granted as an exclusive right for a specified area and time period.
- The Minister for Climate and Energy may stipulate terms for the approval, including on the conditions to be investigated, on reporting, on the performance and results of the preliminary investigation, on the access of the Minister to utilise the results of the preliminary investigation, cf. and on compliance with environmental and safety requirements and similar.

#### *Permits and procedures*

For development and establish of offshore wind park projects in Denmark, three licences are required. All licences are granted by the Danish Energy Agency (Danish Energy Agency, 2012):

1. License to carry out preliminary investigations
2. Licence to establish the offshore wind turbines (only given if preliminary investigations show that the project is compatible with the relevant interests at sea)
3. Licence to exploit wind power for a given number of years, and – in the case of wind farms of more than 25 MW – an approval for electricity production. (given if conditions in licence to establish project are kept)

When the project can be expected to have an environmental impact, an Environmental Impact Assessment (EIA) must be carried out. The specific procedure for the Environmental Impact Assessment (EIA) regarding offshore electricity producing installations is described in Executive Order No. 684 of 23 June 2011 on EIA. That also includes sections that implement the EU EIA directive (PM). In general, an Environmental Impact Assessment (EIA) report must be prepared before an application to set up an offshore wind farm can be processed (Danish Energy Agency, 2012).

The rules governing EIA reports are described in Executive Order no. 684 of 23 June 2011. Any party applying to establish an offshore wind farm must prepare an environmental report in order to ensure:

- That the environmental conditions within the defined installation are described,
- That impact and reference areas are studied and described,
- That all known environmental impacts in connection with the establishment and operation of the wind turbine installation have been previously considered and assessed, and
- That the authorities and the general public have a basis for assessing and making a decision regarding the project.

When, on the basis of preliminary investigations (license 1) an application (including an EIA report) has been submitted regarding an offshore wind power project, the Danish Energy Authority present this material for public consultation with a deadline of at least eight weeks. After that the final authorisation for the establishment (license 2) of the offshore wind farm is done according to detailed conditions that reflect both the conclusions of the EIA report and consultation responses from the general public and the authorities concerned. The authorisation, issued by the Danish Energy Authority, is made public. Any party with an interest in the decision has the right to register a complaint with the Energy Appeal Board regarding the decision's environmental aspects. The authorisation may not be acted upon before the appeal deadline has expired. Once authorised to carry out a project, the developer must provide the Danish Energy Authority with documentation proving how the conditions in the permit issued will be fulfilled. This must be done in the form of a detailed project description of the construction/installation works. The developer may not begin to construct the offshore wind farm until the Danish Energy Authority has determined that the documentation submitted is sufficient (Danish Energy Agency, 2012).

When an installation is ready to produce electricity for the grid, the holder of the authorisation for the establishment applies to the Danish Energy Authority for a permit to exploit the wind energy (license 3). Electricity production may not begin before such a permit has been issued. In addition, the developer must also obtain a licence to produce electricity if the overall project has a capacity of more than 25 MW and if the developer does not already hold such a licence (Danish Energy Agency, 2012).

In general, the establishment of offshore wind turbines can follow two different procedures: a government tender procedure run by the Danish Energy Agency; or an open-door procedure. For both procedures, the project developer requires all 3 licenses (Danish Energy Agency, 2012). In the open-door procedure; the project developer takes the initiative to establish an offshore wind farm of a chosen size in a specific area. In an open-door project, the developer pays for the transmission of the produced electricity to land. An open-door project cannot expect to obtain approval in the areas that are designated for offshore wind farms in the report Future Offshore Wind Power Sites – 2025 from April 2007 and the follow-up to this from September 2008. There are three examples of the open-door procedure. It was followed for the DONG Energy off-shore wind farm at Avedøre and Frederikshavn – and for the Sund&Bælt project at Sprogø.

