



Review

New perspectives on sea use management: Initial findings from European experience with marine spatial planning[☆]Fanny Douvere^{a,b,*}, Charles N. Ehler^a^a Intergovernmental Oceanographic Commission, UNESCO, Paris, France^b The Man and the Biosphere Programme, UNESCO, Paris, France

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ABSTRACT

Increased development pressures on the marine environment and the potential for multiple use conflicts, arising as a result of the current expansion of offshore wind energy, fishing and aquaculture, dredging, mineral extraction, shipping, and the need to meet international and national commitments to biodiversity conservation, have led to increased interest in sea use planning with particular emphasis on marine spatial planning. Several European countries, on their own initiative or driven by the European Union's Marine Strategy and Maritime Policy, the Bergen Declaration of the North Sea Conference, and the EU Recommendation on Integrated Coastal Zone Management, have taken global leadership in implementing marine spatial planning. Belgium, The Netherlands, and Germany in the North Sea, and the United Kingdom in the Irish Sea, have already completed preliminary sea use plans and zoning proposals for marine areas within their national jurisdictions. This paper discusses the nature and context of marine spatial planning, the international legal and policy framework, and the increasing need for marine spatial planning in Europe. In addition, the authors review briefly three marine spatial planning initiatives in the North Sea and conclude with some initial lessons learned from these experiences.

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1. The nature and context of ecosystem-based, sea-use management

The results of the 2005 Millennium Ecosystem Assessment (MEA), as well as other global and regional assessments of the marine environment, confirm that biodiversity in the world's oceans and coastal areas continues to decline as a consequence of uncoordinated and unsustainable human activities. Recently a group of leading scientists concluded in *Science* that 'the loss of marine biodiversity is increasingly impairing the oceans' ability to produce seafood, resist diseases, filter pollutants, maintain water quality and recover from perturbations such as over-fishing and climate change.' (Worm et al., 2006)

The MEA recognizes that people are at the centre of this situation. Ongoing population growth, technological change, and shifting consumer demands all have considerably increased the need for

more food, more energy and more trade. An increasingly larger share of goods and services comes from coastal and marine resources.

With ocean resources being limited both in space and amount, these developments have proven to be devastating for many marine places. Essentially, increased pressure on the marine environment has led to two important types of conflict. First, not all uses are compatible with one another and are competing for ocean space or have adverse effects on each other (user vs user conflicts). But a larger concern is the cumulative impact of all these activities on the marine environment, i.e., the conflicts between users and the environment (user–environment conflicts).

Traditional concerns about nature included direct impacts such as water quality and habitat loss. More recently, environmental concerns have shifted to the marine life support system or 'ecosystem' that nurtures and sustains important resources that are valued for various reasons. As a result, the traditional *sectoral approach* to natural resource and environmental management has shifted toward a more holistic *ecosystem approach* that calls for a comprehensive look at all dimensions of environmental problems (Laffoley et al., 2004). In their jointly adopted vision, two regional commissions for the protection of the marine environment, OSPAR¹

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¹ OSPAR is the Commission for the Protection of the Marine Environment of the Northeast Atlantic. More information on: <http://www.ospar.org>

and HELCOM², define an ecosystem approach to sea use management as (OSPAR-HELCOM Joint Ministerial Meeting, 2003; ICES, 2003):

The comprehensive integrated management of human activities based on the best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of marine ecosystems, thereby achieving sustainable use of goods and services and maintenance of ecosystem integrity.

Today, the ecosystem approach has become widely accepted as a key framework for delivering sustainable development in both the terrestrial and the coastal and marine environment. It provides an important framework for assessing biodiversity and ecosystem services and evaluating and implementing potential responses. Application of the ecosystem approach involves a focus on the functional relationships and processes within ecosystems, attention to the distribution of benefits that flow from ecosystem services, the use of adaptive management practices, the need to carry out management actions at multiple scales, and inter-sectoral cooperation. A number of other established approaches, such as integrated water resources management and integrated ocean and coastal area management, are consistent with the ecosystem approach and support its application in various sectors or biomes. The application of ecosystem approaches in the marine and coastal areas builds on the concept of integrated management, already widely used for the management of these areas (Ehler and Chua, 2006).

An in-depth review of the application of the ecosystem approach, carried out by the Convention on Biological Diversity (CBD), revealed however, that various barriers prevent actual implementation of ecosystem-based management. Despite its broad acceptance and wide range of principles, definitions and guidelines, the ecosystem approach is still more a concept, widely discussed at scientific fora, but with few examples of actual practice. It is increasingly clear that governments and stakeholders lack the necessary tools to make an ecosystem approach operational in the marine environment, especially with regard to cross-sectoral integration. In particular, the concept lacks *concrete* guidance that allows balancing conservation and sustainable use of natural resources. The CBD review recognizes that the implementation of an ecosystem approach to coastal and ocean management is a complex and demanding process, and that – among other needs – practical tools need to be developed that can make this process more tangible (CBD, 2007). Other research conducted to evaluate current practice and application of ecosystem-based management, resulted in similar conclusions and confirm the need for more operational tools that can move implementation forward (Arkema et al., 2006). One way to do this is through the use and application of marine spatial planning.

2. Marine spatial planning: an essential step toward ecosystem-based, sea use management

A key characteristic of ecosystem-based management is that it is place-based or area-based (McLeod et al., 2005), which is a marked departure from existing approaches that usually focus on a single species, sector, activity or concern (Crowder, et al., 2006). Where sectoral management implies that each sector regulates particular activities or projects taking place at a particular location (or site) within a certain area, ecosystem-based management implies that, after an area has been defined, sustainable development and use

will be established for all activities in the whole area (CoastNet, 2003).

The place-based character of ecosystems, the spatial and temporal development of ocean resource uses, and conflicts among them, together with the need to develop human uses in places that minimize their impacts on ecologically or economically important places in the marine ecosystem, all draw attention to the need to look at the system from a spatial (and temporal) perspective. It is obvious that apart from measures that can control the performance of human activities (for example, a limit on pollution discharges), effective implementation of ecosystem-based management will also require measures that control the spatial and temporal development of human activities in the marine environment. Analogous to land use planning in the terrestrial environment, marine spatial planning can provide the analytical basis for identifying and evaluating these measures in coastal and marine environments.

Spatial planning is an important tool for managing the development and use of land in many parts of the world. In North America and Europe it is commonly used as a component of land use management. The traditional and incremental, *permit-by-permit approach* has been enhanced by a *comprehensive planning approach* that lays out a vision to be developed for an area.

