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**Research project of the Federal Ministry of Transport, Building and Urban Affairs (BMVBS) and Federal Office for Building and Spatial Planning (BBR)**

**Integrated Coastal Zone Management (ICZM): Strategies for coastal and marine spatial planning**

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**Final report**

**The role of spatial planning and ICZM in the sustainable development of coasts and seas**

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## **Integrated Coastal Zone Management (ICZM): Strategies for coastal and marine spatial planning:**

### **The role of spatial planning and ICZM in the sustainable development of coasts and seas**

#### **Final report**

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## Statement of the BBR/BMVBS

Integrated coastal zone management (ICZM) is still relatively new in Germany both as a philosophy and instrument. As such, it has not yet become common practice at all levels of spatial planning. Aided by EU activity, ICZM had become fully established within research and planning by early 2002. In line with EU demands, federal Government published a stocktake on the coastal and marine environment in spring 2006, which formed the basis for a national ICZM strategy. Federal research projects and the work involved in preparing the report to the EU have significantly contributed to spreading the concept of ICZM and also intensified the debate on ICZM at all levels.

In parallel to the national ICZM debate instigated by the EU, federal spatial planning has recognised the need to take account of changes in the marine environment, moving away from a purely natural to a more developed environment. Legal prerequisites had to be met to allow spatial and regional planning to meet the new challenges posed by developing coastal and marine environments. The federal Spatial Planning Act was amended in 2004, requiring spatial development plans to be drawn up by the Länder for their respective coastal waters. The Exclusive Economic Zone (EEZ) is the responsibility of the federal level, for instance where the designation of priority areas for offshore wind farms is concerned. Planning guidelines for coastal waters and the EEZ will be ready shortly, providing much-needed clarity in spatial policy and a definitive framework for ICZM processes.

In order to develop contributions to the national ICZM strategy from the point of view of federal spatial planning, the BBR and BMVBS instigated a three-year research project, the results of which are summarised in this report. Addressing researchers as well as ICZM practitioners, the report particularly emphasizes the relationship between spatial planning and ICZM, highlighting some significant contributions, but also limitations of spatial planning when it comes to implementing ICZM.

Looking at their basic remit, ICZM and spatial planning are two sides of a coin. ICZM is process-oriented and aims to develop long-term solutions to conflicts of interest in a holistic manner. These sustainable solutions however are not legally binding. Spatial planning, in contrast, is primarily a plan-oriented instrument which is legally binding and which provides a mandatory framework for ICZM processes. It is to be noted that the national context has just undergone change: On 1 September 2006 the reform of the German federal system took effect. Whether this will lead to shifts in competencies and therefore affect ICZM processes will still need to be established.

The basic regulatory framework for spatial development is the result of an intense process of deliberation within spatial planning. Informal instruments such as regional management were recently added to the range of available instruments in order to respond to needs more rapidly and flexibly. Informal spatial planning therefore closely resembles holistic and process-oriented ICZM. This report outlines different definitions of ICZM as well as demands placed on spatial planning in the context of ICZM. The authors conclude that spatial planning is an essential instrument for implementing ICZM.

This report is the latest of a series of publications dealing with ICZM from the perspective of spatial planning. These include a special volume "Spatial planning in the marine environment" published in the BBR series "Informationen zur Raumordnung". Here the focus is on implementing ICZM at the national level. It therefore represents a useful step towards operationalising ICZM and achieving sustainable coastal and marine development. The opinions expressed in this brochure are those of the authors and may diverge from those held by the BBR and BMVBS.

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## Summary

The research project “Integrated Coastal Zone Management (ICZM): Strategies for coastal and marine spatial planning”, was funded by the German Federal Ministry of Transport, Building and Urban Affairs (BMVBS) and the Federal Office for Building and Spatial Planning (BBR) from 2002 to 2006. Conceived to support the development and implementation of a national ICZM strategy, the project took stock of development trends, opportunities, and challenges faced by Germany’s coastal and marine areas and made practical suggestions for implementing long-term ICZM processes from the special perspective of spatial planning. Project results were incorporated into the recently published “Integrated Coastal Zone Management: Assessment and steps towards a national ICZM strategy”, which was drafted by the Federal Ministry of Environment and adopted through cabinet decision on 22 March 2006 (<http://www.ikzm-strategie.de/>)

### The stocktake

One of the most important contributions of the project is a *stocktake* of development trends, opportunities and challenges facing German coastal and marine areas. Spatially, this comprised five coastal Länder, the coastal waters of North and Baltic sea as well as the Exclusive Economic Zone (EEZ). Following a short description of the coastal and marine environment, the stocktake mostly focuses on current forms of coastal and marine resource use as well as their respective administrative and institutional context. Particular attention is paid to global driving forces that influence national trends and developments, such as climate change, global trade or the recent EU enlargement. Although new maritime industries are regional driving forces in their own right, often sparking economic development and technological innovation, such industries are increasingly determined by global forces and international interests. This in turn influences management options available at a national and regional level.

The stocktake served as a baseline for developing some general guiding principles for national ICZM. One of these is that ICZM is best implemented through the principle of subsidiarity. National ICZM should focus on those issues that are of national relevance or require a national solution, regional ICZM on regional issues and so on. Where individual forms of use are concerned, a spatial impact assessment of trends and developments can help to draw out those forms of use for which management needs to be co-ordinated first and foremost at national level and where management would not be achievable on the regional or local level alone. Criteria for assessing the required scale for dealing with developments and spatial trends include:

1. their inherent dynamism,
2. their intensity of development,
3. their likely impact on other forms of use,
4. their absolute significance,
5. the sheer spatial scale of development,
6. their political relevance and administrative context.

High national relevance of trends is given when forms of use:

1. show strong national or regional dynamics in their development,
2. are closely linked to (and likely to impact on) many other forms of use,
3. are highly significant at a political level,
4. have high potential for conflict and are spatially incompatible with other forms of use,
5. have high emotional significance.

Based on an analysis of likely spatial impact, *national German ICZM* must take particular account of the following:

- developments in global trade and corresponding developments in maritime traffic and seaports;
- developments in energy and climate policy, and corresponding plans for large-scale, offshore wind farms, including the necessary cable connections to the mainland;
- development of mariculture,
- developments in marine extractive industries,
- meeting the requirements of European environmental directives such as the designation of marine protected areas;
- meeting coastal protection requirements, especially from the standpoint of global climate change.

The assessment carried out in the project was qualitative and relative, as opposed to quantitative and absolute. It can be supplemented with a description, vis-à-vis coastal zone development, of the decisive driving forces and the identifiable, quantifiable impacts (“drivers and pressures”) on the ecological, economic, and social systems, as was done in the federally funded collaborative research project “Zukunft Küste — Coastal Futures.”

Identifying national focal points is a first step. What matters next is whether different forms of use can actually co-exist in what essentially are limited spaces. This depends on their inherent compatibility, defined here as the ability to share the same physical space. Based on the three criteria scale of development, inherent dynamics and intensity of development, a tentative assessment of spatial compatibility was carried out in this project, using a qualitative and relative approach as opposed to a quantitative and absolute one. Results are described in Glaeser et al. (2004).

### **General guiding principles for ICZM**

The project served to establish a set of guiding principles for national ICZM. Among these is the so-called *systems approach* which treats coasts and seas as an integrated ecological, economic, and social system. Another is the concept of polyculture, which promotes win-win situations for combined forms of use with the help of suitable management instruments.

Different coasts have different needs. Any national ICZM strategy can only serve as a general guideline within the framework of system-oriented implementation on the North and Baltic Seas and must be appropriately tailored to particular, actual conditions. A similar approach is taken in the revised principles and strategies for spatial planning which were published by the BBR in 2006. These promote a much more regional approach to spatial planning, taking into account demographic trends and the disparities that for instance exist between rural regions and metropolitan growth areas. These revised guidelines are a useful framework for developing targeted management measures to meet specific coastal needs.

On the other hand, there are structurally oriented results related to the shaping of long-term ICZM processes and the creation of necessary information and communications structures.

### **ICZM as a cycle**

ICZM at the federal level can only be successful if (a) the activities of the different administrative, sectoral and organizational levels are tightly interwoven, and (b) the exchange between actors at federal-level, state/Länder-level, district and local community level is actually effective. Of crucial importance is the understanding that ICZM is a continuous process — that is, an unbroken cycle from

the initial step of stocktaking, through the development of visions and formulation of goals, up to the elaboration of management proposals, implementation, and monitoring.

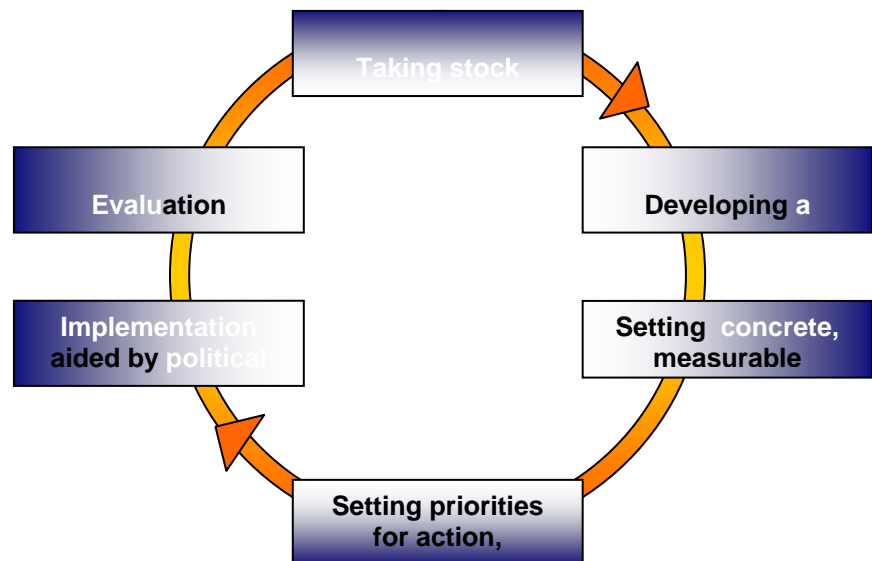


Fig. 1: The ICZM cycle

An effective ICZM cycle needs systematic alignment with European interests and European coastal and marine policy. The EU green paper on maritime policy confirmed many of the concepts developed in the project and referred to ICZM explicitly as a part of a comprehensive maritime policy. A prerequisite however is that spatial planning system must also become more comprehensive, integrating regions, coastal waters and the EEZ in a single conceptual approach. This is obvious when considering that marine resource use has notable impacts on land (and vice versa), irrespective of existing administrative boundaries.

### ICZM and spatial planning

One of the crucial methodological aspects to the project was the investigation of the *relationship of ICZM to spatial planning*. What is the role of ICZM in spatial planning and, conversely, the role of spatial planning in ICZM? The best way to understand this relationship is to take the strategic components of ICZM as a starting point, particularly where long-term visions for coastal and marine areas are concerned. Visions are necessary for the planning of long-term developments and also for creating the necessary management structures, procedures and tools of implementation. The task of generating such visions for the coast is generally delegated to society and does not fall to spatial planning alone. ICZM can therefore be seen as a process which provides a broad conceptual framework. Within that framework, spatial planning represents an important tool for management and minimising conflicts of use.

Another way of understanding the relationship is that ICZM is essentially an informal process designed to facilitate better governance of coastal and marine space. Spatial planning, on the other hand, is a highly formalised approach backed up by a complex legal framework and procedures. Still, ICZM and spatial planning do complement one another. ICZM can only be successful if it is able to account for spatial trends and developments and builds on the specifics of the German administrative system, including formal spatial planning. Spatial planning processes in turn can benefit from the more informal instruments of decision-making that are commonly employed in ICZM.

### **Demands placed on monitoring**

Monitoring trends and developments, as well as the impacts resulting from these developments, is a crucial element in the approach sketched out above. The project developed initial ideas for a monitoring system that links ecological indicators with indicators measuring social and economic impacts. A specific “maritime character” is suggested as a new spatial characterisation. On the one hand, this is defined by the spatial impacts of maritime developments in the sea, for instance in terms of the absolute area covered. On the other, “maritime character” also takes into account the economic impacts and spatial knock-on effects of marine-based developments on land. Factors taken into consideration here include employment opportunities, changes in the capital stock in coastal regions or demographic effects. Most of these can be monitored with existing systems of data collection, leading to a new qualitative description of coastal regions based on sea-land interchange. The seascape itself is also considered in the definition of “maritime character”. The EEZ and coastal waters are viewed as distinct landscapes with specific and often different qualities, including also aesthetic qualities. More detailed results are provided in the final report and the page on monitoring.

### **Intangible project results**

The project results go beyond stocktaking and the elaboration of strategic proposals. During the course of the project a series of events (workshops, conferences) were organised which permitted vibrant exchange between different actors in the ICZM process and which, at the same time, represented different forms of stakeholder dialogue. The dominant theme in every case was the development of a German national ICZM strategy from the perspective of spatial planning. The project therefore defined itself as process oriented, giving special weight and particular attention to the integration of the different administrative levels. In terms of dialogue, all events succeeded in incorporating the concerns of various administrative levels — including island level, coastal district level, regional level and state/*Länder* level, in addition to the German federal level — and gaining the participation of representatives from different sectors. In this sense, the project itself represented an example of implementing core ICZM principles, namely, the promotion of transparency, participation, and informational exchange among all of the key actors involved in the management of German coastal and marine area development.

### **Looking ahead**

From our perspective, the successful continuation of the dialogue is an essential task for the future. Even though a national strategy has now been provided, ICZM in Germany is still in its early stages. Because of international relations and complexities, much is dependent upon whether the integrative approach and the stakeholder dialogue can be transferred to the level of international discourse and European maritime policy. In Germany, implementation can only succeed if the ICZM dialogue between the relevant and responsible actors is set up as a long-term process. This must go hand-in-hand with effective monitoring which takes into account changes in coastal and marine areas *at all system levels*, that is, *holistically*. The identification and management of spatially impacting changes is thus the primary task of spatial planning in terms of German national ICZM.

## 1. Background and project description

In recent years Germany has experienced a lively dialogue on Integrated Coastal Zone Management (ICZM). In large measure this was triggered by the 2002 Recommendation of the European Parliament and Council, which demands that member states implement ICZM in the form of a national strategy. The German ICZM strategy was prepared under guidance from the Ministry for the Environment (BMU) and has recently been submitted to the EU.

Due to growing pressure offshore, spatial planners are also beginning to take a closer look at Germany's seas. Recently, the remit of state spatial framework plans, prepared by the German Länder, was extended to include all inshore waters. At the same time, first steps were taken to develop a spatial planning strategy for the German EEZ. Outside spatial planning, coastal Länder have increasingly taken up the challenge of ICZM and begun to prepare their own ICZM strategies. All these efforts reflect growing concern over the rapid intensification of use, which has been particularly notable in recent years in Germany's offshore areas. Given the long-established planning system on land, it is sensible to look for options that would provide for an inclusive strategy to cover both land and sea as a continuous area. The following basic trends serve to highlight the need for an inclusive spatial planning approach:

- Developments in global trade and linked to these, developments in shipping and port infrastructure,
- Developments in energy and climate policy, resulting in the development of large-scale offshore wind farms,
- Developments in mariculture,
- Developments in marine aggregate extraction,
- Demands resulting from European Directives, e.g. the designation of marine protected areas,
- New demands in coastal defence as a result of climate change.

In Germany, these trends emerge alongside the more traditional coastal and marine uses such as tourism, fisheries and mussel fisheries and lead to entirely new potentials for regional development. In some locations for instance, the offshore wind energy sector has produced significant economic clusters comprising manufacturers, operators, planners and financial services. Such potentials are particularly significant for structurally weak rural regions where options for development tend to be limited.

The sustainable management of coastal and marine systems requires instruments of planning where options for new development can be weighed against existing and expected pressures on ecological, economic and social systems. Principles of ICZM need to be linked to those of spatial planning in order to provide a clear framework for devising and implementing sound management of coasts and seas.

### Project design

Against this background, the Federal Office for Building and Spatial Planning (BBR) and Federal Ministry of Transport, Building and Urban Affairs (BMVBS) funded a three-year research project aimed at developing contributions to the national ICZM strategy and its implementation from the perspective of spatial planning.

The project aimed to carry out a stocktake of coastal and marine uses and associated trends. It also set out to describe the tasks of the various administrative actors involved in ICZM, to suggest potential measures for improving co-ordination between them and, where necessary, to design instruments for implementing co-ordinated action. Another task was to differentiate between the tasks of a national

ICZM strategy, and within it, spatial planning on a national level, and tasks to be carried out at a regional or local level. The project was not designed to develop a general, cross-sectoral ICZM strategy, but took a constructive look at expected key developments facing spatial planning in the medium term. The project explicitly refers to the national level, although links to the international and regional level are highlighted where required.

## The geographical context

The project covers Germany's coastal areas on both North and Baltic Seas including the respective EEZs. On the landward side, the project area is delineated by administrative boundaries or the inland sphere of influence of specific forms of use. Although the project has a clear national remit, it does differentiate between North Sea and Baltic Sea areas since different natural systems, economic and social conditions and international contexts lead to rather different points of departure. The international level is only referred to if it directly bears on spatial planning in Germany.

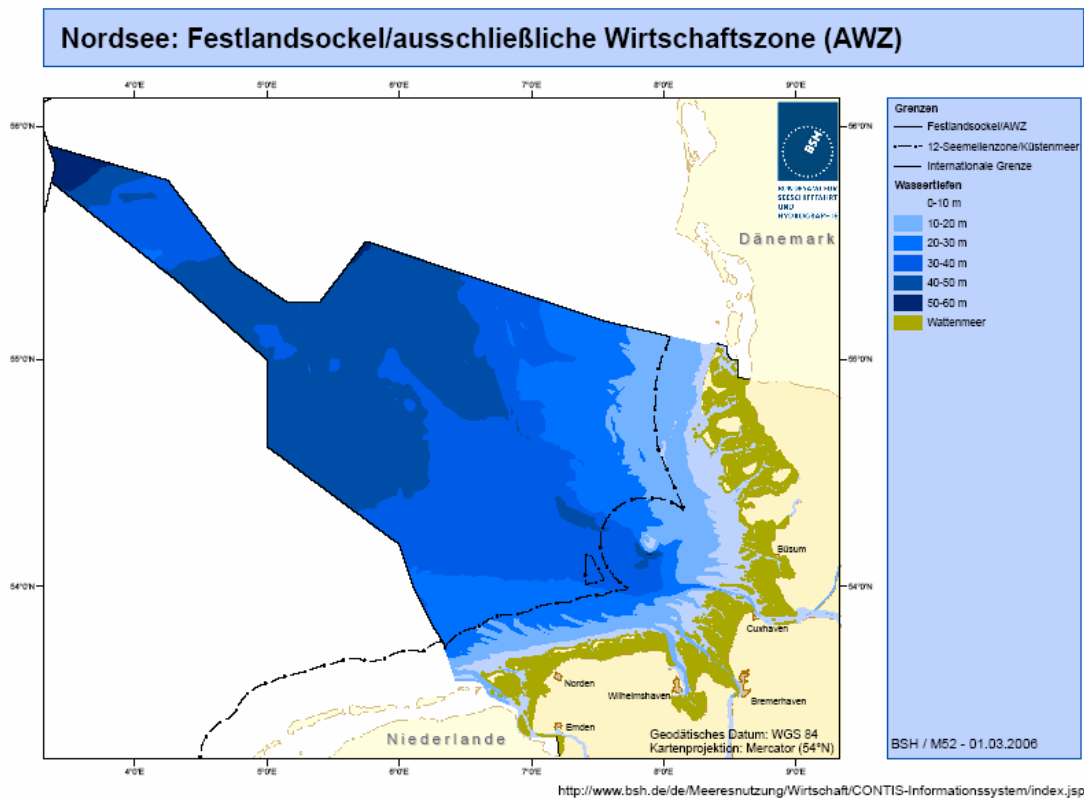


Fig. 2: German North Sea coast and the Exclusive Economic Zone (BSH 2006)

## The project team

The project team comprised the following institutions and scientists:

- Social Science Research Center Berlin (WZB) (Prof. Dr. Bernhard Glaeser, Kira Gee)
- Research and Technology Centre West Coast (FTZ), Bülsum (Dr. Andreas Kannen, Dr. Katharina Licht)
- Institute of Geography, Christian-Albrecht-University, Kiel (Prof. Dr. Horst Sterr)

## **Project structure and timetable**

The project structure closely corresponded to the EU recommendations for establishing a national ICZM strategy in which strategic proposals are based on a comprehensive stocktake in the coastal and marine areas. The stocktake was based on a search of relevant literature and identified sectors, trends, actors, laws and institutions with an influence on Germany's coastal areas. The stocktaking exercise was primarily considered a descriptive snapshot which would yield basic information on key ecological, economic and social parameters on the coast, give an overview of all essential current forms of use and highlights trends and conflicts of use. The stocktake also identifies the administrative, institutional and legal framework of ICZM, with particular focus on existing informal ICZM structures, actors involved in ICZM initiatives and research institutes. The stocktake was updated in 2006 and is now available as a printed report (Gee et al. 2006).

Results of the stocktake were used to identify key issues that different administrative levels will need to take into account both within the existing framework of spatial planning and also as part of any long-term management of German coasts and seas. To rank issues in terms of importance, different forms of use and trends were weighed by the project team according to a specific set of criteria, which allowed issues of national importance to be separated from those of regional or local significance (see also Glaeser et al. 2004). Based on this step, 10 theses were developed, describing core principles and priorities for action which a national ICZM strategy needs to take into account from the point of view of spatial planning (see also Gee et al. 2003). On 23 and 24 October 2003 these theses were discussed at a national workshop at the BMVBW in Berlin, bringing together experts from a range of national agencies and scientists (BMBVW 2004).

