North SEE

A North Sea Perspective on Shipping, Energy and Environmental Aspects in Maritime Spatial Planning

A Comparative Analysis of Spatial Planning Designations in North Sea Countries

June 2019

Interreg North Sea Region NorthSEE

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Report conducted by Fraunhofer Center for Maritime Logistics and Services CML

Foreword

The North Sea faces the challenge of an increasing pressure to cater for the spatial demands for human activities. As a result, the countries bordering the North Sea are preparing maritime spatial plans for their national waters and exclusive economic zones. For most of the countries in the North Sea Region spatial plans do already exist. However, there is a multitude of different planning approaches and planning criteria.

The NorthSEE project aims to achieve greater coherence in the planning processes and consequently in the spatial plans. Another objective is to create better conditions for sustainable development in the North Sea region through maritime spatial planning, focusing on the fields of shipping, energy and environmental protection.

To address the issue of differences in the planning systems, and to contribute to a better coherence of spatial plans, the Federal Maritime and Hydrographic Agency, BSH, has tendered a study to analyze the spatial planning designations. In a first step, the Fraunhofer CML analyzed existing regional planning regulations and systems in the North Sea Region. Secondly, a framework to combine and harmonize planning designations and the corresponding map symbology were elaborated. This resulted in an approach for a common map legend.

The study serves as a result under Work Package 6 for the Activity 6.2 Conduct a comparative analysis on maritime spatial planning systems in the North Sea Region and Activity 6.6 Common Map Legends. The results will be a starting point for further international discussions about how to increase the coherence between the different spatial plans.

Please note that the report does not claim to be complete in any way.

Hamburg, 18th June 2019

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FINAL REPORT

Common Maritime Spatial Planning North Sea

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List of Abbreviations

AIS	Automatic Identification System
BSH	Bundesamt für Seeschifffahrt und Hydrographie
COLREGS	International Regulations for Preventing Collisions at Sea
EEZ	Exclusive Economic Zone
IMO	International Maritime Organisation
ICES	International Council for the Exploration of the Sea
MARPOL	International Convention for the Prevention of Pollution from Ships
MPA	Marine Protected Area
MSP	Maritime Spatial Planning
NM	Nautical Mile
OSW	Offshore Wind
SOLAS	International Convention for the Safety of Life at Sea
TSS	Traffic Separation Scheme
UK	United Kingdom
UNCLOS	United Nations Conventions on the Law of the Sea
WP	Work Package

1
Introduction

The continuous growth of European maritime traffic together with increasing vessel sizes challenge waterways and the oceans due to an increasing use. In addition to the traditional uses of seas, such as shipping or fishery, new types have evolved in the past years. These include, for example, the sand and gravel extraction, gas extraction, the laying of pipelines and submarine cables, research and military exercises, as well as the rapidly growing offshore wind energy.

The North Sea is a dynamic economic region with increasing competition between varieties of marine utilisations. At the same time, the limited marine space and the valuable, sensitive marine and coastal ecosystem require a considered approach for future development. Maritime Spatial Planning (MSP) is an approach to make this possible aiming to find solutions for the sustainable use of maritime space, balancing social, economic and environmental interests. These multiple applications can lead to conflicts between the different forms of use but also to conflicts with the goal of environmental and nature conservation. MSP is a planning instrument that coordinates the increasing intensity of use, individual interests as well as claims for protection. Nevertheless, the systematic MSP has so far been limited, especially in cross-border maritime spatial planning. Countries have different planning systems and approaches, and there are still no established mechanisms to enable cross-border MSP.

While marine and coastal planning are often directed towards an individual sector, MSP considers a region as a whole and integrates policies and objectives across different sectors, addressing the multiple and potentially conflicting uses of the sea. In "a marine area, different zones may be prioritized for vessel traffic, security zones in ports waterways, safety zones around maritime installations, military exercise zones, dredging sites, critical habitat designations or aquaculture areas" (Blæsbjerg, Pawlak, Sørensen, & Vestergaard, 2009). The majority of nations bordering the North Sea has individual MSPs varying regarding their orientation as well as effectiveness. So far, there is no MSP at a North Sea scale. For the protection of the North Sea, it would be helpful, if these individual plans were co-ordinated to allow consistent tracking of important transnational marine planning issues. Expected effects would be the prevention of disagreements concerning shipping routes, energy infrastructure and marine environmental and conservation areas.

The study on cross-border spatial planning planned by the *Bundesamt für See-schifffahrt und Hydrographie* (BSH) within the framework of the Interreg VB project North-SEE pursues the goal of creating transparency on the existing and planned regional MSP regulations in each country of the North Sea aiming at formulating recommendations for a cross-border MSP developing a uniform symbolism for a cartographic representation.

This study is integrated into the activities 6.2 "Comprehensive analysis on MSP systems in the NSR" and 6.6 "Common map legends" of the Interreg VB project NorthSEE contributing to cross-border and large-scale MSP in the North Sea region.

1.1
The North Sea Area

This section provides a short overview of the North Sea area used to develop a common map for MSP.

The North Sea area covers the EEZ and territorial waters comprised between United Kingdom (particularly England and Scotland), Belgium, the Netherlands, Germany, Denmark, Sweden and Norway. It is more than 970 kilometres (600 mi) long and 580 kilometres (360 mi) wide, with an area of 570,000 square kilometres (Safety at Sea project: Norwegian Coastal Administration, 2008). Around the edges of the North Sea are sizeable islands and archipelagos, including Shetland, Orkney, and the Frisian Islands. For the most part, the sea lies on the European continental shelf with a mean depth of 90 metres (300 ft) (L.M.A., 1985).

Countries that border the North Sea all claim the 12 nautical miles (22 km; 14 mi) of territorial waters, within which they have exclusive fishing rights (European Commission, 2013). The Gross Domestic Product (GDP) per capita tends to be higher in larger urban centres, particularly in capital cities, whereas rural regions tend to be less productive.

1.2 Scope of the Study

This study contains the analyses of existing regional planning regulations in the North Sea region as well as the development of a cartographic presentation of cross-border spatial planning in the North Sea. The following Figure 1 illustrates the individual contents of each WP and the connections between the different WPs. The content-related WPs 1 and 2 are closely linked to WP3, which includes regular meetings with the BSH as well as the documentation of project results (reports, maps) in English.

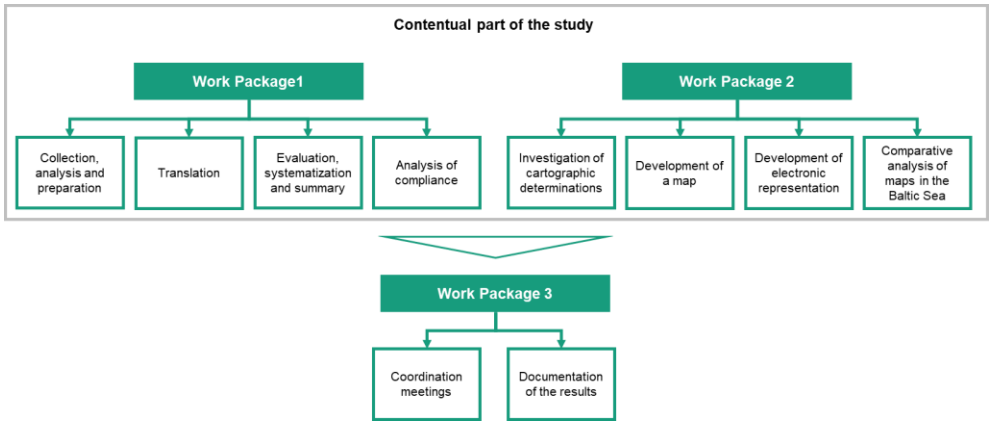


Fig. 1
Concept of the study and structure of the work packages 1-3

2
Analysis of existing regional planning regulations in the North Sea region

The state-of-the-art in MSP across the North Sea Region will be analyzed to create transparency on existing regional planning regulations in the North Sea region and to identify differences between the individual spatial regulations in the North Sea region. For this purpose, existing international, European and national legislations will be presented briefly within the first section in order to analyse coexistences between different topics in MSP as well as differences in regulations between the states. Based on existing international legal regulations concerning the maritime area, the specific national laws and regulations are presented within this section.

The following analysis is based on the structure shown in Figure 2. Following the presentation of international laws and regulations - in particular the United Nations Convention on the Law of the Sea (United Nations, 1982) - the underlying European and, finally, national and, in the case of Germany, state-specific regulations are recorded concisely.

Fig. 2
Structure of the procedure for gathering international, European and national legislation for MSP

In addition to the reviews presented in the following sections, Appendix 8 examines compliance with the shipping areas specified in MSP.

2.1
International Laws and Regulations

The *United Nations Convention on the Law of the Sea* (UNCLOS) (United Nations, 1982) is the legal framework within which all measures and activities in the sea and maritime environment must be implemented and performed. Within UNCLOS, a range of competing interests including the rights of coastal states is examined. One part of achieving a balance between these is achieved through the division of the sea into maritime zones.

Although UNCLOS does not contain any specific provisions on MSP, the main content of UNCLOS is the regulation of the sovereignty of coastal states and states are required to take measures necessary to protect and preserve rare or fragile ecosystems, as well as the habitat of depleted, threatened, or endangered species (cf. Part XII, Article 194 of (United Nations, 1982)). It also covers responsibility and liability for damage caused by pollution of the marine environment, including in the areas beyond national jurisdiction (cf. Part XII, Article 235 of (United Nations, 1982)).

Based on a specified *baseline*, UNCLOS establishes different, partly overlapping zones for the exercise of sovereignty, with the distance from the coast decreasing the control of the coastal state. The regional, national and local basis for MSP is being developed

at these various geographic scales in many parts of the world. The zones are described in the following sections.

Internal Waters

Internal waters are "waters on the landward side of the baseline of the territorial sea" (Part II, Article 8 (1) of (United Nations, 1982)) and can include bays, rivers, estuaries and ports. A coastal State has full sovereignty over its internal waters and can restrict entry into them (cf. Part II, Article 2 of (United Nations, 1982)). Consequently, a coastal state enjoys the widest possible freedom to undertake MSP within its internal waters (cf. Part II, Article 8 of (United Nations, 1982)).

Territorial sea

Each coastal state has the right to a territorial sea up to a limit of 12 nautical miles from a "baseline" (cf. Part II, Article 3 and 5 of (United Nations, 1982)). A coastal State has sovereignty over its territorial sea, subject to the right of innocent passages by foreign vessels (cf. Part II, Article 8 of (United Nations, 1982)). As a consequence of this fact, ensuring the conditions for safe and efficient navigation might be required of MSP in the territorial sea. (cf. Part II, Article 18 of (United Nations, 1982)).

Contiguous Zone

States may establish a contiguous zone from the outer edge of the territorial seas to a maximum of 24 nautical miles from the baseline (cf. Part II, Article 33 of (United Nations, 1982)). The contiguous zone exists to protect the state concerning infringement of its "customs, fiscal, immigration or sanitary laws" (Part II, Article 19 (1(g)) of (United Nations, 1982).

Exclusive Economic Zone

Beyond the territorial sea, a coastal state may claim an Exclusive Economic Zone (EEZ), which is an "area beyond and adjacent to the territorial sea" (Part V, Article 55 of (United Nations, 1982)), that can extend up to 200 nautical miles from the baseline for the territorial sea (cf. Part V, Article 57 of (United Nations, 1982)).

Within its EEZ, a coastal state has "sovereign rights for the purposes of exploring, exploiting, conserving and managing living and non-living natural resources […] and other activities for the economic exploitation and exploration of the zone […] as well as jurisdiction" (Part V, Article 56 (1 (a)) (United Nations, 1982)) with regard to artificial islands, installations and structures, marine scientific research and the protection of the environment (cf. Part V, Article 56 of (United Nations, 1982)). Within the EEZ, the state has the exclusive right to construct and regulate the construction, operation and use of installations and structures for the purposes mentioned before and other economic purposes (cf. Part V, Article 60 of (United Nations, 1982)). The competence of a coastal State to implement MSPs in its EEZ may not derogate from the rights of other States in those waters, including the freedom of navigation and the right to lay submarine cables.

Continental Shelf

Each coastal state has a continental shelf comprising the "seabed and sub-soil of the submarine areas that extend beyond its territorial sea" (Part VI, Article 76 (1) of (United Nations, 1982)) to the outer end of the continental shelf or up to 200 nm from the baseline if the continental shelf does not extend that far (cf. Part VI, Article 76 of (United Nations, 1982)). A coastal state has "sovereign rights for the purpose of

exploring [its continental shelf] and exploiting its natural resources" (Part VI, Article 77 (1) of (United Nations, 1982)). The economic rights within the continental shelf extend only to non-living resources and sedentary living resources. It allows the coastal state to build artificial islands, installations, and structures. As with the EEZ, continental shelf rights do not grant a state the right to restrict navigation.

High Seas and The Area

The ocean surface and the water column beyond the EEZ are referred to as the high seas in UNCLOS. Finally, "high seas are open to all states, whether coastal or land-locked" (Part VII, Article 87 (1) of (United Nations, 1982)). Thus, no state may claim sovereignty over the high seas. The seabed and the seabed beyond the limits of national jurisdiction are referred to in the Convention as the "Area" consisting of everything that is not a continental shelf. It is not subject to sovereignty and "the Area and its resources are the Common Heritage of Mankind" (Part XI, Article 169 of (United Nations, 1982)).

Figure 3 summarizes the legal boundaries of the zones specified by UNCLOS.

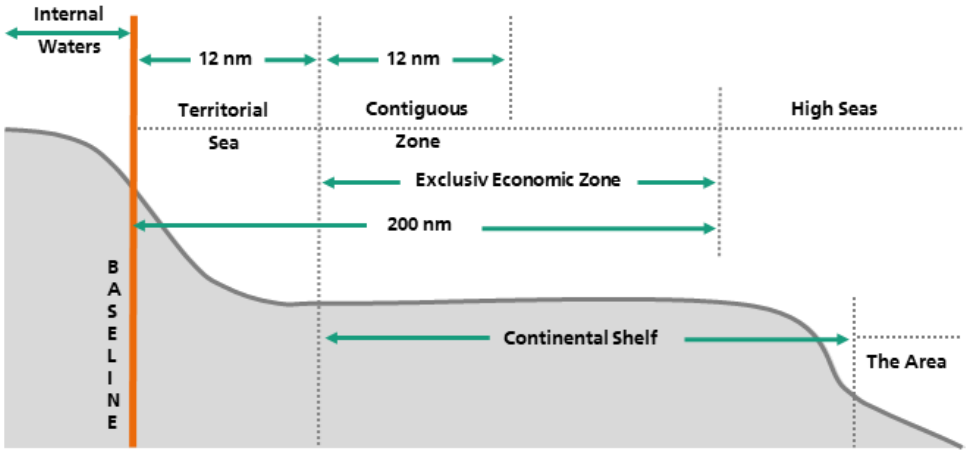


Fig. 3
Legal boundaries of the oceans (not to scale), cf. (United Nations, 1982)

In addition to UNCLOS, there are fundamental resolutions of the IMO and the United Nations, which can be found in Table 5 in Appendix 1.

2.2
European Laws and Directives

2.2.1 Directive 2014/89/EU

The European framework for MSP is the *Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning* (European Commission, 2014b) which defines MSP as a

> "Process by which the relevant member state's authorities analyse and organize human activities in marine areas to achieve ecological, economic and social objectives." (European Commission, 2014b).

It is foreseen that MSP builds on existing national policies not affecting the competence of member states to design and define its format and content, but is conditioned by the obligation of political and institutional conformity with certain requirements laid down in the *Directive*. Thus, "when establishing and implementing maritime spatial planning, member states shall consider economic, social and environmental aspects to support sustainable development and growth in the maritime sector, applying an ecosystem- based approach, and to promote the coexistence of relevant activities and uses" (Article 5 (1) of (European Commission, 2014b)). Another objective is the sustainable development of energy sectors at sea, maritime transport, fisheries and aquaculture. MSP should help to preserve, protect and improve the environment and counteract climate change and "pursue other objectives such as the promotion of sustainable tourism and the sustainable extraction of raw materials" (Article 5 (2) of (European Commission, 2014b)).

In particular, coherence should be ensured between MSP and other processes. Therefore, "when establishing and implementing maritime spatial planning, Member States shall set up maritime spatial plans, which identify the spatial and temporal distribution of relevant existing and future activities and uses in their marine waters." (Article 8 (1) of (European Commission, 2014b)).

The activities and interactions, which are used in the common map creation of the study, are described below (cf. Article 8 of (European Commission, 2014b)).

Shipping and Ports

Shipping areas are strongly influenced by international regulations. In particular, UNCLOS (United Nations, 1982) should be mentioned which guarantees freedom of navigation in accordance with Article 58. The International Maritime Organization (IMO) sets international rules and standards, in particular the definition of traffic separation schemes (TSS), which lay down mandatory lanes at potential hazard points for the use of separate lanes in traffic between installations.

The *International Convention for the Safety of Life at Sea (SOLAS)* (IMO, 1974) forms the legal basis of ship routeing measures in the EEZ and on the high seas. It should be noted that the coastal states are entitled to take measures to restrict shipping, but are not entitled to unilaterally enact laws on shipping. In contrast, in its territorial sea, a coastal state can impose the use of specified sea-lanes and TSS taking into account the recommendations of the IMO (IMO, 1985), (IMO, 1991).