In the government tender procedure, the Danish Energy Agency announces a tender for an offshore wind turbine project of a specific size, e.g. 200 MW, within a specifically defined geographical area. Often, a government tender is carried out to realise a political decision to establish a new offshore wind farm at the lowest possible cost. Depending on the nature of the project, the Danish Energy Agency invites applicants to submit a quotation for the price at which the bidders are willing to produce electricity in the form of a fixed feed-in tariff for a certain amount of produced electricity, calculated as number of full-load hours. The winning price will differ from project to project because the result of a tender depends on the project location, the wind conditions at the site, the competitive situation in the market at the time, etc. In projects covered by a government tender, Energinet.dk owns both the transformer station and the underwater cable that carries the electricity to land from the offshore wind farm.

### *Innovation policy*

The government promotes the long-term reliability of the energy supply and a continued diversification of the supply to several sources of energy and to promote the continued development of wind power technology. In Denmark, there are a wide range of technological development environments and research programmes in the wind power industry.

## Chapter 8

### Analysis of perceived obstacles by different groups of stakeholders for the development of MUPs for each case study

#### 8.1 Introduction

The aim of the present chapter is to outline the major barriers perceived by different groups of stakeholders for the development of MUPs that apply to each site. Therefore, in what follows obstacles are grouped into the following three categories: **policy** obstacles related to international agreements, regional or local constraints, **institutional** obstacles related to public services or bureaucracy and **stakeholders** obstacles that are related to social groups affected by the project to be developed.

#### 8.2 Mediterranean Site

##### International, national and regional legislative obstacles

National legislation affects fishery types:

- “... in order to reduce impacts on the sea bed and on rounding sea water, current must be greater than 2 cm/second on average per year and sea depth must be greater than 20 m ... These conditions do not apply to shell-culture”
- “As for marine aquaculture carried out in coastal areas with essential ecological relevance for the conservation of biodiversity and of biological resources, with impacts on the maritime fishery such as ponds, lagoons, marshes (... Venice lagoon ...), peculiar dispositions are set up to control for environmental impact and to avoid water pollution”.

Regional legislation fishery size:

- a maximum increase of 10% of the extension of 2600 ha

National legislation affects energy size and types:

- the obligatory opinion from the competent Environmental Impact Assessment or Strategic Impact Assessment Commission for each plan and program, according to the EU legislation, although this is not specific to fishery or energy projects.

##### Institutional/administrative constraints and incentives

With regard to obstacles to fishery,

- “Regions set up consulting local commissions ...”
- “Regions are in charge of authorization for aquaculture activities ...”, with fines and temporary suspension up to permanent withdraw of concessions, in order to preserve marine biological resources as well as to prevent, discourage and eliminate illegal, undeclared or unregulated fishery

As for incentives to fishery,

- “up to 80% of insurance premium can be refunded by the State ...”, with some conditions to be met.

As for subsidies to fishery,

- “up to 50% of investment expenditures can be reimbursed by the Region ...”.

As regards obstacles to energy,

- authorizations for construction and operation is issued by the Ministry of Infrastructures and Transports, once consulted the Ministry of Economic Development and the Ministry of the Environment, ... provided concessions of the maritime State property use by the peripheral offices of Genio Civile

As for incentives to energy,

- 0.34 € per kWh for all plants smaller than 5 MW producing energy from marine renewable sources.

### **Social conditionings**

- Tourism activities in the near coast might be affected by fishery activities.
- Unlike other energy sectors, wave energy generation is in an early stage of development and there is no established industry consensus on codes and standards. However, some offshore structural standards seem to be the most applicable.
- Trade and tourist maritime ways might be affected by a Multi-Use Plant.

## **8.3 Atlantic Site**

### **International, national and regional legislative obstacles**

- International Marine Spatial Planning (MSP) instruments set up provisions influencing the legislative and procedural requirements for Offshore Renewable Energy and the related grid infrastructure.
- The maritime spatial planning is closely related to a legal framework

- The priority principle for navigation has been firmly anchored in the United Nations Convention on the Law of the Sea (UNCLOS) and is reflected in the dominant position of the shipping sector.
- The fundamental right to lay submarine cables is firmly anchored in the UNCLOS.
- Lack of clarity of information, specific uncertainty related to grid capacity reinforcements (e.g. Spain).
- Cross-border cooperation on MSP would support projects crossing several EEZ such as large-scale offshore wind projects, and the interconnectors of the future pan-European grid.

#### **Institutional/Administrative**

- The current permitting procedure is complex
- Insufficient coordination and complex permitting procedure are pointed out as barriers for offshore grid development.
- Length of permitting varies greatly depending on type of administration.