In the next step proposals were drafted for a national ICZM strategy from the point of view of spatial planning. These were presented at a second national workshop at the BMVBW in February/March 2005. Both the stocktake and the recommendations were used to develop Germany's national ICZM strategy, a task which was carried out by the Federal Ministry for the Environment (BMU). In August 2005 an expert workshop took place in Leck/North Frisia, where participants fine-tuned demands and discussed instruments and processes required to implement ICZM in a spatial planning context.

In summary, the project comprised the following steps:

1. Internet- and literature-based stocktake of spatial uses and the relevant institutional framework on Germany's coasts and seas;
2. Based on the stocktake, development of initial suggestions on the design and implementation of a national ICZM strategy. Discussion of both stocktake and strategic suggestions at a national conference (BMVBW, October 2003);
3. Final version of the stocktake and recommendations on implementing a national ICZM strategy from the perspective of spatial planning. Discussion of these recommendations and the experiences gained in other countries at an international conference (BMVBW, February/March 2005);
4. Fine-tuning of the recommendations with federal and regional planners, local representatives and scientists at an expert workshop in Leck, North Frisia (August 2005). Update of the stocktake to include recent developments and suggestions for a permanent monitoring programme to trace the effects of marine resource uses on coastal areas.
5. Publication of a final report

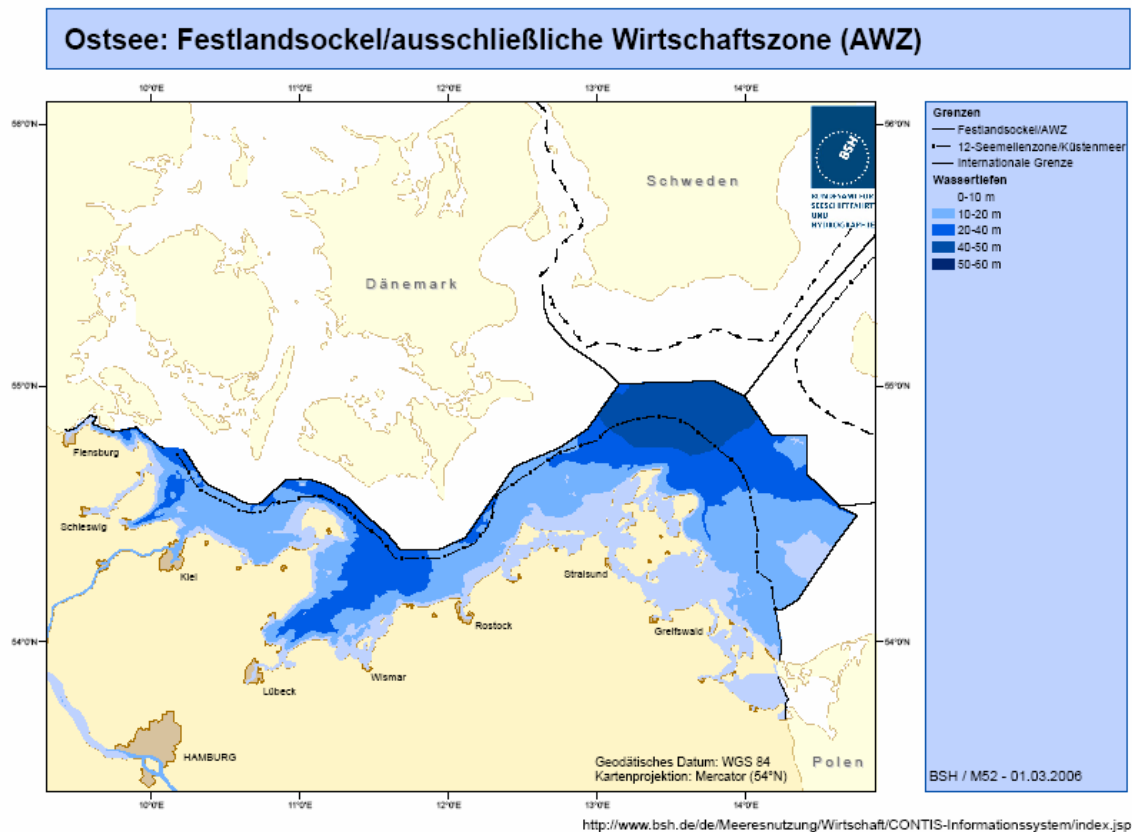


Fig. 3: German Baltic Sea coast and Exclusive Economic Zone (BSH 2006)

## Project reports

Project results are documented in the following reports:

1. Federal Ministry of Transport, Building and Urban Affairs (BMVBS) and Federal Office for Building and Spatial Planning (BBR) (2006): Integrated Coastal Zone Management (ICZM): Strategies for coastal and marine spatial planning. Final report: The role of spatial planning and ICZM in the sustainable development of coasts and seas. Berlin, October 2006
2. Expert Workshop "Implementing visions: Demands placed on instruments and processes of ICZM in the context of marine spatial planning". 15 - 17 August 2005 in Leck, North Frisia. Summary report (in German only)
3. Federal Ministry of Transport, Building and Urban Affairs (BMVBS) and Federal Office for Building and Spatial Planning (BBR) (2005): National ICZM-Strategies – European perspectives and developments. Conference report. (in German with English contributions and an English summary)
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## 2. Germany's coasts and seas: An overview of current trends

Germany's coasts are special in many respects. First is their outstanding ecological importance, highlighted for instance in the designation of both North and Baltic seas as "particularly sensitive sea area" (PSSA). Many other designations abound, covering the coastal strip, inshore waters, in the EEZ, along the Bodden coast and the Wadden Sea. The coast also has significant economic potential. Many new forms of use have recently developed alongside the more traditional forms, with particular focus on offshore industries and technologies. Last not least, the coast is also a place of residence and history whose emotional value can constitute an important driving force for future developments.

The following section is a summary of a more detailed stocktake of current forms of use. Apart from the current state of play, expected trends are listed alongside the most likely potentials for conflict with other forms of use. Where possible at this stage, special issues arising from these trends and challenges for spatial planning are also summarised. This description forms the basis for an overall assessment of trends and analysis of focal points for ICZM and spatial planning, both at a national level and separately for the North Sea and Baltic Sea coasts.

### 2.1 Trends in marine resource uses

#### 2.1.1 Shipping

##### *Current situation*

Although the UN Convention on Law of the Sea guarantees the freedom of shipping movements and prohibits restriction of ships to prescribed routes, shipping corridors constitute important structural elements of inshore waters and the EEZ, ensuring the safe and unhindered passage of ships. Shipping comprises a number of very different forms of shipping and types of ships, such as freight, cruises, ferries, drifting traffic as well as stationary traffic, the so-called roadsteads.

Spatial planning differentiates between inter- and intrazonal shipping. The former comprises shipping movements from German ports and harbours to international waters and neighbouring countries, passage from ports to the EEZ as well as shipping between the EEZ and German coastal waters. The latter refers to any offshore supply runs, military shipping, dumping, sport boats and ferries.

Shipping movements are generally increasing, leading to greater frequentation of important coastal shipping routes and above all the German EEZ. 95% of the global movement of goods and 62% of the European movement of goods is down to seaborne transport. The Baltic Sea, one of the busiest waterways in the world, makes up for 15% of all seaborne trade<sup>1</sup>. The rapid development of the Baltic and Russian sea ports is an important trend for the Baltic, with many coastal cities reconstructing and expanding their port and harbour facilities and developing into important transshipment points for the transport of oil<sup>2</sup>. By 2015 shipping movements in the Baltic are expected to double, although any growth in oil transport will depend on the development of trade with Russia. Tanker size is also expected to rise. For the North Sea similar developments are predicted, based on growth in container, oil and ferry transport. Freight is expected to double by 2015 in terms of number and size of shipped units compared to 2003<sup>3</sup>. In Hamburg and Bremerhaven the transshipment of containers has more than doubled in the last 10 years. In Hamburg, the largest German container port and second only to Rotterdam in Europe, about 8 million standard containers were transshipped in 2005, in

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<sup>1</sup> Rytkönen et al. (2002)

<sup>2</sup> Rytkönen et al. (2002)

<sup>3</sup> SDN (2005)

Bremen/Bremerhaven the same figure reached a little over 3.7 million<sup>4</sup>. The construction of artificial offshore structures such as offshore wind farms, their subsequent servicing and secondary use as well as growth in sport boat use leads to expectations of rising intrazonal shipping traffic too<sup>5</sup>.

Although smaller ports can benefit from growth in intrazonal shipping, it is mostly large ports that benefit from the predicted growth in container shipping or oil transport. In order to make best possible use of these opportunities, ports and harbours need an environment that ensures unhindered shipping and transport of goods. This requires efficient harbour infrastructure, rapid transshipment of goods, safety in navigation and the availability of designated shipping routes. For EU Member States shipping and transport policies represent a framework. For interzonal shipping effective link-ups are required to European transport corridors both at sea and on land. Multimodal interfaces are also helpful in that they can bring together commercial and non-commercial transport uses.

### **Conflicts**

In both coastal waters and the EEZ shipping has to meet environmental standards and respect protected area designations. Nevertheless, shipping has "privilege of spatial use", which brings with it considerable potential for conflict. Conflicts arise with nature conservation (accidents, pollution), offshore wind farming and the maintenance of cables and pipelines on the sea bed. Maximum safety at sea is considered a priority, so if conflicts arise, they are usually resolved in favour of shipping. The position of prime importance is also reflected in German legislation<sup>6</sup>.

Together with the Federal Waterways and Shipping Authority (WSD) the Federal Ministry for Transport, Building and Urban Affairs has developed a so-called Safety Concept for the German Coast, which is continually updated and expanded according to need. Top priorities include the avoidance of shipping accidents and the minimisation and control of any damages. The concept relies on separating opposing streams of traffic through traffic rules, monitoring of traffic by dedicated centres, the mandatory use of pilots, policing, availability of tugs, fire protection as well as control of accidents involving pollutants.

To increase safety before the coasts so-called separation zones have been implemented, which spatially separate ships travelling in opposing directions and also ships carrying different types of load. In the EEZ the responsibility for marking and managing these separation zones lies with the Federal Waterways and Shipping Authority<sup>7</sup>.

A joint accident command was established on 1 January 2003 in Cuxhaven as a competence centre for the prevention of maritime emergencies. A maritime centre of command brings together all relevant information. In its everyday work the accident command acts as a centre of competence for controlling accidents involving pollutants, fire-fighting, emergency rescue and PR<sup>8</sup>.

Marine spatial planning can support the establishment of central nodes for shipping on a small and large scale. Unhindered passage of ships must be ensured. In order to minimise risks, emergency and contingency planning, precautionary measures as well as issues of insurance and liability are important points to consider, particularly in the context of offshore wind farms and other fixed installations. These measures must be designed to minimise the risks of accidents and therefore avoid any negative impacts on ecology and local coastal economies.

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<sup>4</sup> <http://www.bremen-ports.de/evopage/files/2/113828990743d8ecf3819af.pdf> (23.3.2006); [http://www.hafen-hamburg.de/de/index.php?option=com\\_content&task=view&id=2854&Itemid=255](http://www.hafen-hamburg.de/de/index.php?option=com_content&task=view&id=2854&Itemid=255), (23.3.2006)

<sup>5</sup> Buchholz, H. (2002)

<sup>6</sup> Landesregierung Schleswig-Holstein (2005)

<sup>7</sup> [http://www.wsv.de/Schiffahrt/Seeschiffahrt/Ausschliessliche\\_Wirtschaftszone/index.html](http://www.wsv.de/Schiffahrt/Seeschiffahrt/Ausschliessliche_Wirtschaftszone/index.html) (15.2.2006)

<sup>8</sup> <http://www.bmvbw.de/Maritime-Notfallvorsorge-Aufbau-eines-Havariekommandos-.956.htm>

## 2.1.2 Cables and pipelines

### *Current situation*

Laying cables and pipelines on the sea bed is common practice both nationally and internationally. Often, the shortest distance between two end points crosses the sea, and there are added economic advantages from the lack of planning regulations and the simple technique of lowering cables directly onto the sea bed.

Internationally cable and pipeline routes are of increasing significance for the telecommunication and electricity sectors, as well as oil and gas. New marine forms of resource use bring with them specialised needs such as that for high voltage cables or waste water pipelines. The growing economic links in Europe and the liberalisation of the electricity sector is likely to increase the trend towards international cables and pipelines in the sea. NorNed, a high voltage cable planned as early as 1994, is set to lead from Norway to the Netherlands, with 2007 as expected completion year. The debate on a suitable route through the North Sea was led by the Federal Shipping and Hydrographics Agency (BSH). In the Baltic construction of the North European Gas Pipeline (NEGP) was begun, which will transport an annual volume of 55 billion cubic metres of Russian gas through the Baltic Sea to Germany, meeting about half of the current consumption. Construction of the Russian section was begun in Babajewo on 9 December 2005. The pipeline is expected to be operational in 2010<sup>9</sup>. Regionally, product pipelines are set to be of increasing significance, transporting products from offshore installations to the mainland, as well as electricity cables to feed energy generated offshore into the mainland grid. This may impinge on national conservation interests.

The majority of the current conflict potential arises from regional cable and pipeline projects rather than international routes.

### *Conflicts*

International cables are laid in a largely unco-ordinated manner. Damage occurs by cables crossing each other and also by drag netting, and maintenance and removal of obsolete cables is difficult due to the lack of a comprehensive inventory or access to such information. Other issues include damage to ecosystems through the process of laying and maintenance, as well as pollution in case of laying oil pipelines. Conservationists also point to the potentially harmful effects of electromagnetic fields on migratory marine mammals and fish species, requiring measures such as burying cables lower in the sea bed or concentrating several cables in a single route. Feeding electricity generated in offshore wind parks directly into three-phase cables and the laying of empty pipes in parallel to high voltage cables is currently not possible due to technological problems<sup>10</sup>. Ideas of bundling cables, and in particular the use of central nodes to efficiently lead offshore electricity to the mainland in a concentrated manner are therefore open to question.

Connecting transnational high voltage cables to the German grid requires better co-ordination of planning at sea and on land. Also required are suitable entry points equipped with transformers for the 380 and 220 kV nets, grid capacities and new high voltage power lines. This in turn requires approval through spatial planning processes<sup>11</sup>.

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<sup>9</sup>[http://www.aktuell.ru/russland/wirtschaft/nicht\\_teurer\\_aber\\_sicher\\_ostseepipeline\\_baustart\\_1294.html](http://www.aktuell.ru/russland/wirtschaft/nicht_teurer_aber_sicher_ostseepipeline_baustart_1294.html);  
[http://de.wikipedia.org/wiki/Bild:Baltic\\_sea\\_map\\_with\\_pipeline.jpg](http://de.wikipedia.org/wiki/Bild:Baltic_sea_map_with_pipeline.jpg);  
[http://www.handelsblatt.com/hbiwwwangebot/fn/re/hbi/sfn/buildhbi/cn/bp\\_artikel/docid/1002500/STRUCID/200012/PAGEID/20038/index.html](http://www.handelsblatt.com/hbiwwwangebot/fn/re/hbi/sfn/buildhbi/cn/bp_artikel/docid/1002500/STRUCID/200012/PAGEID/20038/index.html) (16.3.2006)

<sup>10</sup>Viking Cable - Ermessensentscheidung für den Klimaschutz. <http://umwelt.landsh.server.de/servlet/is/12482/hg0109.doc>

<sup>11</sup>[http://www.offshore-wind.de/show\\_article.cfm?cid=67](http://www.offshore-wind.de/show_article.cfm?cid=67)

From the point of view of spatial planning cable and pipeline routes need to be concentrated at a national and international level, ensuring also a common spatial orientation. Routes should be as direct as possible and aligned with shipping routes. This has consequences for the planning of offshore wind farms or other zoning approaches, which will have to be set out so as to minimise interference with these straight routes<sup>12</sup>. International co-ordination of activities at the level of Regional Seas is therefore required.

Nationally, co-ordination is required with the Länder in order to determine suitable feed-in points for offshore electricity. These are likely to represent central coastal service centres which combine various functions in one location.

### **2.1.3 Marine protected areas and coastal nature reserves**

#### ***Current situation***

With increasing pressure of use protection of marine ecosystems is becoming more and more important. Due to the high dynamism of the systems involved and the non-stationary nature of some marine fauna the designation of marine protected areas can be difficult. Whilst some species are dependent on certain conditions such as breeding areas, others travel long distances, requiring effective international co-operation for their protection.

Germany is signatory to several international conventions. The most important agreements at an EU level are the EU Birds Directive, which demands the designation of so-called Special Protection Areas, as well as the EU Habitats Directive. Others include the Ramsar Convention for the protection of wetlands, the Bonn Agreement to protect migratory birds as well as special agreements on the protection of seals and whales. All international conventions protect both individual species and their habitats.

Until 2002 Natura 2000 sites, Important Bird Areas and Special Protection Areas were only proposed in coastal and inshore waters. Amendment of the Federal Nature Protection Act in April 2002 also allowed the designation of marine protected areas in the EEZ. Four areas in the North Sea and six in the Baltic have since been formally proposed to the EU as potential SPAs<sup>13</sup>.

In the Baltic Sea HELCOM agreed the designation of special Baltic Sea Protected Areas, which are significant for migratory birds as rest and breeding areas. In the North Sea, the Wadden Sea offers a continuous protected area extending from the Dutch to the Danish coast. In addition to its designation as a National Park, the entire Wadden Sea is also classed as a Particularly Sensitive Sea Area (PSSA) by MARPOL and IMO. In 2005 the Baltic Sea was also included in the list of PSSAs<sup>14</sup>. PSSAs serve to regulate shipping and allow the introduction of appropriate transboundary measures such as requirements for navigation or shipping safety.

Despite the stated difficulties there is a trend towards increased designation and recognition of the significance of marine protected areas. Developments at an EU level and the introduction of an EU-wide marine strategy support this trend<sup>15</sup>. Greater continuity between marine protected areas and coastal nature reserves is planned.

Due to the number of competing interests and high pressure of use, coastal protected areas are often special areas of conflict. Along the entire German North Sea coast the Wadden Sea is of global significance as a unique habitat and breeding area for many species of bird. In Germany the Wadden

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<sup>12</sup> Buchholz, H. (2002)

<sup>13</sup> [http://www.bmu.de/naturschutz\\_biologische\\_vielfalt/natura\\_2000/doc/35487.php](http://www.bmu.de/naturschutz_biologische_vielfalt/natura_2000/doc/35487.php) (15.2.2006)

<sup>14</sup> [http://www.imo.org/Environment/mainframe.asp?topic\\_id=760](http://www.imo.org/Environment/mainframe.asp?topic_id=760)

<sup>15</sup> EU CKommission (2005)

Sea is managed in three National Parks, which are also biosphere reserves and might even become UNESCO World Heritage Sites. The Trilateral Wadden Sea Agreement provides an additional framework for the integrated management of this continuous natural area. On the Baltic coast, Germany has two National Parks at Jasmund and the Vorpommersche Boddenlandschaft, as well as a biosphere reserve on the island of Rügen.

With growing interest in the environment and outdoor recreation, coastal national parks play an increasing role in tourism. For these regions, large protected areas become cornerstones of marketing that can assist in promoting sustainable tourism in the surrounding areas.

### **Conflicts**

Marine protected areas can be sensitive to changes in water quality and other systemic disruptions. Systemic changes can be caused by badly sited offshore wind farms, which in the Baltic Sea could affect water exchange rates and disrupt the natural balance of the system (e.g. salinity). Water quality is also dependant on the nutrient and pollutant intake from rivers and cannot therefore be controlled by coastal or marine management alone. In this context the implementation of the Water Framework Directive (WFD) becomes a key element of successful coastal zone management. Another problem is the potential long-range effects of alterations to the sea bed or abiotic changes for which monitoring and control are all but impossible. In principle, therefore, marine protected areas conflict with all other forms of use that have a negative effect on habitats and individual species. These include sediment extraction, fisheries, dumping, shipping, cables and pipelines, low flight zones, (potentially) offshore wind farming, tourism and (potentially) mariculture.

Spatial analysis can help to determine which conflicts are insurmountable and which can be resolved through appropriate management. Spatial planning needs to recognise the importance of marine protected areas whilst at the same time developing regulatory approaches for new and existing demands on marine resources. Although they need to be designed so as to ensure maximum ecosystem protection, marine protected areas should not exclude new and innovative forms of use as a point of principle.

Zoning and other management concepts in coastal protected areas have led to restrictions of other forms of use, most notably fisheries and tourism. During the 1999 amendment of the National Park Act in Schleswig-Holstein, this led to considerable debate and resistance of the population to the National Park. Indirect factors such as the influx of pollutants or the effects of coastal protection measures are difficult to influence or regulate. In the Baltic Sea region, activities in river catchments or industrial air pollution have an influence on the sensitive marine environment. International co-operation and the implementation of appropriate regulatory measures represent a big challenge in the international areas affected.

Given appropriate management tourism can be compatible with nature conservation objectives. In many cases public participation in protected area planning can lead to greater acceptance of management measures. Because of the particularly emotional nature of the debate, a clear distinction needs to be drawn between real and imagined conflicts in the case of nature conservation.

## **2.1.4 Aggregate extraction and mining**

### ***Current situation***

In many North Sea countries marine sand and aggregate extraction is a growing sector of the economy, yielding up to 15% of the national demand<sup>16</sup>. Given the growing national demand the

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<sup>16</sup> OSPAR (2000)

volume extracted has grown particularly in countries without significant terrestrial deposits. In 2003, Germany alone extracted 704m<sup>3</sup> of sand and gravel in the North Sea and ca. 438m<sup>3</sup> in the Baltic Sea<sup>17</sup>. Marine aggregates are mostly used in coastal defence, in beach feeding schemes and in the construction industry. Most commercially interesting deposits are situated at depths of 6 to 20 m. The total volume of deposits available has not yet been determined, but promising extraction sites have been identified in both North Sea and Baltic on the basis of explorative investigations.