Raw Material Extraction

Deriving from their sovereignty over their territorial seas and the sovereign rights that they hold over their EEZ and continental shelf, coastal states face a few constraints over the spatial planning of oil and gas extraction and the exploitation of other non-living natural resources. Such rights are obliged in the *Directive 94/22/EC of the European Parliament and of the Council of 30 May 1994 on the conditions for granting and using authorizations for the prospection, exploration and production of hydrocarbons* (European Commission, 1994) ensuring that access to such resources is non-discriminatory. At national level, mining laws and commodity safeguard clauses for the extraction of materials apply. These can be found in Appendix 2-7.

Alongside these the European basis of the *Framework conditions for the sustainable supply of raw materials in the EU* (European Commission, 2014c) as well as the *Evaluation and Exchange of Good Practice for the Sustainable Supply of Raw Materials within the EU* (European Commission, 2014d) are valid.

Installations and Infrastructures (Offshore Renewable Energy Production)

Basic zoning provisions of UNCLOS (United Nations, 1982) confer broad powers on coastal states to undertake MSP in respect of power generation (cf. Part V, Article 56 of (United Nations, 1982)). In addition, UNCLOS (United Nations, 1982) confers on the coastal state the exclusive right to construct artificial islands and other structures within such waters, which might be necessary for power generation, although these may not interfere with recognised sea-lanes essential to international navigation (cf. Part V, Article 56 of (United Nations, 1982)). At the regional level, *OSPAR* (OSPAR, 2002) has issued guidance on the environmental impact and location of windfarms.

Fishing and Aquaculture

The basic regime for fisheries under international law is set out in UNCLOS (United Nations, 1982) Article 56, which expressly recognises the sovereignty of the coastal state over living marine resources in its territorial waters and sovereign rights over such resources in the EEZ. This right shall be governed by Articles 61 et seq. of UNCLOS, which are linked to the general obligation to take conservation and management measures to ensure the sustainable exploitation of fish stocks.

At European level, fishing is governed by the *Common Fisheries Policy* (European Commission, 2013), that applies to community waters and fishing vessels that sail the flag of a member state. Fish stocks shall be maintained to enable sustainable fishing practices and it must be ensured that they are managed in a rational, responsible and sustainable manner under economically and socially appropriate conditions, taking into account their impact on the marine ecosystem (cf. Article 2 of (European Commission, 2013)). Within the 200-mile zones, all member states have free access to a specified maritime area (cf. Article 5 of (European Commission, 2013)).

No specific reference is made to aquaculture in UNCLOS (United Nations, 1982). As aquaculture is actually practised primarily in proximity to the coast, the regime applying to the territorial sea is of most interest. Within European waters, there are ecological requirements for aquaculture that must be observed as done in the *Council Regulation (EC) No 834/2007 of 28 June 2007 on organic production and labelling of organic products and repealing Regulation (EEC) No 2092/91* (European Commission, 2007).

Military Training Areas

Within its territorial sea a coastal state may temporary suspend the right of innocent passage in order to undertake military exercises provided prior notice is given (cf. Part II, Article 25 (3) of (United Nations, 1982)).

Nature and Species Conservation Sites and Protected Areas

UNCLOS (United Nations, 1982) does not require the establishment of marine protected areas, but imposes a number of general obligations on states to protect the marine environment in sea areas under their jurisdiction as well as the high seas, including measures to protect ecosystems and habitats. The fact that no state may claim sovereignty over high seas by definition precludes the unilateral declaration by a state of enforceable protected areas in the high seas (cf. Part XI, Article 145 of (United Nations, 1982)).

The International Convention for the Prevention of Pollution from Ships (*MARPOL*) (IMO, 1973) defines certain special areas in which mandatory methods for pollution control are required providing the legal basis for the declaration of particularly sensitive sea areas. Other relevant agreements include the *Convention for the Protection of the*

Marine Environment of the North-East Atlantic (*OSPAR*) (OSPAR, 2002). Two EC directives contain legal tools that are used for the establishment of protected areas: The C*ouncil Directive of 2 April 1979 on the conservation of wild birds* (European Commission, 2009b) and *Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora* (European Commission, 1992).

The *Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy* (European Commission, 2008) reinforces this requirement as member states will be required to draw up national action plans with marine protected areas being an essential part of it.

In terms of regional agreements, the *OSPAR Convention* (OSPAR, 2002) imposes a general obligation on the parties to take all possible steps to prevent and reduce pollution because of dumping at sea and prohibits the dumping of wastes. At international level, the *London Convention* (IMO, 1972) prohibited the dumping of certain types of waste and required a special permit for the dumping of wastes. At the EC level, the principal instrument is the *Council Directive of 15 July 1975 on waste (75/442/EEC)* (European Commission, 1975) which also applies to the disposal of wastes to the ocean or seas including seabed insertion.

Submarine Cable and Pipeline Routes

While Article 58 of UNCLOS (United Nations, 1982) expressly recognises the freedom of all states to lay submarine cables and pipelines within the EEZ, Article 79 (3) provides the coastal state limited spatial planning powers over the laying of pipelines and cables. In addition, Article 79 (5) (United Nations, 1982) states that states must take due account of existing cables or pipelines when laying submarine cables or pipelines.

Scientific Research

UNCLOS (United Nations, 1982) expressly recognises the exclusive rights of coastal states to authorize and conduct marine scientific research in their territorial sea (Article 238). Within the EEZ and on the continental shelf the coastal state also has the right to regulate marine scientific research by other countries and international organisations but may only withhold its consent under specific conditions (cf. Article 246 (5) (United Nations, 1982)). The limitations are that research must not interfere with other permitted uses of the sea.

2.2.2 Natura 2000

Natura 2000 (European Commission, 1992c), (European Commission, 2007b) is a coherent network of protected areas within the European Union, which has been established since 1992 in accordance with the *Habitat Directive* (European Commission, 1992). Its purpose is the transnational protection of endangered wild native plant and animal species and their natural habitats. The sites designated under the *Birds Directive* (European Commission, 2009b) will also be integrated into the network of protected areas. Natura 2000 is not a system of strict nature reserves from which all-human activities would be excluded. While it includes strictly protected nature reserves, most of the land remains privately owned. Member states must ensure that the sites are managed in a sustainable manner, both ecologically and economically.

2.3
Existing Spanning Planning Regulations in the States

In order to create transparency between the different states and to develop a common concept for the spatial planning of the North Sea, the further regulations for the MSP of the countries will be analysed more comprehensively. In consultation with representatives of the BSH, the study area is restricted to the following countries:

- Belgium
- Denmark
- Germany
- Netherlands
- Norway
- United Kingdom
    - England
    - Scotland
- Sweden

In the case of Sweden, the partial plan of Oresund/ Kattegat is requested. In the case of the United Kingdom, the Scottish as well and England's Eastern plans are examined. In the latter, reference is always made to the legal texts found in the bibliography.

2.3.1
Belgium

In Belgium, a ministry at national level is responsible for regulations on MSP at federal level. Nevertheless, the regional authorities have the competence to put legislation with respect to spatial planning in place. Due to the constitutional reform of 1980 (The Government of the Kingdom of Belgium, 1980), the powers to legislate on spatial planning have been transferred from the state to the regions, so that the Flemish authority has the power to change regional plans on the territory of the Flemish Region. The MSP has its legal basis in the *Law on the Protection of the Marine Environment in the Sea Areas under Belgian Jurisdiction* (The Government of the Kingdom of Belgium - Belgian Minister of the North Sea, 2014). The cited articles and sections in the following refer to this document.

The primary aspects of this legislation are as follows:

- Good environmental and surface water status
- Safety of shipping and protection against the sea and for defence
- Guaranteeing of sufficient space for all economic activities at sea
- Respecting maritime landscape and under water heritage

Nevertheless, other laws and regulations form the basis of MSP, which are summarised in Annex 2. For a later comparison of the MSP plans and the consolidation of these into a cross-border presentation, the regulations concerning the interactions and activities defined in section 2.2.1 are considered.

Shipping and Ports

Shipping is allowed everywhere in the Belgian seas as long as there are no other regulations in place that forbid it. Furthermore, shipping has priority over other

activities in specified traffic streams (cf. Article 9 (1-2)). As long as they do not restrict or rule out maritime transport, other activities are permitted in these areas (cf. Article 9. (4, 6, 8)). Shipping and dredging are not allowed in and around windfarms (safety zone of 500 meters) (cf. Section 9.7).

Raw Material Extraction

Exploitation sites for mineral, sand and gravel and other non-living extraction in the territorial sea and the continental shelf are specified (cf. Article 11 (1)). A zone prohibiting sand and gravel extraction is designated which serves as a reference zone for monitoring the environmental impact of sand extraction and wind farms (cf. Article 11 (3)).

Installations and Infrastructures (Offshore renewable energy production)

Areas for future activities are designated for a plug at sea or high voltage cabling station for offshore wind and energy atolls where energy can be stored (cf. Section 3, Article 8. (2-3)). In addition, areas for offshore wind, wave and tidal energy production, which have priority over other activities in the specified area, are declared (cf. Article 8 (1-2)).

Fishing and Aquaculture

Professional fishing is generally permitted in the sea areas. Fishing gear type restrictions exist in sensitive zones of the Flemish Banks and a "Special Area for Conservation". Fishing is not allowed within the 4.5 nm zone (from baseline) for "fishing vessels having a gross register tonnage of more than 70" (Article 6 (1)).

Sustainable aquaculture is allowed on two wind farms as "the holder of the concession for the construction and exploitation of a wind farm gives his consent [and] the aquaculture reduces the level of eutrophication" (Article 10 (2)) within the zone.

Military Training Areas

There are multiple areas defined for military uses (cf. Article 13 – 14).

Nature and Species Conservation Sites and Protected Areas

The Belgian MSP adds no extra regulations, but intends to improve coordination of activities in existing areas with environmental conservation. Special protection areas for birds are outlined, where civil engineering and industrial activities as well as activities by publicity and commercial companies are prohibited (cf. Article 7 (3)) as "they are not subject to an appropriate assessment" (Article 7 (3)). There are temporally dependent prohibitions of access to the area in accordance with Article 7 (6). Within an existing marine reserve, all activities are prohibited except those mentioned in Article 7 (9).

Submarine Cable and Pipeline Routes

Installations for cables and pipelines are clustered into corridors. Derogations from these corridors can be authorised by ministry if there are sufficiently motivated compulsive reasons. (cf. Section 3, Article 8 (7-8)). Activities, which render impossible or restrict the laying or operation of piping and cables are prohibited.

Scientific Research

Scientific research is generally allowed everywhere in the Belgian sea areas. Measuring poles and instruments are recognized as important for safe shipping and allowed

everywhere within the Belgian sea areas as well (cf. Article 15) as "long as the spatial allocation of this decree are not jeopardized" (cf. Article 15 (4)).

2.3.2 Denmark

Although Denmark does not yet have a spatial plan for their seas, the Danish Government invented an integrated maritime strategy in 2010; the Danish maritime spatial plan is currently in development and will be finished in 2021 considering the *Act on maritime spatial planning* (The Government of the Kingdom of Denmark - Danish Ministry of Business and Growth, 2016). It will cover all Danish territorial waters and the Danish EEZ, except the waters of the Faroe Islands and Greenland. The Danish Parliament has adopted the *Act on Maritime Spatial Planning* (The Government of the Kingdom of Denmark - Danish Ministry of Business and Growth, 2016), which establishes the framework for spatial planning in the Danish marine areas. It is intended, that the MSP will "take account of economic, social and environmental conditions as well as safety aspects to support sustainable development and growth in the maritime sector, applying an ecosystem-based approach, and to promote the coexistence of various relevant activities and uses" (The Government of the Kingdom of Denmark - Danish Ministry of Business and Growth, 2016).

Sea-based activities are currently regulated by a large number of sectoral acts, like the *Marine Environment Protection Act*, the *Raw Materials Act*, the *Subsoil* Act, the *Continental Shelf Act*, the *Electricity Supply Act*, the *Harbour Act*, the *Act on Safety at Sea* and the *Fishery Act*, which are presented in Table 7 of Appendix 3.

The goal of the spatial plan is to promote economic growth by using the marine areas on a sustainable basis. This includes the development of

- the energy sector at sea;
- maritime transport;
- fishing and aquaculture;
- the extraction of raw materials from the sea and
- the preservation, protection and improvement of the environment, including resilience to the consequences of climate change" (The Government of the Kingdom of Denmark - Danish Ministry of Business and Growth, 2016).

Military activities and municipal plans for use of coastal waters will not be regulated by the plan, but it will consider these.

2.3.3 Germany

National legal basis for the German MSP is the general *Spatial Planning Act* (Federal Republic of Germany - Federal Ministry of Transport and Digital Infrastructure, 2009). In addition, federal coastal states are responsible for setting up spatial targets and principles for their respective share of internal waters and territorial seas in the North Sea. The federal states with coastlines to the North Sea are Lower Saxony and Schleswig-Holstein:

- In Schleswig-Holstein the competent authority is the Ministry of Interior, Rural Areas and Integration (The Government of Schleswig Holstein - Ministry of the Interior, Rural Areas and Integration, 2010)

- In Lower Saxony, MSP is included in the *Spatial Development Plan*, prepared by Lower Saxony Ministry of Food, Agriculture and Consumer Protection (The Government of Lower Saxony - Ministry of Food, Agriculture and Consumer Protection, 2005)

Priority areas shall be defined for shipping, pipeline and submarine cable uses, wind energy and scientific research where other uses are excluded unless they are compatible with the prime uses. Apart from the known laws and regulations, the Table 8 in Appendix 4 depicts rules that apply for MSP in Germany.

The primary principles of German spatial planning are as follows:

- Safeguarding and strengthening maritime traffic
- Strengthening economic power and promotion of wind energy
- Securing and utilisation of the special characteristics and potentials of the EEZ
- Safeguarding the natural basis of life.

Lower Saxony

In addition to the comprehensive spatial development plan for Germany, the spatial development concept for the Lower Saxony territorial area of the North Sea is also in place for the Lower Saxony territorial sea. (The Government of Lower Saxony - Ministry of Food, Agriculture and Consumer Protection, 2005) This approach follows the principles of spatial planning as set out below:

- Achieving the highest possible long-term economic efficiency
- Maintaining the integrity of natural systems and processes
- Broad social acceptance of all measures

Schleswig Holstein

The potentials of the coastal sea and the shore-side coastal area are to be used and sustainably developed. Within the framework of Integrated Coastal Zone Management), the following measures are to be implemented.

- Developing regional strategies to identify and sustainably exploit the potential of the coastal zones of the North Sea and the Baltic Sea, and
- Existing conflicts of use are minimised and conflicts of use are avoided at an early stage in the various space utilisation requirements and developments.

The different spatial use requirements in the coastal zone must be coordinated and the objectives and principles of relevant specialist areas must be observed or taken into account. Planning and measures in the Schleswig-Holstein territorial sea must be coordinated with those in the coastal seas of neighbouring countries and states and with those in the EEZ.

The MSP for the EEZ is defined by the *Raumordnungsplan Nordsee* (Federal Republic of Germany - Federal Ministry of Transport and Digital Infrastructure, 2009). The articles and sections mentioned, if not further specified, are a part of it.

Shipping and Ports

Shipping enjoys the sovereignty guaranteed under Article 58 of UNCLOS (United Nations, 1982) and areas are spatial designated. In order to protect the safety and lightness of shipping, a minimum distance between offshore wind farms on the one hand and TSS on the other hand should be established (cf. Section 3.1.1). The safety

and ease of maritime transport has the highest priority against the very high volume of traffic at sea, which will continue to increase in the future, and the increasing demands for various uses in the maritime sector (cf. (The Government of Schleswig Holstein - Ministry of the Interior, Rural Areas and Integration, 2010)).

Raw Material Extraction

The exploration and extraction of raw materials should be comprehensively facilitated and developed in compliance with the *Spatial Planning Act* (cf. Section 3.2.1 (1)). After abandonment of use, structural facilities are to be dismantled. Existing extraction sites for sand and gravel should be dismantled as completely as possible (cf. Section 3.2.1 (5)). Nevertheless, the prospecting and extraction of raw materials should not affect the safety and ease of transport (cf. Section 3.2.1 (6)) and the interests of fishing should be taken into account in the exploration and extraction of raw materials (cf. Section 3.2.1 (8)).

In the case of raw material extraction measures, consideration shall be given to existing pipelines and submarine cables and an appropriate distance shall be maintained. In the Wadden Sea, the extraction of raw materials is to be completely dispensed with. Due to possible conflicts with other activities, the extraction of raw materials in the North Sea must be concentrated on the necessary areas.

Installations and Infrastructures (Offshore renewable energy production)

In the designated priority areas for wind energy, the extraction of wind energy is given priority over all other spatially uses (cf. Section 3.5.1 (1)). Spatially significant uses in these areas, which are incompatible with the function of the wind energy, are prohibited (cf. Section 3.5.1 (1)). Nevertheless, the extraction of wind energy should not affect the safety and ease of transport (cf. Section 3.5.1 (2)).

