Marine Policy Research

A reflection on CMP projects 2009-2013

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Marine policy research

A reflection on CMP projects 2009-2013

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Preface

The increasing use of European seas leads to environmental problems and to increasing competition between different sectors, such as shipping, offshore energy, marine infrastructure, port development, fisheries and aquaculture. The development of integrated maritime and marine policies is important to manage these activities in a sustainable manner.

In the period 2009-13, research activities in this field were boosted by the Wageningen UR Centre for Marine Policy (CMP). This centre integrated research disciplines such as marine ecology, economics, governance, fishery research, maritime research and marine law. By addressing and integrating these scientific disciplines, the CMP addressed system complexity and interaction, and supported the search for consensus in governance.

The CMP was co-funded by the Province of Fryslân and consisted of four parts of Wageningen UR: Wageningen University, LEI Wageningen UR, Van Hall Larenstein University of Applied Sciences, and IMARES Wageningen UR. The centre facilitated interaction within the broader marine and maritime research and policy network in Europe.

A range of projects funded by the EU and by Dutch research programmes have been carried out on marine policy issues in this context. In this report, the editors present an anthology of the various research activities of CMP researchers. These findings from CMP-related work range from ecosystem-based management through integrated participatory modelling to integrated marine policy initiatives. These contributions form a good basis for further research on relevant topics among collaborating partners of Dutch marine research in the future.

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1 Introduction

Marine policy can be interpreted broadly as governmental interventions targeting any activity located in marine areas. A large share of marine policy research is related to fisheries policy and the Common Fisheries Policy (CFP) in particular. Although the research targeting the fisheries policy is still of high relevance, a more integrated research approach that comprehends multiple sectors in marine spatial planning (MSP) simultaneously, is a new emerging field of interest often referred to in the context of ecosystem-based management. The different research approaches have in common that they deal with challenges of intensified demands for the marine areas for traditional as well as for newer purposes. New activities that are claiming marine space more recently include, for instance, nature conservation and green energy sources such as wind and waves.

The main aim of this report is to provide an overview of some main theoretical and methodological contributions to the scientific literature stemming from CMP-related work. As the material to choose from is comprehensive, we have selected as the basis for the reflections relevant peer-reviewed articles that focus on marine policy issues in the area of the Dutch North Sea. The report draws on texts from various publications (References). Moreover, short descriptions of and links to relevant EU projects in which the CMP researchers collaborated - such as JAKFISH, MESMA, MASPNOSE, ODEMM, WINDSPEED and COEXIST - are provided (Appendix).

In the reflection part, we first introduce the main regulations at global, regional, EU and national levels that are applicable to the Dutch North Sea. This is followed by addressing fisheries policy issues in particular, before we introduce research addressing a broader context covering multiple activities in the North Sea, as well as marine policy information frameworks. Information about experiences of stakeholder participation in modelling exercises is then addressed. Stakeholder participation as a process is reflected upon, before spatial and interdisciplinary research are addressed more broadly. Finally, this is followed by reflections on the actual needs and appropriateness of different types of knowledge in the process of developing marine policies.

2 Overview of the regulatory context

Before addressing the CMP research conducted in 2009-13, we begin with a briefing on the regulatory contexts relevant to the marine policy research in this section. First, the global treaties and regional arrangements at international level are mentioned. This is followed by a briefing on the regulations at national and EU levels. The regulatory contexts provide a background that can assist in understanding the outcomes of the CMP-related research detailed in the following sections.

2.1 International marine treaties

In this section we give a brief overview of the main international treaties at global and regional levels that are applicable to North Sea activities.[1]

Global agreements include:

1. The Johannesburg Declaration of Sustainable development
2. The MARPOL 73/78
3. The Convention on the International Regulations for Preventing Collisions at Sea, 1972
4. The World Heritage Convention
5. The UNESCO Biosphere Reserves, and
6. The RAMSAR Convention.

During the Johannesburg World Summit on Sustainable Development 2002, a plan of implementation (the 'Johannesburg Declaration of Sustainable development') was adopted that treats extensively issues related to fisheries. The main focus of the plan is on the development and implementation of National and Regional Plans of Action to put into effect the IPOA Capacity; Application of Ecosystem Approach; Restoration of Depleted Stocks (2015); and Establishment of 'representative networks' of Marine Protected Areas (Satia, 2003).

By means of the World Heritage Convention, the cultural and the natural heritage of outstanding universal value throughout the world are identified and their protection through international cooperation is ensured (World Heritage Convention, 1972).

The UNESCO Biosphere Reserves are sites established by countries and recognised under UNESCO's Biosphere Programme to promote sustainable development based on local community efforts and sound science.

The RAMSAR Convention - which is properly known as the Convention on Wetlands of International Importance - is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The main objectives are the conservation and wise use of all wetlands through local, regional and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world.

The MARPOL 73/78 and the Convention on the International Regulations for Preventing Collisions at Sea, 1972, target the shipping industry in terms of restrictions regarding safety and pollution.

[1] The text in this section has been adapted from the North Sea case study in the EU FP7 Coexist project, North Sea Case study, Deliverable 4.2. (http://www.coexistproject.eu/)

Regional arrangements include:
1. The OSPAR Convention on the protection of the marine environment of the North-East Atlantic
2. The Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS), and
3. The Wadden Sea Plan.

The OSPAR Convention on the protection of the marine environment of the North-East Atlantic was adopted in 1992 and entered into force on 1998 (OSPAR, 1992). The main goal of the OSPAR Convention is to prevent and stop the pollution of the marine environment and to protect the maritime area against the adverse effects of human activities in order to protect human health and the marine ecosystem. A second goal is to maintain and, where practicable, restore marine areas that are affected.
The Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS) entered into force in 1994. The aim of this agreement is to achieve a favourable conservation status for small cetaceans (United Nations, 1992). Various rules are described in the agreement regarding habitat conservation and management.

The Wadden Sea Plan is a joint initiative of the Netherlands, Denmark and Germany aiming at achieving a) a natural ecosystem, its functions and characteristic biodiversity; b) resilience to climate change and other impacts; c) maintenance of the landscape and cultural heritage; d) sustainable use as defined by the Convention on Biological Diversity and the Habitats Directive; and e) public support for the protection of the Wadden Sea (Common Wadden Sea Secretariat, 2010).

2.2 EU and national level regulation

In this section we give a brief overview of the main regulations at the EU and national levels with relevance to North Sea activities.[1]

EU directives include:
1. The Marine Strategy Framework Directive (MSFD)
2. The Common Fisheries Policy (CFP)
3. The Water Framework Directive (WFD)
4. Natura 2000, and
5. The Bathing Water Quality Directive.

The 'Directive of the European parliament and of the Council establishing a framework for Community action in the field of marine environmental policy' (also known as the Marine Strategy Framework Directive) obliges each Member State to establish a marine strategy that focuses on the protection, preservation and restoration of the marine environment while ensuring the sustainable use of the North Sea (Noordzeeloket, 2011a).

The fishery activities in the North Sea are mainly regulated at EU level through the Common Fisheries Policy (CFP) (EC, 2002). The official name of the policy is 'Council regulation on the conservation and sustainable exploitation of fisheries resources under the Common Fisheries Policy'. Its aim is the conservation and sustainable exploitation of fisheries resources and ensuring the exploitation of living aquatic resources that will provide sustainable economic, environmental and social conditions. The programme promotes sustainable fisheries and aquaculture in a healthy environment that can support an economically viable industry providing employment and opportunities for coastal communities.

The WFD is officially the 'Directive of the European Parliament and of the Council establishing a framework for Community action in the field of water policy'. The main goal of the directive is 'to establish a framework for the protection of inland surface waters, transitional waters, coastal waters and

[1] The text in this section has been adapted from the North Sea case study in the EU FP7 Coexist project, North Sea Case study, Deliverable 4.2. (http://www.coexistproject.eu/)

groundwater' (EC, 2000). This directive focuses on freshwater resources. For the North Sea, the coastal waters, which are referred to in the WFD, are of importance. Natura 2000 is the largest initiative in the field of nature conservation in Europe. It is a network of protected areas that is achieved by contributions from all Member States of the European Union. The conservation and restoration of biodiversity in the European Union is the goal.

The areas that fall under Natura 2000 are indicated in the Birds[1] and the Habitat[2] Directive. These European directives require Member States to protect certain species and their natural habitat and to preserve biodiversity. Together, the sites currently cover about 20% of the European territory.

The purpose of the Bathing Water Quality Directive is to preserve, protect and improve the quality of the environment and to protect human health (European Commission 2006/7/EC).

Regulations at European level within the framework of the Common Fisheries Policy (CFP) are**:**

1. The Plaice Box
2. The European Fisheries Fund (EFF) Operational Programme
3. The Laying down measures concerning incidental catches of cetaceans in fisheries, and
4. The regional implementation of the Shellfish Waters Directive.

The plaice box encompasses an area of circa 42,000 km2, of which circa 24,000 km^2 is located within the 12 nm zone and is located off the coasts of Denmark, Germany and the Netherlands. It has been partly closed to large (>221 kW) beam trawlers to reduce the discarding of undersized plaice since 1989. However, fishing by other gear categories, such as beam trawlers and shrimpers of <221 kW, is permitted as these fleets are considered to have no alternative to fish further away from their ports (EC 850/98 of 30 March 1998).

The main objectives of the EFF are to ensure the exploitation of living aquatic resources and support aquaculture in order to provide sustainability in economic, environmental and social terms. Further, it promotes a sustainable balance between resources and the fishing capacity of the Community fishing fleet, strengthens the competitiveness of the operating structures and the development of economically viable enterprises in the fisheries sector, and fosters the protection and the enhancement of the environment and natural resources where related to the fisheries sector (EC 1198/2006; Art. 4)

Whereas the Council Regulation lays down measures concerning incidental catches of cetaceans in fisheries, the aim of the regional implementation of the Shellfish Waters Directive is to protect and improve the environment of the shellfish waters. It is important to protect certain shellfish populations against various harmful effects of the discharge of polluted substances into seawater. These rules apply to all Member States (EC, 2006).

National regulations in the Netherlands include eight main interrelated programmes with importance to the Dutch marine areas:

1. National Spatial Strategy
2. Policy Document on the North Sea
3. Integrated Management Plan North Sea
4. the Fisheries Law

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[1] Birds Directive
The Birds Directive is officially named 'the Directive of the European Parliament and of the Council on the conservation of wild birds (codified version)' (EC, 2009). The aim is to protect, manage and control all species of naturally occurring birds in the wild state in the European territory of the Member States. The treaty also lays down rules about the exploitation of wild birds. Member States are obliged to take measures to maintain the population of wild birds (EC, 2009).

[2] Habitats Directive
'Council Directive on the conservation of natural habitats and of wild fauna and flora', also known as the Habitat Directive, aims at the conservation of natural habitats and its flora and fauna (EC, 1992). The Habitat Directive requires Member States to take the necessary conservation measures for specific protection areas. It also requires Member States to take appropriate measures to ensure that the quality of natural habitats and habitats of species in special protection zones does not decline and no confounding factors of the species for which the areas have been designated arise. The Directive applies to the territory of the Member States, which at least includes the territorial sea (EC, 1992).

5. Nature Conservation Act, including Natura 2000 areas
6. PKB Third Note Wadden Sea
7. the Flora and Fauna Act, and
8. the Water Act.

Whereas the National Spatial Strategy sets out the vision and its main objectives for the spatial development of the Netherlands, the Policy Document on the North Sea 2009-15 is part of the National Water Plan. It describes several measures that determines where and when types of fisheries, aquaculture and other activities can occur in the Dutch part of the North Sea (IDON, 2006).

The management of the Dutch part of the North Sea is integrated into one plan: the Integrated Management Plan North Sea 2015. This plan is an elaboration of the North Sea chapter of the National Water Plan (NWP) and the associated North Sea Policy, which both came into force in 2010 (IDON, 2011; see Figure 2.1).

This plan aims at a healthy, safe and profitable North Sea. The main goal is to enhance the economic importance of the North Sea and the preservation and development of international nature and landscape values by sustainably developing the spatial-economic activities in the North Sea and align these activities in accordance with the ecological and landscape values present in the North Sea (IDON, 2011). The economic use of the North Sea includes activities in the territorial sea and the exclusive economic zone (EEZ). In the EEZ, according to international maritime law, the Netherlands has the exclusive right to usufruct and also the duty to protect the marine environment (IDON, 2011).

The Fisheries Law from 1963 is the basis of the Dutch fisheries regulation. The regulation should include the legal basis for implementing the obligations of the Netherlands arising from the EU Common Fisheries Policy and international fisheries treaties (Noordzeeloket, 2011c). The regulation distinguishes three types of fisheries: sea fisheries, coastal fisheries and inland fisheries. Each type is managed separately in the regulation. The Dutch fishing zone is the zone that corresponds to the outer boundary of the Dutch continental shelf and the Dutch EEZ (Noordzeeloket, 2011c).