No further extraction is currently planned in German coastal waters. In the EEZ large gravel extraction sites have been granted or are currently undergoing approval. In late 2002 for example, a large field "Weiße Bank" (OAMII) was approved in the North Sea for a period of 30 years.

### **Conflicts**

Sand and aggregate extraction has clear impacts on fisheries, benthic flora and fauna, coastal defence as well as the physical characteristics of the sea bed<sup>18</sup>. Extraction destroys benthic flora and fauna and causes increased sedimentation beyond the actual extraction site. Where influential structures such as sand banks or shallow water areas are affected, water exchange rates and the dynamics of coastal sediment transport can also be negatively influenced. This not only has ecological, but also economic impacts, for instance on fisheries or coastal defence.

In the Baltic Sea sand and gravel are finite resources whose loss cannot be compensated through natural processes. Due to the shallow nature of the deposits particularly severe effects are likely on benthic organisms and therefore the food chain. In Germany, an environmental impact analysis is required for extraction areas exceeding 10 hectares in size or a rate of 3.000 t per year.

Given the high conflict potential of aggregate extraction on land and the increasing scarcity of suitable raw material the importance of offshore extraction is likely to increase. Spatial planning will need to deal with technicalities of extraction, impacts on nature conservation and questions of shipping. Related issues include connections to coastal service centres and ensuring links to transport infrastructure on land.

## **2.1.5 Oil and gas extraction**

### **Current situation**

For many countries oil and gas extraction represent an important sector of the economy. Between 1990 and 1998 the number of oil and gas platforms in the North Sea has grown from 300 to 475, with oil production almost doubling in the same period. The number of pipelines has risen concomitantly, in particular as far as international connections and those across coastal waters are concerned. In 1998, OSPAR estimated that the total length of pipelines connecting offshore platforms to the mainland amounted to 9.700 km in the North Sea.

For Germany oil extraction is of minor importance. Only one oil platform exists in the North Sea, which is situated before the Schleswig-Holstein coast within the Wadden Sea National Park. In 2003 2.2 mio t oil were extracted, representing by far the most prolific oil field in Germany. In 2003 permission was granted for the construction of an oil pipeline across the Wadden Sea, linking the platform to the landing station at Dieksand in Friedrichskoog. Construction was begun in 2005<sup>19</sup>.

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<sup>17</sup> ICES quoted in OSPAR (2000)

<sup>18</sup> OSPAR (2000)

<sup>19</sup> RWE DEA AG –Wintershall AG website

### **Conflicts**

Other than increased pollution risks through accidents, most problems associated with oil and gas extraction arise from installing platforms and pipelines. With a life expectancy of 20 to 50 years, pipelines require continuous servicing and repair, which leads to continuous disturbance of benthic flora and fauna. Bitumen and tar are likely to cause some pollution, as are anti-corrosive substances applied during construction and maintenance.

In Schleswig-Holstein a conflict of interest exists with the National Park, which centres around a principal question of permitting oil extraction within a National Park as well as environmental degradation caused by frequent shipping movements to and from the platform.

The main challenge to spatial planning lies in bundling pipeline routes as much as possible and constructing new platforms in places where pipelines can effectively be routed to the mainland.

## **2.1.6 Open seascapes**

### **Current situation**

Open seascapes are natural landscapes which should be preserved on account of their aesthetic qualities just as natural landscapes are preserved on the mainland. They can accommodate sporadic transitory use, but not necessarily any visible fixed installations. With growing awareness of the finite nature of the maritime landscape and increased access to the sea through recreational pursuits (sport boats, sailing, fishing), demands for preserving such open seascapes are likely to increase<sup>20</sup>. Open seascapes need to be considered apart from new 'cultural seascapes' whose attraction, for instance in the context of tourism, cannot yet be determined. Some technical installations like offshore wind farms have already become tourist attractions in other countries such as the UK or Denmark. Linking such industrial installations to new forms of tourism (e.g. observation platforms, gastronomy) is feasible at least at a theoretical level.

### **Conflicts**

Open seascapes are not currently recognised as something to be preserved in their own right. No instruments exist that allow their protection. Added difficulties arise in measuring their societal significance and prognosis of future use. Because of the lack of designated instruments for their protection, there is a special need for spatial planning to recognise their intrinsic value and consider them equal to other forms of marine spatial use.

## **2.1.7 Dumping at sea**

### **Current situation**

The OSPAR Agreement prohibits the dumping of waste in the North Sea. Exceptions are organic waste from fishing, dredge material, immobile substances of natural origin and, until 2004, ships and platforms<sup>21</sup>. Despite attempts at regulation, the volume of dumped waste is still high. The main sources are commercial fishing as well as tourism in the sea (cruise ships, ferries). Dredge material dumped at sea is mainly derived from dredging rivers, maintaining or widening shipping channels and construction projects. In 1996 a total of 88 million t of material dredged up in the coastal waters and the EEZ was dumped in the North Sea. Between 31 and 67 t (wet weight) was dumped annually in the German Wadden Sea between 1989 and 1997.

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<sup>20</sup> Buchholz, H. (2002)

<sup>21</sup> OSPAR (2000)

Since the majority of dredged material stems from maintaining shipping channels, the total annual volume fluctuates depending on the rates of sedimentation and suspension. It is therefore difficult to predict exactly how much material will be dumped in the German Wadden Sea in future. During recent years the total amount ranged between 40 and 55 million t<sup>22</sup>, with only minor alterations expected<sup>23</sup>. Significant changes are likely to arise from the construction of deep sea ports, which might lead to short-term increases in dredged material.

### **Conflicts**

Drifting waste, whether originating from ships, fishing or domestic sources, represents a problem for animals that can become trapped and also for boats in terms of propeller damage. Waste washing up on beaches represents an aesthetic problem and potentially a health hazard while also affecting coastal ecosystems. In addition, its removal does not come cheaply.

Problems with dumping dredge material arises with short-term increases in volume, for instance with large infrastructure projects, as well as contaminated waste.

Conflicts with dumping dredge material and other waste mainly arise over nature conservation and local water quality and sedimentation. Dumping dredge material also brings with it increased shipping movements out to sea and back.

Working closely with nature conservation interests, the main issue for spatial planning is to make available suitable dumping areas.

## **2.1.8 Fishing**

### **North Sea**

The North Sea is one of the most important fishing grounds of the world. With around 5% of the landed total catch Germany is relatively low in the European league table. The most important commercial fish species include herring, mackerel, cod and pollack. The current crash of cod stocks suggests that the North Sea is generally overfished. In order to prevent further ecological disasters, which would lead to the economic decline of the fishing industry in many regions, quotas have been introduced in certain areas that limit the total allowed catch.

In the German North Sea the shrimp and shellfish industries are of central significance. The annual shrimp harvest amounts to 10.000 t annually, representing a value of 20 to 30 million Euros<sup>24</sup>. In 2004 the total harvest of the German shrimp fishery was 19.221 t. 282 shrimp and flatfish boats were registered in 2004 in Germany, with a total of 12 gross register tonnage and almost 49 kW. 140 fishing vessels specialise in catching groundfish in both North and Baltic Sea. In 2004 the total catch of German fishing vessels landed at German and foreign ports amounted to 132.500 t, which represents an increase of 6.100 t compared to 2003.

### **Baltic Sea**

Because of its special conditions the Baltic Sea represents a unique habitat for both commercial and industrial salt and freshwater species. Fishing is mostly concentrated in the coastal waters. As in the North Sea overfishing is the most significant issue which has led to the introduction of quotas. This

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<sup>22</sup> De Jong et al. (1999)

<sup>23</sup> OSPAR (2000)

<sup>24</sup> OSPAR (2000)

was largely successful, so that only pollack is still considered threatened. For other fish species there is insufficient data to confirm their precise status<sup>25</sup>.

Both in North and Baltic Sea the trend is towards further reduction of quotas and increased management of fish stocks. On the German North Sea coast the number of people employed in the fishing industry shows a steady decline, although shrimp fishing has stabilised in Schleswig-Holstein at a low level. There is a general trend towards reducing fishing fleets, with higher investment in new technology and fishing methods and increased international competition.

### **Conflicts**

The fishing industry is one of the most significant sources of direct impacts on marine ecosystems. At the same time, the fishing industry itself is highly sensitive to the sometimes cumulative effects of other forms of coastal and marine resource use. This leads to highly complex interactions that have not been sufficiently investigated in the North or Baltic Sea.

Despite limits to the Total Allowable Catch many of the important species remain overfished. This is due to the excessive capacity of the fishing fleets, overly efficient fishing methods and increased fish mortality through by-catch<sup>26</sup>. OSPAR estimates that between 30 and 40% of the entire commercial fish stock is removed from the North Sea<sup>27</sup>. Conflicts therefore arise with nature conservation on account of overfishing and subsequent alteration of marine communities, through fishing waste (ghost nets) and disturbance of the sea bed, conflicts between different fisheries because of increased competition and unsustainable practice. Uses that negatively impact on fishing include all those that involve fixed installations with potential impacts on spawning and fishing grounds, installations precluding the free movement of fishing vessels, cable and pipeline routes or the designation of marine protected areas and no-fishing-zones. Also significant are developments at a European level. Growing pressure on remaining resources, the restructuring of EU policy and increasing competition amongst fishermen lead to higher conflict potential and pressure to make maximum use of whatever resources remain.

Spatial planning should seek to support sustainable fisheries in both North and Baltic Sea. Coastal fishing represents an important part of coastal identity and should be stabilised, possibly in collaboration with secondary uses such as tourism. Co-operation with relevant institutions is an important prerequisite for success, as is intense and active participation of the fishermen themselves.

## **2.1.9 Aqua- and mariculture**

### **Current situation**

Aqua- and mariculture comprise the raising of fish, shellfish and molluscs in salt and brackish water. As a form of use it is so far only relevant in coastal waters and not in the EEZ, although possibilities for expansion arise from the secondary use of fixed structures such as offshore wind farms. In the North Sea, only crab and shellfish production is relevant for Germany, concentrating primarily on mussels and to a small degree also on oysters.

Using offshore wind farm areas for mariculture is an option for the future. Pilot installations also exist for closed circulation systems that enable better control of effluent and a reduction of nutrients discharged into the sea. Increased use of the EEZ brings with it additional options for co-use, such as longlines attached to offshore piles.

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<sup>25</sup> <http://www.ibsfc.org/>

<sup>26</sup> OSPAR (2000)

<sup>27</sup> OSPAR (2000)

## **Conflicts**

Mariculture leads to increased nutrient discharge into the sea, the influx of organic matter and a range of biocides, antibiotics and colourings. Another issue is the potential threat of wild species through escaped domestic species and the resulting reduction of the genetic potential. Seed mussels are harvested from natural mussel banks, increasing pressure on this resource.

Similar to fishing, mariculture is also closely linked to other forms of marine resource use and their effects on the marine ecosystem. Spatial conflicts arise from the designation of breeding areas and competition with other forms of fishing, for instance shrimp fishing. Special conflicts also arise with nature conservation over issues of water quality and the discharge of alien substances into marine ecosystems. A main task of spatial planning therefore consists of enabling a maximum degree of co-use and to minimise negative environmental impacts of maricultures.

### **2.1.10 Wind energy and offshore wind farms**

#### **Current situation**

Offshore-Windparks are a relatively recent issue of German spatial planning on the coast. Interest in offshore wind farming has risen considerably with the introduction of financial incentives by Federal Government (Renewable Energies Act 2000, amended in 2004). Especially recently developments have exceeded all expectations. Developments therefore follow trends in other countries, with Denmark and the UK representing pioneers of offshore energy use.

In late 2005 (November) a total of 17.743 MW was generated throughout Germany using just over 17.000 piles. In 2005 wind energy provided around 26.5 Terawatt hours<sup>28</sup>. (TWh; 1 TWh = 1 bn kWh), which provides 4.2% of the country's total energy needs<sup>29</sup>.

A decisive factor for the development of offshore wind energy in Germany was the Renewable Energies Act (EEG) of 1 April 2000, which makes it mandatory for electricity providers and grid operators to purchase and transmit energy generated from renewable sources. The Act also guarantees minimum prices for feeding renewable energy into the grid. It therefore created attractive economic framework conditions for those interested in constructing offshore wind park. The federal strategy for offshore wind energy use<sup>30</sup> suggests a gradual approach towards realising offshore wind potentials in North and Baltic Sea. A start-up phase between 2003/4 and 2007 foresees the installation of pilot parks with a total capacity of 500 MW. By 2010, the first expansion phase will provide up to 3000 MW. By 2030, when offshore wind farms can operate at profit, forecasts envisage up to 25.000 MW of installed power<sup>31</sup>. From a planning perspective, the main obstacle to constructing offshore wind farms has so far been lack of an agreed planning framework for the EEZ and the lack of active management measures. The amendment of the Federal Nature Protection Act and the Marine Facilities Ordinance<sup>32</sup> make it possible to designate marine protected areas in the EEZ and to designate preferential zones for offshore wind energy.

In practice the realisation of offshore potentials is difficult. The current state of the art allows construction of offshore wind farms at up to 40 m depth, effectively restricting them to areas that are already covered by a multitude of other uses such as shipping, fishing, military use and nature conservation.

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<sup>28</sup> ISET-Institut, <http://www.iset.uni-kassel.de/>, 16.02.2006,

<sup>29</sup> BMU (2005): Erneuerbare Energien in Zahlen – nationale und internationale Entwicklung, Stand Dezember 2005

<sup>30</sup> BMU (2002a)

<sup>31</sup> [http://www.bmu.de/files/windenergie\\_strategie\\_br\\_020100.pdf](http://www.bmu.de/files/windenergie_strategie_br_020100.pdf)

<sup>32</sup> Marine Facilities Ordinance (Seeanlagenverordnung - SeeAnlV). Ordinance used for licensing the construction and operation of facilities in the EEZ (<http://www.offshore-wind.de>)

Despite these developments offshore wind farms are amongst the more contentious forms of marine resource use. Critics point towards uncertain effects of fixed large-scale installations on marine ecosystems and the lack of co-ordination with other forms of use when issuing permits. Effects of large-scale farms on migratory birds, whales or fish species also remain unclear.

By March 2006 a total of 31 offshore wind farm projects (27 in the North Sea, 4 in the Baltic) have applied for planning permission. The relevant agency, the Federal Maritime and Hydrographic Agency, has taken into account conflicting interests and societal concerns and restricted acceptable sites to those in deep water (up to 40 m) and a long distance from the coast (>20 km)<sup>33</sup>. As of March 2006, 12 offshore wind farms have received planning permission in the North Sea and two in the Baltic.

In its Strategy federal Government decrees that any expansion of offshore wind farming needs to be environmentally friendly and minimise impacts on nature. To gather relevant data marine research platforms are currently being constructed in the North Sea and the Baltic, with financial support from the Federal Ministry of the Environment totalling 15.3 million Euros<sup>34</sup>.

Annual expansion of wind energy is expected to continue until 2010, although the amount of new installed power will continue to decrease. Since 2003 new installed power on land has decreased considerably from ca. 3000 MW in 2002 to just under 1000 MW in 2005. Until 2010, installed offshore wind power is expected to grow slowly, reflecting the fact that political and technological prerequisites have yet to be created for the effective use of this technology<sup>35</sup>. Predictions for offshore spatial requirements vary depending on the total output and technological developments<sup>36</sup>.

Options for providing structurally disadvantaged rural regions with renewed economic potential are a key factor in the debate on offshore wind farm development. The West coast of Schleswig-Holstein is particularly well placed to benefit from new technologies and secondary effects arising from offshore wind farming. Competition however is stiff, with several ports on the North Sea coast competing for pre-eminence as "offshore wind farm ports" (construction, maintenance, service). These include Esbjerg (Denmark), Husum, Brunsbüttel, Cuxhaven, Bremerhaven, Brake, Wilhelmshaven and Emden. For rural regions, successful use of offshore wind farming to support the local economy will therefore depend on targeted regional planning with a particular view towards infrastructural requirements.

At a European level internationalisation and further liberalisation of electricity markets is expected to lead to denser electricity grids and more links between Scandinavian, British, Irish and continental European grids. This underlines the importance of expanding German grid capacities and creating and using suitable feed-in points.

## **Conflicts**

### *Co-ordination with other forms of use*

Co-ordination of offshore wind farming with other forms of use represents a real challenge for spatial planning. Designating favoured zones for offshore wind farming requires many other interests to be taken into account, for instance mining and access rights to the sea bed, shipping safety, shipping routes, military use, fisheries, nature protection and also underwater cables and pipelines (e.g. telecommunication cables). Potential collisions of oil tankers with offshore wind farms represent a particular concern. Although the coastal Länder have agreed not to place offshore wind farms in the

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<sup>33</sup> BMU (2001)

<sup>34</sup> <http://www.bmu.de>

<sup>35</sup> BMU (2001)

<sup>36</sup> E.g. Buchholz, H. (2002)

Wadden Sea, they do have an interest in placing them as close to the coast as possible to facilitate the testing of relevant technologies.

Various mechanisms of offshore spatial planning are currently being discussed, for instance granting greater autonomy to the Länder, making use of Federal property rights and the granting of long-term leases<sup>37</sup>. For the construction phase seasonal considerations are taken into account in order to minimise negative impacts on the environment. To minimise the risk of collisions scenarios are used to test different mechanisms of prevention, including co-operation with the marine accident command<sup>38</sup>.

#### *Connection to the mainland*

Connecting offshore wind farms to the national electricity grid is a limiting factor since the costs of constructing offshore wind farms are strongly influenced by distance to the mainland, cable routes and the technology used<sup>39</sup>. The best suited areas are those with a distance of up to 50 km from the coast, a water depth of up to 30 m and relatively direct cable routes to a suitable feed-in point on the mainland.

Because of strong nature conservation interests, the idea of multiple cable routes transversing the sensitive Wadden Sea is a problem in the National Park. Current transmission technology places limits on concentrating routes, and alternative routes alongside shipping routes are not always feasible. For future expansion phases the creation of an offshore grid is being discussed<sup>40</sup>. Implementation however will take time since the required technology is not yet available or tested. It also requires co-ordinated planning of projects, requiring more intense co-operation between the participating actors (planners, agencies, operators etc.)<sup>41</sup>. For the wind farms planned in the North Sea options for the best possible bundling of cable have already been discussed.

#### *Expanding grid capacities on land*

Offshore wind energy only makes sense if feed-in points can be provided that are capable of dealing with the output generated. The present grid is unable to absorb large amounts of extra energy from offshore wind farms since feed-in points are relatively distant from the coast and only cover "smaller" initial projects of up to 150 MW<sup>42</sup>. Existing locations with transformers capable of handling both 380 and 220 KV grids are therefore of special significance as central nodal points. Examples of such locations include the nuclear power station at Brunsbüttel or Emden on the North Sea coast.

The expansion of offshore capacities also requires additional investment in the national high voltage grid, most notably an extension of 380 kV power lines both within Germany and to neighbouring states. Suitable routes for new power lines need to be identified as soon as possible since planning procedures can take many years to complete. A comprehensive strategy is necessary to guide the expansion of network capacities and to take into account the expected strong growth of wind energy on land.

Central issues for spatial planning can be summarised as follows:

- Designation of suitable offshore wind energy sites in the EEZ through dialogue with other interests; this has already been achieved;

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<sup>37</sup> BMU (2002b)

<sup>38</sup> Friedrich, A. (2003)

<sup>39</sup> BMU (2001)

<sup>40</sup> <http://www.offshore-wind.de/>

<sup>41</sup> Fachverband Kraftmaschinen, Frankfurt/Main (2001)

<sup>42</sup> Fachverband Kraftmaschinen, Frankfurt/Main (2001)

- Recognition of core impacts and knock-on effects on land (e.g. need for additional high voltage power lines, access to appropriate transport infrastructure, support for secondary industries at coastal feed-in points and concentration of services)
- Making provisions for potential long-term developments, for instance direct conversion of offshore energy into hydrogen. This however would render significant proportions of the necessary grid extension obsolete.

## 2.2 Trends in coastal resource use

### 2.2.1 Development of sea ports

#### *Current situation*

Germany's ports are highly significant as places of transshipment, production and the provision of services. The most important sea ports are Hamburg, Wilhelmshaven, Bremen-Bremerhaven, Rostock, Cuxhaven and Lübeck; smaller ports include Stralsund, Wismar, Saßnitz, Nordenham, Kiel, Puttgarden, Emden, Brake and Brunsbüttel. Directly and indirectly they provide a total of 300.000 jobs<sup>43</sup>. Ca. 45% of German foreign trade passes through its sea ports. Knock-on effects on a local, regional, national and international level resulting from job creation and economic activity are of central importance.

Most German sea ports specialise in the transshipment of particular goods. Hamburg and Bremerhaven are central points of container transshipment, with Hamburg ranking eighth in the world in the volume of containers handled per year. Hamburg also represents a central node of international shipping. Many ports are currently shifting focus to also include passenger traffic. Rostock is a prime example for this, which has developed from a purely freight-oriented port to a modern ferry and passenger port and central gateway to Scandinavian countries.

Globally, the trend is towards further concentration on a few main ports and increased competition for transport chains. Due to growing world trade and the resulting increase in volume transport and turnover ship size is also expected to increase (exceeding 9000 TEU). Large sea ports are the main beneficiaries of these trends, with appropriate logistical and spatial capacities and also connections to a dense feeder and transport network a key requirement for success<sup>44</sup>. On the Elbe River the trend towards larger ships was a key factor in the decision to deepen the river bed to 16 m, providing access to the Port of Hamburg to ships with a tide-independent draught of up to 12.3 m.