With only a few exceptions, there is no clearly articulated spatial vision for the use of marine areas, no plan-based approach to management, and consequently, a lack of certainty for marine developers and users. This is exacerbated by the sector-by-sector responsibilities for approving permit applications in the marine environment.

The application of spatial planning in the marine environment would provide a range of benefits, including (UK-MSP Working Group, 2005):

- Applying an ecosystem approach* to the regulation and management of development and human activities in the marine environment by safeguarding ecological processes and overall resilience to ensure the environment has the capacity to support social and economic benefits (including those benefits derived directly from ecosystems);
- Providing a strategic, integrated and forward-looking framework* for all uses of the sea to help achieve sustainable development, taking account of environmental as well as social and economic objectives;
- Identifying, conserving, or where necessary and appropriate, restoring important components of coastal and marine ecosystems; and
- Allocating space* in a rational manner that avoids or minimizes conflicts of interest and, where possible, maximizes synergy across sectors.

In its broadest sense, marine spatial planning can be defined as (Ehler and Douvère, 2007):

Analyzing and allocating parts of three-dimensional marine spaces to specific uses or non-use, to achieve ecological, economic, and social objectives that are usually specified through a political process.

Marine spatial planning is a sub-activity of the overall planning activity of sea use management. Despite the different contexts, the process for developing marine spatial planning is similar to land use planning in the terrestrial environment. The principal output of marine spatial planning is a comprehensive marine spatial plan or alternatively “comprehensive development plan” or “comprehensive master plan”. It is a “vision” of the future of the marine region or ecosystem and reflects the output of a process in which stakeholders collectively define their purpose, core values, and

² HELCOM is the Baltic Marine Environment Protection Commission. More information on: <http://www.helcom.fi>

perspective for the future. The vision declares common goals, guides regional decision-making, unites stakeholders with a common purpose, and motivates citizens and decision-makers to meet the goals of the vision. The comprehensive marine spatial plan is usually long-term, general in nature and policy oriented and is implemented through more detailed zoning maps, zoning regulations and a permit system. Individual permit or licensing decisions can then be made based on the zoning maps, that in turn reflect the vision of the comprehensive marine spatial plan (Fig. 1).

It is important to recognize however, that marine spatial planning can only influence the spatial and temporal distribution of human activities. Other measures that can influence the inputs to human activities (e.g., limitations on fishing activity and capacity), the processes of human activities (e.g., requirement for “best environmental practice”), or the outputs of human activities (e.g., tonnage limitations on mineral extraction), need to be taken in conjunction with the spatial planning measures.

While initially the idea of marine spatial planning was stimulated by international and national interests in developing marine protected areas, e.g., the Great Barrier Reef Marine Park or the Florida Keys National Marine Sanctuary, more recent attention has been placed on managing the multiple use of marine space, particularly in areas where use conflicts are already clear, for example in the North Sea. Today, various countries have begun to recognize that the time has come for a strategic and integrated plan-based approach for the management of entire marine spaces, instead of the piecemeal view, so that commitments made in a number of important international and national marine policy declarations, including commitments regarding biodiversity and habitat protection, can be fulfilled (Douvère, 2008).

3. International legal and policy framework relevant for the development of marine spatial planning

During the past decades, international environmental law and policy, especially with regard to the marine environment, has expanded significantly. Some of these international and regional legal and policy documents provide a substantive framework regarding the allocation of marine space. Among the most important are the United Nations Convention on the Law of the Sea (UNCLOS), the CBD, Agenda 21, and the World Summit on

Sustainable Development Plan of Implementation. The following sections give a brief overview of these legal and policy documents. The allocation of marine space has further been specified in international agreements for particular sectors, such as some Conventions and Protocols adopted in the International Maritime Organization, the FAO Code of Conduct for Responsible Fisheries, and the World Heritage Convention among others.

3.1. United Nations Convention on the Law of the Sea (UNCLOS)

At a global scale, UNCLOS provides an overarching framework for the allocation of marine space to national states, the rights and obligations regarding these spaces, and a system for international cooperation regarding the management and conservation of the marine environment. UNCLOS introduced the concept of the exclusive economic zones and defined the limits of the territorial seas, the contiguous zones, the continental shelves, and the high seas. The Convention sets out the international framework for the management of these marine spaces, including a legal basis for the regulation of their sustainable use and protection. Aspects that have an impact on the development of marine spatial planning include rights to transit passage, the freedom of navigation, fishing and the laying of submarine cables and pipelines (UNCLOS, 1982).

3.2. Agenda 21, Chapter 17

Chapter 17 of Agenda 21, sets out a framework program of action for achieving protection and sustainable development of the marine environment and its resources. The programme areas include (Agenda 21, 1992):

- Integrated management and sustainable development of coastal areas, including exclusive economic zones;
- Marine environmental protection;
- Sustainable use and conservation of marine living resources of the high seas;
- Sustainable use and conservation of marine living resources under national jurisdiction;
- Addressing critical uncertainties for the management of the marine environment and climate change;
- Strengthening international and regional cooperation and coordination; and
- Sustainable development of small islands.

To achieve the objectives set out for the program areas, in particular the protection of the marine environment and the establishment of an integrated approach to management, Agenda 21 calls for the preparation and implementation of land and water use policies and mechanisms that allow the identification of critical areas, including user conflicts, development patterns or areas for specific management priorities (Agenda 21, 1992).

3.3. The Convention on Biological Diversity (CBD)

The CBD program of work, as well as the principles of the Jakarta Mandate, covers a number of aspects relevant to marine spatial planning, including the central role that is given to marine and coastal protected areas. Decision VII/5 of the CBD describes the various elements of an ecosystem-based marine and coastal management framework. Central to the management framework is an integrated network of marine and coastal protected areas, consisting of (CBD, 2004):

- Marine and coastal protected *areas*, where threats are managed for the purpose of biodiversity conservation and/or sustainable use and where extractive uses may be allowed. These areas are