#### **Stakeholders/Social**

##### Environmental legislation

- o The existing environmental legislation do not explicitly exclude offshore renewable energy installations/infrastructure,
- o Different interpretation of the legislation exist: Some countries consider the protected areas as « NO-GO-areas » for ORE
- o Environmental legislation may slow down or hamper in some specific cases the deployment of offshore renewable energy installations/infrastructure

## **8.4 North Sea Site**

### **Policy obstacles**

In Dutch policies, multi-use platforms are mentioned as a promising way to make the most out of scarce available space (Beleidsnota Noordzee 2009-2015). However, current practice is that there is no demand for multi-use platforms, there are no companies who want to construct them. Energy companies have and will build various offshore wind parks but an offshore aquaculture sector is absent. Consequently, policy-makers and regulators have not been challenged to handle request for permits and a regulatory framework for MUPs is missing. Also, in the spatial plans for the North Sea, there is no area designated for aquaculture. Current practice for offshore wind parks is to forbid other vessels to enter the designated parks, thereby avoiding question on risks and responsibilities. A major obstacle to the development of MUPs is that the new renewable energy subsidy program no longer includes offshore wind developments.

### **Institutional**

Although policy-makers recognize the potential of MUPs, current practice of regulators is to forbid third-party access to the offshore wind parks. Differing insights can be an obstacle to further development. There is no common framework to discuss and assess the risks associated with third-party access. This increases uncertainty. It also explains recurring discussions on the insurance of MUPs.

### **Stakeholders**

Results for the first interviews reveal a lack of trust between offshore wind sector and the fishery community. Fishermen fear reduction in the area available for fishing and object to offshore wind park development. The energy sector fears that it is difficult to come to agreements with the fishing communities, believing they often do not adhere to rules and regulations. NGO's are exploring the feasibility of MUPs. Up to now, they are interested in the potential of realizing ecological valuable zones within the wind parks. Some scientists feed this discussion, arguing that high ecological values can be realized within the wind parks.

## **8.5 Baltic Sea Site**

### **Policy obstacles**

Danish aquaculture is strictly regulated by national, international and regional environmental, planning and nature rules and directives. Despite of this, the Danish government has a very ambitious plan for expansion in aquaculture, including a 3-4 doubling in the sea aquaculture. Before establishing or extending a fish farm in Denmark a EIA (Environment Impact Assessment), HIA (Habitat Impact Assessments), eventual a permission for water use and a permission for placement in land or sea must be obtained. Quite a lot of information is required for getting a premising to start a sea aquaculture farm in Denmark. The process will include several public hearings, and experience is that the process takes more than one year.

For development and establish of offshore wind park projects in Denmark, three licenses are required. All licenses are granted by the Danish Energy Agency (Danish Energy Agency, 2012):

1. License to carry out preliminary investigations
2. License to establish the offshore wind turbines (only given if preliminary investigations show that the project is compatible with the relevant interests at sea)
3. License to exploit wind power for a given number of years, and – in the case of wind farms of more than 25 MW – an approval for electricity production. (given if conditions in license to establish project are kept). There are noise and spacing rules that need to be followed as well as a EIA (Environment Impact Assessment has to be carried out that includes visual impact, noise, shadow, the effects of lighting, impacts on nature, etc. Local municipalities should seek to limit these nuisances.

### **Institutional/administrative obstacles**

Multi Use platforms are a new area in Danish planning. But due to the implementation of the Water Framework Directive and Marine Strategy Directive, Denmark is just started to look at spatial planning of the sea areas with a focus on the different interest and stakeholders. So until now there is no policy about Multi Use Platforms. There is no common framework to discuss and assess the risks associated with third-party access. This increases uncertainty. It also explains recurring discussions on the insurance of MUPs. There are inconsistencies between offshore renewable energy plans and existing Marine Spatial Planning (MSP) instruments.

## **Societal objections**

Aquaculture has great opportunities in remote areas in Denmark in terms of growth and jobs. However, there is some opposition to aquaculture from NGO's especially about emission of nutrients and interaction with habitats and species. Primary focus areas from the NGO's are the discharge of nutrients and the use of antifouling to the nets.