By 2010 German maritime transport is expected to grow by 70 to 80 million t per year, benefiting in particular the Baltic sea ports. This is due to the continuing economic growth in the Baltic and Scandinavian countries, improved infrastructure in Mecklenburg, better links of sea ports to the mainland and also rising investments in port infrastructure. Ports are increasingly seen as part of a European transport chain and need to be closely linked to national transport planning as well as TEN-developments on land and at sea.

Future trends include further specialisation of ports and growing ferry and Ro-Ro volume. The development of new technologies can influence logistics in maritime transport. For Germany, significant developments include the construction of a new deep sea port for very large ships in Wilhelmshaven (see box below).

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<sup>43</sup> [http://www.bundesregierung.de/artikel,-50925/Foerderung-der-Maritimen-Wirts.htm#Seeschiffahrtstandort\\_Deutschland\\_staerken](http://www.bundesregierung.de/artikel,-50925/Foerderung-der-Maritimen-Wirts.htm#Seeschiffahrtstandort_Deutschland_staerken)

<sup>44</sup> [http://www.isl.uni-bremen.de/products\\_services/publications/pdf/weltcontainerhaefen.pdf](http://www.isl.uni-bremen.de/products_services/publications/pdf/weltcontainerhaefen.pdf) (2004)

**Box 1: The JadeWeserPort as a response to these trends**

In 2001 the Länder of Lower Saxony and Bremen decided on the joint construction of deep sea port in Wilhelmshaven on the North Sea coast. Key factors in the decision-making process were the good transport links to the mainland and the exposed location, as well as the existing low tide water depth of 18 m. Nautical simulations confirmed that the port can be accessed independently of the tide by container ships with over 8000 TEU capacity and up to 430 m length<sup>45</sup>. Easy access from the seaward transport routes provide the port with important economic advantages due to reduced costs of approach.

Upon completion the JadeWeserPort will be the most easterly deep sea port of the European North range (between Le Havre and Hamburg). Its annual capacity for turnover will range around 2.7 million TEU. The JadeWeserPort will also constitute an important component of the trans-European "Motorways of the Seas". A transport infrastructure concept ensures logistical links to the mainland and within the port. The port does not perceive itself as competition, but as complement to the traditional ports of Hamburg and Bremerhaven. Synergies exist and will be used for mutual benefit. The JadeWeserPort is expected to become operational in 2009, providing significant economic impulses to the wider region through job generation and new start-up companies.

Construction of the port and the effects of its operation on the immediate and wider environment remain contentious issues. Apart from environmental effects concerns have been expressed over noise and increased traffic in local villages and alongside the new transport routes. Others have raised the visual effects of new port structures on the coast. The construction of the planned Jade-Weser-canal linking the deep sea port at Wilhelmshaven to Bremerhaven is also a contentious issue.

**Conflicts**

Dredging existing harbour basins and rivers to make them suitable for ever larger container ships has serious effects on the ecosystems affected. This particularly concerns the consequences of dredging the Elbe and Weser Rivers. Significant compensation measures are required in the context of expanding the Bremerhaven container terminal. In case of container terminal VI for instance former agricultural land is to be turned into ecologically valuable zones.

The standard of oil tankers is another issue on account of the sensitive nature of coastal and marine ecosystems. Due to more difficult conditions higher standards are required in the North Sea.

With rising shipping volume and growing capacities of German sea ports higher standards are required to ensure safety at sea. This is particularly important in the context of fixed structures, which are also expected to become more commonplace. On the Baltic coast navigation aids need to be improved. Overall, the use of pilots needs to become a standard requirement, as does the provision of accident contingency plans.

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<sup>45</sup> <http://www.jadeweserport.de/corvoweb/index.asp?Auswahl=1&Anzeige=39>

## 2.2.2 Coastal defence

### *Current situation*

The term „coastal defence“ comprises both measures to prevent coastal retreat and loss of land (protection from erosion) as well as measures to protect the coast from flooding and storm floods (protection from flooding). For centuries the construction of dykes has been the primary means of preventing loss of land. Dyke construction should not be mistaken as a purely linear measure, but one affecting the entire space surrounding Wadden areas and islands. Disaster management is at the end of the safety chain, which comprises measures to secure dykes, inform local residents and evacuate affected areas. The last point in particular depends on the co-operation of a number of actors.

Centuries of activities and land reclamation have created unique cultural landscapes in the marshes, often with outstanding significance to flora and fauna. Maintaining these habitats, as well as the continued protection of land from flooding, requires active human intervention in natural coastal processes. Dyke construction and maintenance of the existing dyke line, together with measures of nature conservation, is a core task of the federal state and the coastal Länder. Coastal defence is of added importance in the context of sea level rise and increased frequency of storm surges.

For the most part, Germany's North and Baltic Sea coasts are protected by fixed structures (dykes) or strengthened natural elements (e.g. dunes). Mecklenburg-Western Pomerania is an exception to this, with only 12% of the outer coast – amounting to a total of 42 km – is protected by sea dykes. Since dyke construction tends to have negative effects on sediment transport along the coast, sandy coasts in particular are increasingly protected by softer methods of storm surge control. Beach feeding schemes and feeding to construct storm protection dykes are considered particularly environmentally friendly. In Mecklenburg-Western Pomerania 50 km of coast was fed, representing 14% of the outer coastline<sup>46</sup>.

On coasts secured by dykes, particularly in Schleswig-Holstein, salt marshes play an important role in nature conservation and also in the protection of the dyke base. In Schleswig-Holstein they are subjected to a particular management regime, which seeks to balance interests of coastal defence with those of conservation and resolve any conflicts that might arise.

For Federal Government and the Länder, the safety of people living behind the dykes and the protection of their property continues to be of top priority. Lower Saxony alone is set to spend around 50 million Euros annually on the defence of its North Sea coast<sup>47</sup>. Schleswig-Holstein, which is particularly threatened by storm floods because of its low elevation, invests similar amounts in coastal defence a year. From the perspective of the Länder there is continued need for further investment (e.g. elevation of the profile), which needs to be prioritised according to the degree of threat. In Lower Saxony, for instance, 250 km – about one quarter of the entire dyke line – is estimated to be in need of strengthening<sup>48</sup>. At the same time, nature conservation organisations demand that dykes should be abandoned in areas where this is feasible without threat to human settlements. This particularly affects the Baltic Sea coast, where regeneration of salt marshes is a priority for nature conservation. On the North Sea coast maintaining the current status quo and ensuring effective co-operation between securing the dykes and nature conservation, e.g. in the management of salt marshes, is considered a top priority.

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<sup>46</sup> <http://www.um.mv-regierung.de/kuestenschutz> (2006)

<sup>47</sup> <http://www.mu1.niedersachsen.de/master> (2006)

<sup>48</sup> <http://www.eiz-niedersachsen.de/cgi-bin> (2006)

## **Conflicts**

Despite all attempts at management coasts are dynamic environments without a fixed end state. Coastal defence through fixed structures leads to conflicts of use with cable and pipeline routes, shipping, port development as well as oil and gas exploration.

Conflicts with nature conservation rank among the most prominent conflicts for coastal defence. The construction of dykes and other measures alter the physical environment and also influence hydrography and patterns of sedimentation. All of these can have negative impacts on coastal spawning grounds, biodiversity and individual species.

Coastal retreat is an option where suitable areas are available and where acceptance of the population is present. This can be difficult since coastal defence is still a defining principle for many coastal communities. In Mecklenburg-Western Pomerania protection of the Bodden is a key issue, with deficits in research and planning particularly apparent around the area of Darß and Zingst.

General Plans for coastal defence describe all present and planned infrastructure and anticipated measures in the coastal Länder. They evaluate landscape services and functions and also determine actual requirements for protecting human interests through coastal defence. Coastal defence plans therefore primarily serve to balance interests. The new General Plan for coastal defence of Schleswig-Holstein for the first time includes integrated coastal management (IKM) as a basic tenet. IKM is defined as a dynamic and continuous planning process in which decisions are taken on the protection of human life and property vis-à-vis the forces of the sea. Whilst the objective has remained the same, i.e. protection from storm floods, IKM represents an innovative means in this context to reach the stated objective<sup>49</sup>.

Given the likelihood of greater integration of coastal defence with other forms of use the following issues are of prime concern:

- clarification of basic coastal processes and lines of development,
- a systematic evaluation of the effectiveness of coastal defence,
- based on this, a systematic analysis of actual and expected threats,
- development of acceptable and integrative concepts of coastal defence (e.g. the example of Schleswig-Holstein).

### **2.2.3 Agriculture**

Large areas of Germany's coast are described as structurally weak rural regions in which agriculture continues to play a key role. Key issues include the preservation of traditional cultural landscapes and villages not least for as social spaces.

Agriculture is one of the most important sources of excess nutrient discharge into the sea. This is not only relevant in coastal areas directly adjoining the sea, but also in the large river catchment areas. The influence of agriculture on the coastal and marine environment therefore extends far into the coastal hinterland. Because of the all-embracing nature of agriculture and its close relationship to catchment management and the WFD, it will not be considered in detail here.

Suffice it to say that despite the current structural changes in agriculture the sector is likely to remain a significant one for Germany's coastal regions. Reducing the nutrient load of rivers and coastal waters depends on technological advances, efficient use of fertilisers, national and EU policy, subsidies, and

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<sup>49</sup> [http://landesregierung.schleswig-holstein.de/coremedia/generator/Aktueller\\_20Bestand/IM/Information/K\\_C3\\_BCstenschutz/K\\_C3\\_BCstenschutz\\_20IKM.html](http://landesregierung.schleswig-holstein.de/coremedia/generator/Aktueller_20Bestand/IM/Information/K_C3_BCstenschutz/K_C3_BCstenschutz_20IKM.html) (2006)

not least the growth of organic means of production. Considerable deficits exist in the Baltic region in all these respects.

## **2.2.4 Tourism**

### ***Current situation***

In all coastal regions of Germany tourism is one of the most important economic driving forces. In Schleswig-Holstein, the tourism industry represented 4.7% of the total revenue in 2004, with 80.000 people directly and another 50.000 indirectly employed in tourism. Tourism is particularly important in Mecklenburg-Western Pomerania, with gross turnover reaching 3.5 billion euros annually.

Germany's coastal regions are very attractive to holiday-makers. Apart from the natural coastal landscape and the recreational value of beaches and islands, interest is also growing in coastal towns and cities where the refurbishment of old harbour and industrial sites has created attractive spaces directly on the water. Overnight stays are much higher on the coast than in the hinterland: in Schleswig-Holstein for instance 80% of all overnight stays are in coastal districts and islands.

Until the late 1980s German coastal holiday regions experienced a continuous boom. On the West coast of Schleswig-Holstein, the number of overnight stays in the districts of North Frisia and Dithmarschen rose by 40% compared to 1985. More recent developments however indicate declining tourist numbers and new patterns in holiday-making. Responsible factors include cheap competition from coastal resorts abroad, a trend away from traditional family holidays on the coast and more frequent but shorter holidays instead, and also more careful spending. Despite some stabilisation figures for 2005 still show a certain reluctance of holidaymakers to visit Germany's coastal regions<sup>50</sup> ..

Following years of direct competition coastal regions now show increased individual profile and market stabilisation, which is combined with targeted thematic marketing. Coastal regions focus on quality rather than mass tourism and the qualities of the natural coastal environment, emphasizing possibilities for active recreation, water tourism, wellness, camping and culture. Improvements in tourism infrastructure are an issue particularly in Mecklenburg, since the EU expansion not only leads to higher tourist numbers, but also to much direct competition through new destinations<sup>51</sup>.

According to different prognoses tourism is likely to remain the economic mainstay in most coastal regions. Schleswig-Holstein is expected to stagnate or lose out a little compared to a stable situation in Mecklenburg. Key criteria for success are strategies that focus on the special qualities of the landscape and highlight these in marketing campaigns for individual destinations. Apart from price, the most important criteria for choosing holiday destinations are quality of service, professionalism and attractive landscape. Given increasing competition between regions, analysts expect these to become even more important. Another future key for maintaining or increasing tourist numbers is likely to be thematic rather than regional marketing. Apart from those few places that already have a strong image, guests will increasingly look for packages that meet their very specific needs. Tapping into the potentials arising from demographic change is also likely to be a major opportunity and challenge.

### ***Conflicts***

Tourism brings direct and indirect threats to terrestrial and marine ecosystems. Direct threats include disturbance of breeding birds, access to sensitive habitats or destruction of habitats through infrastructure development. Indirect threats include rising amounts of waste water, domestic waste,

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<sup>50</sup> 13.04.2005 Meldung des Tourismusverband Schleswig-Holstein e.V.: Ergebnisse des Sparkassen-Tourismusbarometers 2005, <http://www.sh-nachrichtenagentur.de>

<sup>51</sup> dwif-Consulting GmbH: Landestourismuskonzeption Mecklenburg-Vorpommern 2010 – Kurzfassung, <http://www.wm.mv-regierung.de>

arrival and departure as well as travel to and from destinations. High numbers of tourists, particularly during the summer months, can also lead to social stress and conflicts between residents and visitors.

In all areas mentioned efforts are under way to limit negative effects and to develop joint strategies for the future. These include attempts to lengthen the season and to achieve a more even spatial spread of tourist numbers.

On the other hand conflicts in other fields can have negative impacts on tourism. Bathing water quality and cleanliness of beaches can significantly influence the choice of holiday destinations. Other environmental issues such as high seal mortality, oil spills, algae or marine pollution create a negative image for coastal tourist regions. Large-scale changes to the landscape, such as those incurred through wind farms, also count amongst these.

On the water, recreational boating is a growing trend with large potential spin-offs for smaller harbours. The use of offshore installations such as wind farms for tourism is conceivable, although it is difficult to come up with definitive figures. It is feasible, at least, to develop specific products aimed at these new offshore markets.

Unlike any other form of use tourism affects both sea and land in a complex pattern of interaction. Travel alone means that the impacts of coastal and marine tourism extend far afield. The effects of short-term trends and fashions can be felt by ferries, certain regions or small ports, to name but a few. Spatial planning needs to be aware of these interactions and seek to support the particular strengths of coastal and maritime tourism. Infrastructural consequences of demographic developments in Mecklenburg-Western Pomerania need to be considered as well as the growing interactions with Eastern European countries. Valuable natural and cultural goods, often key factors for maintaining or promoting tourism, need to be safeguarded. This particularly includes the special attraction of coastal landscapes which are often of particular significance for local identity. A good example for this is the unique cultural landscape of the Wadden Sea coast.

### **3. Key issues for Germany's coasts and seas**

From the sectoral overview and the description of trends a number of issues can be drawn that are likely to dominate coastal and marine developments in Germany in the coming years.

#### **3.1 Larger issues**

##### **Growing significance of global drivers**

First of all is the growing significance of global driving forces. It is readily apparent that developments observed on Germany's coasts and seas no longer result from decisions taken by federal Government or the Länder alone. Increasingly, they constitute responses to wider international trends and developments. Some of these international driving forces, e.g. the growing economic liberalisation, are indeed global, affecting for instance the volume of goods and shipping, whilst others, such as international climate policy, are also guided by the EU. The recent eastern expansion of the EU and the development of closer rapports between European countries can also be counted amongst international driving forces, with impacts such as the development of new economic regions, hotspots of technology or transport links.

International drivers such as these herald many opportunities, but also risks. One of these is the gradual shift in powers of decision-making and competencies: On the one hand, global drivers reduce the scope for regional decision-making, on the other, particularly in the context of a Europe of regions, greater autonomy of regions might result in the long term. What is already apparent is that the national level needs to act as a key link and lynchpin between international developments on the one hand and regional developments on the other. National ICZM and spatial planning need to reflect these shifting roles and competencies, both in terms of creating visions for the coast and in shaping tools for ICZM.

##### **Marine forms of use drive economic development**

In terms of sheer pace of development, marine forms of resource use currently far outstrip those on land. In part, these dynamics are driven by international developments, for instance the growing significance of trade across regional seas. Other enabling factors include advances in technology, which have only recently made possible certain forms of use, as well as the run on largely 'unused' space in coastal waters and the EEZ. This combination of factors, enhanced by a favourable political framework, has led to a veritable boom of marine technologies and the discovery that German seas are actually potential industrial hotspots. Dynamics are currently most pronounced in the field of offshore wind energy and mariculture, but there is also considerable interest in expanding ports and harbours along with other central nodes of transport.

The growing economic valorisation of the sea leads to recognition that developments at sea actually constitute driving forces in their own right, with knock-on effects on infrastructure and ecological, economic or social systems at a national or regional level. Marine-based developments can lead to the establishment of new sectors, new technology and jobs. Whilst this has already led to the formation of technology clusters, there is a caveat in that all of these developments depend on international drivers such as markets. They can therefore only partially be influenced by national or regional policy.

##### **Growing pressure on limited spaces and increased potential for conflict**

With growing intensity of use, competition for limited space is likely. Significant pressure will be experienced in coastal waters and the EEZ, where established forms of use are set to grow alongside more recent uses, such as the oil and gas industry, the construction of international pipelines, offshore

wind farming, the development of different forms of mariculture and the implementation of marine protected areas. Other innovative uses are likely to follow suit or expand as a result of these, for instance electrolysis to obtain hydrogen or the construction of artificial offshore islands.

None of these developments, however, should detract from the fact that Germany's coastal and marine areas are of outstanding ecological significance. The Wadden Sea and Baltic Sea coasts are unique and sensitive ecosystems whose international significance is demonstrated in a wide array of national and international designations. Both North Sea and the Baltic were designated "Particularly Sensitive Sea Areas" (PSSA); in addition, a broad network of marine protected areas is currently being developed as part of Natura 2000. Whilst this is a safeguard for essential ecosystem services, it also highlights the fact that in some areas ecology must take clear precedence over other forms of use.

Which forms of use can co-exist in what precise format or extent is a matter of debate. What is clear is that some mechanism needs to be established to weigh up different spatial demands against the objective of sustainable development. Some form of prioritisation is inevitable. One tool to assist with this is environmental impact assessment. Another tool to implement priorities is the designation of priority areas (as has been done in case of offshore wind farms). A third, more geared towards spatial planning, is to assess spatial compatibility of uses (see chapter 5).

### **Growing interconnectedness of land and sea**

Intensification of marine resource use can only sensibly take place if it is complemented by structural adjustments on land. Planners can no longer afford to view land and sea as separate entities, but must seek to recognise both interdependencies and cause-and-effect relationships. This works both in a positive and negative sense and is linked to the degree of influence exerted by forms of use, the overall concentration of pressures and the sensitivity of the underlying systems. A good example are the many knock-on effects of offshore wind farm development, which are not only felt at the level of marine ecosystems but also in regional and national economic systems (for instance job generation), social systems (e.g. in-migration of young, highly qualified persons) or political systems (e.g. policies supporting the development of secondary technologies). Another example are so-called coastal service centres, mostly towns or cities that bring together the necessary services for offshore industries and provide most of the supporting infrastructure. Examples include the servicing of offshore installations (including the maintenance of offshore wind farms), transport to and from natural and artificial islands and platforms, emergency rescue, tourism, electricity cables and grid connections, road and rail intersections and associated industrial areas. Again, there are considerable potential knock-on effects in the surrounding region in terms of new jobs, communal services or the development of secondary industries.

The example of coastal service centres illustrates an important principle. Other than ecological impacts, which are not considered in any detail here, economic and social effects of new marine uses such as offshore wind farming become tangible only on land. Effects might be visible directly in the coastal service centres or the surrounding regions, along transport corridors or possibly in entirely different locations such as distant economic centres. This interconnectedness of marine and terrestrial resource use is a key point for spatial planning: A holistic perspective is required which regards land and sea as a true continuum and an entity which requires holistic, long-term strategic spatial planning.

### **The danger of new disparities**

Different areas of coast significantly differ in terms of ecological, economic and social systems and also in terms of basic infrastructure. This leads to specific potentials and constraints, which influences their ability to make use of new opportunities. At a regional and local level, this leads to a tendency

towards greater structural disparities, reflecting the rather different fortunes of peripheral coastal regions and urban coastal centres and different opportunities presenting themselves for cities and rural environments. Investments in port infrastructure and European transport networks leads to strong growth and secondary expansion of infrastructural nodes, whilst rural regions continue to be affected by depopulation and/or the decline of traditional industries such as agriculture or fishing. New economic focal points are now developing in tourism or offshore wind energy, but these tend to be highly localised with little impact on the hinterland. Factors that influence a region's ability to make use of opportunities include links to transport and communication networks, access to infrastructure, the ability to encourage industrial clusters or the ability to make use of suitable alternatives such as nature-based tourism. Infrastructure must therefore be a priority for coastal spatial planning at all levels.

Given the increasing density and intensity of use, social tensions amongst the coastal population might also increase, especially where structural problems and disparities remain in place. Tensions might develop in the Baltic region due to structural processes of transformation and the loss of key EU subsidies. Sometimes, tensions arise from a sense of powerlessness and lack of involvement in decision-making. Approaches exist to increase public participation in planning processes, but often the basic mechanisms and original reasons for conflicts are neglected. Coastal reasons are traditional places, and established patterns and traditions are all too often insufficiently considered. This is less of a trend but a clear need, which should be considered in any future ICZM approach.

### **The special case of transport**

A particular challenge is the development of a truly European transport infrastructure, which is currently promoted through the trans-European network initiative (TEN). For Germany, the main issue is how to link developments of such transport infrastructure to the coastal areas on both Baltic and North Sea. In September 2001 the European Commission suggested the creation of so-called "Motorways of the Sea" as new main transport routes between Member States. Conceived as a real alternative to transport on land they form integral parts of the Trans-European Network for Transport, which aims at providing an integrated and intermodal logistical chain for roads, railways and waterways. Motorways of the Seas are designed to shorten transport routes, making transport more efficient and relieving transport corridors on land. For Germany the Baltic Motorway of the Sea is particularly relevant since this will form a connection between the Baltic and central and western European Member States and also take in the route through the North Sea – Baltic Sea channel. The EU makes clear that industry, Member States and the community need to work together in order to make best use of these new possibilities and render the Motorways of the Sea attractive and easy to use. Essential criteria to promote these new routes to the users include concentration on few routes, efficient timing, support of all actors involved in the transport chain for the new project and high quality of services.