Because of the conflicts, especially with the concerns of "shipping", "nature conservation", "tourism" and "fisheries", the Lower Saxony area of the coastal sea must be kept free of offshore wind energy plants in principle (cf. (The Government of Lower Saxony - Ministry of Food, Agriculture and Consumer Protection, 2005)).

When planning pipelines for oil and gas, the requirements of the energy and raw materials industry, in particular those of shipping, coastal protection, nature, landscape and soil protection, fishing, tourism and defence, must be reconciled. Cables from wind energy farms to the mainland are to be laid in corridors as bundled as possible (cf. Section 3.3.1 (10)). Besides, offshore wind turbines outside the designated priority areas are not permitted in Natura 2000 areas (cf. Section 3.5.1 (3)). The interests of fishing and defence are to be taken into account in the planning; operation and construction of facilities for the generation of energy (cf. Section 3.5.1 (11)).

In addition to the planning regulations (Federal Republic of Germany - Federal Ministry of Transport and Digital Infrastructure, 2009), the provisions of the *Ordinance on Installations Seawards of the German Coastal Sea Boundary* (Federal Republic of Germany - Federal Ministry of Justice and Consumer Protection, 1997) are considered.

Fishing and Aquaculture

In the case of fishing, the installation of offshore wind farms, as well as the extraction of raw materials and scientific research, known sites of cultural heritages are to be taken into account. With regard to fisheries, the *Common Fisheries Policy* (European Commission, 2013) shall apply. Nevertheless, there are no regulations on spatial planning.

In order to maintain fishing, its concerns must be taken into account in all spatially relevant measures. Interference with fishing by other uses shall be avoided as far as possible.

Military Training Areas

The plan does not contain any regulations on military use. For information purposes, the existing military exercise areas were included in the spatial development plan and their existence is taken into account in a coordinating manner when determining areas for other uses (cf. Section 4.1).

Nature and Species Conservation Sites and Protected Areas

The EEZ as a natural space is to be permanently secured and developed in its typical, natural forms and with its exchange relationships and interactions for the conservation of biological diversity. Nevertheless, there are no regulations on spatial planning. The existing protected areas, the important resting and feeding areas for seabirds and other marine areas worthy of protection, including in the EEZ, must be protected and, if necessary, developed. Necessary vessels (salvage tugs, oil-catching vessels) shall be positioned in a suitable location.

Submarine Cable and Pipeline Routes

Pipelines and submarine cables are to be laid in clusters, if possible. There are designated priority areas for pipelines. The operation and maintenance of pipelines has priority over other spatially significant uses in these areas. As far as spatially significant planning, measures and projects in these areas are not compatible with the function of the priority area, these are excluded (cf. Section 3.3.1 (1)). In the case of overlapping definitions of priority areas for pipelines with priority areas for wind energy, the interests of the pipelines shall be given priority (cf. Section 3.3.1 (3)).

In the defined reserved areas for pipelines, special emphasis is placed on the operation and maintenance of pipelines. Submarine cables shall cross priority areas established for shipping by the shortest possible (cf. Section 3.3.1 (4)). The safety and ease of traffic should not be impaired by laying, operating, maintaining or possibly remaining after the end of the traffic operation or by the dismantling of pipelines and submarine cables (cf. Section 3.3.1 (5)). The laying of pipelines and submarine cables parallel to the areas defined for shipping should be avoided (cf. Section 3.3.1 (6)). When pipelines and submarine cables are laid, the species-specific periods that are particularly susceptible to disturbance are to be avoided in order to minimise possible impairments of the marine environment when crossing sensitive habitats. The laying of cables, e.g. for the use of wind energy, must be brought into line with the needs of coastal protection.

Scientific Research

Designated areas for research are given special weight to conduct scientific research activities, which must be taken into account when weighting up other spatially plans, measures and projects (cf. Section 3.4.1 (1)). Planned uses should maintain an appropriate distance from existing measuring stations to ensure long-term investigations (cf. Section 3.4.1 (2)).

Nevertheless, research activities shall not affect the safety and ease of maritime transport (cf. Section 3.4.1 (4)). Furthermore, negatives effects on the marine environment are to be avoided.

2.3.4 Netherlands

The *National Water Plan* (The Government of the Kingdom of the Netherlands - Ministry of Infratructure and the Environment and Ministry of Economic Affairs, 2015b) provides a policy framework for MSP based on the *Policy Document for the North Sea 2016-2021* (The Government of the Kingdom of the Netherlands - Ministry of Infratructure and the Environmen and Ministry of Economic Affairs, 2015c). The Policy Document sets out the desired policy for the use of space, within the limits of the marine ecosystem. The Central Government sets the spatial frameworks, allowing the use of space in the North Sea to develop in an efficient and sustainable manner.

The following information are extracted from the *Policy Document on the North Sea 2016- 2021* (The Government of the Kingdom of the Netherlands - Ministry of Infratructure and the Environmen and Ministry of Economic Affairs, 2015c).

Shipping and Ports

According to the *Policy Document for the North Sea* "shipping is an activity of national interest" (The Government of the Kingdom of the Netherlands - Ministry of Infratructure and the Environmen and Ministry of Economic Affairs, 2015c). The primary objective is to improve the competitiveness and accessibility of the shipping industry by establishing a good connection to the sea and existing shipping routes. To this extent, a system of TSS, clearways and anchorages is to be maintained in order to accommodate ships quickly and safely. Mining installations or other individual permanent structures will not be permitted within the shipping routes or in a 500-metre zone surrounding these shipping routes.

To protect the marine ecosystem, measures and initiatives will be implemented to reduce pollution caused by shipping (cf. Section 3.8). Nevertheless, shipping is not permitted around existing oil and gas platforms, with a minimum safety zone of 500 metres.

Raw Material Extraction

Sand extraction for coastal defences and filling is an activity of national interest. Sand is extracted from the North Sea in shallow and deep waters in the form of replenishment sand, fill sand, concrete and masonry sand. In addition, a reserved zone and policy exist for deeper mining (10m). Furthermore, a zone for the extraction of shells is defined (cf. Section 3.4).

It is not allowed to extract sand within the maintenance zone of 500 meters around cables and pipelines. In addition, regulations of the Mining Act of the Netherlands apply. (The Government of the Kingdom of the Netherlands, 2003)

Installations and Infrastructures (Offshore renewable energy production)

Generating renewable energy is an activity of national interest (cf. Section 3.3). Areas have been designated where the construction of wind farms can be allowed. Outside of these areas, the central government does not grant permission for wind farms. The designated areas are outside of the 12-mile zone. In the designated military training areas the positioning of offshore-structures is, due to safety issues, not allowed (cf. Section 3.3).

A sufficient distance between shipping routes, mining sites and wind farms must be guaranteed. When building wind farms, a 500-metre zone should be adhered to for pipelines and electricity cables and a 750-metre zone for telecommunications cables.

Besides wind energy, "oil and gas extraction are regarded as activities of national interest".

Fishing and Aquaculture

"Fishing has access to all areas." However, it should be noted that activities to which national interests are attributed have priority. In addition to this, the directives of Natura 2000, according to which specific areas are closed to fishing - partially or under conditions - must be taken into account (European Commission, 1992c). In accordance to the *Common Fisheries Policy* (European Commission, 2013) the Netherlands is also making efforts to ensure that measures are taken for making fishing and aquaculture more sustainable. Nevertheless, there are no regulations on spatial planning (cf. Section 3.10).

Military Training Areas

"Defence is of national interest". Thus, there needs to be sufficient space in the North Sea for military training purposes. Within exercise zones, the fundamental principle is that collective use of these areas is permitted insofar as this is compatible with the military exercises being engaged in. When not in use, these areas can be used for other activities (cf. Section 3.9).

Nature and Species Conservation Sites and Protected Areas

In addition to the general environmental policy, the policy for the North Sea's protected species is primarily being fulfilled within the framework of *Natura 2000* and by enforcing the *Flora and Fauna Act* (European Commission, 1992).

The *Marine Strategy Part 2* (European Commission, 2008) contains a comprehensive package of monitoring activities focused on the condition of the North Sea environment and on the efficacy of measures. Nevertheless, there are no further national regulations on spatial planning.

Submarine Cable and Pipeline Routes

To ensure efficient use of space, efforts are being made to bundle cables and pipelines in consultation with the initiator, to downsize maintenance zones wherever possible and to remove decommissioned cables and pipelines (cf. Section 3.7).

Scientific Research

There are no further national regulations on spatial planning.

2.3.5 Norway

Norway breaks its EEZ into three regions: the Barents Sea, the Norwegian Sea, and the North Sea (Blæsbjerg, Pawlak, Sørensen, & Vestergaard, 2009). The following explanations focus on the area of the North Sea.

With the *Integrated Management of the Marine Environment of the North Sea and Skagerrak (Management Plan)* (The Government of the Kingdom of Norway - Ministry of the Environment, 2013) Norway aims at being a pioneer in developing an integrated, ecosystem based management regime for the North Sea region. Thus, the main goal of the plan is to allow for sustainable use while ensuring the health of the ecosystem. The latter part of the goal is the basis for environmental protection (cf. (The

Government of the Kingdom of Norway - Ministry of the Environment, 2013)). The following information are gathered from this document if not marked differently.

Shipping and Ports

"The North Sea and Skagerrak are important shipping areas". Safety and accident prevention measures are a vital part of the management of maritime traffic. Thus, "new traffic separation schemes and recommended routes were introduced in the management plan area in June 2011 to route larger vessels and ships carrying dangerous or polluting goods much further away from the coast".

The objective of the routeing system is to reduce both the probability of accidents and the consequences of any oil spills in the event of accidents. Besides, "the North Sea and Skagerrak have been designated by the International Maritime Organization (IMO) as Special Areas under [MARPOL] with regard to discharges of oil and garbage and emissions of sulphur."

Raw Material Extraction

At present, there is no mineral extraction from the seabed in the Norwegian North Sea or the Skagerrak.

The key legislation for the management of Norway's petroleum resources is the *Petroleum Act* (The Government of the Kingdom of Norway - Norwegian Petroleum Directorate, 1996). "The petroleum activities must not unnecessarily or to an unreasonable extent impede or obstruct shipping, fishing […] or cause damage or threat of damage to pipelines, cables or other subsea facilities. All reasonable precautions shall be taken to prevent damage to animal life and vegetation in the sea, relics of the past on the sea bed and to prevent pollution and littering of the seabed, its subsoil, the sea, the atmosphere or onshore" (Section 10 - 1).

Installations and Infrastructures (Offshore renewable energy production)

The *Act on Offshore Renewable Energy Production* (The Government of the Kingdom of Norway - Ministry of Petroleum and Energy, 2010) provides a framework for regulating offshore renewable energy production, and generally applies outside the baseline and on the continental shelf, although it may also be made applicable inside the baseline. Under the *Act on Offshore Renewable Energy Production* (The Government of the Kingdom of Norway - Ministry of Petroleum and Energy, 2010), offshore renewable energy production may in principle only be established after the public authorities have opened specific geographical areas for licence applications.

"The safety zones round petroleum installations are regarded by all parties as essential for safety purposes. Exploration drilling occupies areas, although only temporarily, since a 500-m safety zone is established around the drilling facility or vessel". Dynamically positioned rigs will occupy a somewhat smaller area, while anchoring in deeper water will occupy a larger area.

Fishing and Aquaculture

Under the UNCLOS, Norway and the EU have an obligation to cooperate on the management of shared fish stocks in this sea area. Fishing plans have not introduced new zoning measures, but a number of such measures are already implemented in the sector-based management regime for fisheries. Therefore, at present the zoning part of the Norwegian plans are mainly zoning of the petroleum industry in relation to environmental concerns and fishing activities.

Besides, the *Marine Resources Act* (The Government of the Kingdom of Norway - Directorate of Fisheries, 2015) regulates all harvesting and other utilisation of wild living marine resources and genetic material derived from them.

Aquaculture is not regulated in the Norwegian management plan.

Military Training Areas

Military Training Areas are not regulated in this management plan, but they are affected by environmental conditions in the North Sea and Skagerrak.

Nature and Species Conservation Sites and Protected Areas

The Norwegian government has defined marine bioprospecting as a priority area, and substantial funds are being channelled into incentives for research and development. The aim is to activate the entire range of value creation potential opened up by marine bioprospecting (cf. Section 4.6.1).

Submarine Cable and Pipeline Routes

Under Norwegian law, subsea installations and pipelines must be designed to avoid interference with fishing operations (cf. Section 5.3.3).

Scientific Research

There are no national regulations on spatial planning.

2.3.6 Sweden

The Swedish government is responsible for Sweden's maritime spatial planning in the national EEZ. For the territorial sea, this is regulated and controlled by the municipalities. A list of these can be found in the Table 9 in the Appendix 5.

The *Plan and Building Act* (Government Offices of Sweden, 2010) first approved in 1987, grants municipalities the right and obligation to plan their entire territory, which encompasses internal waters and the territorial sea adjacent to the municipality's land area. Through an amendment to the *Environmental Code* (Government Offices of Sweden, 1998) in 2014, the national government was given the responsibility to elaborate marine spatial plans for all marine waters one nautical mile seaward of the baseline, including the EEZ. Also according to chapter 4 of the *Environmental Code* (Government Offices of Sweden, 1998), marine spatial plans shall be produced for the Gulf of Bothnia, the Baltic Sea and the Skagerrak and Kattegat. The national marine spatial plans are elaborated by the Swedish Agency for Marine and Water Management and adopted by the Government. In consultation with the BSH, only the MSP of the Kattegat / Skagerrak region is considered in the case of the North Sea.

The *Marine Spatial Planning Ordinance* (Government Offices of Sweden, 2015) regulates the Swedish MSP process. It contains provisions on geographical boundaries, the content of the marine spatial plans, the responsibility for preparation, consultation and cooperation in the proposal process, and monitoring and review. The following objectives have been set for Swedish national MSP:

- Achieving and maintaining good environmental status
- Using resources of the sea sustainably so that maritime industries can develop

- Promoting coexistence between various activities and areas of use

The Swedish process has reached its consultation phase. The following information are, if not marked differently, based on the consultation document *Proposal for the Marine Spatial Plan Skagerrak and Kattegat* (Swedish Agency for Marine and Water Management, 2018).

Shipping and Ports

Existing and planned facilities for shipping, ports, roads, railways and aviation are national interest claims. In the case of maritime transport, this includes shipping routes, IMO-regulated navigation areas, anchorage areas, ports and the respective approaches (cf. (Swedish Agency for Marine and Water Management, 2018)). Thus, the Swedish *Marine Spatial Plan Skagerrak and Kattegat* depicts specified reserved areas for shipping.

Raw Material Extraction

According to calculations, there is a significant capacity for carbon dioxide storage in the Swedish EEZ, however, these areas are not located in the North Sea. The investigations leading to this assumption are to be continued. Before certain results, no areas are designated to this use. There might be areas pointed out in the future MSP. In the consultation document, an "interest area for carbon dioxide storage" is marked.

Geological storage of carbon dioxide may only take place in the Swedish exclusive economic zone and in public waters of the territorial sea from one nautical mile outside the baseline, according to the *Ordinance on Geological Storage of Carbon Dioxide* (Government Offices of Sweden, 2014).

Installations and Infrastructures (Offshore renewable energy production)

The areas in the planning map where energy extraction is indicated as utilisation are either areas covered by national interest claims for offshore energy production or areas that are considered to be of significant public interest for energy production.

In order to build a wind farm within the territorial sea, permits are required according to Chapters 9 and 11 of the *Environmental Code* (Government Offices of Sweden, 1998). In the EEZ, a permit is required under the *Exclusive Economic Zone Act* (Government Offices of Sweden, 1992). In addition, a permit is required according to the *Continental Shelf Act* (Government Offices of Sweden, 1966b) for surveys of the seabed and the laying of lines during wind power establishment in the EEZ. The same applies to the Raw Material Extraction.

Fishing and Aquaculture

Commercial fishery is regulated by the EU *Common Fisheries Policy* (European Commission, 2013) with supplemental national Swedish fishing legislation as done in the *Fishery Act* (Government Offices of Sweden, 1993) depicting catching and spawning areas and fish protection areas along the entire Swedish coast. Permits from the county administrative board are required to build and conduct a fish farm pursuant to Chapter 2 Section 16 of the *Ordinance for fishing, aquaculture and the fishing industry* (Government Offices of Sweden, 1994).

Military Training Areas

There are several areas designated for military activities. Furthermore, some areas that cannot be marked due to secrecy are considered in the planning process. In the military training areas temporary closure occurs. Permanent facilities deemed to interfere with the national defence interests are unlikely to be permitted even in areas outside designated defence areas.

According to Chapter 3 Section 10 of the *Environmental Code* (Government Offices of Sweden, 1998), in a decision between two incompatible national interests, priority shall be given to the defence interest if an area or part of an area is needed for a national defence facility.

Nature and Species Conservation Sites and Protected Areas

The use of nature is comprised of areas that are already covered by marine area protection in the form of e.g. Natura 2000, which is of national interest for nature conservation according to Chapter 3 Section 6 of the *Environmental Code* (Government Offices of Sweden, 1998) and/or is planned for marine area protection.