## **8.6 Integration of results**

In the previous sections what has been attempted is to outline the most important obstacles perceived in the different sites for the development of offshore MUPs for wind energy production and/or aquaculture. The obstacles have been grouped into three different categories i.e. policy, institutional and stakeholders obstacles aiming at forming a general framework that can serve as reference for anyone interested in developing a similar project. Although there are some common obstacles to all cases it should be also noted that each site has its own special geopolitical features that determine to a great extent the nature of site-specific perceived obstacles.

To sum up, there are some points that have emerged from the preceding analysis and should be carefully taken into consideration. These include the following:

- Marine spatial planning dictates the development of MUPs in all the four case studies.
- Environmental and ecological issues are heavily involved in the process of design and development of MUPs
- In the North Sea site there is an implicit conflict of interest between fishermen and developers of offshore wind parks in terms of reducing the fishing area available.
- Offshore wind development has been excluded from the recent renewable energy subsidy program launched in the North Sea areas contrary to what is applicable in the Mediterranean case study.
- In some case studies (Atlantic, Baltic) several licenses are required in order to start an offshore aquaculture or wind energy project

- Criticism related to emission of nutrients and interaction with habitats and species with respect to aquaculture has been raised by certain NGOs
- Capacity of the electricity grid is crucial for the offshore energy sector
- Tourism and trade activities might be affected by the development of MUPs near the coastline

## **APPENDIX**

### **Santoña Example<sup>6</sup>**

Santoña wave energy test site was originally promoted to set up a production plant by a joint venture led by Iberdrola. Sodercan supported the project as well as other organism. Nowadays the project has all the environmental permits. The final project approval is pending and it depends on the Ministry of Industry, Energy and Tourism. The way to obtain the environmental permits has been long and tedious.

Figure 1 summarizes the status of the project and it has been obtained from the formal output of the government management site (see figure 2 - in Spanish). As it can be seen, the environmental permits took almost six years from the beginning. Five different

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<sup>6</sup> The example was courteously provided by University of Cantabria partners

administrative levels have been faced and more than 33 communications between the administration and the promoter (Iberdrola) have been carried out.

Santoña is an example of how the administrative procedure proposed by the administration is not agile and flexible with new technologies and maritime uses. Therefore, projects like Santoña may suffer long delays as well as budget overruns. The original project is already on going on Santoña, with some modifications. Nevertheless, other initiatives may be aborted.

The main conclusion after Santoña experience are:

- Improve the coordination between promoter and administration
- Improve the coordination between different administrative levels
- Reduce and simplify the number of studies and administrative steps to be carried out.

The final and main goal of future administrative improvements is reduce uncertainty, cost and time. Otherwise, new technological applications may be aborted.

**Figure 17**

*Santoña Environmental Impact Declaration and final approval chronogram*

Phase	Task	SubTask	Date	Year																	
				May 06	Sept 06	Jan 07	May 07	Sept 07	Jan 08	May 08	Sept 08	Jan 09	May 09	Sept 09	Jan 10	May 10	Sept 10	Jan 11	May 11	Sept 11	
0	<b>Request of environmental impact assessment</b>	Delivery of application and documents to the corresponding authority																			
		Verification of documents and delivery to the Environment Authority	20/06/06																		
1	<b>Determination of the scope of the environmental assessment study</b>	Document transfer to the affected community and reception of answers	06/10/06																		
		Document transfer to the sponsor of the project and answer to the consults	19/03/07																		
2	<b>Environmental Impact Assessment writing and delivery to the authority</b>																				
		<b>Public information and consults</b>	Public information process	1 month																	
		Transfer of the full expedient to the beginning of the Impact Assessment Declaration	29/04/10																		
3	<b>Formulation of the Environmental Impact Declaration</b>		10/10/11																		
4	<b>Publication of the project approval</b>		¿???																		