### **Climate change as a key challenge**

The IPCC Third Assessment Report (2001) points out that climate change must now be considered a reality. Associated with sea level rise and increased storminess, climate change represents a driver of global significance, with notable impacts on all coastal systems and little potential for influence. Impacts will be felt in terms of the ecology of coasts and seas, the potential for human resource use, economic development, social infrastructure and societal processes. Although climate change implies long-term change, certain effects such as increasing storminess will probably become apparent sooner rather than later.

It is difficult to predict just what this will mean for Germany's coasts and seas. A range of analyses have confirmed the relevance of climate change and described consequences for natural, cultural and economic coastal systems on the coast. Effects of sea level rise are often calculated on the basis of population density and the economic value of coastal spaces; other forms of imagining some likely consequences include the discussion of scenarios based on different levels of change. One obvious consequence of sea level rise is a new debate of coastal defence. Although the principle of defence is not being questioned, there are technical limits to increasing the height of sea dykes. For this reason, 'soft' forms of coastal defence are now being discussed, no longer insisting on a comprehensive defence of the entire coast but rather focusing on the protection of settlements and essential economic areas and the provision of contingency planning. A more flexible approach to coastal spatial planning is likely to be an outcome, meaning that the status quo of coastal areas can be adapted to developing conditions.

Dealing with the uncertain effects of sea level rise on coastal and marine areas is one of the most challenging tasks facing marine and terrestrial spatial planning.

### **3.2 Specific focal points for different areas of coast**

Issues common to all German coasts are coastal defence, jobs and environmental protection. At the same time, different priorities are likely to emerge for different areas of coast depending on the ecology, the specific mix of uses and the economic and social context. On a smaller spatial scale, different points of departure are exemplified by structurally weak rural regions and structurally stronger centres of development. On a larger spatial scale, North Sea and Baltic Sea can also be considered cases apart. Although they are equally affected by certain trends (e.g. global drivers), some of their issues require different priorities for management. The following section outlines some of the specific focal points for ICZM and spatial planning.

#### **Focal issues on the North Sea coast**

In the North Sea region protection of the Wadden Sea and its extensive ecosystems functions must be considered a top priority. Securing these functions and preserving the internationally designated protected areas must take precedence over other forms of use. Threats to the Wadden Sea include direct and indirect sources, including tourism activities or fishing in the former and discharge of nutrients or pollutants from rivers in the latter. Shipping accidents rank among the most significant potential threats both to the ecology of the Wadden Sea and to tourism and its associated economy. It is not certain what impact large-scale forms of use in the EEZ will have on the Wadden Sea ecosystem. This particularly concerns the cumulative impacts of several wind farms due to be constructed in the EEZ. In terms of planning, the precautionary principle should therefore be employed.

Offshore wind energy is a key industry for the German North Sea coast, with enormous potential for growth. Regions compete for pre-eminence in the sector and attempt to attract as big a slice of the cake as possible. Regional valorisation depends on the degree to which production of components, the construction of wind farms and their operation takes place in the region itself rather than being externalised. Coastal regions therefore have considerable interest in attracting not only primary industries, but also spin-offs arising from offshore wind farming, such as technology, education and services.

Tourism in the North Sea region is largely dependent on the Wadden Sea and North Sea islands on account of their aesthetic landscape qualities. Conflicts can arise from structural changes to the

landscape, for instance installing large-scale offshore wind farms in coastal waters, as well as the loss of traditional elements of the cultural landscape, for instance working fishing vessels or villages.

The construction of a new deep sea port at Wilhelmshaven and the debate surrounding deeper channels on the Elbe and Weser rivers demonstrates the importance of shipping and port development for the North Sea region. For metropolitan regions such as Hamburg and Bremen/Bremerhaven, much will depend on successfully competing in a global market, underlining the importance of transport infrastructure and the sea-land transport chain for the North Sea coast.

The social context on the North Sea coast and the impacts of developments on the resident population – whether real or perceived - is a key influence on future development. Acceptance of large-scale changes in infrastructure or the social consequences resulting from economic restructuring are some of the issues here. Social conflicts can suddenly emerge when social tension reaches breaking point and a contentious issue emerges as a trigger. Social conflicts often result from inability to cope with change or a perceived lack of control, with loss of regional identity, loss of key landscape elements or loss of self-determination as common triggers. Little research has so far been carried out on social trends and conflicts on Germany's coast. More research is needed since it is ultimately society which determines future coastal development. In the North Sea area, ICZM will need to take account of these socio-cultural issues and develop appropriate mechanisms to enable people to deal with change. Classic instruments such as participation in planning procedures may need to be complemented by other methods providing opportunity for more active involvement in determining the future on the coast.

### **Focal issues on the Baltic Sea coast**

As a transit and development region the German Baltic Sea coast is strongly affected by the transformation processes in the new EU Member States. A key issue is the expansion of Europe's main axes of transport, which is likely to lead to greater flow of goods, increased trade and new impulses for growth. Given their potential for consolidation and increase of capacities, German sea ports emerge as potential winners here in the context of increasing transshipment of goods and growing volume of trade. At the same time, these developments call for appropriate spatial planning strategies in the sea in order to avoid conflicts of use and prevent overuse.

The ramifications of increased trade and internationalisation of activities are difficult to judge. On the mainland one consequence might be a shift of regional centres of development, leading to greater disparities between urban and rural areas. More intense developments in urban centres might also lead to greater concentration of facilities and the loss of smaller rural centres and functions. Areas that are already structurally weak are therefore in danger of becoming even more disadvantaged, such as coastal regions removed from the axes of transport and associated corridors of development. On the other hand, unspoilt landscapes and coasts might constitute an advantage in other sectors of development such as tourism.

Although the precise regional effects of the EU Eastern expansion still need to be analysed in the context of different local contexts and needs, it has become clear that regions and local communities in the Baltic Sea region need to become more proactive in their development. The federal state is taking less responsibility, providing regions with a greater degree of freedom and independence. Greater focus on strengths can lead the way in making best use of the EU eastern expansion and combatting structural disadvantages. ICZM can be a useful tool for realising existing strengths. Nationally, the need for more proactive policies and support should be recognised.

The most pressing ecological issues on the Baltic Sea include the improvement of water quality, reduction of nutrient intake to the Baltic Sea, protection of biodiversity and sustainable fisheries. On

the East coast of Schleswig-Holstein conflicts of interest exist between nature conservation, tourism and coastal defence. Wind energy has also become a contentious issue both on land and offshore. In coastal towns there is the added challenge of refurbishing former harbour and industrial sites and attracting secondary uses.

To effectively use the existing capacities on the Baltic Sea coast, a pan-European perspective is a clear advantage which views land and sea as a continuous space. More so than the North Sea, the Baltic Sea is no longer perceived as a boundary, but a transit space and core zone of a new economic area of European growth. The European Spatial Development Concept (EUREK) specifically targets regions with unused development potential, with additional focus on the development of the European port network and closer links between so-called central gateways throughout the Baltic Sea region. Extending the existing efforts of co-operation between Germany and Poland can lead to further homogenisation of the border region and provide a foundation for the emergence of a new economic centre. It must be said however that this is a long-term perspective since large parts of the Polish border region also need to be considered structurally weak at present.

Apart from providing targeted support to economic development, spatial planning also needs to contribute to the preservation of the ecological regulatory mechanisms of the Baltic Sea. Due to the particular sensitivity of the system all impacts should be avoided that disturb the system beyond its compensatory capabilities. Spatial planning can influence the development of offshore areas, for example through carefully assessing suggested sites for offshore wind farms or other fixed structures. Spatial planning can also influence sectors on land such as agriculture or the siting of industry. This needs to be complemented by regulatory mechanisms or incentives that reduce the influx of nutrients and toxins to the Baltic Sea, impose restrictions on mariculture and make provisions for careful restructuring and expansion of sea port facilities.

### **3.3 Management priorities at national level**

Based on the four dimensions „dynamics of development“, „degree of interconnection with other forms of use“, „absolute significance“ and „political relevance“, trends and developments were assessed for different forms of coastal and marine resource use. Results were used as a basis for determining priorities for action within national ICZM and spatial planning. The following forms of use were identified as national priorities:

- Offshore wind farms (e.g. high dynamism in terms of the number of planning applications, strong interdependence of land and sea, Federal responsibility for the EEZ, high significance for national policy, for instance energy and climate protection),
- Marine aggregate extraction (at certain locations high pressure of use, strong interdependence of land and sea, high potential for conflict with other forms of use, particularly marine conservation),
- Marine protected areas (high dynamism of development, international obligations of the Federal state, Federal responsibility for the EEZ),
- Fishing (high political significance, international political responsibilities at the federal level),
- Preservation of open and unused marine space (federal responsibility for establishing responsibilities, legal responsibilities at the federal level, high potential for conflict),
- Development of sea ports and access to ports (co-responsibility of the federal level for transport infrastructure, high significance in the context of European transport networks and national development policy, high potential for conflict, high local dynamism),

- Shipping safety and accident prevention (high risk potential for other forms of marine space use, federal responsibility in the EEZ and also for federal shipping routes, international ramifications),
- Coastal defence and safeguarding the local population from natural disasters (coastal defence as a prerequisite for economic activities and quality of life).

## 4. ICZM in Germany

### 4.1 A brief overview of ICZM

#### ICZM in the EU

The EU defines ICZM as a 'dynamic, continuous and iterative process through which decisions are taken on the sustainable use, development and protection of coasts including their resources' (European Commission 1999a). Links exist to spatial planning as well as informal processes of decision-making that rely on open dialogue and broad stakeholder participation.

ICZM first became an EU issue in the early 1990s. Growing awareness of the special needs of coastal areas and concerns about mounting pressure cumulated in a three-year "Demonstration Programme on Integrated Management in Coastal Zones". One of its main conclusions was that successful development of European coasts requires co-ordinated strategic actions at a local, regional and national level. This led to a "Communication from the Commission to the Council and the European Parliament on Integrated Coastal Zone Management: A Strategy for Europe" (European Commission 1999a, 1999b). In May 2002 recommendations were adopted concerning the implementation of Integrated Coastal Zone Management in Europe (European Commission 2002), which call upon Member States to develop national ICZM strategies that ensure the successful implementation of good practice in ICZM. Strategies are to be based on the following (European Commission 1999a):

- A comprehensive, holistic and systems perspective,
- Recognising the uncertainty of future conditions,
- Understanding of natural processes in the coastal zone,
- Use of integrated techniques to assess the impacts of uses on the coast,
- Use of a multitude of instruments and tools to address specific problems and the local context,
- Ensuring information flow between all actors,
- Vertical integration (integration of sectoral levels),
- Horizontal integration (integration of all administrative interests) and improved cooperation between sectoral and spatial planning,
- Improved participation of different interest groups,
- Localised solutions geared towards local needs.

A stocktake of the coastal zone is specifically called for as a basis for the strategic suggestions.

#### Integrating ICZM into marine policy

To complement its approach to ICZM the EU has begun to draft a strategy for the marine environment. Its basic framework is outlined in the Communication from the Commission to the Council and the European Parliament of 2 October 2002 "Towards a strategy to protect and conserve the marine environment" (KOM (2002) 539 final version)<sup>52</sup>. As a targeted strategy for the sustainable use of seas and oceans, it is primarily focused on conserving of marine ecosystems worldwide and protecting biodiversity. The strategy is likely to be based on an ecosystems approach containing defined ecological quality objectives. Measures include the complete implementation of the Water Framework Directive, the Habitats Directive as far as it applies to the seas, as well as reducing pressures on marine ecosystems. Focus will also be placed on better co-ordination of the existing regulatory framework and research organisations. Importantly also, the strategy will be developed through an

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<sup>52</sup> <http://europa.eu/scadplus/leg/en/lvb/l28129.htm>

open and participatory process (Schuchardt et al. 2006), which may provide opportunity for developing links with practical ICZM.

The European Commission has announced the publication of a Green Paper on a comprehensive marine policy framework which will support the sustainable and ecologically responsible development of a maritime economy. A stocktake of current ecological, economic, social, geographical and legal factors is planned (Schuchardt et al. 2006).

### **Current status in Germany**

In recent years coasts and seas have gained political prominence at a national level. The EU requirement to develop national ICZM strategies was paralleled by a recent government decision to boost renewable energies, which particularly affected wind energy and with it offshore developments. Planning permission for offshore wind farms, pilot areas in the EEZ, potential ecological effects of large-scale wind farms and competing interests such as marine nature conservation are just some of the issues raised. With much at stake, clearer allocation of competencies and responsibilities is called for, particularly where the EEZ is concerned (e.g. Der Rat von Sachverständigen für Umweltfragen 2004).

Unsurprisingly, marine spatial planning has been most vigorously discussed in an attempt to answer these calls. In an important step towards a marine spatial planning framework, spatial planning competencies in the EEZ were recently handed to the Federal Maritime and Hydrographics Agency (BSH). At the same time the scope of the Länder spatial planning frameworks was extended to include the 12 sm zone. This provides a basis for continuous spatial planning ranging from terrestrial areas out to the territorial limit.

Developments at a national level and in the EEZ are accompanied by growing awareness at Länder level of the potential advantages coastal and marine resources can bring. All five Länder are increasingly interested in maritime research and compete with each other for top harbour facilities or strategic industries. With its programme "Zukunft Meer" (Sea the Future) Schleswig-Holstein was first to present a comprehensive and ambitious approach for developing sea-based industries, followed by Lower Saxony and Mecklenburg - Western Pomerania.

Germany's awareness of ICZM is also growing. This is demonstrated in various strategies and management concepts that have recently emerged for different parts of the coast. However, better integration across scales and land-sea integration are still to be achieved. Also, greater involvement of civic society is called for. First steps have been taken by the Wadden Sea Forum, with some consultation taking place during the current development of a national ICZM strategy or the drafting of principles for spatial planning in the EEZ.

Statutory planning processes carried out for large-scale offshore developments highlight the fact that many of their ecological, social, cultural and economic impacts are still unknown. Integrative spatial assessment is needed to assess the wider impacts of developments, based on both natural and social sciences. At present, offshore wind farming is a case in point, but in the long-term similar needs of integrated impact assessment might arise in the context of other forms of use.

## 4.2 The what and how of ICZM

In Germany there is no clear consensus on how to define or use ICZM. Many actors emphasise its role in nature conservation<sup>53</sup>, and there is fairly widespread consensus that ICZM is related to conflict resolution. Some also consider ICZM an instrument of communication and participation<sup>54</sup>: “ICZM is a process of communication which is used to identify the specific potentials of coastal areas, increase public awareness of these and develop solutions to conflicts.” The actual implementation of ICZM, in particular the role of informal and formal processes, is currently much debated.

### ICZM as a philosophy

ICZM in Germany is seen as both a planning and decision-making procedure and a philosophy. Whilst the planning view suggests an inherently prescriptive approach, the philosophical approach is more open, prescribing only a set of guiding principles that act as essential reference points. Using these principles in a central framework – for instance a national strategy - leaves a high degree of flexibility in putting the strategy into practice, allowing it to be tailored to specific regional conditions and emerging issues. Agreeing on these basic principles – which is the first task in ICZM - creates an element of commonality between different institutions, interest groups, administrative levels and sectors on the coast.

If ICZM indeed represents a philosophy, then the development of common visions for the coast is a logical first step. Visions are less concerned with procedural questions of implementation than attempting to capture and specify societal visions of sustainable coastal development (e.g. by specifying certain priorities for development). A joint vision supported by all actors provides a basis for the subsequent development of national and regional strategies for implementation. In this context continued orientation along societal choices and adaptation to change is essential. To enable a meaningful societal discourse to take place, fora need to be created where opinions can be voiced, ideas exchanged and mechanisms found for an ongoing debate. This discourse on the future of Germany’s coasts and seas should take place across national and regional scales.

In this context spatial and sectoral planning, as well as instruments of deliberation such as EIA or procedures for securing planning approval, become instruments for implementing this philosophy. For existing formal and legal approval procedures this means greater focus on the process of ICZM and the development of process indicators to be able to evaluate success. A retrospective analysis of different exemplary planning approval procedures with view to their potential use as part of ICZM was carried out in the nationally funded RETRO project. Recommendations for procedures adapted to ICZM criteria were developed (Schuchhardt et al. 2004).

### The view of the Länder

At a meeting on 14 April 2005 spatial planning representatives from the Länder of Schleswig-Holstein, Mecklenburg-Western Pomerania and Lower Saxony agreed the following “10 theses on the scope of ICZM and the role of spatial planning in the ICZM process”:

- The role of ICZM is to support the sustainable development of coastal zones, taking into account their specific economic, ecological and social makeup.
- ICZM cannot and should not replace existing political, legal or administrative directives or responsibilities.

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<sup>53</sup>For instance the ICZM strategy of Schleswig-Holstein or the Draft County Development Plan for Mecklenburg-Western Pomerania

<sup>54</sup>Schleswig-Holstein’s “Spatial Planning Framework Coasts and Seas” (2005)

- ICZM cannot and should not replace the principles of integration and balancing of interests by setting new or specific priorities for the development and safeguard of the coast.
- ICZM is to be seen as a basic philosophy of development which sustainably secures the productivity of coastal zones by integrating all interests.
- ICZM contributes to the development of coastal zones by:
  - developing aims and objectives that are forward-looking and also widely accepted,
  - defining strategies for achieving these aims, and
  - ensuring implementation of these aims and strategies based on broad agreement, comprehensive assessment (integration) and scientific fact

### Putting it into practice: ICZM as a cycle

In the context of the above philosophy ICZM should not be perceived as a ready-made blueprint for action or fixed strategy. Rather, ICZM is an ongoing, dynamic and cyclic process which incorporates the various institutions and interest groups on the coast in the development and implementation of objectives. Central stages along the ICZM process are the development of visions, the drafting of aims and objectives, assessment of the need for action, implementation and evaluation (monitoring). ICZM can therefore be described as a continuous response to change and ongoing process of adaptation to changing conditions, societal values and objectives for the coast. Strategies and recommendations for action are a natural outcome of this process, representing visible and also desired 'outputs'.

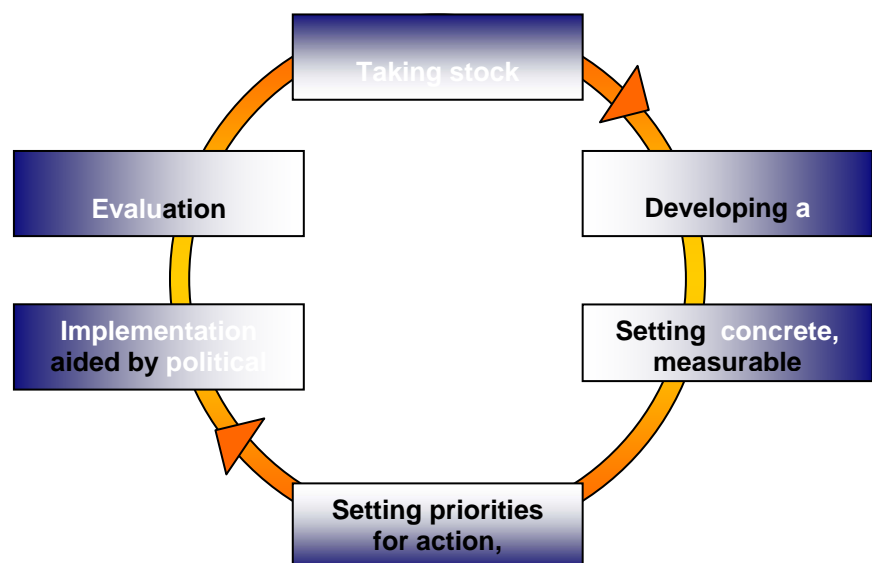


Fig. 4: The ICZM cycle

The ICZM process comprises the following stages:

- A comprehensive **stocktake** on the respective coast, which brings together all necessary data and facts for establishing the status quo. Ecological, economic and social data should be included. The stocktake specifically looks at the interchanges between developments, assessing the degree to which trends can complement each other or lead to a negative cumulative impact. The stocktake provides the basis for all subsequent steps.
- **Developing a vision** for the coast. The vision describes the desired end state for the coast which is to be achieved through the ICZM effort. The vision develops from decisions taken

within society and global conditions and is normative. Its development needs to be participative and ensure the integration of all interest groups and responsible authorities and institutions. As a long-term goal it should act to guide ICZM efforts over several years.

- From the vision **concrete, measurable objectives** need to be developed together with a timetable for implementation. This is also done in a participatory process involving all relevant institutions and interest groups.
- Setting **priorities for action and dealing with problems and particular challenges**. A debate needs to take place on controversial issues, including ways of dealing with dynamic developments or existing conflicts. Again, all relevant institutions need to be part of this debate, as does the interested public on the coast.
- **Implementation** with the aid of political support and existing tools. Analytical tools, instruments of planning and management all play a role, but need to be selected with care and adapted to the respective situation. The ICZM toolbox contains a growing set of instruments that can be applied in many different contexts. Spatial planning provides one of the few cross-sectoral approaches and is therefore one of the most important instruments of implementation.
- **Monitoring** should take place at an ecological, economic, political and social level in order to describe the entire system of the coast. Monitoring makes sure that ICZM is adaptive, in that it feeds into the next stocktake and evaluates the degree to which the objectives and visions originally set out have been achieved. This cross-check of visions in regular intervals and repeated running through the cycle ensures ICZM as a continuous cycle which is able to respond to changing societal conditions or technological developments.