The use of nature protection areas does not cover all valuable or sensitive nature areas that should be protected according to the *Environmental Code* (Government Offices of Sweden, 1998), the ecosystem approach and the objective of sustainable development. The Swedish MSP designates areas of 'particular consideration to high nature values' for areas where human activities might need to be adapted to preserve specific nature values, but which today lack other formal protection. When an activity or measure might affect the environment in a Natura 2000 area in a significant manner, a special Natura 2000 permit according to Chapter 7 of the *Environmental Code* (Government Offices of Sweden, 1998) is also required.

Submarine Cable and Pipeline Routes

The laying of cable must be taken into account where appropriate. Specific areas for energy transmission and distribution are not presented in the current plan proposals. The areas for cable laying should be identified as early as possible to reduce conflicts with other claims. For the laying of lines and cables within the territory, permits are required according to other national laws.

Scientific Research

No information is given.

2.3.7 United Kingdom

Under the *Marine and Coastal Access Act 2009* (Parliament of the United Kingdom, 2009), spatial planning is being introduced for the British marine area, which includes the territorial seas and offshore area adjacent to the UK, the area of sea designated as the UK EEZ the continental shelf. The MSP "East" and "South East" of England as well as the Scottish part are considered.

With the help of the *Act of 2009* (Parliament of the United Kingdom, 2009), the vision of clean, healthy, safe productive and biologically diverse oceans and seas (Parliament of the United Kingdom - Department for Environment, Food and Rural Affairs, 2014) should be reached. Plan policies are central to the role of marine plans in giving effect

to, and conformity with, national policy. In addition, nationally specific laws exist as depicted in the Table 10 in the Appendix 6.

There is a National Marine Plan for the Scottish seas (The Scottish Government, 2015) and a plan for the English seas (Parliament of the United Kingdom - Department for Environment, Food and Rural Affairs, 2014). The following information, if not marked differently, are extracted from the corresponding.

Shipping and Ports

As identified in the *Marine Policy Statement* (Parliament of the United Kingdom, 2011), ports and shipping are critical to the effective movement of cargo and people. Thus, "proposals that require static sea surface infrastructure or that significantly reduce under-keel clearance should not be authorised in International Maritime Organization designated routes." (cf. PS1 (Marine Management Organisation, 2017)). PS1 recognises existing designations for navigation whilst acknowledging the ability to co-locate with many seabed related and non-permanent activities.

As other activities seek to capitalise on the resources of the area, these should be carried out in such a way as to afford protection of safe and competitive shipping (cf. PS2 (Marine Management Organisation, 2017)) so that negative impacts on shipping activities are minimised (cf. Section 3.4.7 (Parliament of the United Kingdom, 2011))

Raw Material Extraction

As set out in the *Marine Policy Statement* (cf. Section 3.3.1 7 (Parliament of the United Kingdom, 2011)), secure, sustainable and affordable supply of energy is of central importance to the economic and social wellbeing of the UK. Within defined areas of potential carbon dioxide storage, activities should not prevent or minimize the storage of carbon dioxide (cf. CCS1 of (Marine Management Organisation, 2017)).

Oil and gas can only be produced where they are found, so "Proposals within areas with existing oil and gas production should not be authorised except where compatibility with oil and gas production and infrastructure can be satisfactorily demonstrated" (OG1 of (Marine Management Organisation, 2017)). In addition, proposals for new oil and gas activities take precedence over others. (cf. OG2 of (Marine Management Organisation, 2017)).

Installations and Infrastructures (Offshore renewable energy production)

The *Renewable Energy Zone* was declared under section 84 of the *Energy Act* (Parliament of the United Kingdom, 2004). It extends up to a maximum of 200 nautical miles from the baseline. The UK has claimed exclusive rights in this area with respect to production of energy from water or winds. As in the case of British fishery limits, the Act amends this legislation so that these zones are designated by reference to the exclusive economic zone (cf. WIND1 of (Marine Management Organisation, 2017)).

Apart from the offshore wind activities, priority areas for tidal streams are designated.

Nevertheless, the *National Policy Statement for Renewable Energy Infrastructure* (Parliament of the United Kingdom - Department of Energy and Climate Change, 2011) states that nationally significant infrastructure projects should not be "grant[ed] development consent in relation to the construction or extension of an offshore wind farm [if] interference with the use of recognised sea lanes essential to international navigation is likely to be caused by the development" (Parliament of the United Kingdom - Department of Energy and Climate Change, 2011).

Fishing and Aquaculture

The *Fishery Limits Act* (Parliament of the United Kingdom, 1976) identifies fishing areas currently extending to 200 nm from the baseline. Concerning the policy FISH1 of (Marine Management Organisation, 2017) it is stated, "within areas of fishing activity, proposals should demonstrate […] that they will not prevent fishing activities on, or access to, fishing grounds". This plan policy supports fishing activity by avoiding adverse impacts resulting from development and activities in the East marine plan areas.

Aquaculture is also protected concerning AQ1 (Marine Management Organisation, 2017) meaning that "within sustainable aquaculture development sites (identified through research), proposals should demonstrate that they will avoid adverse negative impacts on future aquaculture development by altering the sea bed or water column in ways which would cause adverse impacts to aquaculture productivity or potential."

Military Training Areas

The Marine Policy Statement states that "marine activities should not prejudice the interests of defence and national security and the Ministry of Defence should be consulted accordingly" (Section 3.2.2 (Parliament of the United Kingdom, 2011)).

Nature and Species Conservation Sites and Protected Areas

According to BIO1 and BIO2 (Marine Management Organisation, 2017), biodiversity and the protection of the environment are to be ensured. In order to guarantee this, a large number of nature conservation and marine protected areas are designated in the UK.

Submarine Cable and Pipeline Routes

Cables are buried deep in the seabed where possible and installers and operators promote marine safety and protection. Nevertheless, "preference should be given to proposals for cable installation where the method of installation is burial. Where burial is not achievable, decisions should take account of protection measures for the cable that may be proposed by the applicant" (CAB1 of (Marine Management Organisation, 2017)).

A key concern is damage to cables from other activities. The Marine Policy Statement (3.7.4) states that "through the marine planning process, marine plan authorities should help facilitate the coordination of marine activities, a better understanding among relevant industries and the communication of guidelines to ensure both the safety of these installations and safe access to them for maintenance purposes".

Scientific Research

No information is given.

Scotland

Under devolution, the Scottish Parliament can legislate in relation to activities affecting the marine environment in Scotland's inshore waters, except for reserved matters. The UK Parliament legislates for Scotland's offshore waters, but certain matters in this area have been executively devolved. Marine planning matters in Scotland's inshore waters are governed by the Marine (Scotland) Act 2010 (Parliament of the United Kingdom, 2010b), an Act of the Scottish Parliament, and in its offshore waters by the Marine and

Coastal Access Act 2009 (Parliament of the United Kingdom, 2009), an Act of the UK Parliament.

The *Marine (Scotland) Act 2010* (Parliament of the United Kingdom, 2010b) requires that marine plans set economic, social and marine ecosystem objectives and objectives relating to the mitigation of, and adaptation to, climate change. Plans must also state policies for, and in connection with, the sustainable development of the area to which this Plan applies. With the Act, the government pursues the following objectives:

- Achieving a sustainable economy
- Ensuring a strong, healthy and just society
- Living within environmental limits
- Promoting good governance
- Using sound science responsibly

The use of the rooms and thus the spatial planning are recorded in the National Marine Plan (The Scottish Government, 2015), which sets out sets out strategic policies for the sustainable development of Scotland's marine resources out to 200 nautical miles. Marine planning will be implemented at a local level within Scottish Marine Regions, extending out to 12 nautical miles. The boundaries of these regions are required to be set by secondary legislation. The following are relevant for this study:

- Forth and Tray
- North East
- Moray Fith

Other documents relating to maritime spatial planning can be found in Table 11 of Annex 7.

If not marked differently the following information are gathered from (The Scottish Government, 2015). This document covers the Scottish inshore waters and offshore waters to 200nm.

Shipping and Ports

Navigational safety in relevant areas used by shipping now and in the future will be protected, adhering to the rights of innocent passage and freedom of navigation contained in UNCLOS (United Nations, 1982). The following factors will be taken into account when reaching decisions regarding development and use:

- The extent to which the locational decision interferes with existing or planned routes used by shipping, access to ports and harbours and navigational safety. This includes commercial anchorages and defined approaches to ports.
- Where interference is likely, whether reasonable alternatives can be identified.
- Where there are no reasonable alternatives, whether mitigation through measures adopted in accordance with the principles and procedures established by the International Maritime Organization can be achieved at no significant cost to the shipping or ports sector.

Raw Material Extraction

Marine planners and decision makers should consider the impacts of other development or activity on areas of marine aggregate or mineral resource. Where an interaction is identified, consideration should be given to whether there are permissions for aggregate or mineral extraction and whether they require any degree of safeguarding (cf. AGGREGATES 1 of (The Scottish Government, 2015)). In addition,

with regard to the extraction of materials, it must be taken into account "whether any proposed marine aggregate dredging is considered environmentally acceptable and is in accordance with the other policies and objectives of this Plan." (AGGREGATES 2)

Oil and gas exploration should be maximised using the "using the principles of Best Available Technology […] and Best Environmental Practice" (OIL & GAS 1). "Supporting marine and coastal infrastructure for oil and gas developments, including for storage, should utilise the minimum space needed for activity and should take into account environmental and socio-economic constraints" (OIL & GAS 3).

"Consideration should be given to the development of marine utility corridors which will allow carbon capture and storage to capitalise, where possible, on current infrastructure in the North Sea, including shared use of spatial corridors and pipelines" (CCS2).

Installations and Infrastructures (Offshore renewable energy production)

Sites for commercial offshore wind and marine renewable energy development should be identified in the plan. This exploitation is a priority. The existing sites or sites with agreements for energy production must be taken into account if alternative uses for these areas is being considered in the planning process.

Fishing and Aquaculture

Existing fishing sites are safeguarded if possible. To maintain that, other sectors should take the interests of the fishing industry into account (cf. Chapter 6). Fishing activities must be sustainable. Vulnerable stocks, the seabed and archaeological remains are protected. Mechanisms to mediate upcoming conflicts between parties shall be implemented.

Appropriate locations for future aquaculture sites shall be identified in the future plan.

Military Training Areas

The Scottish Seas are used by the Royal Army, Air force and Navy for military training. The designated areas can be closed for the public and the military use has priority before all other applications.

Installation of permanent infrastructure will only be permitted if it is compatible with the military applications (cf. Chapter 15).

Nature and Species Conservation Sites and Protected Areas

The impact of development and use of the marine environment on diadromous fish species should be considered in marine planning and decision-making processes (cf. Chapter 8).

Marine planners and decision makers should support enhancement to the aesthetic qualities, coastal character and wildlife experience of Scotland's marine and coastal areas (cf. Chapter 12)

Submarine Cable and Pipeline Routes

Cables and their maintenance should have as little impacts as possible.

New cables must be routed suitably to provide sufficient clearance for installation and cable protection. They should be buried for protection, if this is not possible suitable protection measures have to be approved and applied (cf. Chapter 14).

Scientific Research

No information is given.

2.4
Differences in MSP regulations between the countries

Activity	Belgium	Germany	Netherlands	Norway	Sweden	United Kingdom	Scotland
Shipping and Ports	▪ Shipping has priority ▪ As long as they do not restrict maritime transport, other activities are permitted ▪ Shipping is not allowed in and around windfarms with a safety zone of 500 metres	▪ Shipping has priority ▪ Safety and ease of traffic must be guaranteed ▪ A minimum distance between offshore wind farms and traffic separation areas should be established	▪ Shipping is an activity of national interest ▪ Mining installations or other individual permanent structures will not be permitted within the shipping routes or in a 500-metre zone surrounding these shipping routes	▪ For shipping, an offshore routing system has been introduced in effect functioning as a zoning plan for the international shipping activities	▪ Shipping is an activity of national interest	▪ Negative impacts on shipping activity, freedom of navigation and navigational safety are minimised ▪ The construction or extension of an offshore wind farm should not be granted if interference with the use of shipping	▪ Navigational safety will be protected
Raw Material Extraction	▪ Exploitation sites for mineral, sand and gravel and other non-living extraction in the territorial sea and the continental shelf are designated ▪ A reference zone for monitoring the environmental impact of sand extraction and wind farms exist	▪ Due to conflicts with nature, shipping, fisheries and defence, the extraction of raw materials must be concentrated on the necessary areas ▪ the prospecting and extraction of raw materials should not affect the safety and ease of transport ▪ Location for raw material extraction should take into account known sites where cultural artefacts are found	▪ Sand extraction for coastal defences and filling is an activity of national interest		▪ Sand extraction is permitted in designated areas	▪ Within defined areas of potential carbon dioxide storage, activities should not prevent or minimize the storage of carbon dioxide	▪ Marine planners and decision makers should consider the impacts of other development or activity on areas of marine aggregate or mineral resource. ▪ Consideration should be given to the development of marine utility corridors which will allow carbon capture and storage
Installations and Infrastructures	▪ The extraction of wind energy is given priority over other uses	▪ The extraction of wind energy is given priority over other spatially uses ▪ If spatially significant uses are incompatible with the function of the wind energy, these are excluded ▪ Wind energy should not affect the safety and ease of shipping ▪ Offshore wind turbines outside the designated priority areas are not permitted in Natura 2000 areas	▪ Wind energy, oil and gas extraction are activities of national interest ▪ Outside designated areas for wind energy extraction, central government does not grant permission for wind farms ▪ Sufficient distance between the shipping routes and wind farms, mining site and wind farms must be guaranteed ▪ Shipping is not permitted around existing oil and gas platforms, with a minimum safety zone of 500 metres	▪ Offshore renewable energy production may only be established after public authorities have opened specific geographical areas for licence applications ▪ Safety zones around petroleum installations are essential for safety purposes	▪ Energy extraction is an activity of national interest	▪ The extraction of wind and water energy is given priority over other spatially uses	▪ The exploitation of wind and marine renewable energy has priority
Fishing and Aquaculture	▪ No specified areas ▪ Professional fisheries is allowed everywhere in the	▪ No specified areas ▪ Interference with fishing by other uses shall be	▪ No specified areas ▪ Fishing has access to all areas, but activities to	▪ No specified areas	▪ Catching and spawning areas but also fish protection areas where	▪ Fishing is given priority over other spatially uses	▪ Existing fishing sites are safeguarded if possible ▪ Appropriate locations for

	sea areas , but ▪ fishing gear type restrictions exist ▪ fishing is not allowed in and around the existing wind farms ▪ Sustainable aquaculture is allowed on specified areas	avoided as far as possible ▪ Installation of offshore wind farms, the extraction of raw materials and scientific research are to be taken into account	which national interests are attributed have priority		fishing is not permitted year round or for parts of the year are designated		future aquaculture sites shall be identified in the future plan
Military Training Areas	▪ Military activities and exercises are given priority over other spatially uses	▪ Securing the functioning of the army is of great national interest.	▪ Defence is of national interest ▪ Within exercise zones, the collective use of these areas is permitted as this is compatible with the military exercises being engaged		▪ Defence is of national interest ▪ In a decision between two incompatible national interests, priority shall be given to the defence interest if an area or part of an area is needed for a national defence facility.	▪ Marine activities should not prejudice the interests of defence and national security	▪ Designated areas for military training exists an can be closed for public ▪ Military use has priority over all other applications ▪ Installation of permanent infrastructure will only be permitted if it is compatible with the military applications
Nature Protection	▪ No regulations, but it is intended to improve coordination of activities in existing areas with environmental conservation. ▪ Special protection areas for birds are outlined, where civil engineering and industrial activities are prohibited	▪ Spatial requirements of military defence must be taken into account ▪ Existing protected areas, the important resting and feeding areas for seabirds and other areas worthy of protection must be protected [Natura 2000]	▪ Natura 2000 is of national interest	▪ Marine bioprospecting is of national interest	▪ Natura 2000 areas are areas of national interest ▪ Nature use in the plan is based on existing marine conservation areas ▪ Areas of particular consideration to high nature value are designated to preserve specific nature values		
Scientific Research	▪ No specified areas ▪ Scientific research is allowed everywhere in the Belgian sea areas	▪ Designated areas for research are given special weight ▪ Research activities shall not affect the safety and ease of maritime transport					
Submarine Cables and Pipelines	▪ Installations for cables and pipelines are clustered into corridors ▪ Activities, which render impossible or restrict the laying or operation of piping and cables are prohibited	▪ The operation and maintenance of pipelines is given priority over other spatially significant uses ▪ As far as spatially significant planning, measures and projects in these areas are not compatible with the function of the priority area pipelines, these are excluded ▪ In the case of overlapping definitions of priority areas for pipelines with priority areas for wind energy, the interests of the pipelines shall be given priority ▪ The safety and ease of traffic should not be impaired	▪ There is a maintenance zone of 500 metres around cables and pipelines in the North Sea and sand may not be extracted within this zone ▪ When building wind farms, a 500-metre zone should be adhered to for pipelines and electricity cables and a 750-metre zone for telecommuni-cation cables	▪ Subsea installations and pipelines must be designed to avoid interference with fishing operations	▪ Specific areas for energy transmission and distribution are not presented ▪ For the laying of lines and cables within the territory, permits are required according to other national laws excluding shipping and fishing	▪ Cables are buried deep in the seabed where possible and installers and operators promote marine safety and protection.	▪ Cables and their maintenance should have as little impacts as possible ▪ New cables must be routed suitably to provide sufficient clearance for installation and cable protection

Tab. 1
Differences in MSP regulations between the countries

2.5 Coexistence between different topics in MSP

In order to draw up a proposal for cross-border spatial planning in the North Sea, the coexistence of activities consisting of conflicts (major conflicts are marked in red and potential conflicts in yellow) and synergies (green) must be recorded in addition to the regulatory authorities of the riparian states. These results are based on (European Commission, 2019) and (European Union - European Maritime and Fisheries Fund, 2017) and depicted in the table below.