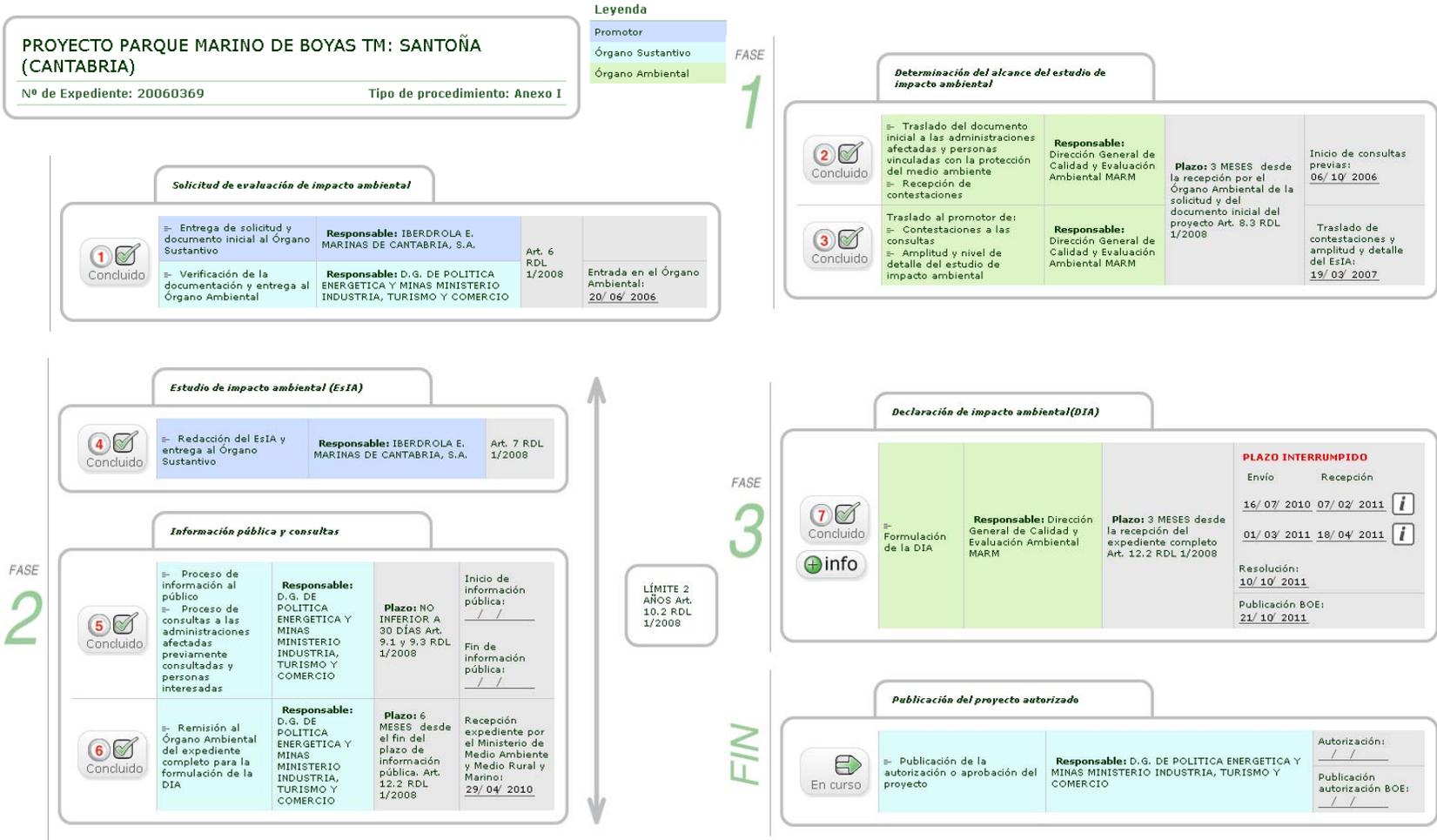


Figure 18 Status of the project: government output

## Chapter 9

### Conclusions and first recommendations

The purpose of the present report is to make an inventory of the current legislation for offshore wind and aquaculture. To this end, the report focus on various legislation and regulation constraints that govern the development of large scale projects involving offshore Multi Use Platforms (MUPs) for wind energy production and aquaculture. A novel layered approach that stratifies the existing legislation on the grounds of area of coverage that is from international rules and policies, to regional, national and finally local legislation has been adopted. In the context of the MERMAID project, four offshore test study sites with unique environmental characteristics are considered:

1. The Mediterranean Sea - a typical sheltered deep water site.
2. The Atlantic Ocean - a typical deep water site
3. The North Sea-Wadden Sea - a typical active morphology site
4. The Baltic Sea - a typical estuarine area with fresh water from rivers and salt water.