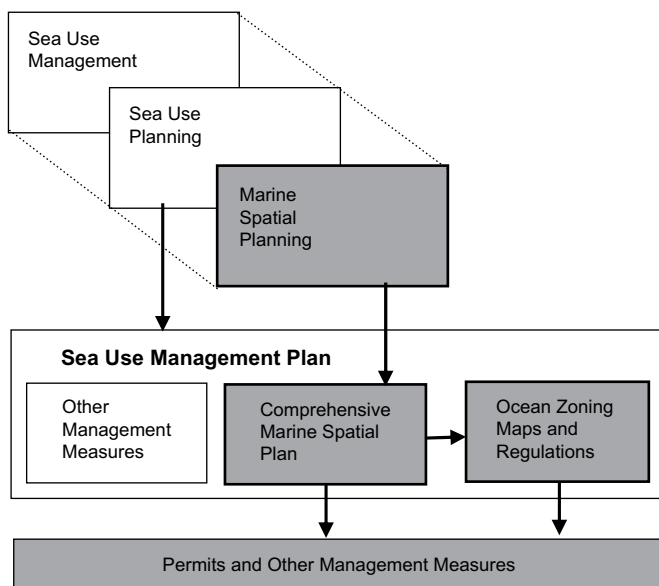


Fig. 1. Comprehensive marine spatial plans and zoning maps as principal outputs of marine spatial planning.

subject to site-specific controls (for example, controls on fishing methods, controls on the removal of certain species, rotational closures, and controls on pollution and sedimentation) that either have an explicit biodiversity objective, a social or economic objective, or a recognized biodiversity effect; and

- Representative marine and coastal protected areas where extractive uses are excluded, and other significant human pressures are removed or minimized, to enable the integrity, structure and functioning of ecosystems to be maintained or recovered. The key purpose of these areas would be to provide for intrinsic values, to allow better understanding of the marine and coastal environment by acting as scientific reference areas, to contribute toward marine environmental recovery, and to act as insurance against failures in management.

Such a marine and coastal protected area network should be located within a framework of spatial management practices over the wider marine and coastal environment that include general restrictions applied to the entire area and site-specific restrictions imposed for non-biodiversity purposes (for example, trawling restrictions to protect cables, restricted areas for defence purposes, etc.) (CBD, 2004b).

3.4. World Summit on Sustainable Development (WSSD)

The commitments made in 2002 at the World Summit on Sustainable Development (WSSD) in Johannesburg have contributed to the development of marine spatial planning at the global, regional and national level. In particular, the WSSD Plan of Implementation called for the development of – among others – land use planning tools for coastal and watershed planning as a means to promote the conservation and management of oceans areas. The Johannesburg Summit further included a number of commitments that are relevant to marine spatial planning. Among the most important are the need to improve efficient use of water resources, the promotion of resource allocation among competing uses in a way that balances basic human needs with the preserving or restoring of ecosystems, and the establishment of representative networks of marine protected areas by 2012 (WSSD, 2002).

Although none of the international legal and policy instruments described above advocate explicitly the need and use of marine spatial planning, they provide a basis for the development of spatial planning in the marine environment as a means to advance the implementation of ecosystem-based management. In addition, in the context of other international legal and policy documents designed for the regulation of individual sectors (e.g., fisheries and maritime transport), ocean spaces are delineated for particular purposes, most often conservation. Examples include 'Special Areas' (SAs) and 'Particular Sensitive Sea Areas' (PSSAs) under some Conventions and Protocols adopted by the International Maritime Organization (IMO) or World Heritage sites designated in the framework of the World Heritage Convention. Because of the spatial component of these measures taken in the framework of these conventions, they are relevant for the development of marine spatial planning. In contrast to the international context, requirements for the development of marine spatial planning in Europe are becoming much more explicit, especially in recent policy documents. This, in turn, is a reflection of an increasing need for a more integrated and strategic sea use management in European coastal and marine areas.

4. The increasing need for sea use planning in Europe

For centuries, the oceans have been of major strategic importance to the economic and social development of Europe.

The land mass of the European Union (EU) has a coastline of 68,000 km, equivalent to seven times that of the USA and four times that of Russia. Almost half of Europe's population lives within 50 km of the coast. As a result of this close association between European citizens and their seas, European coastal seas are heavily affected by increasing conflicts among competing users (European Science Foundation-Marine Board, 2006). In a recent communication, for example, the EU Commissioner for Fisheries and Maritime Affairs emphasized the strategic importance of aquaculture for global food security, but stressed at the same time that the competition for space in European waters is a critical challenge for the sector when expanding during the coming years (Borg, 2007).

Europe's vision for the future strives to balance the need to stimulate economic growth, employment and welfare with the need to maintain and improve the status of the marine environment and its resources (European Commission, 2006a). As early as in 1999, the European Spatial Development Perspective recognized that all sectoral policies have a territorial (or spatial) impact and that a spatial plan is the most appropriate means of resolving conflicts between sectoral interests and policies (Defra, 2005). During recent years, the need for marine spatial planning has become increasingly more important, as reflected in various legal and policy documents in Europe.

The following sections describe the most important documents with regard to marine spatial planning.

4.1. The legal and policy context in Europe

4.1.1. Green Paper on the Future Maritime Policy for the European Oceans and Seas

The EU Green Paper 'Towards a Future Maritime Policy for the Union: A European Vision for the Oceans and Seas' (Maritime Policy), launched in June 2007 aims to provide the basis for a future maritime policy for Europe that allows the development of well-balanced and coherent sea-based policies and activities that reassure mutual reinforcement of economic growth and social welfare on the one hand and good status of the marine environment and its resources on the other hand. Marine spatial planning is seen as a key aspect to managing a growing and increasingly competing maritime economy, while at the same time safeguarding biodiversity. The Maritime Policy considers the management of marine space a keystone of any maritime policy and essential for efficient sectoral policies and rational use of maritime structures. It further emphasizes that without the development of an ecosystem-based marine spatial planning system, it will soon become impossible to manage the increasing, and often conflicting, uses of the oceans. It describes marine spatial planning as a means to (European Commission, 2006):

- Coordinate the spatial implementation of off-shore renewable energy with other activities;
- Provide financial security for investment decisions;
- Advocate marine spatial planning as a tool to enable the management of increasing, and often conflicting, uses of the oceans;
- Manage the competition among various uses (including their multiple objectives) in the marine environment;
- Develop a stable regulatory environment that ensures better and simpler regulation toward the location of economic activity;
- Ensure that individual decision on activities, taken at a national or regional level, but affecting the same ecosystem or cross-border activities (for example, pipelines and shipping routes) are dealt with in a coherent manner;

- Ensure consistency between land and marine systems; and
- Ensure that the future development of offshore activities is consistent with the need to evolve multilateral rules.

The Maritime Policy concludes that a spatial planning system should be conducted through an ecosystem-based approach and established for offshore activities in all waters under jurisdiction of its Member States. The latest communication from the European Commission confirms that integrated marine spatial planning is a fundamental requirement for sustainable development and for achieving an integrated approach to marine management. Building further on existing EU initiatives with a strong marine spatial dimension, the EU Commission plans the development of a 'road map' and a system for the exchange of best practice to facilitate and encourage the further development of marine spatial planning in its Member States (European Commission, 2007).