The Nature Conservation Act 1998 provides the basis for area-based nature conservation measures, including the implementation of European obligations. The Nature Conservation Act 1998 makes it possible to protect nature areas by designating them as 'protected nature monuments' or 'special protection zones' under the Birds and/or the Habitat Directive. The act defines 'nature monument' as 'land or water, or a combination of land and water, that is of general interest for its scientific significance or natural beauty' (Article 1 (c)) (Ministerie van LNV, 1998). The act applies to the Dutch territory, including the territorial sea. An amendment to extend the scope of the Nature Conservation Act 1998 to the EEZ is currently pending in parliament (Noordzeeloket, 2011d).

In the Netherlands, more than 160 areas are notified as Natura 2000 sites. Some of these sites have been permanently designated (Rijksoverheid, 2012). The Voordelta, the Vlakte van de Raan, the Wadden Sea and the North Sea Coastal Zone (from Petten to Rottumeroog) are designated as Natura 2000 sites. Furthermore, three other areas in the North Sea are notified to the European Commission by the Dutch government as Natura 2000 sites: the Dogger Bank, the Cleaver Bank and the Frisian Front. These three sites are expected to be designated by the Dutch government in the coming years. A management plan needs to be developed for each site within three years of the designation date. At the moment, three management plans are ready: 1) Management plan Voordelta; 2) Management and developing plan Wadden Sea; and 3) VIBEG agreement (for the Vlakte van de Raan and the North Sea Coastal zone) (Rijksoverheid, 2012) (see also Bolman and Goldsborough, 2011).

Figure 2.1	Activities planned in the Dutch North Sea (includes Green: ecological areas/ defence areas; Pink: energy areas; Yellow: sand extraction; small grey squares: oil platforms; orange/read: shipping activities) (IDON, 2011)

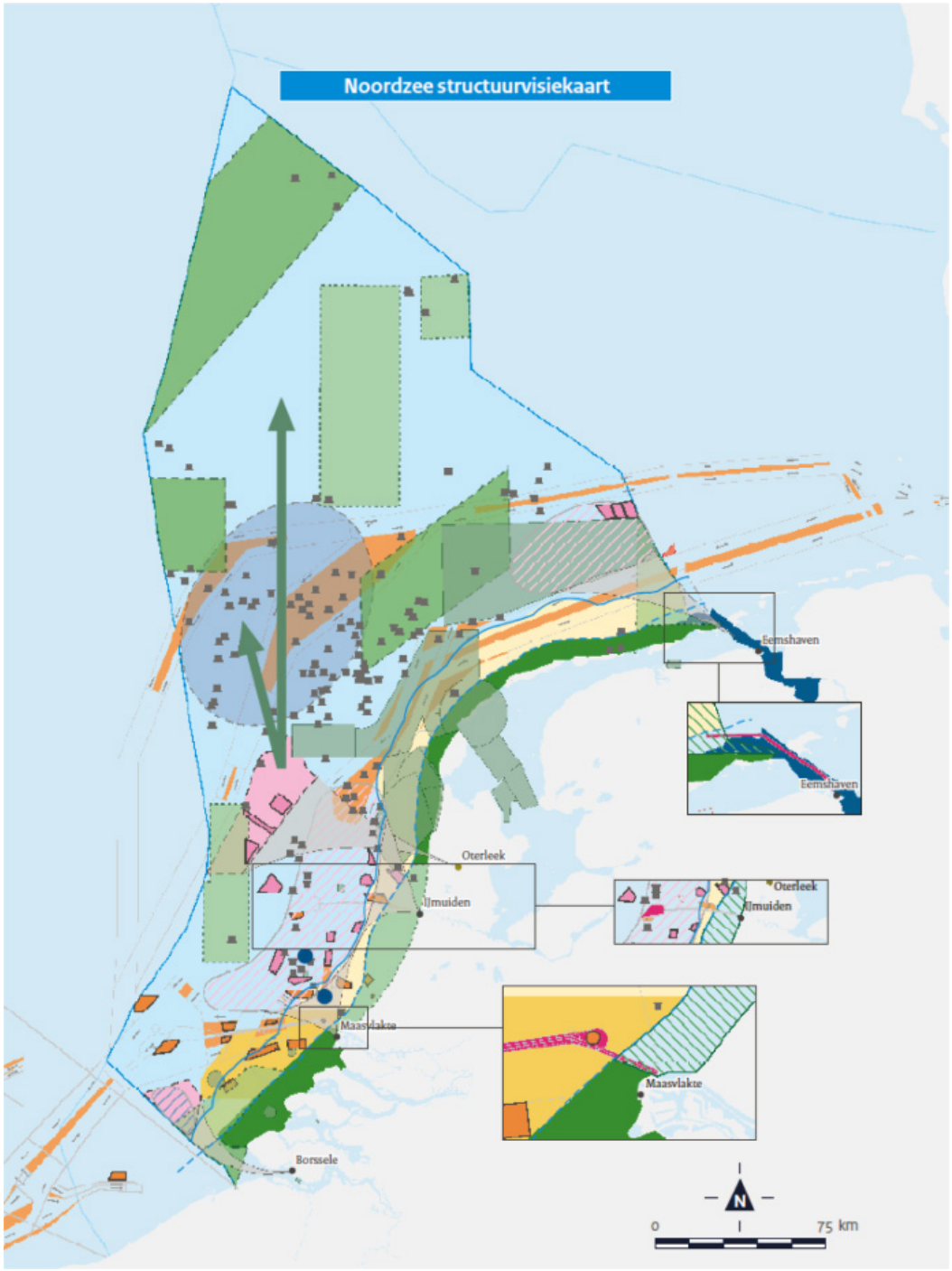
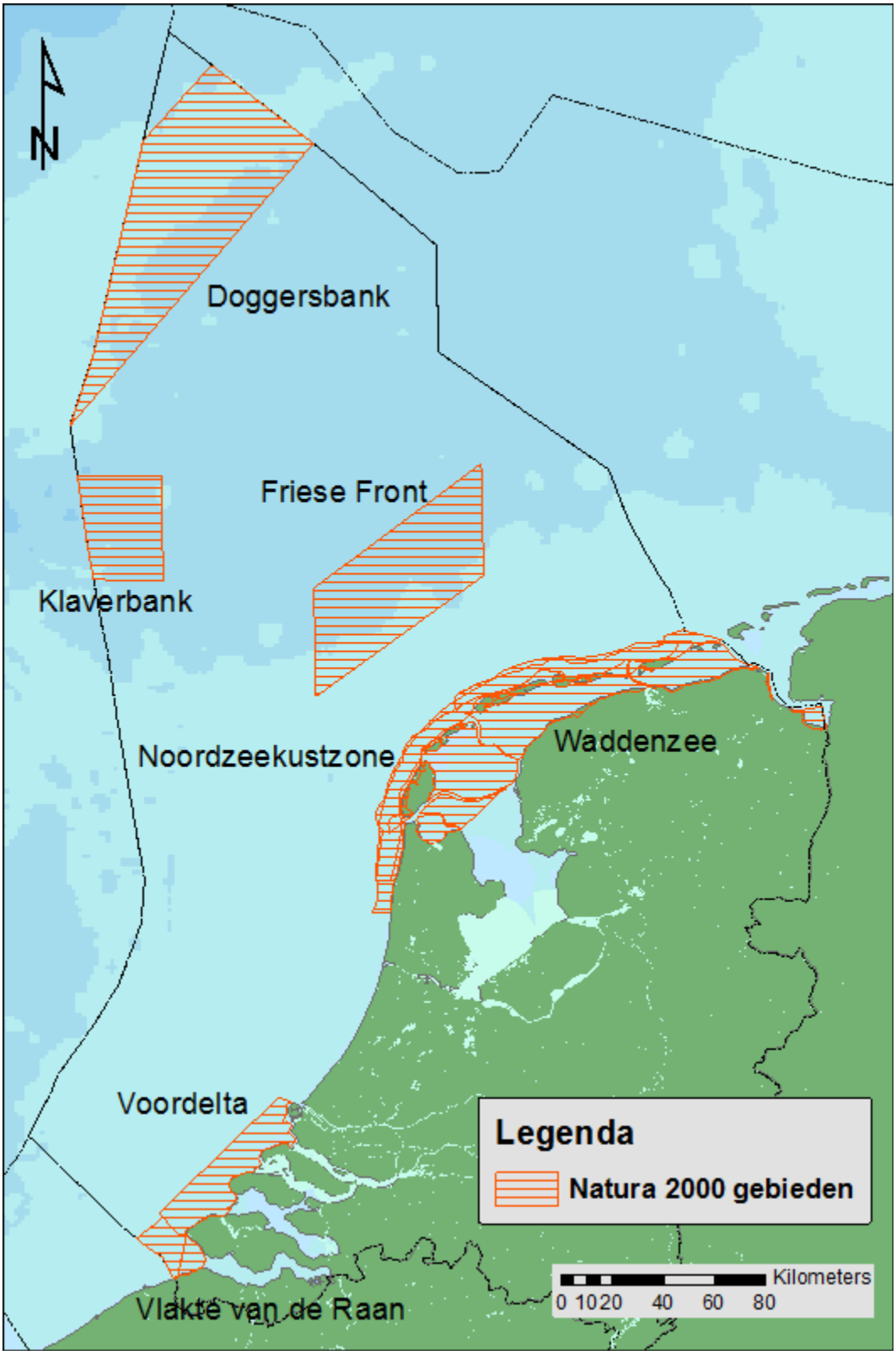


Figure 2.2 **Marine Natura 2000 areas of the Netherlands**



The PKB Third Note Wadden Sea contains a generic outline of the policy for the Wadden Sea. The main objective is the sustainable protection and development of the sea as nature and the preservation of the unique open landscape (Ministerie van VROM, 2007). The management and development plan for the Dutch Wadden Sea combines national policy with the policies and wishes of the region and includes the themes that play a role in the Wadden area (Regionaal College Waddengebied, 2010).

The Management Plan Voordelta concerns an area covering more than 90,000 hectares of the North Sea (Rijkswaterstaat, 2008). The area is called the 'Voordelta' and is localised on the outside of the islands in the southwest of the Netherlands (Figure 2.2). The Voordelta was designated as a Natura 2000 site on February 2008, and the Voordelta Management Plan contains measures for activities in this particular site, which includes five resting areas. The three main objectives of the Voordelta Management Plan are: 1) the conservation of the nature in the Voordelta; 2) compensation for the loss of protected nature due to the construction of the Maasvlakte 2; and 3) to offer space for recreation, fisheries and other human activities within nature conservation areas (Rijkswaterstaat, 2008).

The VIBEG agreement is a contract between the Dutch government, the fisheries sector and environmental NGOs. The agreement is on fisheries management in the North Sea Coastal Zone and the Vlakte van de Raan (VIBEG, 2011). Both areas are designated as Natura 2000 areas, and with the measures in the agreement the conservation goals of Natura 2000 will be met. Both areas are divided into zones: Zone 1) Closed to fisheries; Zone 2) Open to non-soil touching fisheries; Zone 3) Innovative areas, open to current best available techniques; Zone 4) Remaining fishing area; Zone 5) Research area (VIBEG, 2011).

The Dutch implementation of the EFF is aimed at facilitating the transition towards a more sustainable fishery, fostering both the economic sustainability of the subsectors (fisheries, aquaculture and processing industry) and the biological and ecological sustainability of catch and population levels for the demersal and pelagic fish stocks. This is done through three main axes: innovation and cooperation in the sector, restricting fishing capacity, and strengthening the socioeconomic and cultural position of fisheries communities (Operationele Programma EVF, 2007).

The official name of the Flora and Fauna Act is 'the Act of May 25, 1998, containing rules for the protection of wild living plant and animal species'. The Act provides the legal framework for the protection of wild native and exotic plant and animal species. The act applies to the Dutch territory including the territorial sea. An amendment to extend the scope of the Act to the EEZ is currently pending in parliament (Noordzeeloket, 2011e).

The Water Act came into force in 2009 and merges eight laws. The act regulates the management of surface and groundwater, and enhances the relationship between water policy and spatial planning. The act includes the implementation of treaties in the field of water management and the European Water Directives, in particular the Water Framework Directive, the Floods Directive and the Marine Strategy Framework Directive (Noordzeeloket. 2011f). The main objectives of the act are: a) to prevent and where necessary reduce flooding and water scarcity, in conjunction with b) protecting and improving the chemical and ecological quality of water and c) fulfilling social functions by water systems (Article 2.1). These objectives are further described in standards for embarkments, water quantity, water quality and function performance (Noordzeeloket, 2011f).