	Shipping and Ports	Mineral Extraction	Oil and Gas Exploitation
Shipping and Ports		▪ Risk of collision if extraction sites are on / near shipping lanes	▪ Exclusion of shipping from a safety zone around infrastructure ▪ Decommissioning activities will require greater shore-based facilities for the dismantling of offshore rigs and platforms
Mineral Extraction	▪ Marine aggregates are extracted with specialised ships		▪ Use of same seabed space
Oil and Gas Exploitation	▪ Risk for collision increases with structures and among vessels themselves, when traffic density increases as navigable space diminishes	▪ Use of same seabed space	
Offshore Renewable Energy Production	▪ Shipping cannot pass through an area with a wind farm ▪ OSW can have negative impacts on shipping safety and rescue operations ▪ Use of service ships for maintenance	▪ Not allowed in areas of renewable energy ▪ Share space with the marine aggregates sector if the multi-use is considered from a temporal perspective	▪ Difficult to carry out seismic surveys and exploration drilling to map petroleum deposits, and also to carry out oil and gas production, in the same area as the wind farms
Fishing and Aquaculture	▪ Fishing entails navigation (COLREG) ▪ Cargo vessels sail through or very close to fishing grounds where are large concentrations of fishing vessels	▪ Use of the same seabed of aquaculture space ▪ During dredging activity, conflicts exists in with regards to access to fishing grounds and deployment of fixed fixing gear ▪ Potential for seabed extraction to impact on fish and shellfish populations through disturbing habitats	▪ Displacement of fishing activity from the installation during operation and decommissioning from a 500m safety exclusion zone ▪ Where suitable, and if technological and regulatory hurdles can be addressed, co-location of aquaculture facilities with existing oil and gas infrastructure may be possible
Nature	▪ Natura 2000 ▪ Intensively used shipping routes can have negative impacts on areas of high ecological value ▪ Shipping causes turbulence at shallow passages and is therefore limited by depth or speed in a certain location ▪ Impacts on air quality and noise may have negative impacts on marine biodiversity ▪ Physical damage to habitats through the use of anchors	▪ Marine aggregate extraction has the potential to disturb sites of marine archaeological importance ▪ Marine mining and dredging potentially causes environmental damage to the biological diversity and ecosystems	▪ Potential for ecological interactions, particularly during seismic use in exploration and associated disturbance of marine mammals ▪ Offshore installations have the potential to provide protected habitat in the form of artificial reefs
Military	▪ Shipping traffic may need to be suspended in the military areas when exercises are under way, but can otherwise be conducted	▪ In designated military areas no extraction is allowed	▪ **No conflict**
Scientific Research	▪ **No conflict**	▪ **No conflict**	▪ **No conflict**
Submarine Cables and Pipelines	▪ Deepening of fairways poses a risk to pipelines and cables ▪ Anchoring can damage pipelines ▪ Pipelines and cables are laid with special ships	▪ No conflicts unless at the extraction site where no cables can be laid	▪ Oil and gas production represents the main demand for the installation and operation of pipelines ▪ Installation of new infrastructure needs to consider existing pipelines

	Offshore Renewable Energy	Fishing and Aquaculture	Military
Shipping and Ports	▪ OSW farms limit space for shipping activities and have negative impacts on shipping safety and rescue operations through the exclusion of shipping from a safety zone around infrastructure ▪ OSW farms depend on nearby ports with the capacity to provide logistics services for the construction and maintenance of the farms	▪ Fishing entails navigation ▪ Aquaculture devices pose risk to navigation and therefore their installation is forbidden in the vicinity of commercial shipping	▪ Shipping traffic may need to be suspended in the marine training areas when forces exercises are under way, but can otherwise be conducted without restriction in the same place
Mineral Extraction	▪ Areas licenced for aggregate extraction and OSW farms are mutually exclusive, due to potential collisions and damage to the cables	▪ Extraction may alter the physical characteristics of sediments and the seabed	▪ **No conflict**
Oil and Gas Exploitation	▪ There may be potential to have multi-use OSW farms and oil & gas platforms	▪ Displacement of fishing activity from the installation during operation and decommissioning from a 500m safety exclusion zone, and temporary potential displacement during the installation of pipelines	▪ **No conflict**
Offshore Renewable Energy Production		▪ Trawling is not allowed in areas of renewable energy ▪ Fish stocks may increase around OSW farms ▪ Fishing gear and anchoring can cause damage to the turbines and the cables between the turbines, and fishing vessels risk collision with turbines	▪ **No conflict**
Fishing and Aquaculture	▪ OSW farms can have immediate and long-term negative impacts when constructed on reefs ▪ Construction, maintenance and dismantling works can disturb certain species		▪ Fishing traffic may need to be suspended in the marine training areas when forces exercises are under way, but can otherwise be conducted without restriction in the same place
Nature	▪ Impact on benthic habitats from construction of wind farms ▪ Disturbance by noise from construction, pile driving, maintenance, dismantling works ▪ Impact on migration patterns and habitat connectivity ▪ OSW farms may create artificial reefs around their foundations, leading to an increase in biodiversity	▪ Impacts of demersal trawling to benthic habitats ▪ Marine protected areas as a limitation of the access to fishing grounds ▪ Certain kinds of fisheries entail by-catch of protected species and is limited or therefore not allowed in a certain location	▪ In several cases, defence activities overlap with valuable nature areas and the marine spatial plan indicates both uses defence and nature as most suitable use ▪ In some of the areas, nature values are mostly located on the seabed. Under such conditions, both defence activities and shipping can continue without disruption.
Military	▪ Wind farms affect the possibility of conducting defence activities and energy extraction is therefore not proposed in areas with the use of military ▪ Several of the interests of total defence can be negatively affected by wind power stations and other tall objects	▪ Aquaculture devices pose risk to navigation and therefore their installation is forbidden in the vicinity of military shipping	
Scientific Research	▪ **No conflict**	▪ **No conflict**	▪ **No conflict**
Submarine Cables and Pipelines	▪ OSW farms may be integrated to marine grid systems including trans-border supply ▪ Existing pipeline and cable infrastructure, including the need for their maintenance, may hinder the spatial arrangement of an OSW farm	▪ Anchoring and bottom trawling forbidden in areas where cables and pipelines are not submerged	▪ **No conflict**

	Nature	Scientific Research	Submarine Cables and Pipelines
Shipping and Ports	▪ Natura 2000 ▪ Shipping safety is a common interest of both sectors	▪ Shipping safety is a common interest of both sectors	▪ Cables may restrict anchoring in certain areas ▪ Once laid, shipping, cables and pipelines may co-exist in space
Mineral Extraction	▪ Natura 2000	▪ **No conflict**	▪ **No conflict**
Oil and Gas Exploitation	▪ Natura 2000	▪ **No conflict**	▪ No conflicts unless at the extraction site and exclusion zones of oil and gas extraction areas
Offshore Renewable Energy Production	▪ Natura 2000	▪ **No conflict**	▪ Synergies when developing wind farm clusters and offshore energy grids ▪ Conflicts may exist when laying cables around renewable energy systems installations and a proximity agreement might be needed if inside the exclusion zone of the installation
Fishing and Aquaculture	▪ Impacts of demersal trawling to benthic habitats	▪ **No conflict**	▪ Construction of cables can have negative effects on certain species and habitats (physical loss, bio-logical disturbance, electromagnetic field, underwater noise)
Nature		**No conflict**	▪ Impact on benthic habitats from construction of cables ▪ Construction of cables can have negative impacts on species (underwater noise, electromagnetic fields) ▪ Impact on migration patterns and habitat connectivity
Military	▪ In several cases, defence activities overlap with valuable nature areas and the marine spatial plan indicates both uses defence and nature as most suitable use ▪ In some of the areas, nature values are mostly located on the seabed. Under such conditions, both defence activities and shipping can continue without disruption	▪ **No conflict**	▪ **No conflict**
Scientific Research	▪ **No conflict**		▪ **No conflict**
Submarine Cables and Pipelines	▪ Natura 2000	▪ **No conflict**	

Tab. 2
Coexistences between different topics in MSP

The following conclusions can be drawn with regard to the coexistence of different spatial planning sectors and the definitions of the countries: In the shipping sector, the countries of the North Sea generally agree that shipping has priority over other activities or sectors. In the event that other activities do not restrict the shipping sector, however, these are fundamentally outlawed. In addition, the activities military training areas, nature protection and offshore energy can be adapted to a common spatial plan of the North Sea.

The situation is different with the extraction of raw materials. While in the case of Belgium, for example, raw material areas are defined in the planning process; in the case of Germany there are only areas of use for these materials, which are nightmarish to shipping, nature and their activities and not being spatially designated. A consensus for cross-border spatial planning must therefore be created here.

There are also differences in the definition of fishing areas. While in the case of the United Kingdom these have priority over other uses, in the case of the other countries these are permitted but not given priority. The same applies to submarine cables and pipelines, which in the case of the UK and Norway do not represent priority areas. Moreover, it should be noted that only Belgium and Germany tender areas for scientific research.

With regard to the environment and nature protection zones, a harmonisation of data sets and common mapping is needed in order to provide a better knowledge base for spatial impact assessment of sea uses. Besides, data collection/production methods can differ between countries, e.g. concerning information on fish nursery and spawning areas or shipping intensities. Nevertheless, this matrix can provide clues to the search for responsible actors and possible solutions in dealing with cross-sectoral and cross-border issues. Looking at the various elements of the table and the results of Table 1, the level of detail varies from sector to sector. In the shipping and fisheries sector in particular, it should be mentioned that other international framework conditions already regulate many spatial aspects, so that the need to participate in another is not perceived as positive in these sectors.

Based on the limitations presented in the previous section, a combined reflection and analysis of both the overall map and the table clarifies that in the majority of sea space overlaps, sector interests may actually coexist.

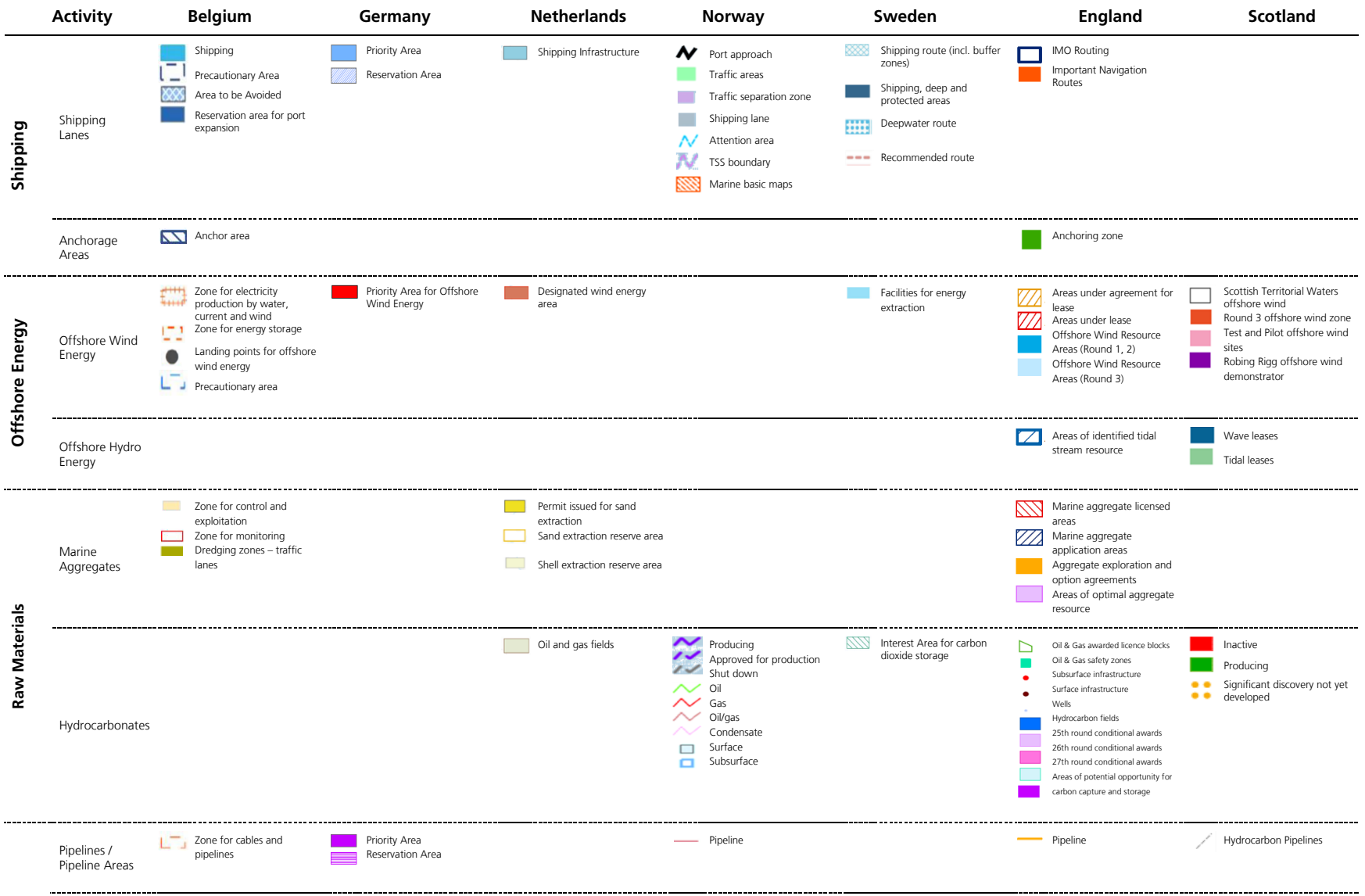
3
Work Package 2:
Development of a cartographic presentation of cross-border maritime spatial planning in the North Sea

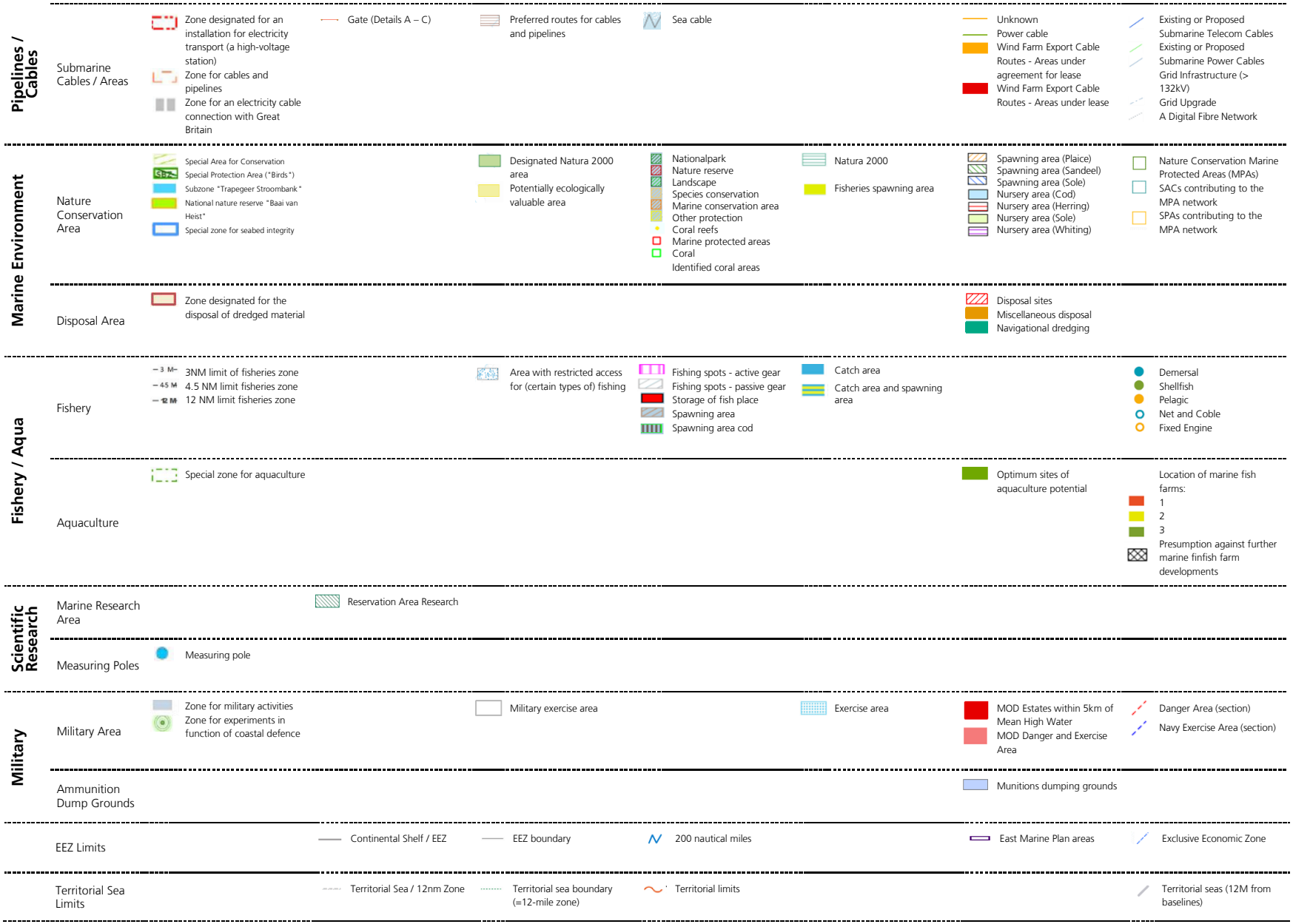
3.1
Investigation of Cartographic Determinations