4.1.2. The EU Thematic Strategy for the Marine Environment

In 2005, the EU Marine Thematic Strategy (Marine Strategy), which will be the environmental pillar of the Maritime Policy, introduced the principle of ecosystem-based marine spatial planning and provided a supportive framework for national initiatives toward spatial planning designed for achieving a good status of the marine environment.

In the context of the Marine Strategy, Europe introduced the concept of 'marine regions' as large, ecologically meaningful, management units for the implementation of the strategy and cooperation between Member States in achieving the objectives of the Marine Strategy (Commission of the European Communities, 2005). Preparation for the identification of European marine regions was provided through an ICES³ study in which 11 marine regions, referred to as 'eco-regions', were defined based on biogeographic features, oceanographic features, and existing political, social and management divisions (ICES, 2004; Commission of the European Communities, 2006) (Fig. 2). This division into eco-regions can be seen as a basic geographical requirement for implementing the ecosystem approach in European waters and builds further on the condition that ecosystem-based management is inherently place-based or area-based.

4.1.3. The EU Recommendations on Integrated Coastal Zone Management (ICZM)

Although the EU recommendations on Integrated Coastal Zone Management (ICZM), adopted in 2002, do not refer to marine spatial planning as such, they do provide a basis for doing so, in particular as part of the requirement of Member States to develop national ICZM strategies. This view was confirmed at the 'First European High Level Forum' on ICZM where the potential to use spatial planning, integrated with sea-use planning and marine resources management, at the national, regional and local level was emphasized as a way to apply a holistic and dynamic perspective in ICZM (First European ICZM High Level Forum, 2002). A recent evaluation of ICZM in Europe now recognizes marine spatial planning as one of the priority themes for the further implementation of ICZM in European coastal zones (Commission of the European Communities, 2007).

4.1.4. The European Wildlife Directives

Among the most important drivers for marine spatial planning in Europe is the European legislation on nature conservation as part of the EU contribution to implement the 1992 Convention on Biological Diversity. The two most significant are the Birds Directive (Council of the European Communities Directive, 79/

409/EEC), providing a framework for the identification and classification of 'Special Protection Areas (SPAs)' for rare, vulnerable or regularly occurring migratory species, and the Habitats Directive (Council of the European Communities Directive, 92/43/EEC) requiring Member States to select, designate and protect sites that support certain natural habitats or species of plants or animals as 'Special Areas of Conservation (SACs)'. Together the SACs and the SPAs will create a network of protected areas across the EU, known as Natura 2000. Natura 2000 forms the cornerstone of Europe's nature conservation policy (European Commission, 2005).

4.1.5. The EU Common Fisheries Policy, the EU Water Framework Directive and the INSPIRE Directive

In addition to those described above, other EU policy and legal documents that are relevant to the development of marine spatial planning initiatives, include the EU Common Fisheries Policy (Council of the European Communities Regulation, 2371/2002) and the EU Water Framework Directive (Directive 2000/60/EC). In the context of the EU Common Fisheries Policy and with the attempt to respond to the challenges of closed or semi-closed fishing areas, the Regional Advisory Council for the North Sea recently established a Working Group on Marine Spatial Planning (Dengbol and Wilson, 2008). The aim of the EU Water Framework Directive is to establish a framework for the protection of inland surface waters, transitional waters (estuaries and brackish waters), coastal waters and groundwater. The principal objective is that these water bodies should achieve good status by 2015, which includes the establishment of a register of protected areas and the development of a management plan (that could include land use or spatial management measures to reduce, for example, diffuse sources of water pollution) for each river basin. Finally, the EU adopted a new Directive (INSPIRE) that aims to make available harmonised sources of geographical information and link all spatial data to a shared infrastructure (Directive 2007/2/EC).

4.1.6. The Fifth Ministerial North Sea Conference

The need for marine spatial planning in European waters is also reflected at the regional level. In 2002, the Ministerial Declaration of the 5th North Sea Conference (Bergen) (Bergen Declaration, 2002) invited the OSPAR Commission to investigate the possibilities of further international cooperation in developing marine spatial planning as a tool for an effective sea use management. The OSPAR Working Group on Marine Spatial Planning is currently designing a set of guidelines to implement marine spatial planning in the Northeast Atlantic Region (OSPAR, 2005).

4.2. Marine spatial planning practices in the North Sea: the way forward

Most marine spatial planning initiatives in Europe are driven by international and European legislation that is, in turn, a reflection of the discussion and controversy regarding new uses of the sea and the seabed and the increasing need to meet commitments on biodiversity conservation. Especially these new uses (i.e. wind farms, marine protected areas, aquaculture) have triggered a pragmatic approach to the development of marine spatial planning.

Several European countries have taken global leadership in developing, and to some extent implementing, marine spatial planning in a broader context. In contrast to other international spatial planning initiatives, the European examples are directing more attention to identifying and resolving conflicts among different sea uses and users (Douvère et al., 2007), and attempt to include all waters under their jurisdiction. These plans also attempt to ensure that conservation objectives are not impaired by human activity.

³ International Council for the Exploration of the Sea. See: <http://www.ices.dk>