This ICZM cycle should take place in parallel at a national, regional and where necessary also local level. Resulting strategies for action should be as specific as possible and be integrated. Methods of implementation should also be specified and be linked to a concrete timetable and indicators of success. This approach ultimately leads to a hierarchy of ICZM structures, which can meet the specific needs of different scales on account of their integrated nature. A common vision for the coast can act as an instrument of integration. A regional vision for the North Sea for instance can act as an umbrella for different strategies for action and serve to specify concrete needs for action at different spatial levels.

### **Process qualities**

In order to be successful, the ICZM process described above needs to meet certain criteria. The most important, as specified in the EU Demonstration Programme, include:

- Transparency of the decision-making process,
- Integration of different levels of action,
- Free interchange between all levels of action,
- Openness to dialogue on the part of all participants.

A common vision can help to ensure participation of all relevant stakeholders. Indicators should be developed to evaluate the ICZM process so that the overall success of the ICZM effort is also measured in terms of process rather than ecological, economic, social or political objectives only. Indicators also assist in improving the process if necessary.

### 4.3 Ground rules for implementation

Implementing the above ICZM approach in Germany should be guided by the following three principles:

#### **An integrated, systems-oriented perspective**

The overall system of “coast” comprises the following four subsystems:

- ecosystem,
- cultural and institutional system,
- social system,
- economic system.

To achieve a holistic assessment of opportunities and risks associated with developments, ICZM and marine spatial planning need to integrate these four subsystems at every stage of the cycle.

#### **Polyculture as a key concept in marine spatial use**

Polyculture is the co-existence of several forms of use in the same space, for instance offshore wind farms and mariculture or protected areas. The concepts of multifunctional space and an integrated spatial perspective are closely linked to this concept. This requires planning approaches that go beyond simple yes-or-no decisions or static forms of zoning. It also requires methods of assessment that can measure the impacts of individual forms of use on others and evaluate their degree of compatibility. The concept of polyculture is therefore closely linked to the systems approach outlined above. Individual and cumulative systems impacts need to be determined for different forms of spatial use. This information then needs to be made available to planners and fed into a transparent process of decision-making on how to best use coastal space (see Box 2).

In this context it is important to emphasise that perceived conflicts are often just as important as actual compatibility. This is the case particularly where aesthetic qualities of land- and seascape, self-image of local communities or traditional community structures (regional identity) are concerned. Other conflicts result from the disappearance of key visual elements such as working fishing boats or features of the landscape. A comprehensive view of both ecological and socio-economic coastal systems is currently being developed by the project “Coastal Futures”.

#### **Box 2:**

During a workshop in Leck/North Frisia, spatial planning representatives agreed that the concept of multifunctional spatial use leads to the following demands:

1. Compatibility means identifying win-win – situations and actively supporting a balance between private spatial use and public interests.
2. This balance of interests requires open, transparent information flow, informal discussions and management of changing cost-benefit structures. Stakeholder values and standards need to be better noted and included in the debate.
3. Different levels of action and decision-making result mean that there is a special need for dialogue. This dialogue must range from the EU level all the way down to the local level, with effective information flow in both directions.

4. Spatial planning and ICZM need to take account of international as well as local interests in the formulation of basic aims.
5. Since not all developments take place at the same speed, decisions must take a long-term perspective. Visions also require regular check-up and renewal, which in turn demands effective monitoring.
6. This means that time must be made to continue the development of visions and scenarios. If established, discussion fora could act as an early warning system for spatial planning.

### **Tailored approaches**

Coasts and seas are not uniform. Rather, they are a marriage of very different physical, geographical and ecological conditions as well as social and economic perspectives. Added complexity is provided by a multi-layered German administrative system and a wide array of international connections. An integrated systems approach makes clear that coastal areas need to be viewed as distinct ecological and socio-economic units with their very own specific development needs. Demands placed on ICZM and possible solutions to problems are therefore also dependent on context. It is obvious that the Wadden Sea and the Wadden Sea islands might face quite different problems than for instance the Baltic Sea coast of Mecklenburg-Western Pomerania, and that different priorities for action might result for each of these coasts. To constructively deal with change on all types of coast, ICZM needs to be flexible without however leading to political or administrative discontinuity. It is precisely the differing nature of individual coasts and their specific needs which makes administrative integration and concerted action at all levels a special priority.

### **No universal solution**

The impact of developments on coastal systems depends on a complex set of parameters and interactions between systems components. Although some quality criteria have been developed for ICZM, this means there is no universal definition of "good" ICZM. Dealing with diverse forms of use, spatial demands and conflicts of use will always be an individual balancing act that needs to take into account a wide array of economic, social and ecological factors. Increasingly, this will also need to deal with questions of scale and mechanisms of decision-making. What developments are influenced by which driving forces, and which developments can be influenced at what level? A multi-scale approach is required to assess impacts at different levels, point out needs for action and facilitate a dialogue across scales.

## **4.4 What role for the federal level in German ICZM?**

### **Priorities for national ICZM**

Challenges for ICZM at a national level include:

- maintaining the integrity of ecological and socioeconomic systems,
- developing ecological and socioeconomic indicators relevant to German coastal areas,
- drafting political and societal objectives for coasts and seas,
- development of appropriate processes, instruments and mechanisms of dialogue.

A national strategy should provide a framework which can accommodate different visions and facilitate their implementation. As an enabling environment, it should:

- a) state basic principles and ground rules for the future development of coasts and seas. These principles should be supported by all stakeholders and arise from values held by society and accepted standards. Examples for such guiding principles are acceptance of the systems approach, the principle of sustainable development or the philosophy of ICZM as a cyclical process taking place at different but interlinked geographical scales.
- b) Secure the continuation of the ICZM cycle by providing an integrative and transparent environment,
- c) Set out structures which allow common visions to be implemented,
- d) Give voice to new demands emerging from formal planning and consent procedures.

### **Suggestions for implementation**

Internationally, the **federal level** already acts as an important point of liaison for a number of agreements, such as HELCOM in the Baltic, OSPAR in the North Sea or the Trilateral Agreement on the Wadden Sea between Denmark, Germany and the Netherlands. The Federal level is also responsible for implementing a range of EU Directives, such as the Water Framework Directive or the designation of protected areas under the Habitats Directive. More responsibilities are likely to arise from the EU maritime strategy and marine environmental directive which are currently being finalised.

Implementation of ICZM should seek to strengthen the role of the federal level as a co-ordinator of interests. This is due to:

- growing internationalisation of coastal developments and increasing interplay between on- and offshore forms of use,
- the need for a central hub where international, national and regional interests and actors come together,
- the need for mechanisms that allow specific regional and local ICZM concepts to be implemented. The national strategy provides the necessary framework for these.

With the national level acting as a main co-ordinator, **regional seas** (in this case **North Sea** and **Baltic Sea**) should represent the central framework for implementing national ICZM. This is based on a systems-oriented approach that integrates land and sea and also on the political significance of the regional seas as national planning and economic spaces.

As a key actor at the regional seas level, the federal level to a large degree determines German policy in the regional seas. At the same time, the Länder and also sectoral administrations exert considerable influence on the development of coastal and marine resource use in the German part of the regional seas. A plethora of organisations is already involved in ICZM and spatial planning, both at an informal regional and international level.

In order to obtain a co-ordinated, long-term ICZM approach within the framework of regional seas, both the federal and the regional seas level need to meet certain prerequisites.

The following must be done at federal level:

- ensure consistent policies for the marine environment (ensure co-ordination between ministries and sectoral authorities)

- a national vision for coasts and seas through a participatory process which involves science and civic society,
- make available information to interested members of the public,
- commit to the national ICZM strategy and its founding principles,
- provide a central point of contact and information hub,
- develop a more international perspective,
- develop links to thematic research.

At the level of North Sea and Baltic sea, respectively, the following must be done:

- bring together all administrative levels represented at this level,
- bring together visions and aims of different levels of activity and use this vision as an instrument of integration,
- ensure systems-based monitoring of regional seas,
- thematic integration and prioritisation (passing on information to the relevant federal institutions)
- international orientation,
- carrying out and initiating thematic research.

## 5. ICZM and spatial planning

In response to the extensive spatial demands in the sea, marine spatial planning has become a much debated issue. With the sea no longer a barrier, but an opportunity, integrated management and planning and a guiding framework for spatial use are increasingly needed. Implicit in this is a considerable shift from earlier views of the sea. What used to be considered primarily a natural space, characterised by mostly fleeting forms of use such as fishing or small-scale shipping, is now largely seen as an economic and industrial space requiring careful planning and weighing of interests.

Spatial planning is well developed in Germany as far as terrestrial areas are concerned. The existing spatial planning framework alone however does not meet all ICZM requirements as specified in the EU recommendations. The following section is an attempt at specifying some of the reasons for this.

### 5.1 A comparison of two approaches

Spatial planning clearly plays a special role within the development of coasts and seas. As a cross-sectoral approach spatial planning is tasked with balancing different interests, seeking to avoid disparities and redress these where possible. The aims of spatial planning therefore match those of long-term ICZM. Because of these similarities, many actors consider spatial planning a central instrument for the implementation of ICZM, not least because it would avoid the creation of any new instruments. The view that ICZM can and should be implemented on the basis of existing instrument is widely held: “The stocktake has shown that the available range of planning instruments in Germany provides a good platform for implementing ICZM in Germany. These instruments are established in law and accepted by society, and with recent amendments already implement much of what is required by ICZM” (BMU 2006). At a Länder level, Schleswig-Holstein considers spatial planning an “established concept that reflects the philosophy of ICZM, offering a tried and tested mix of formal and informal instruments that are geared towards careful development (of space)”<sup>55</sup>.

Room for improvement as far as ICZM is concerned is seen in the fields of integration, participation, communication and the transfer of experiences. In these respects, the formal instrument of spatial planning only represents one building block amongst many. Most important are all forms of informal instruments of decision-making, for instance those employed by informal networks such as the Wadden Sea Forum.

The main difference between the two instruments is their general philosophy. ICZM is a consensus-oriented, ‘soft’ and informal instrument. In contrast, spatial planning is a ‘hard’ regulatory instrument with a distinct output and much less process-orientation than ICZM. Spatial planning focuses on a pre-determined administrative area and has a set planning process, whilst ICZM can be more flexible, involve many different actors and select from a wide range of process options. A major difference is also that spatial planning is tied to existing administrative boundaries, whereas ICZM is free to create new spatial references.

Fig. 5 summarises the main features of the two instruments. A useful summary of the relationship or possible interaction between ICZM and spatial planning is provided in a summary overview prepared by the Länder (Box 3).

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<sup>55</sup> Raumordnungsplan Küste und Meer 2005, S.57/58

| <b>ICZM</b>  | <b>Spatial planning</b>   |
|--|---|
| dynamic concept  | relatively static concept   |
| process-oriented   | plan-oriented   |
| problem-centered, selective approach                                       | comprehensive spatial approach                                    |
| action-centered  | regulatory  |
| Self-guided approach, planning and implementation mostly in the same hands | Planning for others, implementation mostly in the hands of others |
| informal, flexible institutional structures                                | established and fixed institutional structures                    |

**Fig. 5: A comparison of spatial planning and ICZM (adapted from Ahlke and Wagner 2004)**

**Box 3:**

At their meeting on 14 April 2005 spatial planning representatives from Schleswig-Holstein, Mecklenburg-Western Pomerania and Lower Saxony have described the role of spatial planning in the ICZM process as follows:

1. Spatial planning is particularly suited to support sustainable ICZM processes and a management of implementation based on integration and balancing needs. Spatial planning:
  - is tasked with „balancing the different demands made on space and settling conflicts occurring at each respective level of planning“. (Federal Spatial Planning Act § 1 (1) 1)
  - is responsible for facilitating spatial development by providing aims and strategies and implementing these through a set of instruments focused on achieving balance,
  - is tradition-bound to protect space, to facilitate development and to mediate between all structural demands, whether spatial or economic, in an impartial, cross-sectoral manner,
  - has an established range of instruments that reflects the philosophy of ICZM and offers a tried and tested mix of formal and informal instruments geared towards careful development,
  - also has wide-ranging experiences in striking a balance between different administrative levels. In the established system these extend from Federal spatial planning to spatial planning at a Länder and regional level, going all the way to communal zoning and real estate planning and incorporating the so-called counterflow principle.
2. Spatial planning cannot and will not alter sectoral responsibilities and allocate specific (spatial planning) importance to specific needs, forms of use or technologies that are formulated by local authorities or sectors and within their specific area of responsibility.

3. Spatial planning has specific competencies and experiences in generating and making available basic cross-sectoral knowledge on the status quo of space, its development and particular forms of use. This knowledge is instrumental for integrated processes of decision-making and broad information and participation.
4. The regular spatial observation programme and reporting on the state of space, which are handled by the Federal Office in co-ordination Federal Hydrographics and Maritime Agency, should be extended to the sea. This ensures that all ICZM actors have the necessary equal access to information.

## 5.2 Assessing and weighing demands on space – a normative process?

Perhaps the most significant difference between the two instruments is their normative context. This becomes manifest in how the demands placed on coasts and seas are weighed. ICZM is based on setting out a vision for the coast, followed by developing a blueprint for action. Agreeing on a vision is a normative task, involving many actors and sectors of society and asking what future coast might be desirable. § 1 of the Spatial Planning Act describes the task of spatial planning as 'ensuring that different demands placed on space complement one another and resolving conflicts that arise at different spatial levels'. Spatial planning therefore makes no value judgements on the forms of use it deals with, but creates a framework for decision-making based on clear principles and rules.

A tool which can help to point out potential conflicts of spatial use is the idea of "spatial compatibility" of different forms of use. This differentiates between spatially impacting and spatially non-impacting forms of resource use and describes the ability of different forms of use to co-exist within limited space. A first tentative assessment was carried out on existing coastal and marine uses (see Fig. 6). This however is a subjective form of assessment which does not differentiate between actual and perceived spatial compatibility. Perceived conflicts can outweigh actual conflicts particularly where aesthetic qualities of landscape or local traditions are concerned, so that a more objective form of assessing "spatial compatibility" might need to be developed. A socio-economic impact analysis of different forms of use could provide a useful starting point.

## 5.3 New priorities for spatial development


The recent revision of national priorities for spatial development has placed the debate on ICZM and spatial planning into a new context. New national priorities were developed as a response to societal change and the wider driving forces of globalisation, trends towards greater liberalisation and privatisation, European integration, demographic change and changes in spatial use (e.g. greater regional differentiation). Future priorities for German spatial development can be summarised as follows:

- Supporting growth and innovation,
- Securing public services,
- Conserving resources and shaping cultural landscapes.

A key feature of these new guiding principles is the re-interpretation of established principles such as the principle of equivalence. This originally aimed at securing equivalent living conditions throughout Germany with respect to access to jobs, housing, infrastructure and environmental quality. Equivalence does not seek to create uniformity, but has always been interpreted as a situational, dynamic objective which now needs to be re-interpreted in the context of demographic change.

|                              | Offshore wind farms | Marine protected areas | Fisheries | The sea as a public good | Cables | Tourism | Shipping routes | Harbours and ports | Agriculture/run-off | Sand and gravel extraction | Oil and gas exploration | Dumping of dredged material | Aqua- and mariculture | coastal service centres | nature conservation | coastal protection | Military use |
|------------------------------|---------------------|------------------------|-----------|--------------------------|--------|---------|-----------------|--------------------|---------------------|----------------------------|-------------------------|-----------------------------|-----------------------|-------------------------|---------------------|--------------------|--------------|
| Offshore wind farms          |                     | x                      | x         | x                        |        |         | x               |                    |                     | x                          | x                       | x                           |                       |                         |                     |                    | x            |
| Marine protected areas       | x                   | x                      | x         | x                        | x      | x       | x               | x                  | x                   | x                          | x                       | x                           | x                     |                         |                     |                    | x            |
| Fisheries                    | x                   | x                      | x         | x                        | x      |         | x               |                    | x                   | x                          |                         |                             | x                     |                         |                     |                    | x            |
| The sea as a public good     | x                   | x                      | x         |                          |        |         | x               |                    |                     | x                          | x                       | x                           | x                     |                         |                     |                    | x            |
| Cables                       |                     | x                      | x         |                          |        |         | x               |                    | x                   | x                          | x                       | x                           |                       |                         | x                   |                    |              |
| Tourism                      |                     | x                      |           |                          |        |         |                 |                    |                     |                            |                         |                             |                       |                         | x                   | x                  | x            |
| Shipping and shipping routes | x                   | x                      | x         | x                        | x      |         |                 |                    |                     | x                          | x                       | x                           | x                     |                         |                     |                    | x            |
| Harbours and ports           |                     | x                      |           |                          |        |         |                 |                    |                     |                            |                         |                             | x                     |                         | x                   |                    |              |
| Agriculture/run-off          |                     | x                      | x         | x                        |        |         |                 |                    |                     |                            |                         |                             | x                     |                         | x                   |                    |              |
| Sand and gravel extraction   | x                   | x                      | x         | x                        | x      |         | x               |                    |                     | x                          | x                       | x                           | x                     |                         | x                   | x                  |              |
| Oil and gas exploration      | x                   | x                      |           | x                        | x      |         | x               |                    |                     | x                          | x                       | x                           | x                     |                         |                     |                    | x            |
| Dumping of dredging material | x                   | x                      |           | x                        | x      |         | x               |                    |                     | x                          | x                       | x                           | x                     |                         |                     |                    |              |
| Aqua- und mariculture        |                     | x                      | x         | x                        |        |         | x               | x                  | x                   | x                          | x                       | x                           | x                     |                         | x                   |                    | x            |
| Coastal service centres      |                     |                        |           |                          |        |         |                 |                    |                     |                            |                         |                             |                       |                         | x                   |                    |              |
| Nature conservation          |                     |                        |           |                          | x      | x       |                 | x                  | x                   | x                          |                         |                             | x                     | x                       |                     | x                  | x            |
| Coastal protection           |                     |                        |           |                          |        | x       |                 |                    |                     | x                          |                         |                             |                       |                         | x                   |                    | x            |
| Military use                 | x                   | x                      | x         | x                        |        | x       | x               |                    |                     |                            | x                       |                             | x                     |                         | x                   | x                  |              |

Fig. 6: Estimates of compatibility of individual forms of use on coasts and seas (see also Glaeser et al. 2004)

 = incompatible  
 X = conditionally compatible  
 Blank field = compatible

Demographic change is particularly relevant in rural coastal areas, some of which are reaching the limits of demographic carrying capacity (BBR 2005). Increased urbanisation and competition between metropolitan regions are parallel trends.

The new national priorities reflect demands for greater flexibility in guiding regional development. Coastal regions in particular might benefit from being considered cases apart, with ICZM providing a useful frame of reference for setting priorities and action plans. Much greater emphasis however needs to be placed on marine developments and their impacts on coastal regions. A case in point is the relationship between spatial development and transport infrastructure. Transport infrastructure is highlighted as a pre-condition for regional development, but no mention is made of the potential role of marine transport and shipping.

The draft Territorial Agenda of the EU<sup>56</sup> is highly relevant to coasts and seas. It emphasises the following:

- Better links between metropolitan regions and urban centres,
- Promoting new forms of partnerships between urban and rural regions, with particular focus on structurally weak regions,
- Establishing transnational 'regions of innovation' and supporting the development of a knowledge society,
- Strengthening and extending trans-European networks (transport and energy)
- Promoting trans-European risk management,
- Strengthening ecological and cultural resources and their valuation.

The following two could be particularly relevant to coasts and seas:

#### ***Supporting growth and innovation***

- Development of maritime clusters comprising research, teaching, industry and services to make best use of innovation potential of coasts and seas and to develop centres of growth outside metropolitan areas. The Schleswig-Holstein initiative "sea our future" is a good example; more specific regional profiles would be helpful. Some investment and maximisation of regional valorisation are prerequisites of success, which would secure regional economic benefits and contribute to reducing the disparities between urban centres and rural coastal regions.
- Building partnerships across seas, both between metropolitan areas and rural regions of growth. Many successful EU projects confirm the success of increased solidarity between similar regions. Transnational partnerships and networks form the core of integrated projects across regional seas, such as marine spatial planning or establishing ecological quality criteria for the environment.

#### ***Safeguarding resources and shaping cultural landscapes***

- Better integration of marine areas in the development of priorities for spatial development,
- Defining the inherent value of the seascape
- Limiting spatial use in the sea

### **5.4 Summary: How spatial planning can meet the needs of ICZM**

In the context of ICZM the main task of spatial planning is to facilitate a constructive management of change with a view to long-term trends and developments. For this, spatial planning needs to be based on a truly cross-sectoral approach, incorporating ecological, socio-economic and socio-cultural needs, as well as integrate all administrative levels. To implement the principle of polyculture and achieve multifunctional units of use, the following are considered key features for spatial planning:

#### **Flexibility**

Spatial planning has begun to perceive the sea as truly multidimensional, characterised by a highly dynamic environment, complex forms of land-sea interchange and international significance. New forms of use and co-use are likely to emerge. Spatial continuity with the coastal hinterland and the analysis of cause-and-effect relationships are a key factor in integrated coastal and marine spatial planning. A forward-looking framework is required which is able to quickly react to new demands. In

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<sup>56</sup> [http://www.bmvbs.de/Anlage/original\\_988144/Territorial-Agenda-of-the-EU.pdf](http://www.bmvbs.de/Anlage/original_988144/Territorial-Agenda-of-the-EU.pdf) (2007)

order to achieve this, spatial planning and ICZM need to work in concert. The new spatial planning guidelines need to be fed into the ICZM process and vice versa, in order to ensure compatibility of visions at different spatial scales.