To analyse and compare cartographic determinations between the countries, a distinction is made between

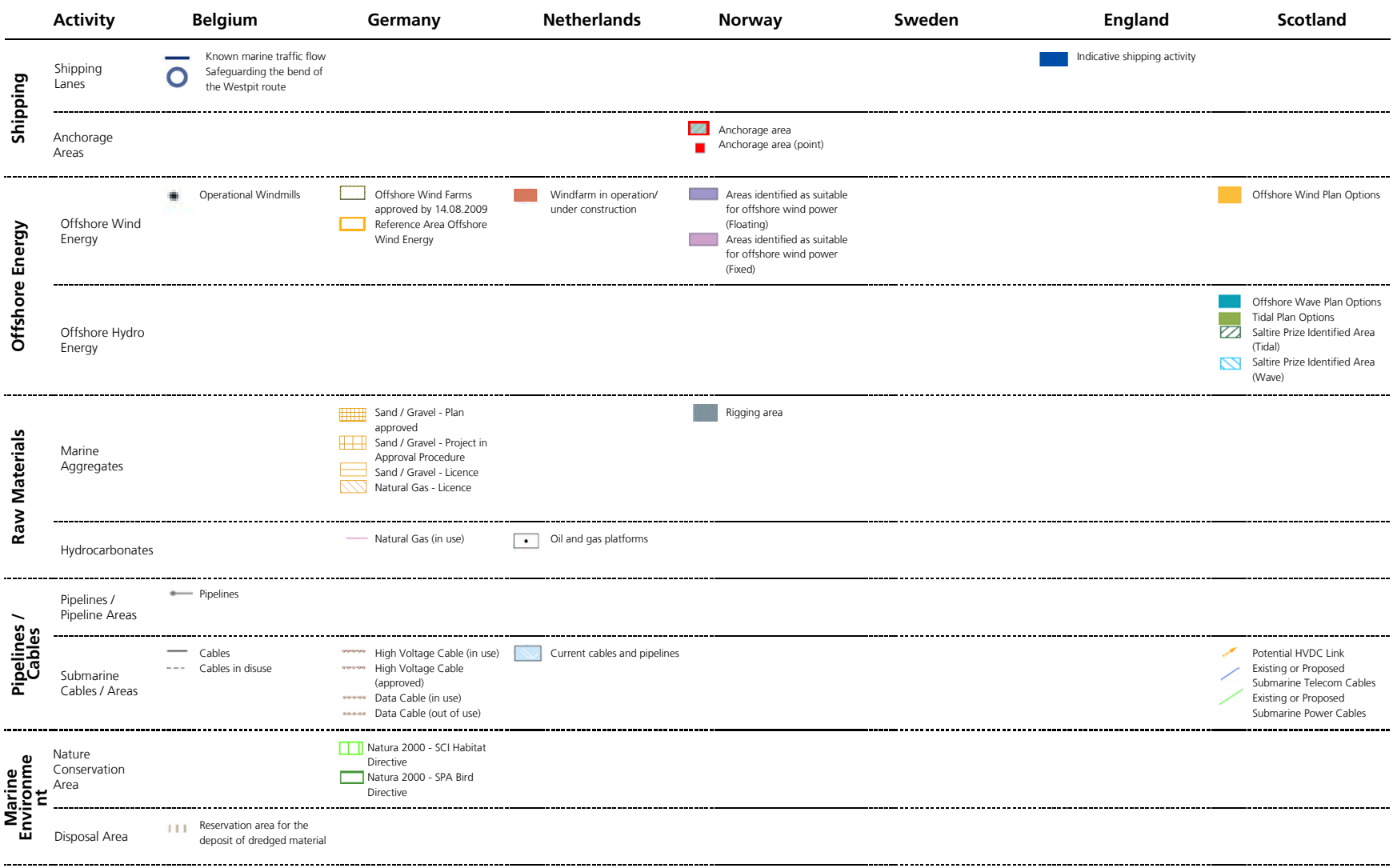
- Spatial Designations, and
- Utilisations

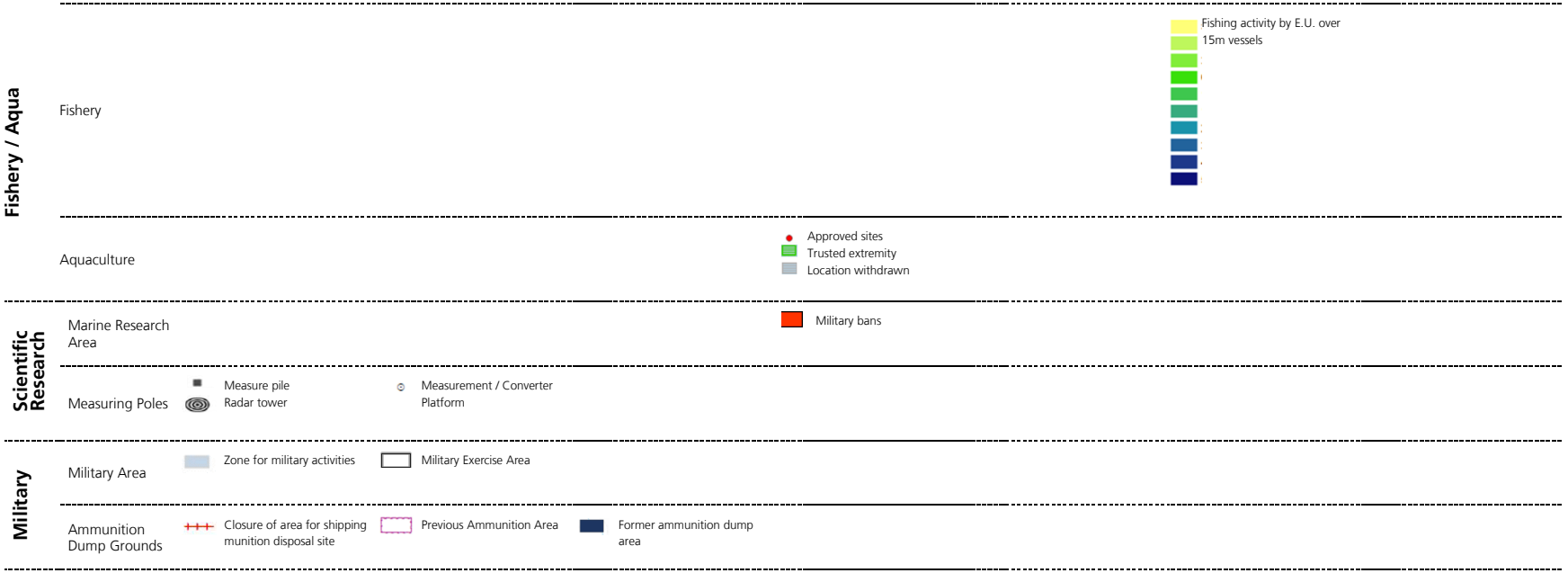
This applies both to the selection of symbols and to textual mentions. For the comparison, the outline used for the map proposal is used. The symbols used to represent the activities are shown in Tables 3 and 4 below. Table 3 describes the spatial designations and Table 4 depicts current uses and information. Since Denmark does not have a spatial planning yet, it is excluded from the analysis.


Activity
Belgium
Germany
Netherlands
Norway
Sweden
England
Scotland
Shipping
Shipping Lanes
Shipping
Precautionary Area
Area to be Avoided
Reservation area for port expansion
Priority Area
Reservation Area
Shipping Infrastructure
Port approach
Traffic areas
Traffic separation zone
Shipping lane
Attention area
TSS boundary
Marine basic maps
Shipping route (incl. buffer zones)
Shipping, deep and protected areas
Deepwater route
Recommended route
IMO Routing
Important Navigation Routes
Anchorage Areas
Anchor area
Anchoring zone
Offshore Energy
Offshore Wind Energy
Zone for electricity production by water, current and wind
Zone for energy storage
Landing points for offshore wind energy
Precautionary area
Priority Area for Offshore Wind Energy
Designated wind energy area
Facilities for energy extraction
Areas under agreement for lease
Areas under lease
Offshore Wind Resource Areas (Round 1, 2)
Offshore Wind Resource Areas (Round 3)
Scottish Territorial Waters offshore wind
Round 3 offshore wind zone
Test and Pilot offshore wind sites
Robing Rigg offshore wind demonstrator
Offshore Hydro Energy
Areas of identified tidal stream resource
Wave leases
Tidal leases
Raw Materials
Marine Aggregates
Zone for control and exploitation
Zone for monitoring
Dredging zones – traffic lanes
Permit issued for sand extraction
Sand extraction reserve area
Shell extraction reserve area
Marine aggregate licensed areas
Marine aggregate application areas
Aggregate exploration and option agreements
Areas of optimal aggregate resource
Hydrocarbonates
Oil and gas fields
Producing
Approved for production
Shut down
Oil
Gas
Oil/gas
Condensate
Surface
Subsurface
Interest Area for carbon dioxide storage
Oil & Gas awarded licence blocks
Oil & Gas safety zones
Subsurface infrastructure
Surface infrastructure
Wells
Hydrocarbon fields
25th round conditional awards
26th round conditional awards
27th round conditional awards
Areas of potential opportunity for carbon capture and storage
Inactive
Producing
Significant discovery not yet developed
Pipelines / Pipeline Areas
Zone for cables and pipelines
Priority Area
Reservation Area
Pipeline
Pipeline
Hydrocarbon Pipelines



Tab. 3 Depiction of cartographic determinations – Spatial Designations


Activity
Belgium
Germany
Netherlands
Norway
Sweden
England
Scotland
Shipping
Shipping Lanes
Known marine traffic flow
Safeguarding the bend of the Westpit route
Indicative shipping activity
Anchorage Areas
Anchorage area
Anchorage area (point)
Offshore Energy
Offshore Wind Energy
Operational Windmills
Offshore Wind Farms approved by 14.08.2009
Reference Area Offshore Wind Energy
Windfarm in operation/ under construction
Areas identified as suitable for offshore wind power (Floating)
Areas identified as suitable for offshore wind power (Fixed)
Offshore Wind Plan Options
Offshore Hydro Energy
Offshore Wave Plan Options
Tidal Plan Options
Saltire Prize Identified Area (Tidal)
Saltire Prize Identified Area (Wave)
Raw Materials
Marine Aggregates
Sand / Gravel - Plan approved
Sand / Gravel - Project in Approval Procedure
Sand / Gravel - Licence
Natural Gas - Licence
Rigging area
Hydrocarbonates
Natural Gas (in use)
Oil and gas platforms
Pipelines / Cables
Pipelines / Pipeline Areas
Pipelines
Submarine Cables / Areas
Cables
Cables in disuse
High Voltage Cable (in use)
High Voltage Cable (approved)
Data Cable (in use)
Data Cable (out of use)
Current cables and pipelines
Potential HVDC Link
Existing or Proposed Submarine Telecom Cables
Existing or Proposed Submarine Power Cables
Marine Environment
Nature Conservation Area
Natura 2000 - SCI Habitat Directive
Natura 2000 - SPA Bird Directive
Disposal Area
Reservation area for the deposit of dredged material



Tab. 4 Depiction of cartographic determinations – Utilisation

3.2 Development of a Map

Based on the analysis results of the previous steps and the legend and map elements described in section 3.1, in this section a concept for a uniform map is presented. As a first approach, the detailed map will always be used as the starting point in order not to exclude any elements and to preserve the level of detail as far as possible. To do this, a distinction is made between spatial designations and utilisation as well.

An A0 representation is used which, in addition to the representation of the common spatial planning in the North Sea, includes a detailed section of the spatial planning map of Belgium. In addition to the basic structure of the map, the following projections are used:

- Coordinate system: WGS 1984 Web Mercator Auxiliary Sphere
- Projection: Mercator Auxiliary Sphere
- Datum: WGS 1984
- False Easting: 0
- False Northing: 0
- Central Meridian: 0
- Standard Parallel 1: 0
- Auxiliary Sphere: 0
- Units: Meter

The aim of developing a common map is to generalise existing planning specifications and uses to recognize data gaps and needs and depict coexistences of different activities and sectors. In addition, a primary goal was to maintain the readability of the map. In the developed chart, the modular approach on MSP presented in this report was converted into a visual representation. For a simplification of several different laws and regulations per country, the basic approach of using two groups (utilisation and spatial designation) has been the fundamental idea of the graphic implementation.

As the representation of different spatial layers should be catchy for the user, different pastel colour based groups have been created. To create an urgent implementation for the user, similar colours have been used for utilisation and spatial designation, as well as simple full colour shapes and diagonal stripes. During the development process, different shapes and colours have been tested to several users, in order to determine the most noticeable colour / shape mix.

Within the implementation of data sources from different European countries, a unique projection and coordinate system has to be used. For this purpose, a WGS 84 Web Mercator Auxiliary Sphere is applied. For the creation of a general overview for MSP in the North Sea, a scale of 1:2.250.000 is used. In the case of Belgium, a detailed chart (1:650.000) is added to the main map.

Charts show a currently view on a specific issue. It is perspicuous that the shown layers and data can change rapidly. In order to provide a generalized approach to chart creation and the maintenance of the chart, the idea of layer hierarchy was established. From top, the country can be found, among them the subdivision into utilisation and spatial designation, followed by the further separation into activities. New layers can be added easily, while using this separations and the colour and shape code developed. For a better approach on the map itself, underneath a detailed legend is shown.

For the presentation on an A0 printed chart not only the layer hierarchy has to be observed, also the transparency, to show layers underneath. The attached description of colours and shapes is related to the basic form and not to the transparent depiction. Some symbols may not be used in the chart yet, but they are necessary for further purposes.

3.2.1 Spatial Designation

Shipping Lane

 R - 136 ; G - 188 ; B - 226

Anchorage Areas

 R - 000 ; G - 090 ; B - 148

Aquaculture

 R – 000 ; G - 052 ; B – 107

Disposal

 R – 119 ; G - 028 ; B – 044

Fishing

 R – 212 ; G - 230 ; B – 244

Marine Aggregates

 R – 255 ; G - 250 ; B – 209

Hydrocarbonates

 R – 203 ; G - 175 ; B – 115

Nature Conservation

 R – 209 ; G - 221 ; B - 130

Offshore Hydro Energy

 R – 242 ; G - 148 ; B – 000

Offshore Wind Energy

 R – 226 ; G - 000 ; B – 026

Military

 R – 076 ; G - 099 ; B – 111

Submarine Cables and Pipelines

 R – 144 ; G - 133 ; B – 186

Scientific Research

 R – 023 ; G - 156 ; B – 125

3.2.2 Utilisation

Shipping Lane

 R – 136 ; G - 188 ; B - 226

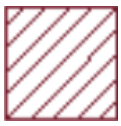
Anchorage Areas

 R – 000 ; G - 090 ; B – 148

Aquaculture

 R – 000 ; G - 052 ; B – 107

Disposal

 R – 119 ; G - 028 ; B – 044

Fishing

 R – 212 ; G - 230 ; B – 244

Marine Aggregates

 R – 255 ; G - 250 ; B – 209

Hydrocarbonates

 R – 203 ; G - 175 ; B – 115

Nature Conservation

 R – 209 ; G - 221 ; B - 130

Offshore Hydro Energy

 R – 242 ; G - 148 ; B – 000

Offshore Wind Energy

 R – 226 ; G - 000 ; B – 026

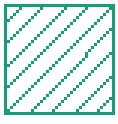
Military

 R – 076 ; G - 099 ; B – 111

Submarine Cables and Pipelines

 R – 144 ; G - 133 ; B – 186

Scientific Research

 R – 023 ; G - 156 ; B – 125

3.2.3 Information

Country

R – 168 ; G - 175 ; B – 175

Natura 2000

R – 180 ; G - 220 ; B – 211

The map shown in Figure 4 is the project result of the study on spatial planning in the North Sea. It shows the current spatial situation including the strategies for the spatial sectors for the countries of the North Sea. As a first attempt to summarise all available information spatially, the map clearly shows the complexity of cross-border coordination with all its different planning phases. The map was also used as a tool in the project to facilitate a discussion on the coexistence of sectors in the marine space.