3 Research on changing marine policy

The European Commission has developed the Marine Strategy Framework Directive (MSFD), which defines good environmental status and the maritime policy. The regulations approached by the MSFD together with the Common Fisheries Policy (CFP) have resulted in some unclear instructions, as both policies aim at governing the marine environment - yet the two policies have a differing signature in policy formulation and implementation. From a fisherman's perspective, these policies present a change in institutional setting: major policy measures are no longer derived only from the EU CFP, but are increasingly also derived from general environmental policy developments.

Marine policy research has to large extent concentrated on the fishery sector. The centrality of this sector in particular can be explained by its role in exploiting the biological resources in the seas. The aquaculture sector is relatively small in the southern Part of the North Sea, and has therefore received less attention. Until the 1990s, fisheries were largely managed by the state. Since then, the Dutch government and the sector have increasingly recognised that a fishing industry cannot be managed effectively without the cooperation and participation of fishers to formulate policy and to implement and enforce laws and regulations. As a result, in the 1990s, the neo-corporatist arrangement was replaced by a co-management system in the Dutch flatfish fishery (Vos and van Tatenhove, 2011).

A policy arrangement approach has been developed to analyse the differences between maritime policies and the way in which they can affect fisheries management (van Hoof and van Tatenhove, 2009). The policy arrangement approach was developed to understand and to analyse change and stability of policy processes, by studying the on-going institutionalisation of policy arrangements. The structure of such a policy arrangement can be analysed along four dimensions (Liefferink, 2006). Whereas one dimension in this theoretical framework concentrates on the actors and their coalitions within the policy domain, a second dimension focuses on the division of resources between these actors that influences differences in power and influence. Power here refers to the mobilisation and deployment of the available resources, while influence refers to the people involved in determining policy outcomes and the way in which they do it. A third dimension looks at the rules to take into account in terms of formal procedures of decision making and implementation, as well as informal rules and practices of interaction within institutions. The fourth dimension concentrates on the current policy discourses entailing the views and narratives of the actors involved in terms of, for instance, norms, values, definitions of problems and approaches to solutions.

Based on analyses applying the policy arrangement approach, a trend is observed for the European Fisheries Policy in terms of it increasingly being determined outside the CFP (van Hoof and van Tatenhove, 2010). For example, besides the MSFD, the Johannesburg Summit on Sustainable Development sets harvest levels at maximal sustainable yield (MSY), while marine policy is increasingly aiming at integrating activities and sectors into one policy framework. In addition, with a trend of increased stakeholder participation, for example, within Regional Advisory Councils, as well as the trend of implementing policies at the regional instead of national level, the locations in terms of level (locus) and the focus of fisheries policy are changing. Because of this rather complex situation, the Common Fisheries Policy debate on how fisheries management should be shaped is intensified. With increased attention for regional resource management and integration and participation across activities, stakes and stakeholders, it is argued that the EU Member States are questioning the exact role and position of the state in fisheries management (van Hoof and van Tatenhove, 2010).

A major challenge facing future EU fisheries management is hence the integration of fisheries management with broader marine management (van Hoof van Leeuwen and van Tatenhove, 2011). The increased focus on such integration, sometimes linked with the term 'ecosystem-based management', can be seen as a driver for both regionalisation and the integration of policy to cover all sectors and activities at the scale of the marine ecosystem.

Linked with the processes of regionalisation and integration, a change is observed regarding discourses in EU management of marine resources and the way they are influencing the Integrated Maritime Policy, the MSFD and the CFP (van Hoof, van Leeuwen and van Tatenhove, 2011). It is questioned whether the traditional role of Member States will be able to keep up with what is needed as a result of the higher intensity of policy setting at the regional level (van Hoof and van Tatenhove, 2010). Looking at the current model of governance in a longer term perspective, specifically at the implications of integrated regional marine management, it is observed that the process of regionalisation and the integration of policy requires a further development of the marine governance system, positioning the regional level into a multilevel governance system (van Hoof and van Tatenhove, 2011).

When institutions change during transition periods, that is, when the interference zone between different institutional settings develops into new policy practices, this is referred to as 'institutional ambiguity' (van Leeuwen et al., 2012). Institutional ambiguity is observed, for instance, between the European, regional and Member State levels in the implementation of the MSFD (van Leeuwen et al., 2012) because of the requirement imposed on Member States to coordinate the implementation of the MFSD through the Regional Sea Conventions. It is argued that new rules are needed to ensure that these institutional settings fit together and have the room to negotiate these rules (van Leeuwen et al., 2012). Institutional ambiguity associated with MSFD implementation on the European and regional level for four European seas (North Sea, Baltic Sea, Mediterranean Sea, Black Sea) has been studied (van Leeuwen et al., 2012). The results indicate different levels of institutional ambiguity in each of the four regions, with the lowest level of ambiguity in the Baltic Sea and the highest in the Mediterranean Sea. Institutional ambiguity also exists on the European level, as coordination efforts have not yet resulted in clear directions for the implementation of the MSFD. The level of institutional ambiguity is influenced by the relative number of EU Member States bordering the particular sea and the extent to which they consider implementation of the MFSD to be urgent. Member States bordering the Mediterranean and the Black seas lack the support of Regional Sea Conventions, in addition to receiving limited direction from the European level.

The on-going changes in marine policy are influencing and changing the trust relationships among fishers following the new governance arrangements (Vos and Mol, 2010). The previous 'thick' trust relationships that characterised the Dutch fisheries industry under a neo-corporatist arrangement had resulted in the isolation of local fisher groups vis-à-vis outsiders. However, under new governance arrangements, in particular the so-called Study Groups, these trust relationships are changing. The establishment of Study Groups, whereby fishers from different localities have to cooperate on sustainability innovations in order to receive subsidies, has led to more diversity within the industry, more collaborations across localities and new forms of 'thin' trust. As such, these Study Groups can be understood as successful experiments in further opening up the fisheries community (Vos and Mol, 2010).

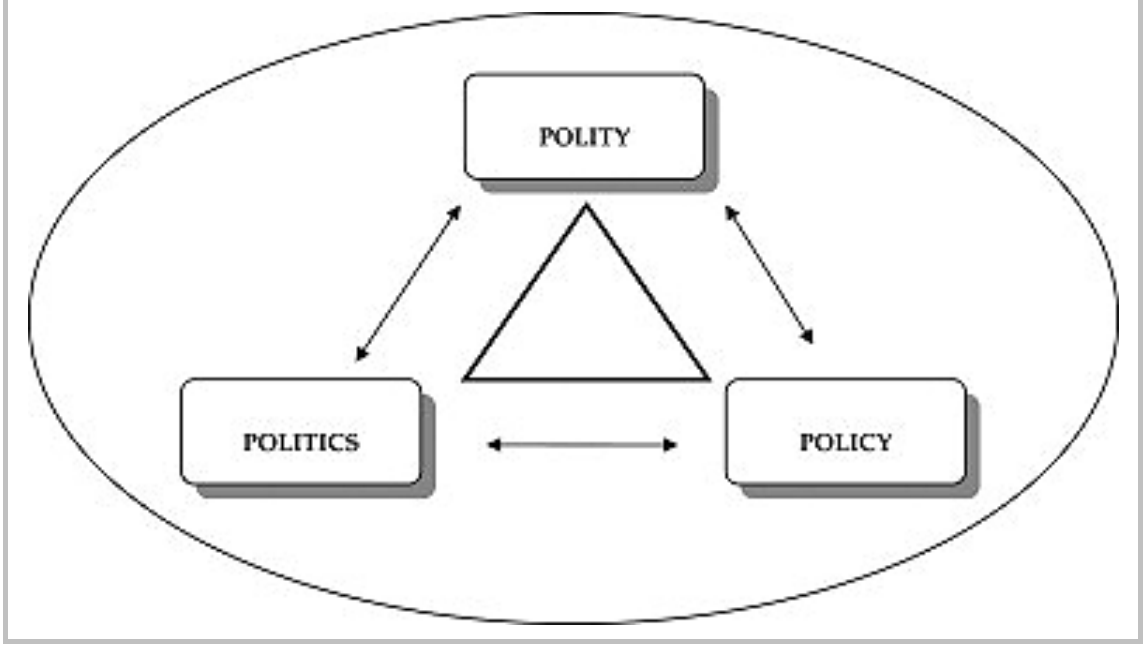
Co-management is often seen as leading to greater procedural legitimacy and subsequently compliance (Vos and van Tatenhove, 2011). However, constructing an effective co-management arrangement is a matter of building not only institutions, but also trust relations between the government and industry. Institutional arrangements such as co-management can contribute to these trust building processes; however, a too strong reliance on institutional arrangements can lead to distrust when new challenges are being faced and institutional arrangements fail to adapt to these changes (Vos and van Tatenhove, 2011).

4 Legitimate arrangements in a broader context

Marine ecosystems are put under more pressure by the increased intensities of multiple economic activities, such as fisheries, commercial shipping, oil and gas production, offshore wind parks, and tourism using the sea (van Tatenhove, 2011). To find solutions to these problems, several countries and the EU are taking initiatives to develop integrated maritime policy. Marine governance is the sharing of policymaking competencies in a system of negotiation between nested governmental institutions at several levels (international, national, supranational, regional and local) on the one hand, and governmental actors, market parties and civil society organisations on the other, in order to govern activities at sea and their consequences. The involvement of multiple actors, multiple levels, and the coordination and integration of different sectoral marine activities will affect the legitimacy of integrated marine governance. Formulated questions of legitimacy and challenges for integrated marine governance have therefore been specified (van Tatenhove, 2011).

In general, the locus and focus of marine governance is shifting from top-down, state-led governance to network governance (van Leeuwen and van Tatenhove, 2010). This shift is captured by the theory of the triangle of marine governance, referring to the institutional setting in which politics and policymaking takes place (polity), policymaking itself (policy), activities of politicians and processes of power (politics), and the interplay between policy, politics and polity (see Figure 4.1).

Figure 4.1 **Triangle of Governance (van Leeuwen and van Tatenhove, 2010)**

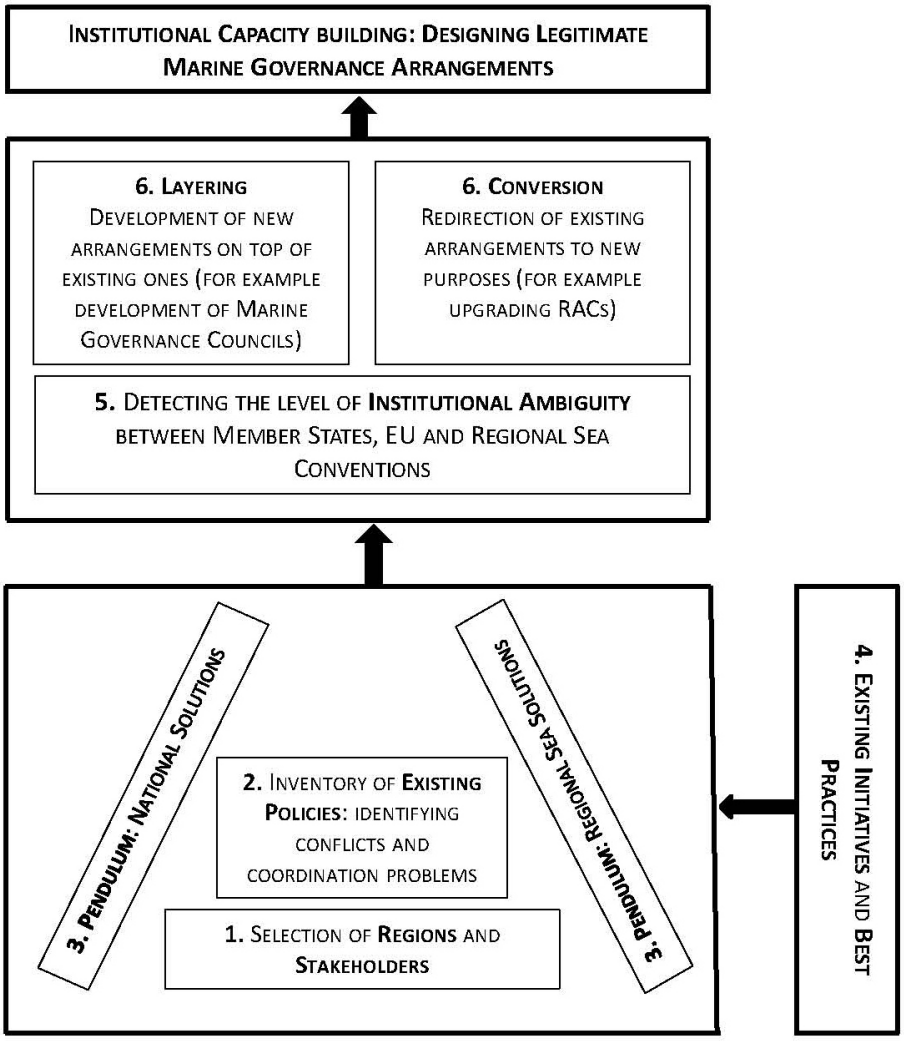


Studying the dynamics of politics and policies in marine governance practices through the triangle shows how and why the shifts in locus and focus occur. The dynamics of marine governance in terms of the interplay between policy, politics and polity is thus illustrated by a case study on the environmental governance of Dutch offshore platforms (van Leeuwen and van Tatenhove, 2010).