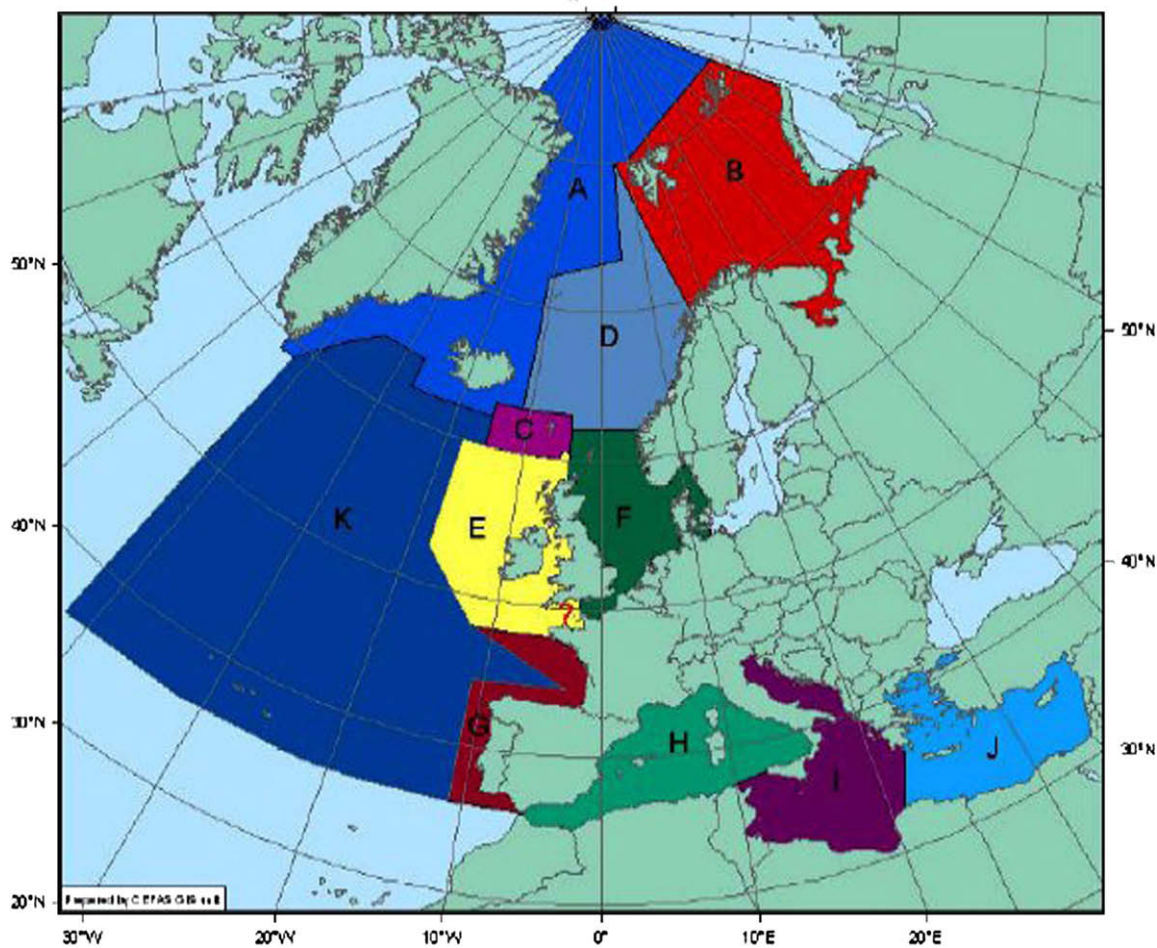


Fig. 2. The identification of marine eco-regions in Europe. Source: EU Marine Strategy, The Story Behind the Strategy, 2006.

The Netherlands has developed an 'Integrated Management Plan for the North Sea 2015', that includes a 'Spatial Planning Policy Framework' directed toward economically efficient use of their marine space (IMPNS2015, 2005). The coastal *Länder* in Germany recently extended their spatial planning competencies to the territorial sea, while the Federal Spatial Planning Act has been amended to allow the development of spatial plans for the entire German exclusive economic zone (Gee et al., 2004). Belgium developed a 'Master Plan' for its part of the North Sea and is among the first countries that has begun to implement its marine spatial plan.

While the United Kingdom has not yet made marine spatial planning operational, it is considering a Marine Bill with the purpose of introducing a new framework for the management of its seas, based on marine spatial planning, that balances conservation, energy and resource needs (Defra, 2007). The bill has been drafted by the Department for Environment, Food, and Rural Affairs (DEFRA) and was an explicit issue of the Labour Party Manifesto (Labour Party Manifesto, 2005).⁴ Legislation is expected to be introduced to Parliament in 2008. In a preparatory phase, the UK government commissioned a study to research options for developing, implementing, and managing marine spatial planning in all UK offshore waters (MSPP Consortium, 2006). The study had two key objectives: (1) to obtain a better understanding and

appreciation of available evidence and experiences to date in the field of marine spatial planning and its relevance and applicability to UK marine and coastal waters; and (2) to undertake a pilot project to determine the feasibility and practicality of developing and applying a marine spatial plan. The Irish Sea pilot project envisaged the setting of goals and objectives, scoping and data collection, forecasting, and the generation of spatial use alternatives. The alternatives were then used in the development of a prototype marine spatial plan. Monitoring and evaluation of the implementation process was proposed to understand the successes and failures of the plan and to provide a basis for future revisions. The pilot project was completed at the end of 2005. Some of its principal findings included (MSPP Consortium, 2006):

- Marine spatial planning should be implemented as a legally-binding process with the purpose of achieving sustainable development of the marine environment;
- Marine spatial planning should be developed at the regional scale;
- The plan-making body should be the guardian of the spatial planning and management process;
- Public participation should be integrated into the spatial planning process;
- Marine spatial planning should plan for the long term, i.e., 20 years or more; and
- Marine spatial planning should be used to identify preferred locations for future development for specific sectors with flexibility to incorporate changes in technology and economics.

⁴ In the 2005 Labour Party Manifesto marine spatial planning is specifically referred to as the basis for a new framework for the seas that balances conservation, energy and resource needs.

Marine spatial planning, as it is currently proposed in the UK Marine Bill is largely based on the outcomes and findings of the Irish Sea Pilot Project.

The following sections examine in more depth the marine spatial planning initiatives taken in Belgium, Germany, and The Netherlands. Each of these countries either is preparing or has completed and started to implement marine spatial plans for the waters under their jurisdiction. For each of the plans, the key objectives, elements of the plan, development process of the plan, and level of implementation of the plan are discussed. In addition, some of the scientific research that has been done to support the development of spatial plans in these countries is described briefly. Although most of these plans are very recent or still in process, some early conclusions and initial lessons can be drawn from them. These initial lessons are summarized in the final section of this paper.

4.2.1. Marine spatial planning in Belgium

Belgium is among the first countries to actually start implementing an operational, multiple-use planning system covering its territorial sea and exclusive economic zone (Plasman and Van Hessche, 2004). Marine spatial planning in Belgium developed on an ad hoc basis, mainly driven by European environmental protection commitments and an increasing amount of new opportunities for the exploitation of the marine environment.

New activities, the expansion of existing activities, an increasing need for nature conservation, and the goal to integrate the management of marine and coastal ecosystems led to increased conflicts that could not be dealt with by a permit system or an environmental impact assessment only. The need for a more comprehensive approach toward spatial planning for the Belgian Part of the North Sea (BPNS) became particularly urgent in light of new national objectives and associated targets such as the need for offshore energy production (i.e., wind farms) and the development of the European network of protected areas (Natura 2000) (Douvere et al., 2007).