### **Integration of plans**

Effective implementation of ICZM also requires integration marine spatial planning in the EEZ, spatial planning for coastal waters and spatial planning on land. Examples of incipient integration include the recent zoning concept developed for coastal waters in Lower Saxony, as well as the 2003 ICZM strategy for Schleswig-Holstein. These initiatives at Länder level need to be linked to national and international approaches such as VASAB 2020 in the Baltic or the trilateral Wadden Sea Forum in the North Sea.

Intersections between land and sea need to become focal points of spatial planning. Coastal service centres for example can bring together different activities and services and develop into decentralised places of growth in rural areas. This would correspond to the national priorities of spatial planning listed above.

### **An international perspective**

Given the internationalisation of the sea it is conceivable that international approaches to spatial planning will be developed for regional seas to complement the respective national frameworks. Advantages would be a more co-ordinated approach to shipping and large-scale offshore planning, such as adjacent wind farms in German and Danish waters. In the North Sea a co-ordinated approach is also important in the context of the sustainable management and protection of the Wadden Sea. Just like terrestrial spatial planning, its marine equivalents should not be limited by administrative boundaries, but oriented along the needs of ecosystems as well as international and national forms of use.

## **5.5 Limits of marine and coastal spatial planning**

With its focus on co-ordination and integration, spatial planning meets some key demands of ICZM. Spatial planning however is not responsible for resolving all manner of conflicts. Strategic contradictions between the aims of nature conservation and resource use for example are unavoidable, but can be used productively. In theory, at least, priority spatial uses such as shipping or port development should be considered equal to others and balanced against other forms of spatial use as part of an integrated analysis that is cross-sectoral and incorporates all levels of action.

Given the multitude of potential and actual conflicts of use, it is clear that spatial planning, with its formal instruments of spatial development plans and spatial planning procedures, only represents one element in minimising and resolving conflicts over allocating space. Tailor-made solutions for specific places and times are more important than setting spatial planning objectives and key concepts and agreeing legal procedures for resolving conflicts.

At the same time it is clear that ICZM cannot be implemented by one authority or sector alone. What is needed is effective interplay of all sectors and levels of action on the coast and in the sea. This means closer co-operation and information exchange between the federal and Länder level, as well as better integration of regional and local activities in federal and Länder programmes. Integration of German activities in European and global initiatives is equally important, as is co-operation between different federal ministries. In order to achieve this, formal and informal instruments can be used, in as far as they secure an effective information flow between the institutions involved and commit participants to use this information accordingly.

## **6. Key elements for implementing ICZM in Germany**

The following is a summary of what are considered key elements for successfully implementing ICZM in Germany.

### **6.1 A vision for the coast**

What coast would we like to see in 20 years time? Answering this question leads to an understanding of the kind of action required and the kind of targets that need to be set for ecology, economy, society and politics. Visions are essential tools for voicing what is often left unsaid and brings together ideas in the form of an inspirational description. Visions represent the deeper reasons for all joint managerial efforts – the “why” – and are the ultimate driving force behind any type of ICZM process.

Developing a vision for the coast must be given top priority in the process towards implementing German ICZM. This is all the more important since a common vision does not yet exist for Germany’s coasts and seas. Visions could be nested, with each administrative level developing their own specific vision for the coast. Conceivably, there would be a broad national vision, which is jointly agreed and supported by all relevant actors. This would then be broken down into more detailed visions for the North and Baltic Sea coasts and possibly another, subordinate level of smaller-scale regional visions. A task of the national strategy would therefore be to demand visions to be formulated, to enable their implementation at different levels and to integrate these within the national context.

Visions cannot be developed by individual interest groups or institutions alone. This is a task that actively involves all administrative scales and sectors. Visions are long-term blueprints for development that provide a basis for decision-making, for weighting individual thematic fields, for evaluating developments and for setting priorities – all the more reason for their joint agreement and joint continued development. Every vision needs to be complemented by a strategic document which specifies aims, priorities and the implementation process for each ICZM region.

Neither a national ICZM strategy nor spatial planning are responsible for providing visions for the coast. The role of both tools is to provide suitable framework conditions and structures for the implementation of visions. The development of visions and action plans needs to be actively initiated, organised and documented. Ideally, this responsibility should be shouldered by institutions that are not involved in issuing permits for any form of use. At a federal level, this could be a task taken on by the BBR as an institution which advises federal government on matters of spatial planning.

### **6.2 Problem-oriented approach and prioritisation**

Problem-orientation is considered a key concept for implementing ICZM. Changing patterns of use and emerging pressures represent the starting point for setting thematic priorities for action. This means monitoring needs to take place to assess changes as they occur and determine their likely impacts on the coastal system.

A number of criteria can be used to set thematic priorities. These include for example the spatial significance of observed trends, dynamics of development, the potential for conflict with other forms of use, the likely spatial demands of emerging forms of use, the emotional value of expected changes and the potential cumulative impacts of changes to the system. A possible approach to identifying national thematic priorities is detailed in Glaeser et al. (2004).

Expected changes are assessed with a view to different scales and abilities of levels to act. Problems that cannot be solved at one level alone are communicated to the next higher level. Suggestions for

constructively dealing with a problem are made by the level which can exert maximum influence, always taking into account the effects of their actions on the other scales and their interests.

### **6.3 Integration of different administrative scales**

Managing coasts and seas in an integrated manner needs to recognise different administrative scales and ensure their effective co-operation. This requires transparency, readiness to communicate, mutual trust and greater permeability of structures. Actors on the coast first of all need to acknowledge their respective options and constraints for taking action. Even with a common vision practical steps for implementing ICZM can only emerge where the constraints of different administrative scales are recognised and accepted as such. At the same time the interests of different levels need to be taken seriously and taken into account during the decision-making process.

### **6.4 A hierarchy of existing structures**

As far as possible, existing structures should be used to implement individual aspects of the ICZM process. Depending on the geographical scale these structures can take very different forms.

A range of multilateral structures exist in the Baltic and North Sea regions, respectively, which in theory at least could take responsibility for developing visions. Examples are VASAB 2020 in the Baltic and the North Sea Commission in the North Sea. In the North Sea, the development of a multilateral vision and corresponding national components could be co-ordinated by an extended Wadden Sea co-operation, possibly on the basis of the strategy which is currently being developed as part of the Wadden Sea Forum. These structures possess the advantage of established regular meetings and could be expanded into fora for the regional seas if they agreed to open themselves to additional issues and a wider range of participants. Once they become permanent structures, these fora could host regular meetings, establish thematic working groups, have an annual public conference and make available minutes of meetings to the public. In addition, an internet-based discussion platform could be established, which would further increase transparency.

Below the level of the regional seas other models are conceivable, for instance for the local level on both islands and the mainland. An example for the North Sea islands are the "island and Hallig island conferences" as well as their international federation "Euregio Die Watten", which already act as a point of integration for ICZM and other activities (regional planning, coastal defence). When using established structures, concrete needs should always be the deciding factor. Structures should not be established without a clear aim or remit.

What is required for successful national ICZM is a central, firmly established national structure at the federal level, which integrates different administrative scales and stakeholders, brings together different approaches and co-ordinates activities.

### **6.5 Ensure central co-ordination and liaison points**

In order to achieve better co-ordination between these many actors and institutions, central decision-making and co-ordination mechanisms should be established both at a federal as well as a regional seas level. Their task is to ensure co-operation between federal level and the Länder, inter-sectoral co-ordination, avoid contradictory sectoral policies and the availability of an international point of contact. At a federal level, this role could be taken on by an interministerial working group, which is composed of special coastal representatives from each ministry. In addition, a public forum should be created which is publicly visible and based on existing structures. One option might be to expand the annual BSH symposium on coasts and seas into a national forum.

## **6.6 A clear mandate for informal structures**

In order to ensure their functionality and universal acceptance, emerging structures need to receive a clear mandate and act in line with a clearly structured and open procedure. Regular reporting on all activities carried out and the publication of a regular progress report, for instance every other year, could be means to ensure acceptance and openness. The progress report could be linked to a regular systems-oriented monitoring report which could conceivably also be presented every other year. Individual tasks could be delegated to the respective ministries, although integration, transparency and openness of the structure must be guaranteed at all stages of the process.

## **6.7 A national forum**

Since a new coastal authority is clearly not an option, the role of 'national integrator' could be played by an informal national forum. The central tasks of the national forum would comprise:

- developing a central vision for the coasts and seas,
- setting priorities for action,
- monitoring success in ICZM,
- ensuring information exchange between Baltic and North Sea activities.

This forum needs to meet regularly, providing an open venue for the concerns of individual actors and interest groups. The joint vision would need to be checked every five years (e.g. has there been any change in global framework conditions, are there any new emerging issues which would need to be considered?) and renewed at least every 10 years. Primarily though, the work of the forum is problem-oriented, which means that solutions would be developed together with other institutions. Should the forum agree, for example, that climate change is a serious problem for the coast, it could commission independent research institutes to carry out studies and present potential solutions. These solutions would then be debated by the forum and either accepted or rejected. Acceptance would impose certain duties and requirements on the forum members. Using the initial solutions as a guideline, they would now be tasked with translating these into more specific solutions within their sector or field. Guided by the joint vision, these solutions would then need to be incorporated into national and Länder policies.

As outlined above the national forum should be linked to existing informal structures. One suggestion would be to use the annual BSH symposium on coasts and seas for that purpose.

Within the national forum a regular reporting duty should be established for all participating actors, sectors and levels. All steps in the decision-making process and the results of meetings are documented and made public using the internet. This ensures transparency and adequate information flow.

At all geographical levels, it is possible to establish specific working groups to look into specific issues and problems. Issues and discussion points can be raised at the national forum by all representatives from any geographical level. If, for instance, the North Sea islands, a conservation organisation or a local company recognise a problem, they can ask for the formation of a problem-oriented working group which then looks into the issue and subsequently presents their results to the forum and the public.

## **6.8 Process rules**

To ensure the success of the process, all participants need to agree on process rules which need to be strictly adhered to. Every forum needs a co-ordinating and neutral secretariat whose staff can also

act as an impartial moderator. Financial support needs to be sufficiently high to allow the forum to act flexibly and independently, for instance by calling a meeting. Excessive bureaucratisation and large inflexible secretariats should be avoided. A scientific advisory council should be established for the national and subordinate North Sea and Baltic fora, whose task it is to accompany the process as such and to link the work of the fora to wider national and international developments and projects.

In order to guarantee synchronicity of processes, information needs to be passed between actors and different structures effectively and efficiently. This can be done through personal communication and regular face-to-face meetings or computer-aided communication such as internet fora or websites. Existing institutions and actors are held to make available means and opportunities to encourage information flow, to integrate information and to create transparency and openness since these are factors critical in creating and maintaining long-term acceptance.

## **6.9 Prerequisites for a successful ICZM process**

The approach suggested here for drafting and implementing a national ICZM strategy largely through informal structures and processes can only be successful if the following prerequisites are met:

- the explicit willingness of all actors and institutions to participate in the process (commitment) and to translate the results of that process into individual action,
- an explicit requirement on authorities and other formal structures to work with others and to make use of informal structures,
- consensus-orientation as a leading principle,
- creating and actively using firmly established information structures,
- establishment of a central organ or forum as a national point of contact for all ICZM-related issues. This organ is not tasked with developing contents, but with sorting through information, co-ordination between different stakeholders, organisation of the ICZM process and keeping in contact with different points of information.

## **6.10 A more international perspective**

National ICZM efforts need to be linked to increasingly international orientation of the ICZM process and a more international approach to marine spatial planning. This corresponds to the systems approach at a regional seas level as well as the change of paradigm in international programmes, which are increasingly focused on human activities, spatial use and international spatial planning rather than environment (e.g. OSPAR). Questions of marine spatial planning are likely to gain greater prominence internationally, driven by developments such as shipping, ports and harbours and international gas and electricity markets.

## **6.11 Stronger links to thematic research**

The national ICZM process should be linked more strongly to thematic research. Creating a cluster of excellence would be advantageous in terms of allowing broader and more interdisciplinary research and better institutional links. At the same time, Germany could benefit through participation in international research programmes such as LOICZ (Land-Ocean Interactions in the Coastal Zone). The main task of thematic research is to support the ICZM process by delivering results that are politically relevant. This requires increased inter- and transdisciplinary research such as “Coastal Futures” or “ICZM Oder”. Integration of scientists in the ICZM process can ensure more regular interchange between science and practitioners and also ensure the practical relevance of research. Systems-oriented research is also an essential to develop appropriate monitoring programmes at an ecological, economic and social level.

## **7. Monitoring for ICZM and marine spatial planning**

As an ongoing process ICZM needs to be continuously adapted to changing framework conditions and new political, economic and social realities. Generally speaking, monitoring is required of the following:

- ecology of coasts and seas,
- socio-economic systems,
- the institutional framework.

Little research has so far been carried out at the interfaces of these levels. From the point of view of spatial planning, and also from a wider management perspective, the following elements would need to be considered in a coastal and marine monitoring system:

- a stocktake of coastal and marine forms of resource use, describing current trends in terms of their dynamism and the impact these might have on ecological or socio-economic framework conditions,
- a description of spatial interrelationships and cause-and-effect-relationships,
- societal values and objectives,
- institutional systems and processes of effecting change (including a means of assessing the success of ICZM itself).

There are two possible approaches to developing a monitoring system. One begins by specifying an outcome (a desired end state of the coast and also an idealized ICZM process), which is followed by a selection of key parameters that describe these outcomes. Indicators and data needs are specified last of all. The other approach begins by developing possible indicators first and only then focuses on parameters. At present, it is unclear which approach is the more profitable one. What is clear, however, is that insufficient links exist between actual data collection and the discussion of what will ultimately need to be assessed in “good” ICZM (see Box 2 below). Another point is that different objectives might exist for different spatial scales of coast, which might require indicators to be locally adapted or ranked in some way.

The discussion on ICZM indicators in Germany and elsewhere is controversial, but is not the subject of this report. The following describes a general approach to developing a monitoring system for coasts and seas from the point of view of spatial planning. Its main focus is on assessing spatial trends on coasts and seas, as well as monitoring the economic and social impacts of coastal and marine developments on land. At this stage, it does not go as far as actually suggesting indicators, but does propose initial parameters that can be used as a basis for future monitoring. Ways are also suggested for linking a marine-based spatial monitoring system to existing systems of data collection on land.

### **7.1 Differentiating between spatially impacting and spatially non-impacting trends**

A spatially oriented monitoring system needs to differentiate between spatially impacting and spatially non-impacting trends on coasts and seas. For terrestrial areas, the BBR regularly describes and analyses the status and foreseeable development of spatial and settlement structures and periodically publishes these as national Spatial Planning Reports (BBR 2005). Whilst this permanent spatial monitoring programme already makes a substantial contribution to assessing the state of coastal regions and the impacts of land-based developments, some additional analysis is required for successful ICZM. This particularly concerns the special land-sea and sea-land interchanges, a defining characteristic of coastal regions. Specific examples include:

- interactions between river catchment areas and/or the coastal hinterland and coastal areas and coastal waters (e.g. material and energy intake into coastal waters or the significance of port infrastructure for export-based industries in the hinterland),
- changes in marine areas and resulting impacts on coastal regions (e.g. economic effects of marine resource use, also threats posed by climate change and expected consequences of climate change).

## 7.2 Maritime character

Another shortcoming of the terrestrial permanent spatial monitoring programme is that it fails to take account of the coast and sea as a spatial unit in its own right, with its very own landscape character and unique set of land-sea interactions. In this report we use **maritime character** as a way of describing the specific nature of coastal and marine areas. Maritime character is defined in two ways. On the one hand, it is a measure of **spatial qualities** or distinctiveness, expressed for instance in the aesthetic qualities of the seascape or coastline. On the other hand, it is a **functional definition**, which is based on specific marine and coastal uses or dependence on these. Focal point of this approach is the need to describe change in coastal and marine spatial use and the effects of that change on the adjoining terrestrial areas. Maritime character therefore also expresses **dependence** of coastal regions on coastal and marine forms of use. Maritime character can be defined for both EEZ and coastal waters as well as terrestrial coastal areas.

### Box 5: Definition of maritime character

A description of an area's maritime character (applicable to both land and the sea) can be based on the following criteria:

#### a) functional criteria

- Functional spatial catchment area with a defining influence on marine and coastal ecosystems and their associated functions (e.g. riverine nutrient discharge into coastal waters, influencing fish populations and with that fishing),
- Dependence of coastal regions on marine spatial and resource uses or economic outputs (e.g. jobs in fishery, oil, coastal tourism, shipyards etc; socio-economic chain of effects)

#### b) qualitative description of space

- Definition of types of seascape and specific coastal character (aesthetic criteria)
- Significance of the sea and the coast for local identity

An assessment of these elements and specifically also their interrelation is difficult based on existing data. The following suggests principles for integrated ICZM-oriented monitoring of coasts and seas based on the existing permanent spatial monitoring programme of the BBR, including measures of maritime character. Where monitoring ICZM processes is concerned, we refer to the current work of the EU Expert Group.

**Box 6: Data deficiencies for establishing a permanent spatial monitor for coasts and seas**

*1. Problems with the availability of data / data requirements:*

- Insufficient access to data (especially also for the public, science and investors);
- Insufficient data exchange, in particular at a transnational level;
- Insufficient information on existing data, i.e. need for a metadata catalogue;
- Data preparation and responsibility for this;

*2. Limited use of existing data:*

- Existing data only describe the status quo. New data are required that describe the impact of new forms of spatial use, taking into account cumulative and transborder aspects;
- Existing data give no information on the spatial impact individual forms of use have on others, the marine environment or terrestrial areas.
- There is a problem with gathering information on and describing often unknown cause-and effect relationships;
- It is also difficult to gather information on cumulative effects due to complex cause-and effect relationships and interchanges;
- Most data have been gathered and analysed for a specific purpose, rendering them of limited use for other purposes.

### **7.3 Specific considerations for spatial monitoring of coastal and marine areas**

In a spatially oriented monitoring programme, the key is to relate maritime character to spatial function and spatial impact. Indicators need to be developed that take account of patterns and multiple use of areas, goal systems and management processes. The demands posed by each of these will be considered in turn.

#### **7.3.1 Patterns of use and multiple use of areas**

The stocktake used the following four dimensions to describe and assess the importance of change in marine spatial use:

- dynamics of change,
- interconnectedness with other forms of use,
- absolute significance,
- political relevance and political-administrative responsibility (in order to be able to assign specific forms of use to the required administrative and decision-making level).

These dimensions are necessary for identifying areas where action might be required and also the scale at which this action needs to take place. However, they only describe individual forms of marine space use and do not allow any integrated evaluation of spatial developments and their impacts. Spatial planning focuses on patterns of use and the cumulative impacts of patterns on the system as a whole. This means capturing and evaluating the cumulative impacts of patterns of use. This requires:

- a description of patterns of use, in particular in the marine environment,
- a description of land-sea interchanges,
- a description of landward impacts of resource use in the sea,
- a description of the driving forces responsible for changes in spatial use,
- a description of societal values and norms.

Analysing patterns of use is closely linked to the principle of polyculture and the concept of multifunctional space. In the context of a spatial monitoring programme, patterns of use can be assessed using the following:

- cost-benefit relationships of different forms of spatial use,
- potential competition between forms of use and compatibilities (in order to identify win-win-situations)

### **Land-sea interchange**

Depending on what types of influence are considered, an integrated land-sea perspective might extend the notion of 'coastal' to include entire river catchments. A number of monitoring programmes exist for ecological parameters of land-sea interaction. Translated into legislation, these could also become spatially relevant (e.g. when regulations concerning agricultural pollutants affect farming practices). Close relationships also exist between catchment areas and coastal waters in the context of the EU Water Framework Directive. The WFD is instrumental in specifying water quality targets and selecting criteria for assessment. Ecologically speaking at least, a permanent coastal and marine spatial monitoring programme can therefore resort to many data already provided.

Land-sea interchange also has an economic dimension, with ports and harbours constituting an essential node of global trade. These interchanges could be described by the proportion of imports and exports generated in the hinterland (for instance Bavaria) or by specific sectors of industry (e.g. the automobile industry), which are then handled by German sea ports. They too can be described on the basis of existing economic data and incorporated in a permanent spatial monitoring programme.

Coastal areas are increasingly affected by extreme flooding events and storm surges, a special form of land-sea interchange. This threat is likely to increase in future in the context of climate change, placing additional responsibility on spatial planning and anticipation. Coastal defence and the perception of threat by the local population are highly relevant in the context of coastal and marine monitoring, as is the development of indicators to describe the effectiveness of emergency and contingency measures.

### **Landward effects of marine resource use**

Landward effects of marine resource use comprise:

- Sensitivity and vulnerability of coastal areas and ecosystems to shipping accidents (and/or the effects of chemicals and oil released into the sea);
- Economic and social dependence of coastal areas on marine forms of resource use, e.g. fishery, oil, coastal tourism, shipyards etc.

Dependence of terrestrial regions on marine space and resource uses was already suggested as a central parameter for the definition and assessment of the functional maritime character of coastal regions. An example for approaching such a functional characterisation is provided in section 9.5.

### **External driving forces**

To spot change early, and to initiate a relevant debate in good time, drivers of spatial change need to be monitored and an estimate provided on their likely impact on coastal and marine areas. Drivers of regional (and national) developments include:

- processes of globalisation (e.g. affecting port development and shipping),
- political developments (e.g. energy policy, energy supply, aspects of security of supply, climate policy),
- societal values and norms such as safety from terrorism, shipping accidents, natural disasters or general attitudes to risk,
- technological developments (e.g. use of hydrogen, energy technology or „blue“ biotechnology),
- global environmental change.

The effects of global environmental change are set to become an increasingly significant driver of change on coasts and seas. New climate scenarios drawn up by the Intergovernmental Panel for Climate Change and a special report of the German Scientific Advisory Council for Global Environmental Change (WBGU) have pointed towards more rapid change than originally anticipated.