Competing spatial claims and conflicts between maritime economic activities and biodiversity in Europe's seas continue to challenge governments and non-governmental actors (van Tatenhove, 2013). Responses to these problems have resulted in a fragmented patchwork of EU policies and private initiatives and regulations at different levels. It is clear that the different sets of problems in each sea and the existing institutional arrangements (which are often created in an ad hoc fashion) require different

responses and a regional approach to marine governance that is more flexible than a pan-European one. It is possible to develop integrated maritime governance arrangements for Europe's regional seas by identifying the conditions for more effective and legitimate EU marine governance arrangements, and examining whether it is possible to turn the tide of marine governance to the level of the regional sea (van Tatenhove, 2013). Using concepts from institutional theory - such as institutional ambiguity, institutional layering and conversion, and institutional capacity building - six building blocks have been identified that could help to turn the tide, help to develop legitimate regional-level marine governance arrangements, and help to strengthen the capacity of marine institutions and governance (Figure 4.2).

Figure 4.2 **Six building blocks to enhance institutional capacity building and to design MSFD (van Tatenhove, 2013)**



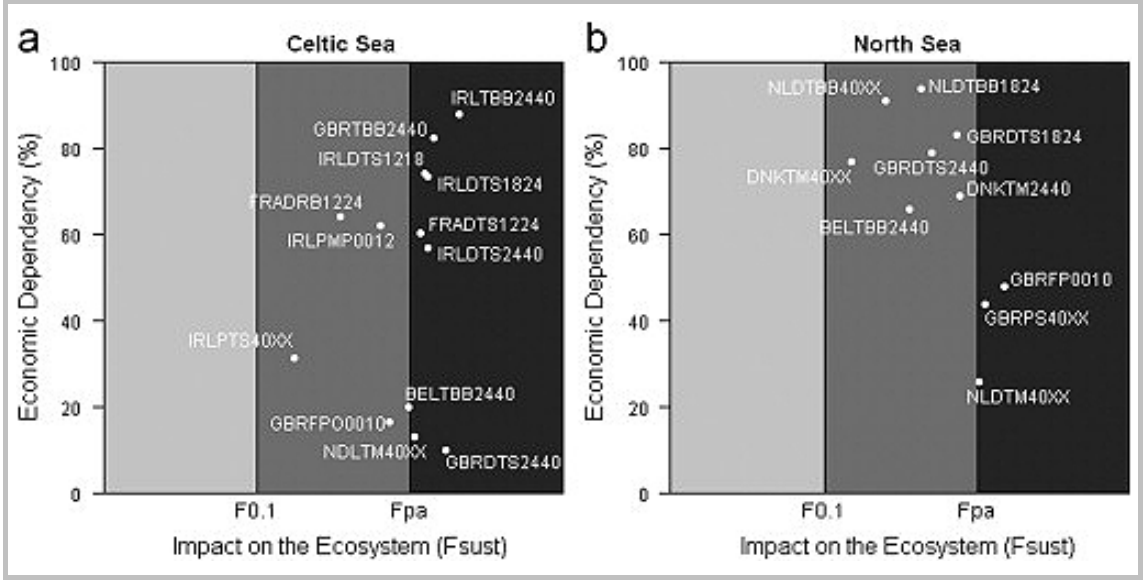
5 Ecosystem approach and ecosystem-based management

Approaches that usually focus on a single species, sector, activity or concern are more frequently challenged by the emphasis on managing particular areas. Ecosystem-based management is place- or area-based in focusing on a specific ecosystem and the range of activities affecting it (Douvere, 2008). Whereas sectoral management implies that each sector regulates particular activities or projects taking place at a particular location (or site) within a certain area, the ecosystem-based management of areas implies that, after a certain area has been defined, sustainable development and use will be established for all activities in the whole area (Douvere, 2008). This key characteristic of ecosystem-based management is central to on-going research on marine policy in the CMP network.

The more holistic way of looking at marine policy has developed into a series of ecosystem-related management approaches, including strategies referred to as ecosystem approaches as well as the ecosystem-based management approach. An ecosystem approach can typically be seen as a monitoring and risk-based approach that is based on understanding ecosystem dynamics and functioning, and that determines how natural processes can be used to achieve the aims of the activity (Bolman, 2013). Ecosystem-based management is flexible and adaptable to the marine activities, incorporates the values of the ecosystems in decision making, which are based on processes applying interdisciplinary approaches, and explores win-win solutions for people, planet and profit (Bolman, 2013).

A specific ecosystem approach was investigated in two case studies, the Celtic Sea and the North Sea (Gascuel et al., 2012). The fleet-based approach was shown to be the pathway to implement an effective ecosystem approach to fisheries management (EAFM) in European seas. First, this approach investigates the health of each ecosystem, based on a reconstruction of long time-series of catches, an analysis of mean indicators or stock trajectories, and an analysis of ecosystem indicators. Second, a fleet-based synthesis is obtained by using indicators of both the ecological impact and the economic performances of the major fleets operating within each ecosystem. Assessment diagrams are derived by combining these two main aspects, showing whether each fleet segment, on average, sustainably exploits the stocks (Figure 5.1). Although results are preliminary because of the poor quality of the available data, the analysis shows that simple indicators can be estimated that clearly highlight contrasts between fleet segments. Such an approach contributes to the evolution from a stock-based to a fleet-based management that reflects the ecological, economic and social pillars of the sustainable development of fisheries (Gascuel et al., 2012).

Figure 5.1 **Fleets' economic dependency in the Celtic Sea and the North Sea compared to their impact on ecosystems**



6 Information flows as a cause of change

The availability of more information becomes more influential in governing conflicting human activities and spatial claims at sea, as well as change in processes, institutions and practices of marine governance (Toonen and van Tatenhove, 2013). A conceptual framework for assessing informational processes related to integrated marine governance has been developed and named 'marine scaping'. Marine scaping serves as an analytical lens, referring to the practice of staging and ordering marine activities in time and space. The marine scaping framework brings together the dynamics of information and the specific place-bound setting of competing claims at sea, and captures change by looking at the interplay between seascape, humanscape and mindscape. The Marine Protected Area (MPA) network of the North Sea was used as a case study to illustrate applications of the framework (Toonen and van Tatenhove, 2013). By showing the process of marine scaping through information, it became clear that specific conditions have frustrated the development of a network of MPAs, including the difficulties in harmonising informational processes at different levels, as well as the lack of clarity about who should be included, what goals should be set and what information is actually needed. However, informational interactions can allow new possibilities at the level of the regional sea (Toonen and van Tatenhove, 2013).

The concept of 'scape' is important in the new vocabulary of contemporary social sciences. Scape relates to global flows of people, information, technologies and money. The ideas move through five imaginary scapes that are fundamental to the current world order. Scape can be understood as a fluid and irregular shape of a field of social practices that is not objectively given but a deeply perspectival construct, inflected by the historical, linguistic and political locations of different sorts of actors, as illustrated in Figures 6.1A and 6.1B (Toonen and van Tatenhove, 2013).

Figure 6.1A **Marine scaping through information (Toonen and van Tatenhove, 2013)**

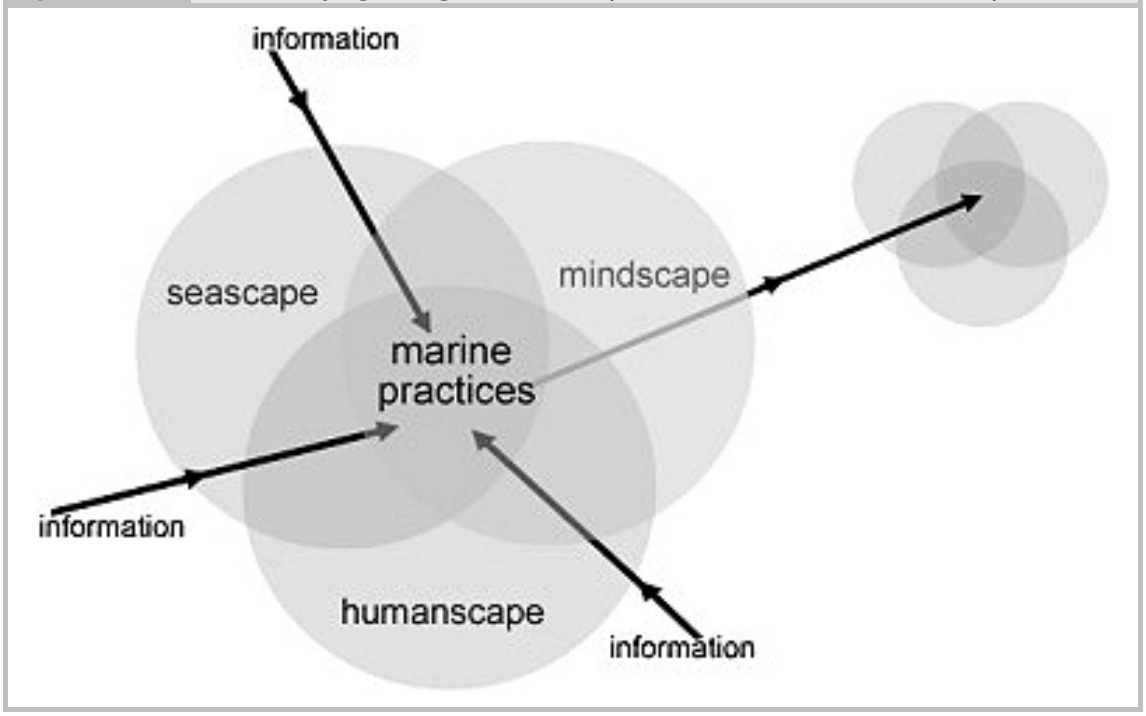
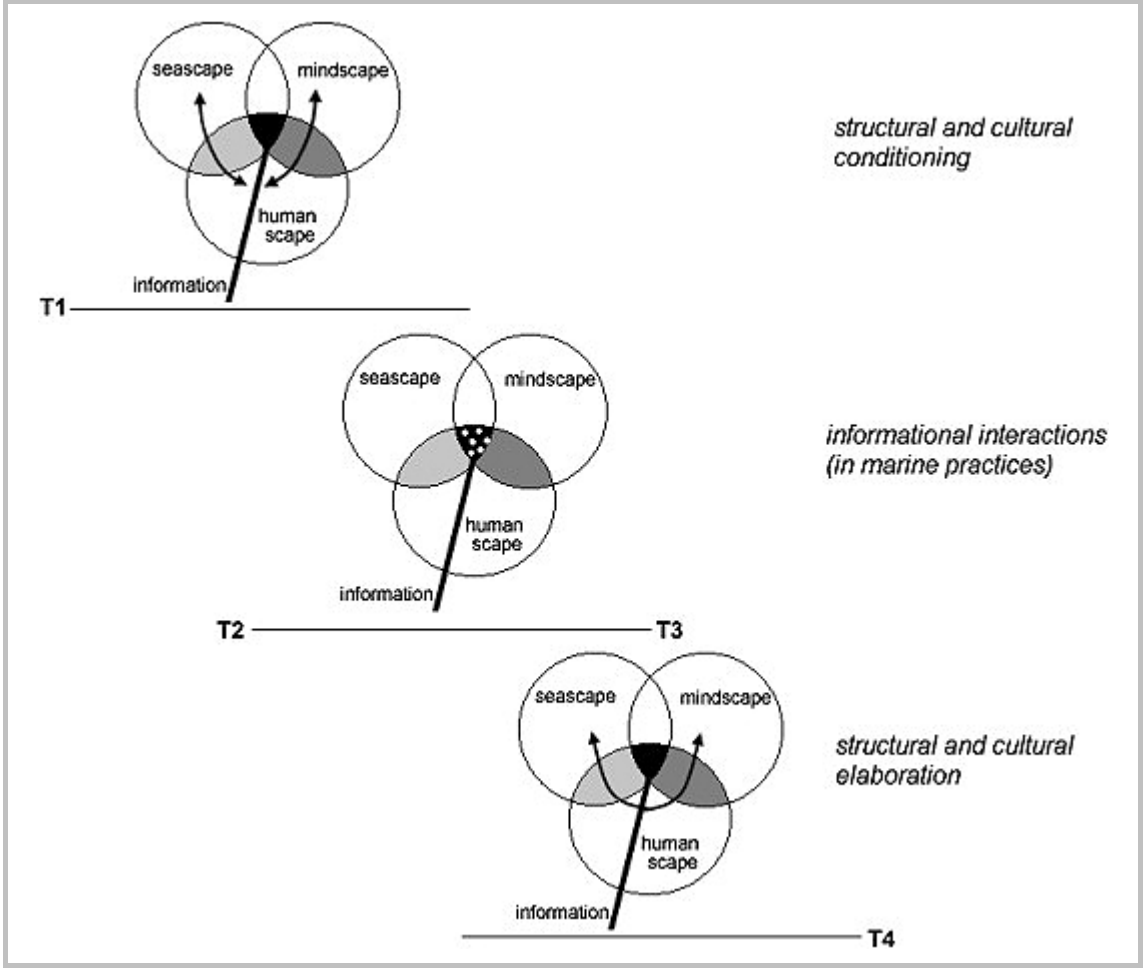
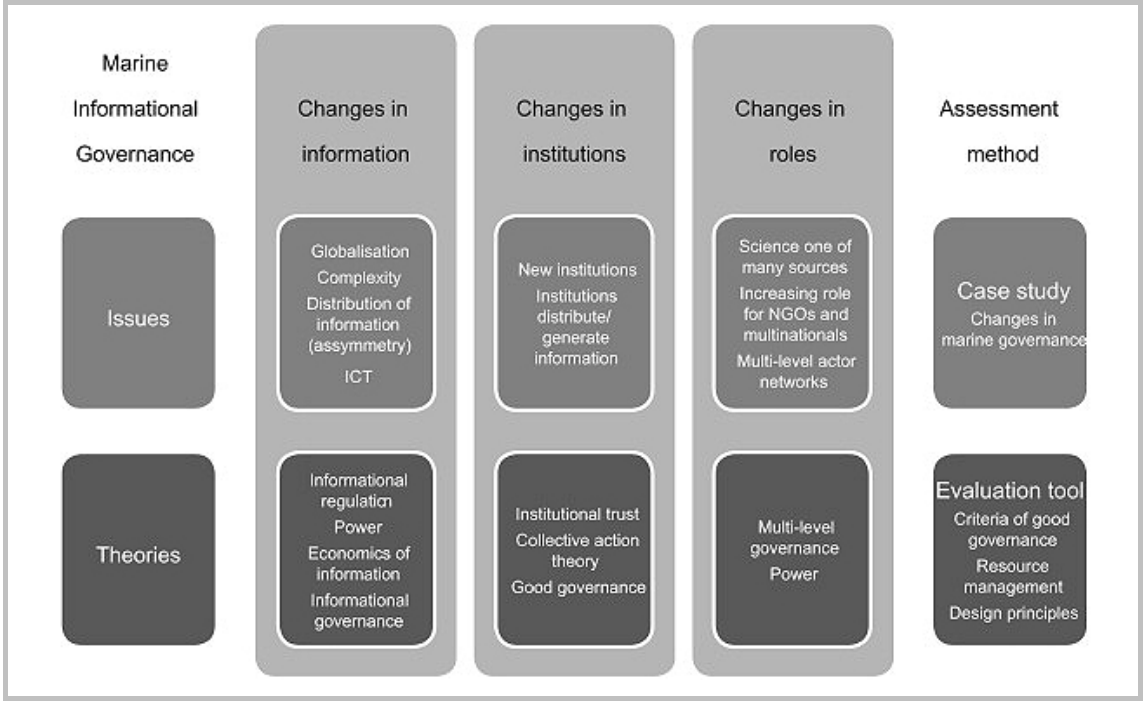