The response to this challenge resulted in the development of a spatial plan, referred to as the 'Master Plan', for the entire BPNS. Despite the lack of a formal legal basis for marine spatial planning in Belgium, the 'Master Plan' provides a translation of current and future objectives of various sectors into a spatial vision. The objectives of the spatial plan included the development of an offshore wind farm, the delimitation of marine protected areas, a policy plan for sustainable sand and gravel extraction, enhanced financial resources for the prevention of oil pollution, the mapping of marine habitats, protection of ship wrecks valuable for biodiversity, and the management of land-based activities that have an impact on the marine environment (Bossu and Plasman, 2004).

The 'Master Plan' has been implemented incrementally since 2004. The first two phases of the 'Master Plan' are now operational and focus on spatial delimitations for sand and gravel extraction and a zone for future offshore wind energy projects (Phase 1), followed by the delimitation of marine protected areas as part of the EU Natura 2000 Network (see above) (Phase 2). New actions on spatial planning are being studied and focus on the protection of marine shipwrecks for archaeological, biodiversity and ecological interests, the development of a marine component for existing terrestrial protected areas, and the allocation of a research zone for alternative fishing methods (Douvere et al., 2007).

At the scientific level, the discussions and controversy regarding new uses and requirements of the sea and seabed led to the GAUFRE (Maes et al., 2005) study that made it possible to anticipate new developments in a balanced and sustainable way. The study started with an extensive analysis of the spatial impacts of each existing use and two expected uses (the establishment of marine protected areas and wind energy farms) in the BPNS, followed by

a 'impact analysis' that laid out various types of conflicts among uses and between the uses and the environment. The most innovative part of the study envisaged the creation of scenarios for future use of space expressing an integrated vision for marine spatial planning for the BPNS, based on a set of core values. Six scenarios were developed, depending on the relative importance of the key values. The alternative scenarios are referred to as 'a relaxed sea', 'a natural sea', 'a rich sea', 'a playful sea', 'a mobile sea', and 'a sailing sea'. The process of creating alternative scenarios for the future use of marine space was seen as a means rather than an end in itself. Different values were considered and weighted to elaborate a complete spatial structural plan for the BPNS. However, the selection of a desirable structural plan was considered as a political, not a technical nor scientific, decision.

More recently, a scientific study on the biological valuation of the BPNS has been completed. The study resulted in a set of maps showing the intrinsic biological value of different sub-areas within the BPNS. The maps were developed using available spatial data for macrobenthos and seabirds and to a lesser extent data on the spatial distribution of demersal fish and epibenthos. These marine biological valuation maps are considered as a unique but indispensable tool to obtain objective and scientifically sound spatial plans that could provide a basis for the implementation of sustainable management actions in the future (Derous et al., 2007).

4.2.2. Marine spatial planning in The Netherlands

Discussions about new and often competing demands for ocean space in the Dutch part of the North Sea (DPNS) have been subject to political debate in The Netherlands for a long time. Some of them go back to 1980s and refer to the creation of an offshore airport, industrial facilities, waste disposal, and land reclamation. As in other North Sea coastal states, the need for comprehensive spatial planning became particularly urgent because of new uses that require ocean space, including wind farms and marine protected areas.

In 2005, the Dutch Ministry of Housing, Spatial Planning and the Environment published for the first time a North Sea chapter in their national 'Spatial Planning Policy Document'. The Dutch marine spatial planning policy aims at preventing fragmentation and promoting the efficient use of space, while giving private parties the scope to develop their own initiatives in the North Sea. This overall objective is elaborated in more detail in the 'Integrated Management Plan for the North Sea 2015' (IMPNS 2015) where it is translated into: (1) spatial management to foster a healthy sea; (2) spatial management to foster a safe sea; and (3) spatial management to foster a profitable sea (IMPNS2015, 2005).

The Dutch government has opted for a marine spatial planning approach that defines 'use zones' only where necessary (e.g., shipping routes, military exercise, ecologically valuable areas). This approach allows a considerable amount of freedom to the private sector by giving them the latitude to develop initiatives within certain constraints. Spatial planning is considered as a means of fostering sustainable use while simultaneously allowing as much scope as possible for private sector initiatives (IMPNS2015, 2005).

Marine spatial planning in the Netherlands is to large extent already implemented (Fig. 3). Key elements of the spatial plans include (IMPNS2015, 2005):

- *Opportunity maps* that show where human activity is permitted to develop within the current legislative and regulatory framework and where users believe it is most likely to develop;
- *A spatial monitoring and permit tracking system* that facilitates the development of an up-to-date picture of current and anticipated uses of space and the validation and applications of the various permits;