It has to be mentioned that the map developed by the case study broadens the overview of the sectors and gives stakeholders the opportunity to find out about the location. Interestingly, from a cross-border perspective, the map shows very few cross-border conflicts, while there may well be some cross-sectoral conflicts both within a country and bilaterally.

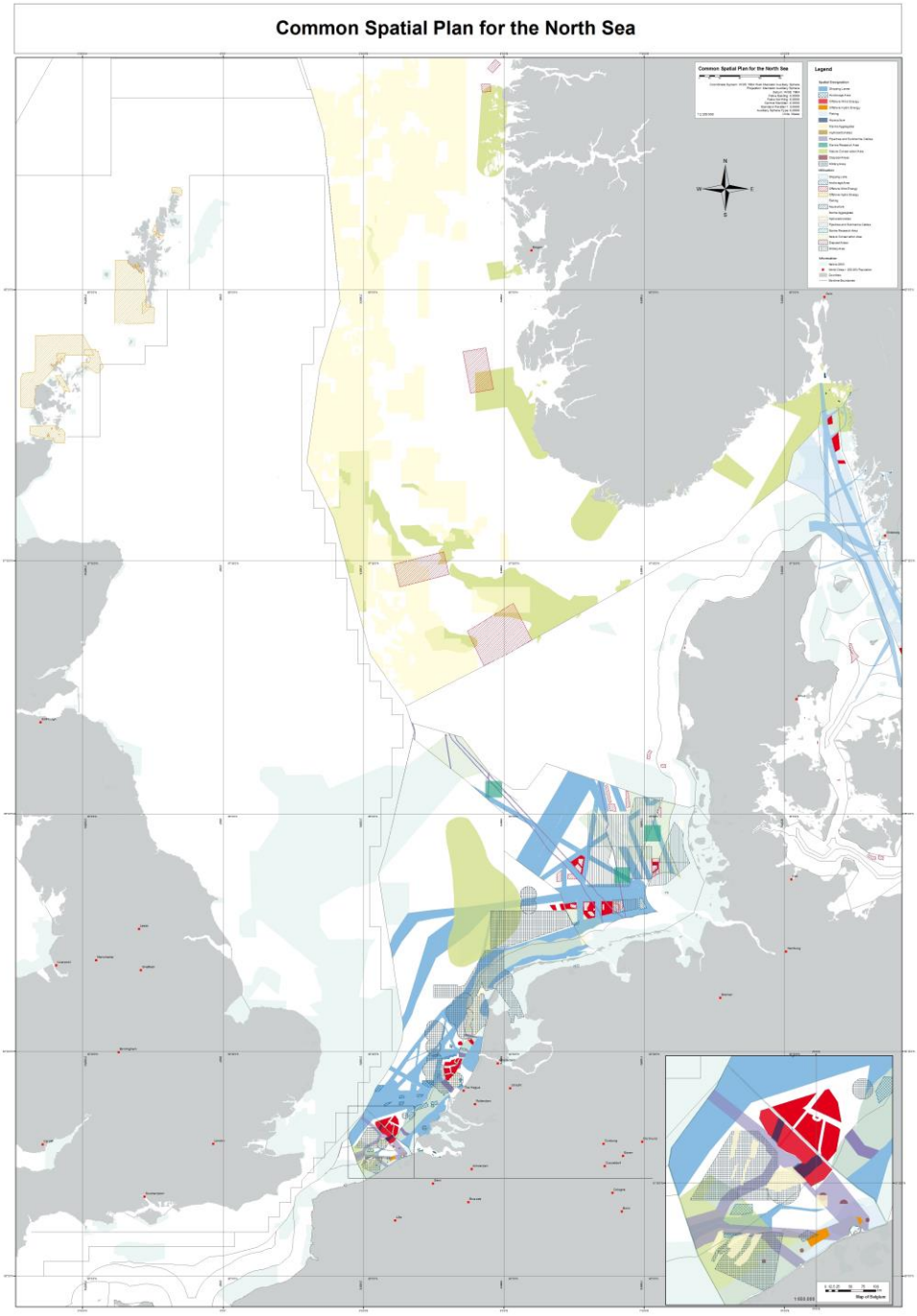


Fig. 4
Common Spatial Plan for the North Sea

3.3
Transfer to the Baltic Sea

Finally, section 3.3 proves in how far the concept can be transferred to the maritime spatial planning across the Baltic Sea. For this purpose, an analysis of the determinations in the Baltic Sea is carried out in a first step. Subsequently, appropriate recommendations for action with regard to required changes are formulated, which are also included in the study.

The results of the Baltic SCOPE (Baltic SCOPE, 2017) project towards the coherent cross-border MSP in the central Baltic Sea will be consulted for this purpose. For the analysis of cartographic determinations in the Baltic Sea, a distinction is made between the sectors Environment, Energy, Fisheries and Shipping.

3.3.1
Shipping

In the case of shipping, the layers or symbols shown in Figure 5 are used within the Baltic Sea. In addition to the representation of historical and thus not real-time traffic intensities, which are established by the data integration of data of the automatic identification system AIS, ports as well as areas to be avoided, restricted areas and traffic separation zones are presented.

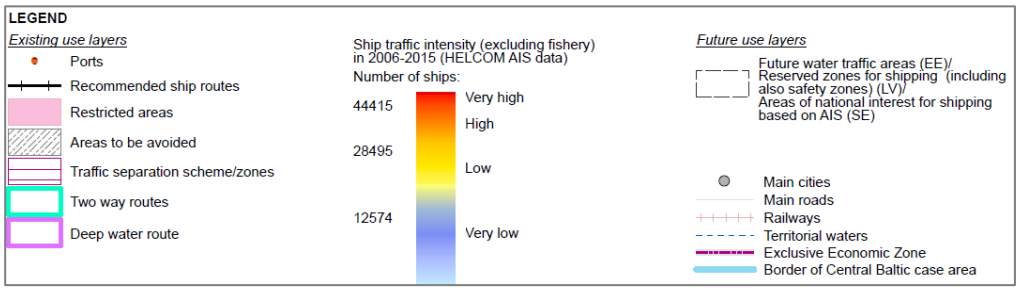


Fig. 5
Map legends of the shipping sector in the Baltic Sea (Baltic SCOPE, 2017)

In contrast, no traffic intensities are presented in the approach developed within the present study. However, these could be easily integrated with the ship motion data available at the BSH. In addition, a distinction is made within the proposed map between planning specifications and current uses. This could also be extended to the Baltic Sea by introducing hatched layers.

3.3.2
Environment

Similar to the consideration of the shipping sector, in contrast to the map proposed for the North Sea, no distinction is made between planning determinations and future and current uses. However, in this case explicitly existing Natura and HELCOM areas as well as spawning grounds are shown.

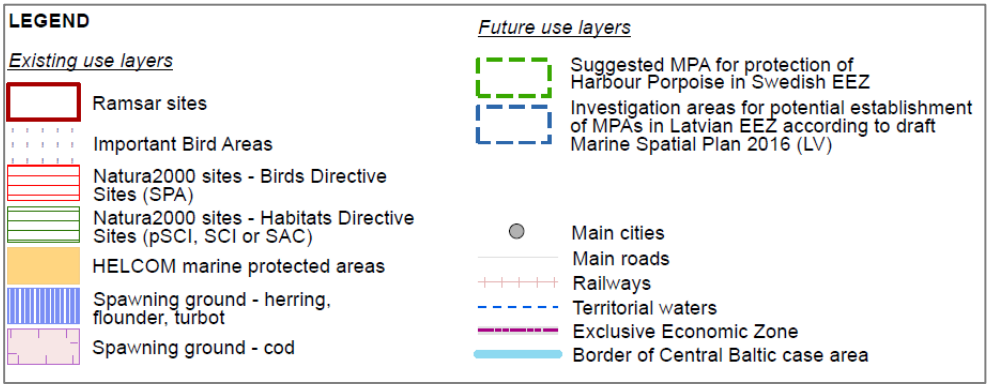


Fig. 6
Map legends of the environment sector in the Baltic Sea (Baltic SCOPE, 2017)

3.3.3
Energy

Looking at the energy sector, there are many overlaps with the approach of cross-border spatial planning in the North Sea. In addition to the description of existing wind turbines and corresponding cables, planning areas for offshore wind energy are also given, so that a strong transferability is given here by colour adaptations of the layers and thus of the approaches..

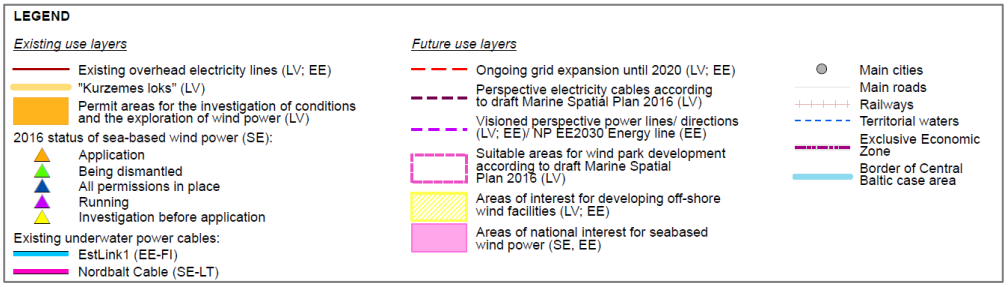


Fig. 7
Map legends of the energy sector in the Baltic Sea (Baltic SCOPE, 2017)

3.3.4
Fisheries

In the case of the Baltic Sea, the intensities of fishing activities are also depicted in the same way as in the shipping sector. These could also be integrated into the map of the North Sea using existing data.

In addition, both fishing ports and trap net are visualized on the map. Analogous to the map development for the North Sea, a distinction is made between priority and reserved areas or areas of use for the fishery and these are represented accordingly.

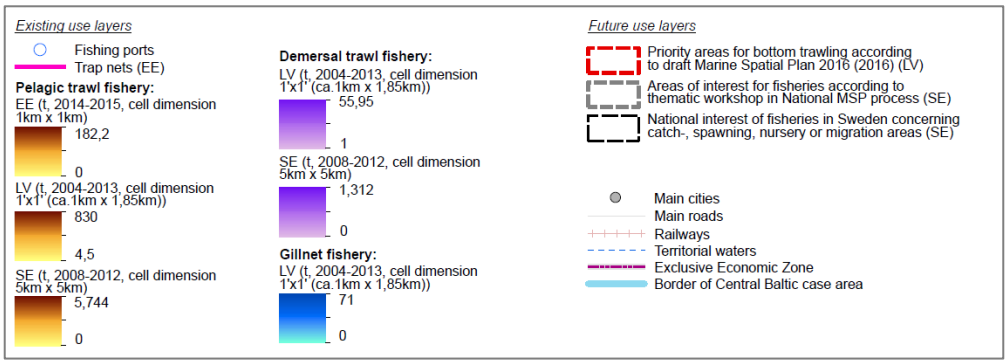


Fig. 8
Map legends of the fisheries sector in the Baltic Sea (Baltic SCOPE, 2017)

Generally, the approach in this report and the Baltic SCOPE (Baltic SCOPE, 2017) is the same, but the result distinguishes in several issues. The way to compare and evaluate laws and regulations from different countries and their executive authorities, is quite different. Contrary to the validation of the laws as well as the map presentation using the sectors "Energy", "Shipping", "Environment" and "Fishing" in the Baltic SCOPE (Baltic SCOPE, 2017), the presentation of spatial planning was divided into further topics in order to highlight possible differences - in particular in the legislation in more detail.

4
Conclusion and Recommendations

Based on the results presented in the previous sections it can be stated that a cross-border MSP in the North Sea area is possible under the premise of coexisting sectors in the countries as well as adapted regional planning regulations. This applies in particular to the use of nature conservation zones, in which other burdensome activities have to be reduced by preventive actions.

What the map represents in particular is the cross-border representation of related activities. With the introduced layer functions, quick conclusions can be drawn regarding the spatial planning of activities. In addition, the uncertainty in the spatial planning of countries whose MSPs are new or have not yet been introduced must be taken into account.

Within the scope of the present study, not all necessary data were provided. For the further development of a cross-border map for the North Sea, these have to be gathered in a first step and, if necessary, processed with the defined WGS 84 projection. The electronic representation is configured so that new data can be easily integrated into the specified layers.

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Appendix

Appendix 1: International and European Laws and Regulations

Appendix 2: Belgian Laws and Regulations

Appendix 3: Danish Laws and Regulations

Appendix 4: German Laws and Regulations

Appendix 5: Swedish Laws and Regulations

Appendix 6: UK Laws and Regulations

Appendix 7: Scottish Laws and Regulations

Appendix 8: Compliance with Shipping Areas

Appendix 1 – International and European Laws and Regulations

Legislator	Year	Legislation	Source
United Nations	1982	United Nations Conventions on the Law of the Sea (UNCLOS)	(United Nations, 1982)
United Nations	1992	United Nations Conference on Environment & Development 1992. Chapter 17: Protection of the oceans, all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and the protection, rational use and development of their living resources	(United Nations, 1992)
United Nations	1992	Convention on Biological Diversity	(United Nations, 1992b)
United Nations	2002	Report of the World Summit on Sustainable Development	(United Nations, 2002)
International Maritime Organisation	1966	International Convention on Load Lines	(IMO, 1966)
International Maritime Organisation	1969	International Convention on Civil Liability for Oil Pollution Damage (CLC)	(IMO, 1969)
International Maritime Organisation	1969	International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties	(IMO, 1969b)
International Maritime Organisation	1969	International Convention on Tonnage Measurement of Ships	(IMO, 1969c)
International Maritime Organisation	1971	Convention relating to Civil Liability in the Field of Maritime Carriage of Nuclear Material (NUCLEAR)	(IMO, 1971)
International Maritime Organisation	1971	International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (FUND)	(IMO, 1971b)
International Maritime Organisation	1972	Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter	(IMO, 1972)
International Maritime Organisation	1972	International Convention for Safe Containers (CSC)	(IMO, 1972b)
International Maritime Organisation	1973	International Convention for the Prevention of Pollution from Ships (MARPOL)	(IMO, 1973)
International Maritime Organisation	1974	International Convention for the Safety of Life at Seat (SOLAS)	(IMO, 1974)

International Maritime Organisation	1976	Convention on Limitation of Liability for Maritime Claims (LLMC)	(IMO, 1976)
International Maritime Organisation	1978	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW)	(IMO, 1978)
International Maritime Organisation	1979	International Convention on Maritime Search and Rescue (SAR)	(IMO, 1979)
International Maritime Organisation	1985	Resolution A.572 (14) General Provisions on Ships' Routeing	(IMO, 1985)
International Maritime Organisation	1989	Resolution A.672 (16) Guidelines and Standards for the Removal of Offshore Installations and Structures on the Continental Shelf and in the Exclusive Economic Zone	(IMO, 1989)
International Maritime Organisation	1989	International Convention on Salvage	(IMO, 1989b)
International Maritime Organisation	1991	Resolution A.720 (17) Guidelines for the Designation of Special Areas and the Identification of Particularly Sensitive Sea Areas	(IMO, 1991)
International Maritime Organisation	1996	International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea (HNS)	(IMO, 1996)
International Maritime Organisation	2001	International Convention on the Control of Harmful Anti-Fouling Systems in Ships	(IMO, 2001)
International Maritime Organisation	2001	International Convention on Civil Liability for Bunker Oil Pollution Damage (BUNKER)	(IMO, 2001b)
International Maritime Organisation	2002	Resolution MSC.137 (76) Standards for Ship Manoeuvrability	(IMO, 2002)
International Maritime Organisation	2004	International Convention for the Control and Management of Ships' Ballast Water and Sediments	(IMO, 2004)
International Maritime Organisation	2009	The Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships	(IMO, 2009)
OSPAR	2002	Convention for the Protection of the Marine Environment of the North-East Atlantic	(OSPAR, 2002)
European Commission	1984	Agreement for cooperation in dealing with pollution of the North Sea by oil and other harmful substances (Bonn Agreement)	(European Commission, 1984)
European	1992	Council Directive 92/43/EEC of 21 May 1992 on the	(European

Commission		conservation of natural habitats and of wild fauna and flora	Commission, 1992)
European Commission	1992	European Convention on the Protection of the Archaeological Heritage	(European Commission, 1992b)
European Commission	1999	Council Directive 1999/32/EC of 26 April 1999 relating to a reduction in the sulphur content of certain liquid fuels and amending Directive 93/12/EEC	(European Commission, 1999)
European Commission	2000	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	(European Commission, 2000)
European Commission	2000	Directive 2000/59/EC of the European Parliament and of the Council of 27 November 2000 on port reception facilities for ship-generated waste and cargo residues	(European Commission, 2000b)
European Commission	2001	Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment (SEA Directive)	(European Commission, 2001)
European Commission	2001	Directive 2001/96/EC of the European Parliament and of the Council of 4 December 2001 establishing harmonised requirements and procedures for the safe loading and unloading of bulk carriers	(European Commission, 2001b)
European Commission	2002	Recommendation of the European Parliament and of the Council of 30 May 2002 concerning the implementation of integrated coastal zone management in Europe	(European Commission, 2002)
European Commission	2002	Directive 2002/59/EC of the European Parliament and of the Council of 27 June 2002 establishing a Community vessel traffic monitoring and information system and repealing Council Directive 93/75/EEC	(European Commission, 2002b)
European Commission	2004	Regulation (EC) No 725/2004 of the European Parliament and of the Council of 31 March 2004 on enhancing ship and port facility security	(European Commission, 2004)
European Commission	2005	Directive 2005/35/EC of the European Parliament and of the Council of 7 September 2005 on ship-source pollution and on the introduction of penalties for infringements	(European Commission, 2005)
European Commission	2005	Directive 2005/65/EC of the European Parliament and of the Council of 26 October 2005 on enhancing port security	(European Commission, 2005b)
European Commission	2006	Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC	(European Commission, 2006)
European Commission	2006	Council Directive 2006/88/EC of 24 October 2006 on animal health requirements for aquaculture animals and products thereof, and on the prevention and control of certain diseases in aquatic animals	(European Commission, 2006b)