Figure 6.1B **Marine scaping framework, defined by structure (T1), agencies (T2, T3) and elaboration (T4) (Toonen and van Tatenhove, 2013)**



Marine governance involves interaction between networks and actors from different types and levels of organisations (Hoefnagel et al., 2013). The concepts 'multilevel' and 'network governance' no longer assume that national governments are the dominant policymaking unit. At all levels, information is crucial to, for example, overcoming social dilemmas of collective action in marine resource use and management. Informational governance has been introduced as a term linking the increasing importance of information, information technologies and information processes in environmental governance with theories of multilevel governance, collective action, trust and information economics (Hoefnagel et al., 2013). This linking of theories and concepts is illustrated in a framework showing the changing role of information in marine resource management and its impacts on enterprises, institutions and actual practices of governance. The framework in Figure 6.2 can thus help in investigating the effectiveness of informational governance in solving problems related to marine resources (Hoefnagel et al., 2013).

Figure 6.2 **Framework to study informational governance (Hoefnagel et al., 2013))**



7 Integrated participatory modelling

A large share of marine policy research on stakeholder participation has been related to the involvements of stakeholders in defining which variables should be included in theoretical models, or in terms of stakeholder feedback on shaping the theoretical models. More precisely, stakeholders were sometimes asked to give opinions on specific parameters, for instance, in terms of how different aspects were interlinked. The stakeholders were thus included in specific research tasks, which were based on assumptions and paradigms that they were unfamiliar with. As such, participatory modelling developed as an important theme within marine policy.

Participatory modelling is a relatively new approach in European natural resource governance and only a few exercises have been carried out (Pastoors et al., 2012; Röckmann et al., 2012). A variety of types, forms and tools of participatory modelling were identified and tested in four case studies to obtain more experience. These case studies were on 1) the impacts of harvest control rule on Western Baltic spring-spawning herring; 2) improving stock assessments of Central Baltic herring; 3) management strategy evaluation on Mediterranean swordfish; and 4) the impacts of long-term management plans on North Sea Nephrops. Each case study lasted one to three years (Röckmann et al., 2012). Uncertainties were addressed in all case studies and in all cases extensive discussions between scientists and RAC/ICCAT stakeholders took place.

The actual impacts of the participatory modelling work on fisheries management decisions are unclear (Pastoors et al., 2012). The involvement of an 'extended peer community' in the process of participatory modelling has led to mutual learning about the framing of key issues, which again has resulted in more legitimacy, although the learning aspects differed across case studies. At the same time, it is observed that, for instance, an agreed long-term management plan for Western Baltic spring-spawning herring was not agreed despite the participatory modelling efforts and the more or less joint stakeholder recommendations to the policymakers. Notably, this may be explained by the implications of the socio-political context, especially where both the EU and Norway are concerned (Pastoors et al., 2012).

Participatory modelling appears to be foremost an object of research, not an approved method for policy implementation (Röckmann et al., 2012). However, when approaching real-life problems, modelling should not be seen as the priority objective as such. Instead, in a science-stakeholder collaboration, joint problem framing should take place in an open and transparent manner in order to focus on the relevant problems. When people communicate with each other, their ability to understand each other improves (Röckmann et al., 2012).

There is a need for a shared understanding of what the key challenges actually are, as well as of the true ambitions and motivations of the involved scientists and stakeholders (Pastoors et al., 2012). Relevant questions before beginning a participatory modelling process can be (Pastoors et al., 2012):

- Will the participatory modelling contribute to decision-making, or will it be limited to knowledge development?
- What are the main stakes and uncertainties?
- What is the structure of the network? (heterogeneous? centralised?)
- Are there strong disagreements expected on facts or values?
- Are potential participants already familiar with each other?
- Will actors be available for the duration of the project?
- Are any key actors missing?
- Will the available tools be sufficient to serve the modelling process?
- Are the participants sufficiently open to new ways of thinking and framing?

Particularly important to participatory modelling is a good atmosphere that can allow open dialogues to address the uncertainties in a participatory, transparent, clear and understandable manner. Moreover,

transparent two-way communication involving respectful listening is important when reflecting on uncertainties, knowledge gaps and a realistic time frame (Röckmann et al., 2012).

Note that the role of science in the process is crucial to the outcomes. For instance, science can be used as a means to encourage certain policies, or to explore different management scenarios that could be used to underpin the advice from the stakeholders to the policymakers. Openness about the roles of stakeholder interests versus the role of science is crucial to ensure trust among participants (Pastoors et al., 2012). There is also a need to train scientists to make connections between scientific and stakeholder communities. Participatory modelling is built on trust, and building trust takes time (Pastoors et al., 2012). Some stakeholders have only limited time and money, which will influence the participatory modelling methodologies.

Notably, more participation is not always better, as this depends on what the aim is and whether participation is the best way to realise the goals (Pastoors et al., 2012). The socio-political context in which the participatory modelling will take place must be fully understood. In order to understand how participation affects the outcome of a policy process, it is important to assess the links between participation and credibility, and between salience and legitimacy, and to develop a strategy on how to handle these (Pastoors et al., 2012).

Furthermore, an important element in participatory modelling projects involving natural resource management is a clear strategy to evaluate the outcomes. It is essential to monitor and evaluate the process in order to assess the impacts of the work. For instance, Jones et al. (2009) provide a protocol for evaluating participatory modelling projects through the 'protocol of Canberra', which consists of two main components: the Designers Questionnaire (capture the project team's experience and the logic of the design) and the Participants Evaluation Guide (capture the experiences of all project participants). This type of evaluation can assist in making stronger claims about whether social learning, increasing legitimacy and an improved knowledge base have been established in the project.

With thought-through design, participatory modelling has the potential to facilitate and structure discussions between scientists and stakeholders about uncertainties and the quality of the knowledge base. Moreover, it can contribute to collective learning, increase legitimacy and advance scientific understanding. Experiences with integrated participatory modelling are being used in on-going projects on fisheries management. The EU project called BENTHIS (see Appendix) aims to evaluate alternative fishing methods that reduce the impact on benthos. The involvement of stakeholders is required in designing and testing gears, as well as in weighting the pros and cons of alternative methods. To this end, decision support systems are built, using participatory multi-criteria assessment. A comparable approach is being used in the EU project called MYFISH (see Appendix) to evaluate alternative definition of MSY.

8 Stakeholder participation in processes

Stakeholder participation is a central issue for marine developments in general, and for marine spatial planning in particular. The increased centrality of stakeholder participation in marine policy can be explained by several emerging societal trends. One trend is that policies are not targeting single sectors as they used to do, but are providing multi-sector management of seas in specific locations (Douvere, 2008). The expertise within specific fields of research is thus not sufficient, and therefore the need to involve the relevant stakeholders in fine-tuning the use of sea in space and time appears stronger. Another trend is related to the need to ensure legitimacy in decision making processes (Varjopuro, 2008). This is because a policy strategy with societal support is both easier and cheaper to manage. Besides, the role of the state tends to develop into multilevel governance, while the role of science as a prominent source to knowledge is getting weaker (Mol, 2006). Furthermore, the need for public engagement (including dialogues with the public) because of the public's right to take part in its own governance, the need for conflict resolution to provide opportunities to discuss, manage and resolve differences in views and positions, and the need for decision quality in which participation can help identify the most appropriate policy, have been addressed by, among others, Stange (2013).

Successful stakeholder participation can contribute to sustainable marine development if a process-oriented approach is designed to ensure the transparent treatment of different types of information, trust, legitimacy and representation (Goldsborough, 2012).

Important to stakeholder processes is that stakeholders have clear expectations about their role and what possibilities they have to actually influence the outcomes. This is challenging when issues are complex; for instance, in the Dogger Bank process the clarity of expectations was limited because of the uncertainty surrounding Natura 2000. Alternative expectations were raised regarding the degree to which fishing could continue despite the setting up of Natura 2000 (Erfeling, 2012). The unclear expectations led to a high degree of disillusionment especially among fishers. Related to clear expectations is the task of setting clear objectives. In the Dogger Bank process, uncertainty and a lack of knowledge of the marine environment had a negative effect on the degree to which objectives emerged from discussions.

Note that in practice, the stakeholders have limited and discrepant availability of time and resources to be part of participatory processes, which may result in some people, depending on money and time, can influence a lot more than others. It is therefore advised that authorities should make arrangements for the limited resources of stakeholders. For instance, if stakeholders indicate that it is problematic to deal with large amounts of information, resources could be invested to present topics in a more transparent manner (Pastoors et al., 2012).

In the Dogger Bank stakeholder process (Pastoors et al., 2012), several aspects of trust were acknowledged although some trust aspects were absent. For instance, one stakeholder commented: 'I did not enter the process with a high degree of trust. While I trusted the part of the process that related to the port authority [Havenbedrijf Rotterdam], and gained trust in the way in which staff of Rijkswaterstaat participated, I did not trust the fishing aspects.' (Erfeling, 2012)

One challenge for stakeholder participation processes aimed at enhancing sustainable marine spatial planning, is that the stakeholders do not recognise the product as their own product. This is mostly because it is not clear how the researchers have used the stakeholders' inputs throughout the process, and it is often unclear what aspects actually lead to the final recommendations. A lot of this can be solved with more transparency throughout stakeholder processes (Pastoors et al., 2012; Soma, 2010).