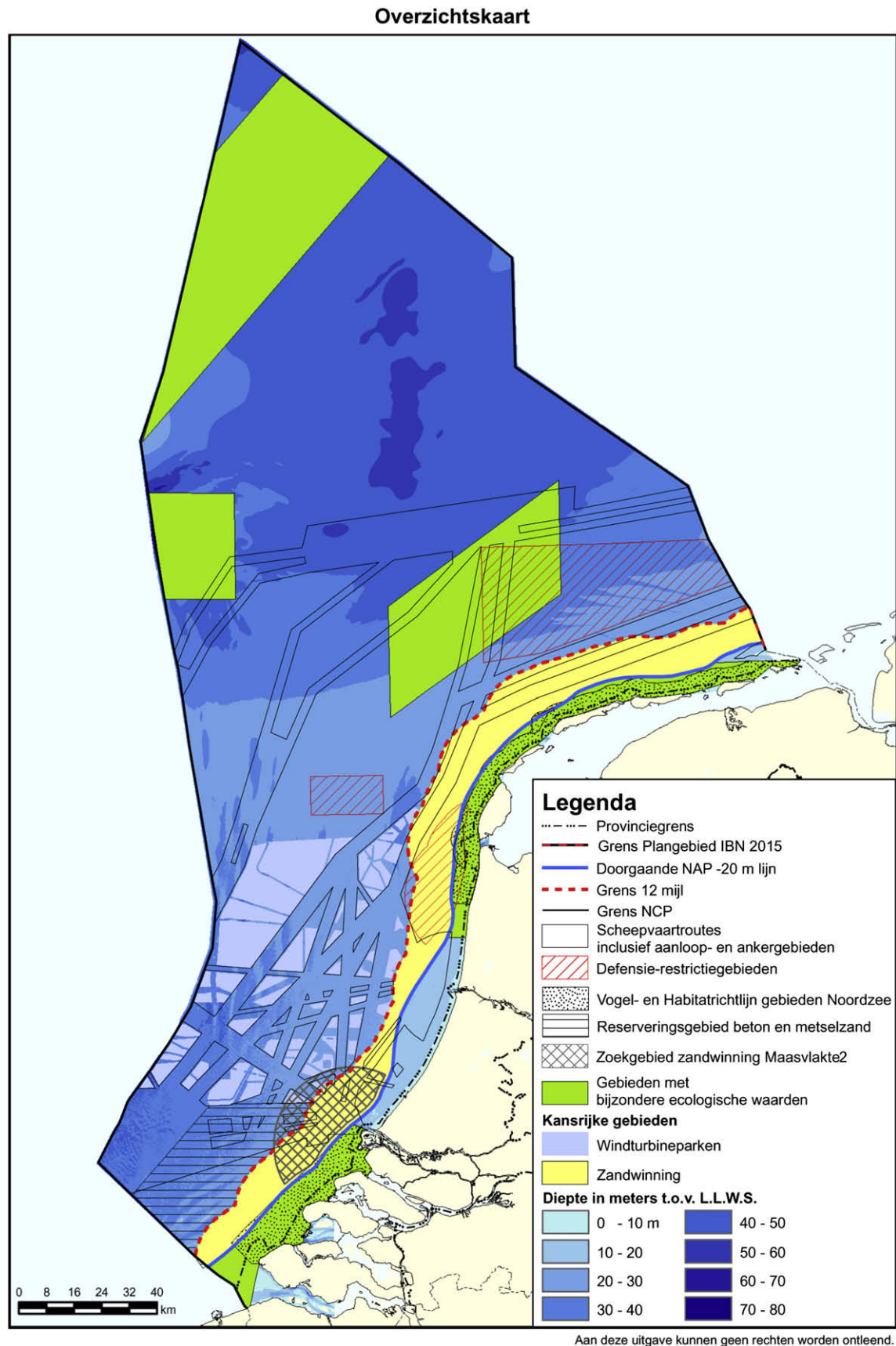


Fig. 3. Marine Spatial Planning in the Dutch Part of the North Sea. Source: Rijkswaterstaat Noordzee, 2005.

- *Integrated (spatial) assessment framework for issuing permits* that provides more forceful and explicit guidance on the basis of spatial aspects such as the multipurpose use of space;
- *Exploratory spatial studies for a specific activity* that allows adjustments in the management of one or more activities;
- *Disadvantage compensation* that can be claimed from the competent authority if a user believes that it is being harmed by another legal use; and;
- *Joint initiatives* promoted by the government to invite the private sector and civil society to present initiatives that combine use functions.

To form a picture of potential problem areas, an analysis was made of the current use of space in the DPNS and the developments surrounding existing and new activities. This analysis culminated in maps that show the spatial impact of current activities and the future pressure on space, including potential conflicts, in the DPNS (IMPNS2015, 2005).

Further research activities have paid particular attention to both the economic and ecological value of the Dutch part of the North Sea. An ecological evaluation of the DPNS was conducted for the designation of areas with special ecological value. Based on the result of the study, opportunity maps for protected areas were designed as part of the IMPNS 2015 (Lindeboom et al., 2005).

Research on the economic valuation of the DPNS is underway but not yet completed. The study aims to gain insight in the current and future economic value (measured in production value and employment) of the main offshore activities (oil and gas, marine aggregates, fishing, shipping, wind farms, and cables and pipelines) in relation to their use of space. Forecasts have been made of their economic value and spatial needs until 2015. The study will result in three alternative scenarios in which an analysis will be made of potential spatial conflicts and possibilities for harmonization and compatibility, depending on estimated economic growth rates (slow, middle or high) of the offshore activities during the coming ten years (Rijkswaterstaat Noordzee, 7 May 2007, The Netherlands, personal communication, 2007). These scenarios will provide better insight and guidance on where more government action, in the form of spatial planning, is required.

4.2.3. Marine spatial planning in Germany

Marine spatial planning in Germany is conducted at two levels. The German *Länder* (states) are responsible for the development of marine spatial planning in the territorial sea while the federal government is responsible for marine spatial planning in the exclusive economic zone (ROG, 2006).

Through marine spatial planning in the territorial sea, Mecklenburg-Vorpommern aims to pay particular attention to the opportunities offered and risks presented by the Baltic Sea region to the *Länder*. Further, it wants to ensure conflict management between the demands of new technologies (offshore wind energy sites), tourism and nature protection and traditional sectors like shipping, fishing and defense at an early stage. The objectives and principles of the plans are similar to those for the planning of land use and are embedded in the broader context of integrated coastal zone management (Landesraumentwicklungsprogram Mecklenburg-Vorpommern, 2005).

Marine spatial planning in the German exclusive economic zone is still in an early stage. Real interest by the federal government in developing marine spatial planning for waters under German jurisdiction started around 2000 and was particularly stimulated by the shocking effect of new maps displaying the numerous proposals for the development of large-scale offshore wind energy farms. This flood of applications was triggered by a guaranteed subsidy for electricity generated by wind power. Various project proposals were overlapping in space and caused concerns for the

effects on the marine environment. Other motives for developing marine spatial planning included the different competences for approval of activities in the exclusive economic zone and the difficulties this posed with more intense and diverse uses of oceans and coastal waters and the various conflicts among different users it created.

Prior to developing plans, the German government decided to first establish a strong legal basis for the development of marine spatial planning. In July 2004 an amendment of the Federal Spatial Planning Act entered into force stating that the Federal Ministry of Transport, Building and Urban Affairs should develop a legal instrument setting out the objectives and principles of spatial planning in the exclusive economic zone (ROG, 2006). The Federal Maritime and Hydrographic Agency was given responsibility for preparing a spatial plan, and associated environmental report for both the North Sea and the Baltic Sea. A draft spatial plan was released for public consultation in early 2008.

The aim of the spatial plan is to establish sustainable management of space, in which social and economic demands are consistent with ecological functions. The associated environmental report aims to identify and evaluate the likely significant effects on the environment that could result from implementing the spatial plan. Key elements of the plan will include (ROG, 2006):

- *Priority areas* that are reserved for a defined use in which other conflicting uses are excluded;
- *Reservation areas* in which defined uses have a priority; and
- *Suitable areas* in which defined uses are allowed inside, but excluded outside, the designated areas

An important step toward allocation of marine space for specific uses was the designation of 'preferred areas' for wind energy in December 2005 for one area in the North Sea and two areas in the Baltic Sea. These 'preferred areas' will automatically turn into priority areas as soon as the spatial plan enters into force.

In the context of the development of the plans, no new scientific research initiatives have been taken. The plans are mainly developed based on existing data that were analyzed and synthesized by experts at the Federal Maritime and Hydrographic Agency (Fig. 4).