European Commission	2006	Directive 2006/113/EC of the European Parliament and of the Council of 12 December 2006 on the quality required of shellfish waters	(European Commission, 2006c)
European Commission	2007	Council Regulation No 708/2007/EC of 11 June 2007 concerning use of alien and locally absent species in aquaculture	(European Commission, 2007c)
European Commission	2007	Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions - An integrated maritime policy for the European Union	(European Commission, 2007d)
European Commission	2008	Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive)	(European Commission, 2008)
European Commission	2008	Directive 2008/106/EC of the European Parliament and of the Council of 19 November 2008 on the minimum level of training of seafarers (recast)	(European Commission, 2008b)
European Commission	2008	Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions - A European strategy for marine and maritime research : a coherent European research area framework in support of a sustainable use of oceans and seas	(European Commission, 2008c)
European Commission	2009	Directive 2009/16/EC of the European Parliament and of the Council of 23 April 2009 on port state control	(European Commission, 2009)
European Commission	2009	Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds	(European Commission, 2009b)
European Commission	2011	Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment Text with EEA relevance (EIA Directive)	(European Commission, 2011)
European Commission	2012	Regulation (EU) No 530/2012 of the European Parliament and of the Council of 13 June 2012 on the accelerated phasing-in of double-hull or equivalent design requirements for single-hull oil tankers	(European Commission, 2012)
European Commission	2012	Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions - Blue growth opportunities for marine and maritime sustainable growth	(European Commission, 2012b)
European Commission	2013	Regulation (EU) No 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC	(European Commission, 2013)

European Commission	2013	Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee of the Regions - Strategic guidelines for the sustainable development of EU aquaculture	(European Commission, 2013b)
European Commission	2014	Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions - Innovation in the blue economy: realising the potential of our seas and oceans for jobs and growth	(European Commission, 2014)
Trilateral Wadden Sea Cooperation	2010	Wadden Sea Plan 2010	(Trilateral Wadden Sea Cooperation, 2010)
Netherlands and Germany	2014	Treaty between the Kingdom of the Netherlands and the Federal Republic of Germany on the cooperation in the area of the Eems and the Dollard	(The Government of the Kingdom of the Netherlands and Federal Republic of Germany, 2014)
Scheldt commission	2018	Scheldt Conventions	(Scheldt Commission, 2018)

Tab. 5
Global legislations with relevance for maritime spatial planning

Appendix 2 – Belgian Laws and Regulations for MSP

Legislation	Date	Source
"Polder law". Wet van 3 juni 1957 betreffende de polders	1957	(The Government of the Kingdom of Belgium, 1957)
"Improvement of the fairway near Walsoorden". Overeenkomst van 13 juli 1970 tussen de Regering van het Koninkrijk België en de Regering van het Koninkrijk der Nederlanden betreffende de verbetering van de vaarweg voor de Westerschelde nabij Walsoorden	1970	(The Government of the Kingdom of the Netherlands and The Government of the Kingdom of Belgium, 1970)
„Law on nature conservation". Wet van 12 juli 1973 op het natuurbehoud	1973	(The Government of the Kingdom of Belgium, 1973)
"Width of the territorial sea." Wet van 6 oktober 1987 tot bepaling van de breedte van de territoriale zee van België	1987	(The Government of the Kingdom of Belgium, 1987)
"Dunes decree". Decreet van 14 juli 1993 houdende maatregelen tot bescherming van kustduinen	1993	(The Government of the Kingdom of Belgium, 1993)
Expansion of the fairway in the Western Scheldt. Verdrag tussen het Vlaams Gewest en het Koninkrijk der Nederlanden inzake de verruiming van de vaarweg in de Westerschelde, ondertekend te Antwerpen op 17 januari 1995	1995	(The Flemish Region and Government of the Kingdom of the Netherlands, 1995)
Agreement between Norway and Belgium concerning the laying of the gas transportation pipeline "Norfra" on the Belgian continental shelf	1996	(The Government of the Kingdom of Norway and The Government of the Kingdom of Belgium, 1996)
„Ports Decree". Decreet van 2 maart 1999 houdende het beleid en het beheer van de zeehavens	1999	(The Government of the Kingdom of Belgium - Belgian Ministry of Flemish Community, 1999)
"MMM Law." Wet van 20 januari 1999 ter bescherming van het mariene milieu en ter organisatie van de mariene ruimtelijke planning in de zeegebieden onder de rechtsbevoegdheid van België	1999	(The Government of the Kingdom of Belgium, 1999)
"EEZ Law". Wet van 22 april 1999 betreffende de exclusieve zone van België in de Noordzee	1999	(The Government of the Kingdom of Belgium, 1999b)
"Protection of maritime heritage". Decreet van 29 maart 2002 tot bescherming van varend erfgoed	2002	(The Government of the Kingdom of Belgium, 2002)
"Integrated water policy decree." Decreet van 18 juli 2003 betreffende het integraal waterbeleid	2003	(The Government of the Kingdom of Belgium, 2003)
„Common nautical management in the Scheldt estuary". Verdrag tussen het Vlaams Gewest en het Koninkrijk der Nederlanden inzake het gemeenschappelijk nautisch beheer in het Scheldegebied, ondertekend in Middelburg op 21 december 2005	2005	(The Government of the Kingdom of the Netherlands and the Flemish Region, 2005)
Decreet van 16 juni 2006 betreffende de begeleiding van de scheepvaart op de maritieme toegangswegen en de	2006	(The Government of the Kingdom of Belgium, 2006)

organisatie van het Maritiem Reddings- en Coördinatiecentrum		
Wet van 5 februari 2007 betreffende de maritieme beveiliging	2007	(The Government of the Kingdom of Belgium, 2007)
„Agriculture and fisheries policy".Decreet van 28 juni 2013 betreffende het landbouw- en visserijbeleid	2013	(The Government of the Kingdom of Belgium, 2013)
"Protection of underwater heritage". Wet van 4 augustus 2014 betreffende bescherming van het cultureel erfgoed onder water	2014	(The Government of the Kingdom of Belgium, 2014b)

Tab. 6
Belgian laws and ordinances for MSP

Appendix 3 – Danish Laws and Regulations for MSP

Legislation	Date	Source
Harbour Act ("Lov om havne")	1999	(The Government of the Kingdom of Denmark, 1999)
Continental Shelf Act	2005	(The Government of the Kingdom of Denmark, 2005)
Marine Environment Protection Act ("Bekendtgørelse af lov om beskyttelse af havmiljøet")	2005	(The Government of the Kingdom of Denmark, 2005b)
Act amending the taxation of waste and raw materials Act ("Lov om ændring af lov om afgift af affald og råstoffer")	2008	(The Government of the Kingdom of Denmark, 2008)
Fisheries Act ("Bekendtgørelse af lov om fiskeri og fiskeopdræt (fiskeriloven)")	2008	(The Government of the Kingdom of Denmark, 2008b)
Electricity Supply Act ("Bekendtgørelse af lov om elforsyning")	2012	(The Government of the Kingdom of Denmark, 2012)
Raw Material Act (Bekendtgørelse af lov om råstoffer)	2013	(The Government of the Kingdom of Denmark, 2013)
Consolidated act on safety at sea ("lov om sikkerhed til søs")	2014	(The Government of the Kingdom of Denmark - Danish Maritime Authority, 2014)
Act on Danish subsoil exploitation ("Lov om ændring af lov om anvendelse af Danmarks undergrund")	2015	(The Government of the Kingdom of Denmark, 2015)

Tab. 7
Danish laws and ordinances for MSP

Appendix 4 – German Laws and Regulations for MSP

Legislation	Date	Source
Federal Mining Act (Bundesberggesetz)	1980	(Federal Republic of Germany - Federal Ministry of Justice and Consumer Protection, 1980)
Ordinance on Installations Seawards of the German Coastal Sea Boundary (Verordnung über Anlagen seewärts der Begrenzung des deutschen Küstenmeeres)	1997	(Federal Republic of Germany - Federal Ministry of Justice and Consumer Protection, 1997)
Environmental Impact Assessment Act (Gesetz über die Umweltverträglichkeitsprüfung)	2005	(Federal Republic of Germany - Federal Ministry of Justice and Consumer Protection, 2005b)
Energy Industry Act (Energiewirtschaftsgesetz)	2005	(Federal Republic of Germany - Federal Ministry of Justice and Consumer Protection, 2005c)
Law on the Tasks of the Federation in the Field of Maritime Navigation (Gesetz über die Aufgaben des Bundes auf dem Gebiet der Seeschifffahrt)	2016	(Federal Republic of Germany - Federal Ministry of Justice and Consumer Protection, 2016b)
Continental Shelf Ordinance (Festlandsockel-Bergverordnung)	2016	(Federal Republic of Germany - Federal Ministry of Justice and Consumer Protection, 2016)

Tab. 8
German laws and ordinances for MSP

Appendix 5 – Swedish Laws and Regulations for MSP

Legislation	Date	Source
Act concerning the Territorial Waters of Sweden	1966	(Government Offices of Sweden, 1966)
Continental Shelf Act	1966	(Government Offices of Sweden, 1966b)
Continental Shelf Ordinance	1966	(Government Offices of Sweden, 1966c)
Enlargement and Closure of Public Navigation Channels and Public Ports Act	1983	(Government Offices of Sweden, 1983)
Heritage Conservation Act	1988	(Government Offices of Sweden, 1988)
Exclusive Economic Zone Act	1992	(Government Offices of Sweden, 1992)
Swedish Minerals Act	1992	(Government Offices of Sweden, 1992)
Fisheries Act	1993	(Government Offices of Sweden, 1993)
Ordinance for fishing, aquaculture and the fishing industry	1994	(Government Offices of Sweden, 1994)
Environmental Code	1998	(Government Offices of Sweden, 1998)
Ordinance on Land and Water Management	1998	(Government Offices of Sweden, 1998b)
Water Quality Management Ordinance	2004	(Government Offices of Sweden, 2004)
Planning and Building Act	2010	(Government Offices of Sweden, 2010)
Marine Environment Ordinance	2010	(Government Offices of Sweden, 2010b)
Environmental Impact Analysis Ordinance	2013	(Government Offices of Sweden, 2013)
Ordinance on Geological Storage of Carbon Dioxide	2014	(Government Offices of Sweden, 2014)
Marine Spatial Planning Ordinance	2015	(Government Offices of Sweden, 2015)
Act concerning Territorial Waters and Maritime Zones of Sweden	2017	(Government Offices of Sweden, 2017)

Tab. 9
Swedish laws and ordinances for MSP

Appendix 6 – UK Laws and Regulations for MSP

Legislation	Date	Source
Harbours Act	1964	(Parliament of the United Kingdom, 1964)
Fishery Limits Act	1967	(Parliament of the United Kindgom, 1967)
Electricity Act	1989	(Parliament of the United Kingdom, 1989)
Merchant Shipping Act	1995	(Parliament of the United Kingdom, 1995)
Petroleum Act	1998	(Parliament of the United Kingdom, 1998)
Energy Act	2004	(Parliament of the United Kingdom, 2004)
Planning Act	2008	(Parliament of the United Kingdom, 2008)
Flood and Water Management Act	2010	(Parliament of the United Kingdom, 2010)
Marine Strategy Resolutions	2010	(Parliament of the United Kingdom, 2010c)

Tab. 10
UK laws and ordinances for MSP

Appendix 7 – Scottish Laws and Regulations for MSP

Legislation	Date	Source
A Fresh Start: The renewed Strategic Framework for Scottish Aquaculture	2009	(The Scottish Government - The Ministerial Group for Sustainable Aquaculture (MGSA), 2009)
National Renewables Infrastructure Plan – Stage 1	2010	(Scottish Enterprise, 2010)
National Renewables Infrastructure Plan – Stage 2	2010	(Scottish Enterprise, 2010b)
Carbon Capture and Storage - A Roadmap for Scotland	2010	(The Scottish Government, 2010)
UK Marine Policy Statement	2011	(Parliament of the United Kingdom, 2011)
Scotland's Marine Atlas: Information for the National Marine Plan.	2011	(The Scottish Government, 2011)
A Sectoral Marine Plan for Offshore Wind Energy in Scottish Territorial Waters	2011	(The Scottish Government, 2011b)
Submarine Cables and Offshore Renewable Energy Installations Proximity Study	2012	(The Crown Estate, 2012)
Offshore Wind Energy in Scottish Waters – Regional Locational Guidances	2012	(The Scottish Government, 2012)
Tidal Energy in Scottish Waters – Regional Locational Guidances	2012	(The Scottish Government, 2012b)
Wave Energy in Scottish Waters – Regional Locational Guidances	2012	(The Scottish Government, 2012c)
Oil and Gas UK Economic Repo	2013	(Oil & Gas UK, 2013)
Scotland's Offshore Wind Route Map - Developing Scotland's Offshore Wind Industry to 2020 and Beyond	2013	(The Scottish Government, 2013)
An Assessment of the Benefits to Scotland of Aquaculture	2014	(The Scottish Government, 2014)
Scotland's Third National Planning Framework	2014	(The Scottish Government, 2014b)
UKCS Maximising Recovery Review: Final Report	2014	(Wood, 2014)
United Kingdom multiannual national plan for the development of sustainable aquaculture	2015	(Parliament of the United Kingdom - Department for Environment, Food & Rural Affairs, 2015)
Offshore wind, wave and tidal energy applications: consenting and licensing manual	2018	(The Scottish Government, 2018)
Scottish Regional Inshore Fisheries Groups (RIFGs)	2019	(Inshore Fisheries Groups, 2019)
Code of Good Practice for Finfish Aquaculture	2019	(Scottish Salmon Producers' Organisation , 2019)
National Marine Plan interactive (NMPi)	2019	(The Scottish Government, 2019)

Tab. 11
Scottish laws and ordinances for MSP

Appendix 8 – Compliance with Shipping Areas

As described in the introduction to work package 1, the following section reviews the compliance of maritime actors' behaviour with the areas designated for navigation. The Automatic Identification System (AIS) introduced by the IMO to increase safety in shipping provides the data basis for the subsequent analyses. The data transmitted by AIS transmitters for the exchange of nautically relevant information between different ships and shore stations can be classified into three categories:

- Static data
- Dynamic data
- Voyage-related data

According to the recommendations published by the International Telecommunication Union (International Telecommunication Union, 2014) the AIS data exchange consists of 27 different messages. The most relevant for navigation are the position reports (messages 1, 2 and 3) and the static and voyage related ship data (message 5). Depending on the ship's speed and navigation status, these messages are transmitted regularly by ship stations.

For further analysis, the Fraunhofer internal AIS dataset for the period 01.02.2016 - 30.04.2018 of the North Sea and Baltic Sea will be used. In addition, the following parameters are considered according to (International Telecommunication Union, 2014):

- MMSI — Maritime Mobile Service Identity
- ShipType — Identification number of the type of ship specified in accordance with Recommendation ITU-R M.1371-5 (International Telecommunication Union, 2014)
- Length — Overall length of the vessel in metres
- Breadth — Breadth ("beam") of the vessel in metres
- Draught — Maximum current draught in meters
- Latitude — Latitude in 1/10 000 min (90°, north = positive (according to complement), South = negative (according to complement)
- Longitude — Longitude in 1/10 000 min (180°, east = positive (according to complement), West = negative (according to complement)
- SOG — Speed Over Ground in 1/10 knots
- COG: — Course Over Ground in 1/10 = (0-3 599) °
- TH — True Heading from 0 to 359°

The magnetic north pole corresponds to the value 0°.

For the analysis of related ship movements the historical position data of the AIS trip are used. The assumption is made that a trip consists of at least one segment. The dynamic (position) data of the AIS, whose time interval is less than 15 minutes, are combined to a segment. If the interval between two AIS messages is greater than 15 minutes, a new segment has been created. The generated segments consist of start and end position as well as start and end time. The generated segments are combined into trips in a next step: If the start or end position of a ship was in port, a trip was completed. With the help of polygons, which represent the ports of the North Sea and the Baltic Sea, intersection points of position information with the ports can be determined.

The leaving of the traffic separation area "TERSCHELLING GERMAN BIGHT EAST" for ships entering the port of Hamburg is considered as an example. For this purpose, the defined traffic separation area is defined as a polygon and it is discussed whether there were intersections of the polygon or not.

After evaluation of the data, the proportion of ship movements taking place within the shipping priority area is 97.96% and the corresponding proportion of non-compliant movements is 2.04%.