Reflecting on coastal zone management and the role of citizens compared with that of stakeholders, environmental policymaking can be challenging because of lobbying by strong private interests (Soma and Vatn, 2010). This results in less consideration about what is best for the wider community. Based on literature that clearly distinguishes between private and social values, research has shown how the framing of the process influences which types of value become legitimate in a particular institutional setting and process. It has been shown that the framing of a process in terms of, for instance, representation (e.g.

representation of a community view versus private interests) and time perspective, is influential to the outcome (Soma and Vatn, 2010).

Questions about legitimacy, transparency and trust also come into play in participatory design processes. One of the objective of the EU project called MERMAID (see Appendix) is to design multi-use platforms at sea (MUPS) that enable the co-production of wind energy and aquaculture. A participatory design process is used to bring science and society together. Case studies in four European waters (including the North Sea) revealed the importance of regional differences at first hand. Prior knowledge and understanding of what MUPS are and could be varied greatly. Participation can create the trust and legitimacy required to build a shared understanding of MUPS, but at the same time requires a priori trust and legitimacy. Existing networks, experiences of participation, and policy history determine how stakeholders enter a participatory design process and cooperate to create a common framing of MUPS.

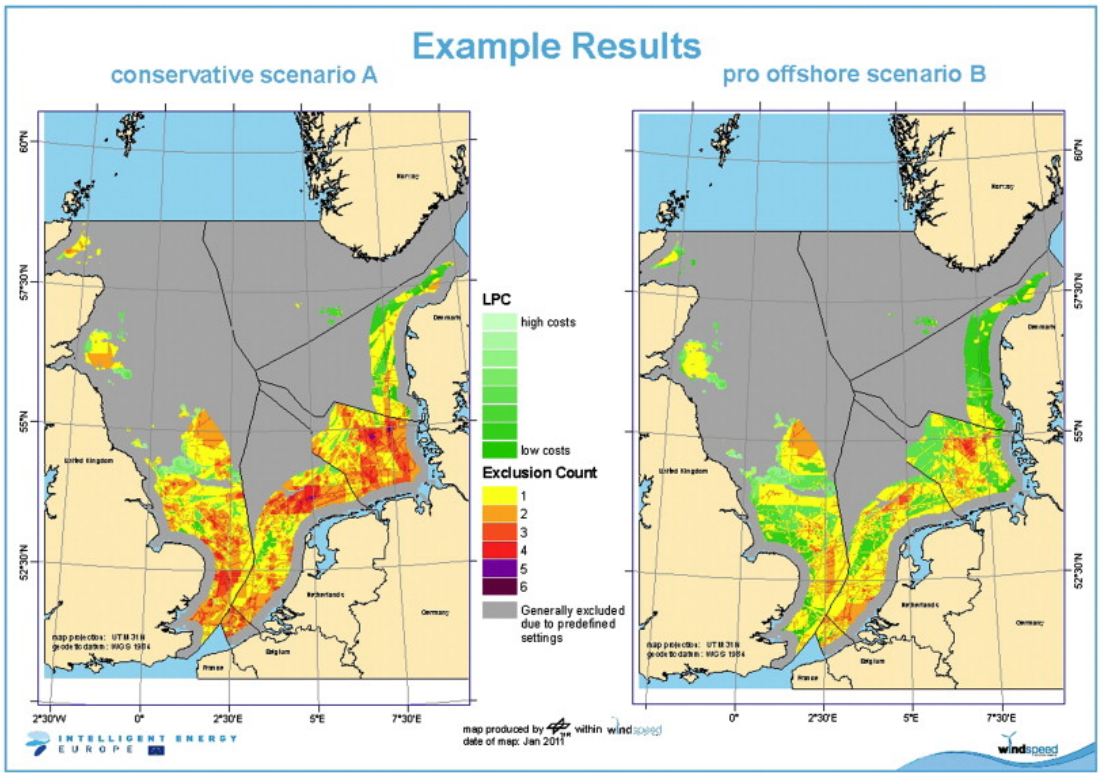
9 Spatial and interdisciplinary focus

Marine policy researchers have also been specialising in spatial mapping techniques to reflect on multidisciplinary issues and as means to provide information in a transparent manner, particularly when discussing future scenarios.

Offshore wind energy (OWE) in the North Sea has the potential to meet a large share of Europe's future electricity demand (Shillings et al., 2012). To deploy offshore wind parks in a rational way, the overall OWE potential has to be realistically determined. This has to be done at an international, cross-border level and by taking into account the existing man-made and nature-related uses of the North Sea. Combining conflict analysis with cost assumptions for offshore wind farms and their expected electricity yield, favourable areas for OWE areas in the North Sea have been identified and shown on maps (see Figure 9.1). This mapping approach can assist in reducing conflicts between offshore wind deployment and existing sea uses in the North Sea for future planning. The results can assist decision makers in developing transnational roadmaps for OWE.

Hence, geographic information systems (GIS) have been used to identify suitable areas for offshore wind parks in the North Sea (Shillings et al., 2012). A series of inputs - such as depth, distance to shore, sea use exclusion for shipping, military zones and nature conservation - were used in a model, and based on the outputs, certain areas were recognised as more suitable for wind parks in two scenarios.

Figure 9.1 **Decision support maps (Shilling et al., 2012)**



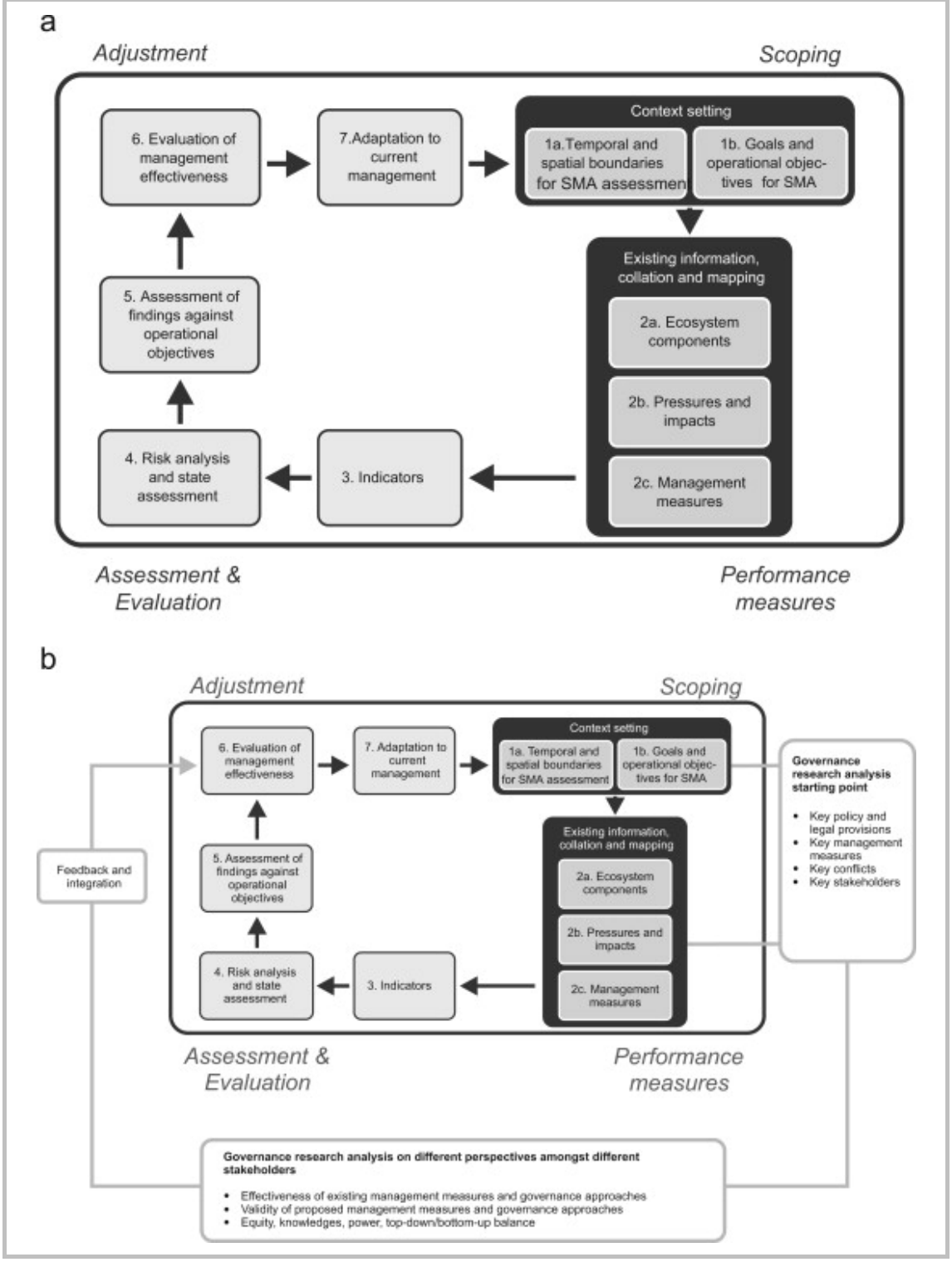
10 Evaluation frameworks for marine spatial planning

While the increased interest in marine policy is expected to continue in the coming years as a result of the increasing demands for space at sea, we face a challenge regarding the combination of very different types of information with different types of stakeholder processes while ensuring trust, legitimacy, transparency and representation. Processes of information gathering occur in interdisciplinary research teams and may lead to favourable spatial presentations of alternatives to marine spatial planning. Given the challenges of finding good ways of presenting different types of information throughout different types of processes with stakeholder involvements and analysis, there is a need for structures. Several EU projects on marine spatial planning are defining frameworks to find appropriate structures that reflect on the different aspects in a transparent manner.

One example of a framework for marine spatial planning is the MESMA framework (Stelzenmüller et al., 2012), which is designed for monitoring and evaluating spatially managed areas (SMAs). The framework provides guidance on the selection, mapping and assessment of ecosystem components and human pressures, the evaluation of management effectiveness and potential adaptations to management. It also provides a structured approach and advice on spatially explicit tools for practical tasks, like the assessment of cumulative impacts of human pressures or pressure-state relationships. The flowchart in Figure 10.1 shows a proposed framework to monitor and evaluate SMAs through seven key steps (Figure 10.1a), and the proposed framework steps and the links to the governance research elements (Figure 10.1b). The seven steps in Figure 10.1a are:

- Step 1: definition of the spatial and temporal boundaries (step 1a). In relation to those boundaries, the high-level goals and operational objectives are delineated for the respective run through the process (step 1b).
- Step 2: identification, collation and mapping of existing information. Step 2a: mapping of ecosystem components relevant to the set of objectives. Step 2b: mapping of pressures and impacts. Step 2c: summary of existing or proposed management measures.
- Step 3: definition of performance measures or indicators together with their reference points.
- Step 4: risk analysis or state assessment.
- Step 5: summary of assessment results against operational objectives.
- Step 6: evaluation of management effectiveness.
- Step 7: summary of assessment results and formulation of recommendations (e.g. alternative management scenarios).

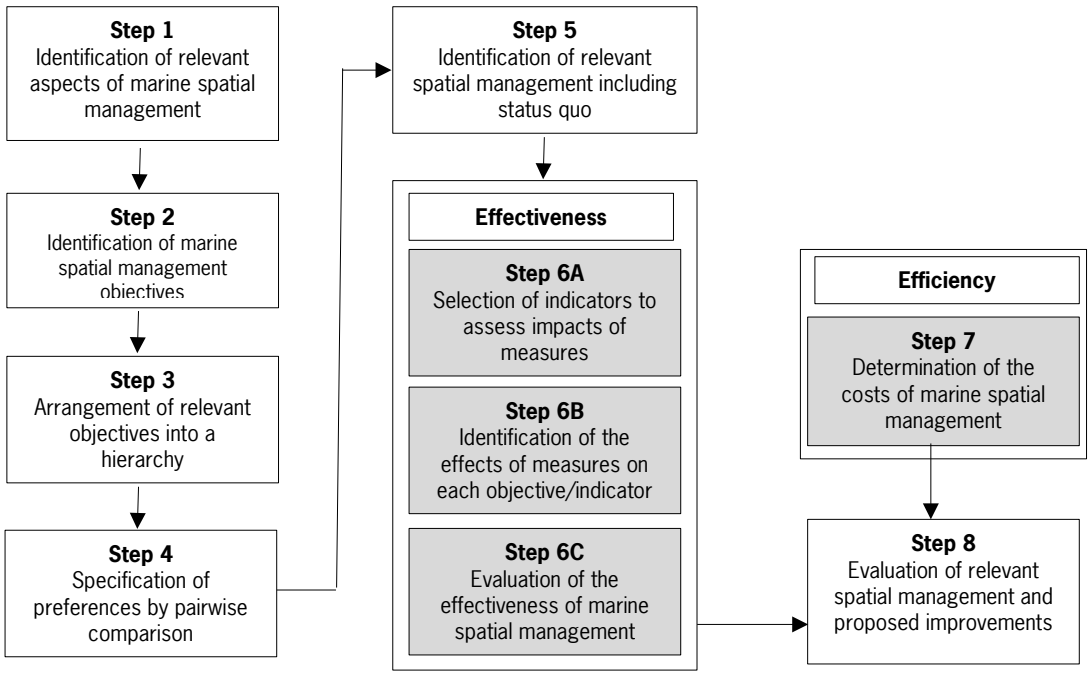
Figure 10.1 **Flowchart (a) shows the proposed framework to monitor and evaluate spatially managed areas (SMAs) through seven key steps, and flowchart (b) shows the proposed framework steps and the links to the governance of research elements**