5. Conclusion

Marine spatial planning, compared to land use planning, is a fairly new and emerging area (Peel and Lloyd, 2004). The spatial planning initiatives described above are some of the best examples available today, but are nevertheless still at an early stage. This makes it difficult to determine whether particular approaches being adopted will have more effective results and positive outcomes than others in delivering ecosystem-based management. However, having analyzed the planning processes and considering the broader context of the areas for which the spatial plans have been prepared, some initial conclusions can be drawn.

Obviously, the need for marine spatial planning is strongly, if not entirely, influenced by the need for a framework that allows management of the increasing demand for ocean space and ecologically responsible decision-making about new uses of the sea. All three marine spatial planning initiatives examined above have this as the overall goal. However, the goals of the plans are fairly general and are – except perhaps for the Belgian case – not really translated into concrete objectives whose effectiveness can be measured over time.

The spatial plans for Belgium, the Netherlands and Germany are significant steps in the direction of applying ecosystem-based management to the marine environment. All three of the spatial planning processes are undertaking science-based efforts to define ecological valuable features of their entire planning area. However,

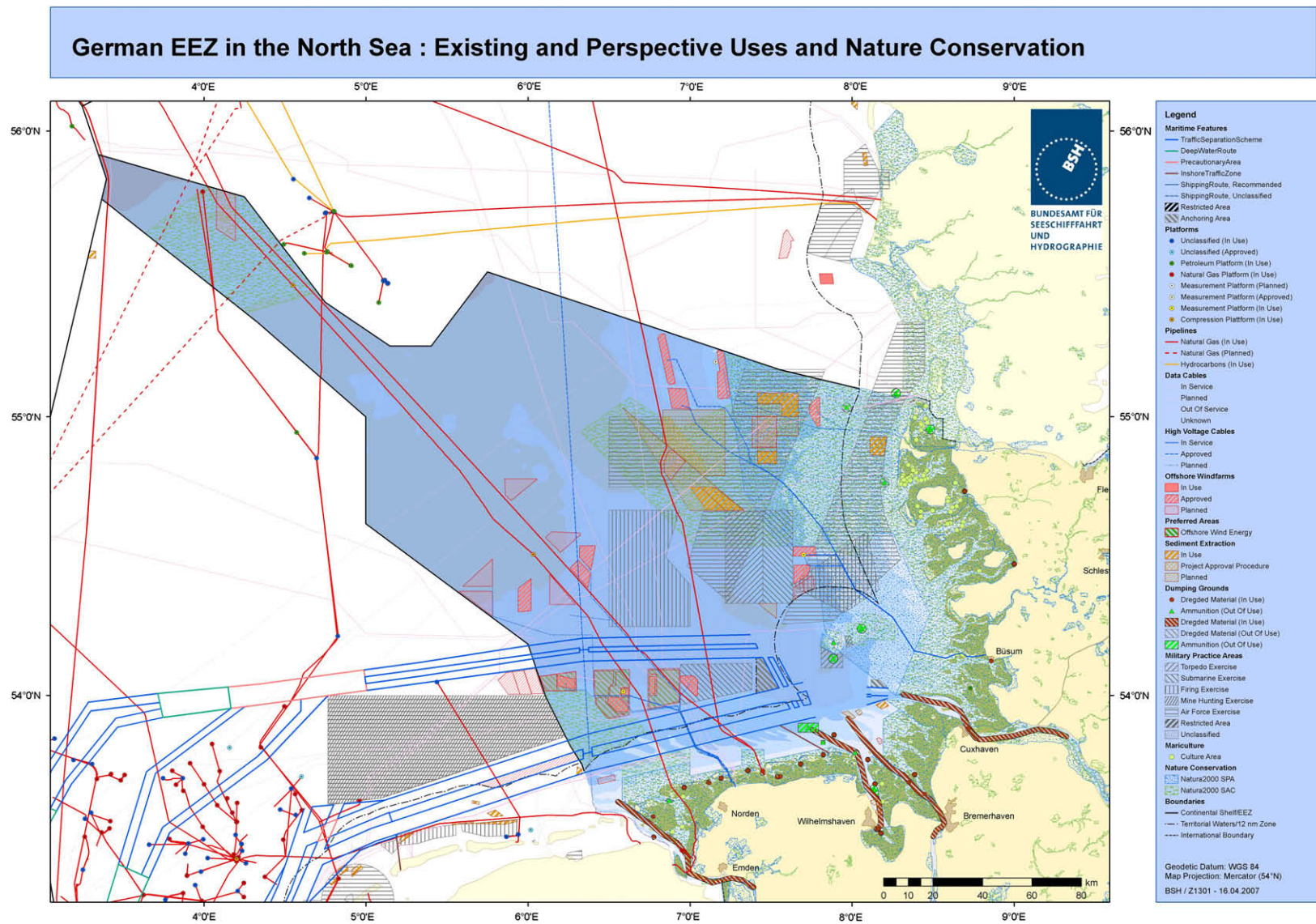


Fig. 4. Offshore uses of the German North Sea. Source: Bundesamt für Seeschifffahrt und Hydrographie, 2007.

although this is important step, it is only a first step. Central to ecosystem-based management is the provision of sustainable use of marine goods and services. Sustainable use requires management that seeks both ecological sustainability and social and economic sustainability. In all three spatial planning approaches, valuation of social and economic aspects of the planning area is not integrated systematically and in a manner consistent with ecological valuation methods. A social and economic valuation, for example, should connect particular offshore activities with onshore communities and economies, and evaluate the importance of the offshore activity to the communities and economy on land (e.g., St. Martin and Hall-Arber, 2008).

Finally, perhaps one of the most important conclusions to draw from these initial marine spatial planning initiatives is their lack of international perspective. All three of the countries described have planning and management jurisdiction over ocean spaces that are adjacent to each other. Ocean spaces of all three of these countries are physically connected to each other. Various uses, including shipping, fisheries, cables and pipelines, oil and gas industry have, or can have, impacts across boundaries. In addition, national boundaries are mainly based on political and administrative considerations and obligations and are not necessarily meaningful from an ecological perspective. The interconnectedness of adjacent ocean spaces, the cross-boundary impact of ocean uses, and the broader scale needed to be ecologically meaningful require that marine spatial plans developed at the national level are embedded in a broader, international context and integrate, or at least address, the dynamics of the system as a whole. National marine spatial plans should be translated into international spatial policies in which sea uses and biodiversity protection measures are planned to complement one another on an international, or regional scale. However, none of the three spatial planning initiatives have integrated or addressed this broader international context nor do they have a framework in place that might allow cooperation in the future.

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