Following the identification of perceived obstacles for each case study we have grouped them into three distinct categories namely policy obstacles, institutional/administrative and social/environmental obstacles. Based on existing and future research, spatial planning and regulation of individual developments should avoid harmful effects and promote social welfare. In general, we can assert the following that applies for the four case studies:

- International Marine Spatial Planning (MSP) instruments such as laws, conventions and agreements set up provisions influencing the legislative and procedural requirements for Offshore Renewable Energy and the related grid infrastructure for example in Germany there are regional plans for the territorial seas and national EEZ (Exclusive Economic Zones) plans.
- There is a great deal of licenses required for the development of large scale projects such as license to carry out preliminary investigations, license to establish the offshore wind turbines etc.
- Electricity grid infrastructure limitations can have an adverse impact on renewable energy facilities located off the coast.
- Offshore projects are of larger scale than onshore projects. The amount of energy generated at sea, i.e. in an uninhabited area off the coastline, will be difficult to be delivered on land.

However, this does not constitute an obstacle in the North Sea Site because it can be solved through specific technical skills.

- Environmental legislation such as Natura 2000 network or Birds Directive may slow down or hamper in some specific cases the deployment of offshore renewable energy installations/infrastructure. In particular, seabed including members of the benthic habitats such as corals or geomorphological underwater features such as submarine canyons, seamounts, escarpments or trenches among others are clearly could be in severe danger by offshore installations.<sup>7</sup>
- Stakeholders conflict of interests can result in significant setbacks for the development of MUPs
- There is an insufficient mapping of the protected areas in the marine environment within the EU physical boundaries.
- Tourism and trade activities could be affected by the development of projects near the coastline.

In the vein of the preceding findings the current report has striven to highlight the major obstacles and limiting procedures faced by large scale projects' developers and the following recommendations result:

- Regulative and administrative processes should be coordinated across Europe as far as practical
- A single authority ("one stop shop") should be responsible for each potential site and should issue transparent and suitable guidelines in an acceptable manner.
- Maritime spatial planning should be adopted by all countries and regions to exploit at the most the space available in every study site. In particular, in cases where the connection of offshore wind farms to the national electricity grid is required, the space for cabling is scarce.
- An Environmental Impact Assessment addressing the various costs and menaces to the physical surroundings should be carried out before the development of each project. Environmental Impact Assessment belongs to a wider set of rules and procedures that has been established in 1985 by EU (European Union Directive (85/337/EEC), EIA Directive)

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<sup>7</sup> For more on this the reader is urged to visit [www.oceana.org](http://www.oceana.org)

and was enlarged in the so-called Strategic Environmental Assessment (SEA) Directive (2001/42/EC) in 2001.<sup>8</sup>

- Cross-border cooperation on MSP would support projects crossing several EEZ such as large-scale offshore wind projects, and the interconnectors of the future pan-European grid.
- All countries should define the protected areas and share information on the social and environmental impact of wind farms.
- It is necessary to extend the interconnection capacity of regional electricity grid.
- There are synergies between offshore projects and cross-country inter-connectors of regional electricity markets that are currently not being exploited i.e. providing renewable energy to the European consumers, enhancing the energy markets and increasing the security of supply by catering transmission capacity
- Harmful effects to the physical surroundings and wildlife should be alleviated by adopting certain actions e.g. according to a recent report rotating blades can have a ‘disruptive impact’ on some bird species
- Technical design of the project should comply with certain requirements in terms of: technology, size, location, timing and scale.
- Stakeholders views must be explicitly incorporated in the decision process for a project to be viable and promote social welfare. It is the governments’ responsibility to regulate and monitor the progress of each development.
- Political and financial support should be maintained over a long period of time. Frequent changes in policies and subsidy programs increase uncertainty for investors and thereby hamper development.

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<sup>8</sup> See Barker & Wood (2001), Marsden & de Mulder (2005)

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