Another example of a framework developed for marine spatial planning is the Coexist framework (Soma et al., in press), where marine spatial planning is seen as being challenged by complex situations in European countries as a result of multiple interests, stakeholders, management possibilities and contexts. Different types of information, including facts and also information based on experiences, values and interests, can be relevant to policymakers. Management assessments in complex situations require a satisfactory evaluation framework design that can ensure transparent treatment of involvement, interests and the different types of information to make it accessible to policymakers, as well as to identify information gaps and to structure the decision making processes while information is gathered and stakeholders are involved (see also Soma, 2010). The framework is based on the principles of ensuring involvement, transparency and legitimacy when assessing the possibilities. The appearance of these principles in the application process of the framework in six case studies is addressed. Evidently, the coexistence of multiple activities in the long-run will require an adequately encompassed stakeholder strategy in order to arrive at sustainable marine spatial planning in European coastal waters. This is shown in Figure 10.2, where the Coexist evaluation framework is broken down into eight steps:

- Step 1: identification of operational plans and regulations.
- Step 2: identification of marine spatial management objectives.
- Step 3: arrangements of objectives into hierarchies.
- Step 4: specification of preferences according to relative importance.
- Step 5: identification of relevant bundles of measures, i.e. scenarios, including a status quo
- Step 6: (a) selection of indicators, (b) identification of effects and (c) evaluation of marine spatial management.
- Step 7: efficiency is addressed by referring to the costs of each scenario.
- Step 8: the outcomes of effectiveness and efficiency are put together in a final evaluation to propose improvements.

Figure 10.2 **The Coexist framework and the eight relevant steps**



11 Science and knowledge

In the context of marine policy, it has been discussed whether science-based knowledge should be regarded as the only type of knowledge that is useful as decision support, or whether other types of knowledge (such as value-based or experience-related knowledge) should be regarded as equally important also when no evidence can show that it is true. Following this is the question whether science-based knowledge should always be regarded as the complete truth. This discussion is relevant particularly because of all the uncertainties and information gaps in the marine areas.

Knowledge requirements appear in institutional and administrative settings and for the identification of policy priorities, emphasising the importance of strong datasets and knowledge bases (Hommes et al., 2012). However, as was observed in a case study conducted in the Thornton Bank, it is also important to know who will be empowered to decide on trade-offs when objective analyses cannot establish this even when good databases are available. Moreover, it is important to achieve agreements on which existing knowledge will be used, and how, and not only to decide on new data and knowledge requirements.

Stakeholders will sometimes prefer to have information based on clear scientific data, for instance regarding a certain share of area in percentages needed to be sure that certain species are protected in marine areas (e.g. in the Dogger Bank area) (Hommes et al., 2012). However, such information can be difficult to obtain because of high uncertainties about ecological conditions, and may lead to even more unclear answers.

It is a common understanding that MSP has to be based on sound information and scientific knowledge, and planning processes need to evolve with the knowledge and learning of the stakeholders involved, which is often referred to as adaptive management. Adaptive management is based on the view that collective learning should be acknowledged as a process, not a collection of facts and data. During such a process it can be helpful to make a distinction between facts, opinions and interpretations. As there is always a risk that there is not enough information, for adaptive management, two aspects are important in this respect, namely to agree on 1) what knowledge base should be used and 2) how to provide the necessary quality assurance on data and knowledge (Hommes et al., 2012). Hence, with adaptive management decisions can be made also when data are scarce.

Related to the discussion of science and knowledge, the potential ecological effects of cockle fisheries and gas exploitation in the Dutch Wadden Sea and their implications for policy and management have been the topic of vigorous societal debates (Floor et al., 2013). Ecological science has played crucial, but also controversial roles in these debates. Several social science studies have been dedicated to analysing these roles and making recommendations for the improvement of science-policy interactions. Lessons for ecological scientists and policymakers have been drawn on how to understand and guide the interactions of science and policy in Wadden Sea management. Studies addressing science-policy interactions in the Dutch Wadden Sea can be grouped into three main perspectives, emphasising the social and economic dynamics of resource management, the role of nature views and discourses in controversies, and the influence of science dynamics in policy and management debates. The review demonstrates that ecological knowledge and ecological scientists have played important roles in the controversies concerning cockle fisheries and gas exploitation. However, scientific knowledge was not always the most important factor in the decision-making process, and scientific insights were not always used as expected by the scientists. How scientific knowledge is used and interpreted by stakeholders was dependent on their interests and their nature views, and on the dominant policy discourses. Ecological knowledge and scientists themselves became part of the policy debates, for example in discussions on uncertainty and reliability (Floor et al., 2013).

The position of scientists in policy debates was strongly influenced by the policy setting and by changes in this setting, for instance by the operation of mediators or by new interpretations of legal rules. A lesson to be drawn for scientists is that they should reflect on the sort of position (e.g. independent outsider or engaged stakeholder) they take in a debate. They should also be aware that this position is

strongly influenced by the policy context. For government and other stakeholders, an important lesson is that by shaping adequate policy settings they can contribute to more productive and effective interactions with science and scientists (Floor et al., 2013).

12 Concluding remarks

This report addresses some main contributions to research on marine policy issues that were central to the CMP network during the period 2009-13, a lot of which is on-going and will proceed within EU projects and collaboration otherwise.

While regulation at different levels remains complex, some main trends have been observed. For instance, earlier marine policies focused on single sectors, such as the fishery sector. There has been a shift, however, to considering more sectors simultaneously, towards the multi-sector management strategies, encouraged by, for instance, the Marine Strategy Framework Directive (MSFD).

Ecosystem-based management has emerged as a place- or area-based strategy focusing on a specific ecosystem and the range of activities affecting it. The trend of management strategies reflecting on multiple sectors, multiple actors and multiple levels is reinforced by new possibilities emerging from new flows of information by means of new and rapidly evolving information technologies. Research on changing institutional settings - for instance in terms of conflicts, institutional ambiguity, trust or legitimacy - are highly relevant to reflect upon and analyse the observed trends.

Within the CMP network, it is observed that the research focus on stakeholder participation has been broadened. Whereas stakeholder participation has focused on how to improve research techniques and models by getting feedback on uncertain aspects in on-going analysis, it is increasingly acknowledged that stakeholder participation also makes sense if the stakeholders can be part of on-going processes and provide contributions based on their own premises. To reflect on the qualities of stakeholder participation, research on legitimacy, accountability and transparency are central.

Complexities related to the spatial dimensions in particular have resulted in expertise in GIS technologies presenting and analysing trends on maps, as a way to ensure transparency while sharing information. The complexities in terms of ecological and political conditions, reflecting on the importance of different types of knowledge to marine policy, as well as processes of information gathering by means of stakeholder participation and analysis in interdisciplinary research teams, have driven the need to develop frameworks for complex marine management. The examples of frameworks presented in this report are particularly designed to take into account complex matters relevant to marine spatial planning.

Although not all research contributions within the CMP network are reflected on in this report, the briefing demonstrates important research contributions by the CMP network to marine policy in the North Sea in 2009-13. CMP and its projects have successfully established a connection between science and stakeholders by participating in various MSP processes and studying these processes while maintaining its independence. The contributions give a good basis for further research on relevant topics among collaborating partners of Dutch marine research

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Appendix 1

CMP-related research projects

In this appendix we give a brief introduction to the projects that are regarded as CMP-related, and that include two or more partners from the Netherlands (IMARES, LEI, van Hall Larenstein, Alterra, Wageningen University).

A.1 MASPNOSE

(www.cmp.wur.nl/UK/Research/maspnose/)

The proposed MASPNOSE project aims to facilitate concrete, cross-border cooperation among European countries on ecosystem-based maritime spatial planning (MSP), with a focus on the territorial waters of Belgium, the Netherlands, Germany and Denmark. Building on previous and on-going initiatives, the project will explore opportunities for collaboration among North Sea countries and envision an international strategy for the southern North Sea, establishing elements for a common agenda for cooperation of countries in the region.

MASPNOSE will examine in detail the development of MSP in Belgian, Dutch, German and Danish waters while focusing heavily on cross-border issues and opportunities in areas shared by these countries.

A.2 MERMAID

(www.mermaidproject.eu/project/intro)

The EU energy strategy 'Energy 2020' has the objective of reducing greenhouse gasses by at least 20%. To reach this goal, up to 140 GW of offshore wind farms are currently planned. As a result, offshore wind farms will take up large areas of ocean space.

Even though the European Union is well placed to profit from the global growth in aquaculture, the production of the European aquaculture industry has stagnated. Lack of space, access to good quality water and very strict EU legislation concerning the protection of the environment limit the further development of this industry. The premise of MERMAID is that combinations of functions offer benefits for both actors. The extensive offshore developments that will take place within the coming 10 years will have to be optimised in order to reduce the energy costs, to find sufficient ocean space for both aquaculture and renewable resources, and to minimise the negative environmental impact.

MERMAID will therefore develop concepts for the next generation of offshore platforms that can be used for multiple purposes. The project does not envisage building new platforms, but will theoretically examine new concepts, such as combining structures for energy extraction, aquaculture and platform-related transport. Case studies will focus on the North Sea, Baltic Sea, Mediterranean Sea and Atlantic.

A.3 MESMA

(www.mesma.org/)

The EU FP7 project Monitoring and Evaluation of Spatially Managed Areas (MESMA) focuses on marine spatial planning and aims to produce integrated management tools (concepts, models and guidelines) for monitoring, evaluating and implementing spatially managed marine areas, based on European collaboration.

MESMA is expected to supply innovative methods and integrated strategies for governments, local authorities, stakeholders and other managerial bodies for planning and decision making at different local, national and European scales, for the sustainable development of European seas.

At the heart of the MESMA project is the MESMA framework. This framework explores in a logical way how the management initiatives in a certain area were established, so that they can be evaluated and monitored. In cases where no management plans are available, following this framework leads to recommendations for future plans.

A.4 MYFISH

(http://www.myfishproject.eu/)

The new Common Fisheries Policy (CFP) came into effect on 1 January 2013. It aims to provide EU citizens with a stable, secure and healthy long-term food supply. To achieve the objective of the new CFP, the EU fisheries will be managed by multi-annual plans and governed by the ecosystem approach and the precautionary principle. The challenge therefore is to make fishing environmentally, economically and socially sustainable.

Myfish will contribute to the CFP by defining management measures. The concept of maximum sustainable yield (MSY) will be extended and integrated with the economic and social components of the society.

There is no common agreement on the interpretation of the 'sustainability' and 'yield' components of the MSY concept and on the effects that achieving MSY for one stock may have on other stocks and the broader ecosystem, economic system and social system. The Myfish project will address these ambiguities by evaluating different MSY objectives, conditional on different kinds of constraints (ecosystem, economic, social) and with different kinds of management measures to achieve the objectives.

Myfish aims at developing new MSY indicators that can ensure high levels of fishery yield while respecting ecological, economic and social sustainability, thus contributing to the achievement of the Good Environmental Status (GES) foreseen in the Marine Strategy Framework Directive (MSFD).

Myfish will achieve this objective by addressing fisheries in all Regional Advisory Council areas and integrating stakeholders (the fishing industry, NGOs and managers) throughout the project. Existing ecosystem and fisheries models will be modified to maximise stakeholder-approved yield measures while ensuring acceptable impact levels on ecosystem, economic and social aspects. Implementation plans will be proposed and social aspects addressed through the active involvement of stakeholders.

The project will follow a regional approach with case studies in the Baltic Sea, North Sea, Western Waters and Mediterranean Sea, and on wide ranging stocks.

A.5 FIMPAS

(http://www.noordzeenatura2000.nl/index.php?option=com_content&view=article&id=185&Itemid=166&lang=en)

Natura 2000 states that the designation of nature areas, the objectives and the management measures must be scientifically founded. In addition, the management plan must be developed in close consultation with stakeholders and eventually be widely accepted. And that is exactly the reason for establishing the FIMPAS (Fisheries Measures in Protected Areas) project. The project is based on the model of the German EMPAS project.