Although these drivers cannot always be described in quantitative terms, qualitative descriptions of current developments can help to identify potential impacts in form of qualitative scenarios. These can then be introduced into a societal discourse on visions and guiding principles for coastal development. This meets demands for pro-active and forward-looking forms of spatial planning.

### **Societal values and norms**

Ultimately, patterns of use and also conflicts over priorities are driven by society's values and norms. Values are a major force of change, with strong influence e.g. on decision-making processes, preferences and political processes. They are also a useful indicator on what might be acceptable in terms of policy and what might remain controversial. Recent research for example highlighted different values and norms held by different groups of society in the context of offshore wind farming (Gee et al. 2006), which can now be used to tailor conflict resolution and regional management approaches. A permanent spatial monitoring system can make good use of such data to pinpoint future trends, fashions or likely limits of acceptance, using tools such as stakeholder analysis or questionnaire surveys in the general or local coastal population.

### **7.3.2 Goal systems**

Whether it is decisions taken on marine space use or the division of tasks between different administrative scales, marine spatial planning and ICZM are always guided by a system of political and societal objectives. Goal systems include political objectives (e.g. climate policy), which might result in an expansion of offshore wind energy, as well as environmental or structural objectives. Most decisions taken on spatial or resource use can be analysed in terms of their goal systems. The Land of Lower Saxony, for instance, justifies its programme of marine spatial planning and the resulting co-ordination of offshore wind energy on the basis of the following political objectives:

- energy policy (renewable energy targets of the EU, the federal state and the Land itself),
- structural support of coastal regions,
- supporting the potential for innovation and competitiveness of the wind energy sector,
- generating a secure environment for planning and investment decisions,
- minimising risks, interventions and negative impacts of offshore wind energy.

The overall goal system of ICZM can be seen to comprise:

- creating an optimised structure of multiple resource use on land and in the sea (polyculture),
- addressing different spatial levels (national, regional and local) and their respective priorities,
- taking up long-term and future-oriented trends and developments,
- supporting maritime economies,
- security and the provision of adequate coastal defence,
- maintaining the integrity of ecological and socio-economic systems and developing a guiding framework for development,
- applying the ecosystem approach.

Another goal system is the EU Water Framework Directive, which can be seen as a model for internalising external spatial conflicts (in this instance between river catchment areas and coastal waters) and possibly providing an example for other spatial interrelationships. Other goal systems relevant at a political level include the European Marine Strategy and the recent Green Paper on maritime policy.

Spatial monitoring will not yield meaningful results if it fails to take account of existing goal systems. Monitoring trends and developments, as well as the spatial, ecological, economic or social impacts of these trends, only makes sense if the real situation determined on the ground can actually be compared to a desired end state. Usually, this end state would be specified in the respective goal system. Based on the monitoring results, action can then be taken to correct undesired trends or to continue successful management practices.

Visions and/or guiding principles form a special type of goal system, in most cases an informal one. In ICZM, visions are usually developed by a group of relevant stakeholders in the context of management of certain sections of coast. Whatever their spatial or temporal scope, they are a necessary framework for taking action, irrespective of whether this action is taken by administrations, as part of formal approval procedures or in the context of investment decisions. Visions do not necessarily form the starting point of ICZM, but they do need to be developed as part of a consensual ICZM process. In order to be monitored, visions must be translated into tangible objectives and specified milestones, just like the more formal goal systems set out above.

### 7.3.3 Management processes

In the context of ICZM, demands made of management processes commonly include:

- an ability to account for the perspective of both winners and losers (defined for example in terms of interests or geographical space),
- transparency, providing for an open flow of information flow as a basis for balancing interests,
- providing for dialogue between different levels of decision-making and implementation (EU, federal state, Land, local districts), and incorporating higher political-strategic as well as local interests in the objectives of coastal and marine development,
- ability to include informal discussion,
- facilitating long-term decisions on the basis of integrated, consensual visions and guiding principles as a basis for spatial and sectoral planning,
- providing for regular assessment and if necessary renewal of visions.

Management processes are linked to **process indicators in ICZM**. One approach is to describe the degree to which ICZM has been used and implemented in a region or country. This however does not specify whether ICZM objectives are met through regionally adapted, suitable ICZM processes or not. More information on process indicators is provided in section 8.7.

### 7.3.4 Summary requirements of indicators

In order to meet the various demands sketched out above, indicators used to monitor the spatial effects of marine and coastal developments need to achieve the following:

- describe the degree to which offshore uses have a **spatial impact** on land, e.g. through infrastructural requirements such as ports or roads,
- describe the degree to which offshore uses define the surrounding coastal areas, leading to a **specification of qualitative and functional maritime character** for all relevant spatial units (towns, districts, regions);
- describe the degree to which marine forms of use are significant to the local, regional or national **economy**, to the **job market** and the **social environment** (primarily in terms of associated infrastructure, but also in terms of social cohesion or local distinctiveness);
- describe the potential contribution of coastal and marine resources to **nationally significant developments or policies**, e.g. renewable energies, import and export, or the provision of recreational spaces of supra-regional significance.

## 7.4 The DPSIR approach as a structural aid

In the context of permanent spatial monitoring for coasts and seas, land-sea interactions are a key element in assessing the interdependence of marine and terrestrial space. As set out above, “maritime character” is partly a functional label which describes the degree to which terrestrial areas, expressed in spatial units such as districts, depend on the use of coastal and marine resources. But this seemingly obvious functional relationship is embedded in a highly complex systems context, with multiple cause-and-effect relationships and temporal factors to consider. One way to simplify such cause-and-effect relationships is an approach developed by the European Environment Agency, the so-called DPSIR concept (Driver-Pressure-State-Impact-Response). This is a way of sorting all available information (and based on this, also indicators) into five categories: driving forces (drivers), pressure of use (pressure), a description of the status quo (state), the effects of pressure on that state (impact) and management responses and/or institutional options for taking action (response).

The DPSIR concept is a useful tool which can readily be adapted to the needs of a permanent spatial monitoring system for coasts and seas. In the context of spatial planning, the categories can be interpreted as follows:

- Driver: all natural or man-made factors which cause changes in a system, either directly or indirectly. ‘System’ here refers to coastal and marine systems in the context of spatial planning and includes social, economic and institutional as well as ecological components.
- Pressure: environmental pressure or pressure of use acting on the coastal and marine system as a result of the drivers. In the context of land-sea interchanges, pressures for instance comprise material and energy flows between rivers and coastal waters and include all forms of marine and coastal resource use.
- State: a stocktake description of the system which is influenced by drivers and pressures. In the context of spatial planning analysis includes ecosystems, the current state and trends in spatial use, social infrastructure, the institutional system governing coastal and marine resource use and the current state of particularly relevant sectors. A description of the state must also include societal values and standards, as well as attitudes of local communities to central developments (e.g. coastal defence, wind energy).

**Impact:** specifies the effects of drivers and pressures on the coastal and marine systems. Contrary to the previous step, which is purely descriptive, impacts already contain an element of evaluation. The classic definition of impact in environmental assessment refers to the knock-on effects of ecosystem deterioration on resource use (ecosystem goods and services), using e.g. algal blooms as indicator of excess eutrophication with potentially negative impacts on tourism. The spatial planning context takes a wider perspective of impacts, including impacts of drivers and pressures on all elements listed in 'state'.

**Response:** describes societal forms of response to (environmental) systems change. Central elements include management options, institutional responses and their framework conditions, as well as individual changes of behaviour (e.g. changes in holiday destinations). Response also includes changes to the existing legal framework, the introduction of monitoring systems, or investment decisions affecting the location of businesses.

In the context of spatial planning, the concept of drivers particularly serves to identify and represent trends that influence coastal and marine spatial use. Offshore wind farm developments, for example, are largely driven by energy and climate policy, whilst shipping and port developments are driven by an increasingly globalised economy. Key factors likely to drive the development of German coasts and seas include:

- energy policy and energy needs,
- economic and institutional globalisation,
- societal perception of climate change and the resulting impacts on coastal defence and security of economic spaces,
- technology (shipyards, wind energy, aquacultures, „blue biotechnology“)
- development of the market, e.g. in the field of marine natural substances used in pharmaceutical industry.

Pressures are usually defined through a stocktake, examples of which are provided above. Ecological pressures not listed in the stocktake can for instance result from:

- introduction or displacement of species,
- import and export of energy and/or matter,
- resource use / removal,
- natural physical and biological factors.

## **7.5 An example for selecting socio-economic indicators for spatial monitoring on the coast**

The previous sections have established that functional maritime character can be defined as dependence of coastal regions on coastal and marine forms of resource and space use. In DPSIR terminology, this requires a definition of socioeconomic impacts marine-based developments have on terrestrial areas. The national research project "Coastal Futures – Zukunft Küste" has developed an approach to just that. A local case study area (the German North Sea coast of Schleswig-Holstein) was selected to test the approach, but it can be transferred to other coasts and scales as necessary. It is based on measuring the economic impact of certain industries with likely demographic developments and to scale this down to specific regions of coast. Once a simplified model of cause-and-effects has been established, different assumptions concerning future drivers and pressures as

well as different management options (response) can be applied to give rise to various future scenarios.

To look at economic impact of specific industries, the system of national accounting is a useful starting point. In Germany, national accounting regularly provides key economic data at a Länder and district level. Although this cannot always be broken down to the level of individual districts or towns, the available data sets can highlight patterns of development with sufficient precision to forecast likely economic futures. From these national accounting data, parameters now need to be selected which summarise relevant information and show up economic trends at different spatial levels.

Economic performance then needs to be linked to social impact, which in turn needs to be considered in the context of wider social trends and developments. Jobs and secondary employment effects are one way of measuring social impact. In terms of spatial planning, other relevant impacts include demographic changes and changes to the basic infrastructure (e.g. roads, public transport, schools, medical care).

In summary, the socio-economic impacts of coastal and marine forms of use can be measured through the following:

- real and expected demographic developments (prognoses drawn from various forecasts),
- access to employment (expressed through the rate of employment, employee's contributions to social security, percentage of those that are self-employed, rate of unemployment),
- structure of the economy (relationship between industry and services),
- capital stock and capital efficiency (capital productivity, modernity, added value relative to the number of employed persons)
- individual quality of life (disposable income, savings rate, share of transfers in the total income)

The share of transfers to and from a region indicates whether the region is able to develop sustainably and independently or whether it will continue to be dependent on transfers from outside.

A number of criteria were taken into account in the selection of indicators:

- availability of long-range data sets,
- representation, over time, of differences between urban (fringes) and rural regions,
- the ability to combine different measures of economic and social stability at a sectoral and individual level,
- taking stock of early signs of change (capital stock – modernity),
- ability of indicators to be cross-compared.

On this basis the following indicators were chosen:

- invested capital
- modernity
- number of employees
- gross domestic product, gross value added
- number of inhabitants
- number of persons in work,
- output-capital ratio, capital co-efficient, capital intensity
- capital stock
- price concept
- savings-income ratio
- disposable income

### **Box 7: A mini-scenario as an example**

The following mini-scenario provides an example of how the DPSIR approach can be implemented in practice. For each step, a number of conceivable parameters are presented, which could be developed into more specific indicators to be employed in a spatial monitoring programme for coasts and seas. The scenario presented here is not based on real data. Although it represents a conceivable future, it is purely hypothetical.

As a starting point, the following assumptions are made:

**Driver:** Germany in the year x is characterised by growing consumption of energy. Since conventional sources cannot keep pace and oil supplies are increasingly unreliable, national policy supports increasing energy independence and seeks to reduce Germany's reliance on foreign energy imports. Renewable energies are still widely supported by the general population and by all political parties. On the mainland, wind energy continues to be controversial, but a first generation of deep-water wind farms in the EEZ has been successful. Government continues to make available tax subsidies for offshore wind farms and has made available special funding to encourage more construction.

**Parameters:** e.g. degree of political support of individual developments (for instance, number and orientation of funding programmes provided at federal and Länder level), assessment of trends in society to establish attitudes towards regenerative energies; comparative cost-benefit analysis of different sources of energy.

**Pressures:** Large marine areas are made available for offshore wind park construction, leading to the exclusion and ultimately conflicts with other forms of use. Fisheries are particularly affected, as are marine nature conservation, shipping, aggregate extraction and maintenance of cables and pipelines on the seabed, none of which can necessarily co-exist with large-scale offshore wind parks. Knock-on effects also ensue on land. Tourism responds by creating new offshore attractions, whilst nature-based tourism is decreasing on account of highly visible coastal and marine industrial installations (aesthetic landscape impact). This affects the number of overnight stays in the region and indirectly jobs in tourism and tourist infrastructure.

**Parameters:** e.g. changes in the relative amount of space given over to individual forms of use, spatial compatibility of uses, density of use in the sea per km<sup>2</sup> (number of uses per unit of space), percentage of marine space without permanent fixed structures, data from sEIA etc.

**State:** The description of the status quo on is based on a socioeconomic assessment of coastal regions in terms of their dependence from coastal and marine forms of resource use. Functional interrelationships between land and sea are calculated from demographic and socioeconomic data at district level. Ecological parameters are monitored separately.

**Parameters:** e.g. invested capital, modernity, number of employees per sector or industry, gross domestic product, gross value added, number of local residents per district, number of persons in work, output-capital ratio, capital co-efficient, capital intensity, capital stock, price concept, savings-income ratio, disposable income, demographic data, in-migration, out-migration per district or region, social infrastructure such as number of schools, secondary schools and universities, access to medical care, access to public transport etc.

**Impacts:** Offshore wind farms are fixed structures whose life cycle comprises construction, maintenance, operation and decommissioning (or repowering). Accident control (e.g. to prevent collisions with ships) or the potential for co-use also need to be considered. Potentially, this leads to an expansion of the production chain and increases the total value added, ranging from manufacture of wind turbine components to construction and regular maintenance. Added value is apparent in the number of employees and the emergence of secondary economic effects, e.g. the development of tourist trips to offshore wind parks. In-migration of qualified young persons can lead to increased numbers of young families in the local population, which in turn leads to increased demand for primary and secondary schools as well as improved infrastructure and local accessibility. Economic impacts thus indirectly manifest themselves in demographic and spatial trends and the need for infrastructure to respond.

**Parameters:** e.g. population structure (ratio of younger to older residents), supply of kindergartens or schools (oversupply, undersupply), available housing (over- or undersupply), access to and quality of basic social infrastructure such as health care (number of doctors per 100.000 inhabitants, hospital beds per 10.000 inhabitants), other data available in the BBR spatial monitoring programme.

**Response:** Observed developments are compared to general societal objectives (e.g. support for renewable energies) and specific visions and objectives for the coast and the sea (e.g. a sustainable coast, protection of marine habitat and species, maintaining a certain quality of life for local residents). This leads to a decision on how much offshore wind farming is actually desirable and how wind farming can be balanced against the demands made by other forms of use. Management measures are discussed and implemented: for instance, selecting preference areas for certain forms of use, setting concrete limits, drafting participatory management plans etc.

## **7.6 Implications for establishing a permanent spatial monitoring system in the sea**

In order to implement a permanent spatial monitoring system as described above, existing forms of monitoring need to be adapted. The following describes some of the challenges still faced by spatial planning in the context of coastal and marine monitoring.

### **7.6.1 Gathering economic data on specific maritime industries**

To describe the maritime character of a region based on the socio-economic impacts of marine-based industries, data need to be made available that (a) allow a comparative assessment of different industries, and (b) show up the specific socio-economic changes that result from changes in each form of use. This type of economic data is best provided per sector of industry (e.g. fishing, aggregate extraction etc). Where sectors do not yet exist, specific new categories need to be established. Since offshore developments as a whole are composed of many sectors, fine-tuning of current monitoring programmes is required so that specific maritime effects can be filtered out from general economic trends. The service sector for instance, presently brings together services from many different fields, without differentiating between types of service or specific industries. In order to determine the specific effects of marine industries on the wider economy, this category would need to be broken down into more specific services, e.g. those relating to offshore-wind farming or other marine industries. The same applies to manufacturing (e.g. provision of steel, electronic parts etc.), financial services, research and development, as well as education and training (e.g. number of trainees in certain trades etc.) Based on this, it is possible to calculate the proportion of jobs in certain marine industries relative to the total number of jobs per region. Rates of employment can also be calculated per sector. This means comparisons can be made between "traditional" sectors such as fishery and "new" marine forms of use (e.g. in offshore wind industries) based on their relative proportion of overall economic development. The effect of marine industries on the gross national product can be specified for individual regions, Länder or Germany as a whole. An economic definition of "maritime character" could therefore comprise the proportion marine industries and services represent relative to the total value generated in a region.

### **7.6.2 Qualitative description of indirect infrastructural impacts**

Economic development affects local demographic trends, which in turn affect infrastructural needs. Current infrastructural forecasting (e.g. predicting future demands for schools or kindergartens in regions) is based on general population trends, generally without taking into account regional economic developments. In order to establish a relationship between economic trends, demography and spatial and/or social infrastructure, population data need to be raised beyond the standard population census. Specific data is required on regional in- and out-migration, in particular with respect to age, family status and income of the migrating population. If offshore wind industries for instance become an economic pull factor, this might lead to more young qualified employees migrating to a region, plus also cause local young people to stay in the region. An indirect effect of such trends might be an increased likelihood for establishing young families or greater demand for leisure-based activities or cultural resources.

It is important to note that demographic and infrastructural effects such as these can only be described in qualitative terms. Quantitative assessments are possible in retrospect, but even then it is difficult to put down observations to clear-cut cause-and-effect relationships. A causal relationship can only be established between offshore industries, their economic impacts on the mainland and likely social knock-on effects and not vice versa. Elements of the social system, expressed in terms of

demographic trends and infrastructural knock-on effects, therefore at best represent indirect indicators for the impacts of offshore developments.

The type of social impacts listed above is already monitored in the permanent spatial monitoring programme of the BBR. What is new is the concept of combining these with specific economic data raised for marine and coastal industries.

### **7.3.3 Agreeing on specific ‘seascape parameters’: Maritime character as a guiding principle for the EEZ and coastal waters**

Apart from economic and spatial impacts on land, the maritime character of an area can also be determined on the basis of the landscape itself. This requires an aesthetic assessment of marine areas and coastal waters. Examples for indicators or values used are the proportion of unused space, the proportion of fixed, visible structures, or a special definition of “wilderness” for the sea. Initial ideas can be taken from efforts made in other countries: Ireland and Wales for instance have developed a system specifically for the qualitative assessment of seascapes (Hill et al. 2001). Indicators such as aesthetic qualities will then need to be weighed compared to ecologic, economic or social indicators, which will need broad participation from coastal stakeholders and society at large.

## **7.7 Process indicators**

At a European level, an EU expert group has developed criteria designed to measure progress in ICZM. These process indicators correspond to five steps of the ICZM process and 26 individual actions. They are also assigned to three spatial scales (national, regional, local). The expert group suggests self-assessment as a principle for gathering the required data, which is subject to controversy due to the inherent subjectivity and also limited group of persons involved. The five phases of the ICZM process are described as follows:

1. A foundation for future ICZM activities has been laid,
2. A framework for future ICZM activities has been created,
3. Vertical and horizontal integration exists between actors,
4. An effective, integrative and participatory coastal management programme has been established,
5. ICZM is fully implemented.

Priority actions have been assigned to these phases, whose status of implementation is to be assessed every three to five years.

A fundamental problem with process indicators for ICZM is the lack of a definitive point of reference. When is an ICZM process to be considered ideal? Also, ICZM processes can only be evaluated in the context of a desired end point for a pre-defined area. What state of coast represents that desired end point, and what spatial scale are we referring to? Process monitoring is therefore strongly dependent on clear-cut spatial frameworks, objectives and targets. It also requires continued evaluation of societal norms and values and visions for the coast. Regular interviews with stakeholders and network and communication analysis can be helpful tools in this context.

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## List of abbreviations

### Ministries and authorities

|       |   |
|-------|---|
| BBR   | Federal Office for Building and Spatial Planning                            |
| BMBF  | Federal Ministry for Education and Research                                 |
| BMELV | Federal Ministry for Food and Agriculture                                   |
| BMU   | Federal Ministry of the Environment   |
| BMVBS | Federal Ministry for Transport, Building and Urban Affairs (formerly BMVBW) |
| BMVg  | Federal Ministry of Defence   |
| BMWi  | Federal Ministry of Economics and Technology                                |
| BSH   | Federal Shipping and Hydrographics Agency                                   |
| WSD   | Federal Waterways and Shipping Authority                                    |

### Other acronyms

|                      |  |
|----------------------|--|
| EEG                  | Renewable Energies Act   |
| EEZ                  | Exclusive Economic Zone  |
| EU                   | European Union   |
| FTZ                  | Research and Technology Centre West Coast  |
| HELCOM               | Helsinki Commission  |
| ICZM                 | Integrated coastal zone management   |
| IMO                  | International Maritime Organisation  |
| MARPOL               | International Convention for the Prevention of Marine Pollution from Ships         |
| MW                   | megawatt   |
| OSPAR                | Convention for the Protection of the Marine Environment of the North East Atlantic |
| PSSA                 | Particularly Sensitive Sea Area  |
| ROB                  | Federal Spatial Planning report, published by the BBR every five years             |
| Ro-Ro                | roll-on-roll-off   |
| Seeanlagenverordnung | Marine Facilities Ordinance  |
| TEN-Network          | Transeuropean networks   |
| TEU                  | twenty foot equivalent unit  |
| TWh                  | Terawatt hours   |
| VASAB                | Vision and Strategy around the Baltic Sea 2010                                     |
| WFD                  | EU Water Framework Directive   |
| WSF                  | Wadden Sea Forum   |
| WZB                  | Social Science Research Center Berlin  |