The FIMPAS project is headed by ICES (International Council for the Exploration of the Seas), as requested by the Dutch government. There is a good reason for this, since the three areas are located outside the 12-mile zone, where the Netherlands has a large measure of control over fishery policy. Although they do lie within the EEZ (Economic Exclusive Zone), this is where the European fishery policy has major control. The management measures related to the fisheries must eventually be incorporated in the Common Fisheries Policy of the EC. Stakeholders from various North Sea countries will therefore also be involved in the workshops in the framework of the FIMPAS project.

Martin Pastoors from the Centre for Marine Policy was the chairman of a group that concentrated on the Dogger Bank. This concerns four adjoining national sections of the continental shelf. The Danish part will not be designated an N2000 area; however, the German, Dutch and English parts will. And these three countries are not in line when it comes to the appointment procedures and preparation of fisheries measures. Nevertheless, the goal is to achieve a uniform management of the Bank. This is very important for the users of the area. Just like in a number of other marine N2000 areas, the porpoises are protected on the Dogger Bank. However, porpoises are opportunists when it comes to geographical distribution: they follow the schools of prey fish. This with the exception of the nurseries: the areas where the young are born, such as the sea region west of Sylt. Because porpoises will not pay any attention to the borders

of the N2000 areas, the ministry is working on an integral species protection plan for the porpoise, parallel to the N2000 procedures.

A.6 ODEMM

(http://www.liv.ac.uk/odemm/about_odemm/)

The challenge: the Marine Strategy Framework Directive deals with the implementation of an ecosystem approach to marine environmental management, and the Habitats Directive contributes to the protection of representative habitats. Human activities may have a severe impact on marine ecosystems. It is therefore important that the conduct and management of such activities (including fisheries, dredging, etc.) are carried out in a way that supports the objectives of the Marine Strategy and the Habitat Directive. The challenge here is to investigate and quantitatively evaluate, specify and propose options and actions for a gradual transition from the current fragmented management of these activities (e.g. fish stock-based regime for fisheries management) to a mature integrated management, including strategies for the implementation of the ecosystem approach at regional level, reconciling short-term economic objectives with long-term ecosystem sustainability objectives.

The objectives: the overall aim of the Options for Delivering Ecosystem-based Marine Management (ODEMM) project is to develop a set of fully-cost ecosystem management options that will deliver the objectives of the Marine Strategy Framework Directive, the Habitats Directive, the European Commission Blue Book and the Guidelines for the Integrated Approach to Maritime Policy. The key objective is to produce scientifically-based operational procedures that allow for a step-by-step transition from the current fragmented system to fully integrated management.

A.7 SOCIOEC

(www.socioec.eu/)

SOCIOEC is a collaborative project that has received funding from the European Union under the Seventh Framework Programme of Cooperation (FP7; Food, Agriculture and Fisheries). The project consortium is made up of 25 partners from 12 countries and is coordinated by the Johann Heinrich Von Thünen Institute, based in Germany. The consortium comprises both stakeholders representative of the fishing sector and experts from three key academic disciplines of fisheries sciences (ecology, economics and social sciences).

SOCIOEC runs for 36 months and aims to perform a comprehensive analysis of the wide range of current and emerging management measures in the current Common Fisheries Policy (CFP). It will develop possible new future measures to be introduced in order to achieve a more profitable and efficient fishing sector that provides sustainable employment, supports society's aims and contributes to societal wellbeing.

SOCIOEC specifically targets the failures of the CFP and works with the people involved in fisheries to prevent future failures.

A.8 VECTORS

(www.marine-vectors.eu/)

VECTORS is a multidisciplinary, large-scale integrated European Project supported within the Ocean of Tomorrow call of the European Commission's Seventh Framework Programme, which aims to improve our understanding of how environmental and man-made factors are impacting marine ecosystems now and how they will do so in the future. The project will examine how these changes will affect the range of goods and services provided by the oceans, the ensuing socioeconomic impacts, and some of the measures that could be developed to reduce or adapt to these changes.

VECTORS will inform the development and implementation of forthcoming strategies, policies and regulations such as the International Maritime Organization Convention on Ballast Water Management, the EU Maritime Policy and the EU Marine Strategy Framework Directive.

VECTORS will also develop a common, spatially-explicit cross-sector model framework (sensu ATLANTIS) that will link all of the key research within VECTORS. A further goal is to produce regular

synthesis reports of the project's progress and results. The implications of the project's findings will be summarised and disseminated to the policymaker and stakeholder audience.

VECTORS will explore the current and future ecological, social and economic consequences of change in the marine environment and is therefore focused on the ecosystem approach in the strictest sense, in which humans are an integral part of the ecosystem. The project believes that the overall aim of marine management is to deliver economic goods and services for the benefit of society while maintaining, enhancing and protecting ecological goods and services.

At the end of the project, a final VECTORS synthesis report will be prepared and made widely available. It will provide firm and detailed recommendations to the full spectrum of policymakers and stakeholders.

A.9 VQS

Every year, the European Commission (EC) sets total allowable catches (TACs) for fish stocks in the EU and distributes portions of the TACs to Member States according to a fixed formula. Dutch fishers cooperate with the government in co-management groups to manage their individual transferrable quota. This is done by leasing and selling quota and by quota exchange between EU countries and Norway, a highly complex system that aims to contribute to an economically efficient quota uptake and a more sustainable harvest of the North Sea stocks by using information technology. The quota swaps are arranged by co-management groups in close cooperation with individual Dutch and foreign fishing enterprises, the Dutch Fish Board, Dutch and foreign ministries, foreign producers organisations and the EC. New features, like electronic fishing logbooks, will be added to this system in the near future. How does the practice of virtual quota swaps contribute to a sustainable marine resource governance and an efficient exploitation of the marine resources? By analysing and assessing the practice of this new mode of informational governance against a set of criteria, this research will provide a better understanding of the changing role of information and information processes in natural resource management.

A.10 GAP2

(gap2.eu/)

GAP2 is an EU FP7 project that runs from 2011 to 2015. The purpose of GAP2 is to demonstrate the role and value of stakeholder-driven science within the context of fisheries' governance. Put simply, we bring scientists, fishers and policymakers together. How we do this ranges from funding exchange trips between research and management organisations, engaging with wider society about fisheries management, to coordinating 13 research projects (case studies) centred upon fishers and scientists working together. GAP2's work is coordinated by an interdisciplinary team across Europe, with expertise ranging from social science to fisheries management. GAP2 is building upon the success of GAP1, an 18-month project that ran from 2007 to 2009, and was also funded by the European Commission's FP7 programme. Among the many and varied outputs of GAP1 were 15 fisher-science partnerships from 11 European countries, which formed the basis of GAP2's case studies. One of the six work packages (WP3) is led by Martin Pastoors, Wageningen University. WP3 also involves a PhD candidate (Kari Stange) based in the Environmental Policy Group, WUR. The aim of WP3 is to establish and demonstrate concepts and mechanisms that will enable the uptake of participatory research knowledge and promote the application of stakeholder know-how to European policies on fisheries and the marine environment. This work focuses on three tasks: 1) analysing the use of shared concepts in transferring the knowledge required for evidence-based policymaking; 2) developing and applying concepts and mechanisms that effectively bridge the gap between different actor groups; and 3) engaging policymakers, stakeholders and scientists in formulating expectations for research needs and contributing to the establishment of mechanisms for the uptake of participatory research outcomes consistent with the needs of the CFP, MSFD and Natura 2000.

A.11 JAKFISH

The legitimacy of the scientific underpinning of European fisheries management is often challenged because of the perceived exclusion of fishers' knowledge and the lack of transparency in generating

scientific advice. One of the attempts to address this lack of legitimacy has been through participatory knowledge development. The JAKFISH project (Judgement and Knowledge in Fisheries Management involving Stakeholders) focussed on the interplay between different actors in constructing the underpinning of policy decisions for sustainable fisheries. We tested participatory modelling as a tool to enhance mutual understanding and to increase legitimacy, and found that it can be instrumental in developing a broader knowledge base for fisheries management and in building trust between scientists and stakeholders. However, the participatory approach may not always work. Through social network analyses, we found that the number of connections and the frequency of interactions between individuals in different groups (science, fisheries, eNGOs, policy) provide an important clue regarding the potential effectiveness of participatory approaches. We used three concepts to evaluate the role of scientific knowledge in policymaking: salience, legitimacy and credibility. In situations with high stakes and high uncertainties, the evaluation of scientific analyses for policy decisions needs to involve a broader peer community consisting of scientists, policymakers, NGOs and fisheries in order to increase the legitimacy of results. When stakes are low and uncertainties are modest, the credibility of scientific results are sufficiently addressed through traditional scientific peer review.

A.12 BENTHIS

(http://www.wageningenur.nl/en/show/Benthic-Ecosystem-Fisheries-Impact-Study-BENTHIS.htm)

BENTHIS is a pan-European research project to study the impact of bottom trawling on the sea bed and all the animals living on or in the seabed. The 5-year project is coordinated by IMARES and carried out by a consortium of leading European marine research institutes, universities and fishing industry partners from 12 countries.

Benthic ecosystems play an important role in the functioning of marine ecosystems. There is serious concern about the adverse impact of fisheries that may negatively affect the fisheries yield and integrity of the sea bed. The Common Fisheries Policy and the Strategy Framework Directive call for an improved scientific basis to integrate the role of marine benthic ecosystems in fisheries management.

BENTHIS will develop quantitative tools to assess the impact of fisheries on the benthic ecosystem and collaborate with the fishing industry to develop innovative technologies and new management approaches to reduce the impact on benthic ecosystems. The diversity of the benthic ecosystem in European waters and the role of benthic species in the ecosystem functioning will be studied. The impact of fisheries will be studied on benthic organisms and on the geo-chemistry. The newly acquired knowledge will be synthesised in a number of generic tools that will be combined into a fishing/seabed habitat risk assessment method that will be applied to fisheries in the Baltic, North Sea, Western waters, Mediterranean and Black Sea. In the North Sea we will focus on the beam trawl fisheries for flatfish and shrimp fisheries. In the other areas the focus will be on otter trawl fisheries for roundfish and Nephrops and shellfish fisheries.

BENTHIS will collaborate with fishing industry partners to test the performance of innovative technologies to reduce fishing impact, and to develop new management approaches and explore the effects on the ecosystem and the socioeconomic consequences.

A.13 MEECE

(www.meece.eu)

MEECE is a European FP7 project that uses predictive models to explore the impacts on marine ecosystems of both climate drivers (acidification, light, circulation, temperature) and human-induced drivers (fishing, pollution, invasive species, eutrophication).

The implementation of the EU's Marine Strategy Framework Directive (MSFD) requires the application of an ecosystem-based approach to the management of human activities. Underpinning the delivery of the MSFD is the scientific challenge of investigating and understanding the sensitivities and potential responses of marine ecosystems, to both climatic change and the direct effects of human activity. If we do not understand how the ecosystem will respond to these multiple drivers, we will find it very difficult to manage marine ecosystems.

Effective knowledge transfer requires communication between MEECE scientists and global users (e.g. policymakers, advisory bodies, research managers, conservation and user groups, management bodies), and results in the production and exchange of existing or new research-based knowledge in decision-making. Key MEECE target groups include decision makers in both science and policy areas, SMEs interested in the application of knowledge, and the public as a whole.

A.14 COEXIST

(www.coexistproject.eu)

The project: this is a multidisciplinary project with 13 partners from 10 European countries, coordinated by the Norwegian Institute of Marine Research and funded by the European Commission's Seventh Framework Programme. Project duration: 36 months; started April 2010.

The challenge: Europe's coastal zones are of great socioeconomic value; however, they are also under pressure to balance competing activities and face potential conflict over space allocation. Stakeholder groups are diverse and represent diverse sectors, particularly fisheries, aquaculture, tourism, wind farm operation and nature conservation in marine protected areas. Above all, there is a requirement to preserve a valuable natural resource and meet environmental protection rules and regulations. This is the challenge the COEXIST project faces.

Project objective: COEXIST will evaluate competing activities and interactions in European coastal areas. The ultimate goal is to provide a roadmap to better integration, sustainability and synergies across the diverse activities taking place in the European coastal zone.

Project results: A roadmap for integration of aquaculture and fisheries with other activities in the coastal zone will be the central output of the project. The ultimate project outcomes will be: characterisation of relevant European coastal marine ecosystems, their current utilisation and spatial management. Evaluation of spatial management tools for combining coastal fisheries, aquaculture and other uses, both now and in the future.

The mission of Wageningen UR (University & Research centre) is 'To explore the potential of nature to improve the quality of life'. Within Wageningen UR, nine specialised research institutes of the DLO Foundation have joined forces with Wageningen University to help answer the most important questions in the domain of healthy food and living environment. With approximately 30 locations, 6,000 members of staff and 9,000 students, Wageningen UR is one of the leading organisations in its domain worldwide. The integral approach to problems and the cooperation between the various disciplines are at the heart of the unique Wageningen Approach.

More information: www.wageningenUR.nl/en/lei

Wageningen UR Memorandum 13-062