Towards marine spatial planning in the Baltic Sea

BALANCE Technical Summary Report 4/4

Baltic Sea Region INTERREG III B

BALANCE

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Towards Marine Spatial Planning in the Baltic Sea	

Authors	Kindström, Merit	Date
Editors:	Lindblad. Cecilia	May 2008
Jan Ekebom,	Mattisson, Annelie	
Jenni Jäänheimo,	Sandström, Alfred	
Johnny Reker	Vadim Jermakovs	
		Approved by
		Jesper H. Andersen

Authors:
Jan Ekebom,
Johnny Reker
Feucht, Christiane
Lamp, Jochen
Pitkänen, Timo
Snickars, Martin
Jenni Jäänheimo,
Sørensen, Thomas
Vestergaard, Ole
Blanner, Peter
Wichmann, Henrik
Bergström, Ulf
Sundblad, Göran
Haldin, Michael
Martin, Georg
Aigars, Juris
Andersen, Jesper
Bergstöm, Lena
Bostöm, Minna

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CONTENTS

APPENDICES

0 PREFACE

In 2005 a consortium consisting of a total of 27 governmental agencies, research institutions, universities, regional authorities and NGO´s in 8 countries from the Baltic Sea Region put forward an application the BSR INTERREG IIIB Neighbourhood Programme with the aim of developing tools for promoting a transnational and cross-sectoral approach to marine spatial planning within the Baltic Sea, Kattegat and Skagerrak. The project name was BALANCE.

The timing of the BALANCE project turned out to be exceptionally good. The project started when the EU had already started to work on its Marine Strategy while HELCOM developed a Baltic Sea Action Plan (BSAP). By the end of the BALANCE the EU marine strategy had developed into the Marine Strategy Framework Directive and HELCOM agreed on the Baltic Sea Action Plan in October 2007, or about a month before the BALANCE ended. These two, very important documents, has very significantly influenced the project's work on marine spatial planning.

Therefore, and reflecting the international spirit of these initiatives, BALANCE has been based on extensive transnational cooperation, which involves many different scientific disciplines while aiming to bridge the gap to environmental management and policy drivers for the marine ecosystem within the Baltic Sea Region. A key element in BALANCE has been to show that *informed* management and marine spatial planning has to be based upon sound science. If it is not, it is more likely to do more harm than any good for the involved stakeholders, sectoral interest and for the environment. The work should only be seen as a step towards informed marine spatial planning in the Baltic Sea Region.

At the same time, we are very pleased to know that marine spatial planning is climbing higher and higher on the international agenda i.e. as an important part in HELCOM´s Action Plan for the Baltic Sea. Our data-sets, as far as immaterial rights restrictions and copyrights allow us, will be available at HELCOM.

The results, products and recommendations presented in this report represent the experiences of an independent international partnership, and do not represent any national or official viewpoint of the involved research institutes or governmental agencies. The work is part financed by the European development fund BSR INTERREG IIIB Neighbourhood Programme and partly by the involved partners. It is number four of four Technical Summary Reports based on 33 Interim Reports.

More information on the BALANCE project is available at www.balance-eu.org, HELCOM at www.helcom.fi and on the BSR INTERREG IIIB Neighbourhood Programme at www.bsrinterreg.net.

Jan Ekebom[a], Jenni Jäänheimo[a] & Johnny Reker [b]

May 2008
The Natural Heritage Service, Metsahällitus, Finland [a]
The Danish Spatial and Environmental Planning Agency [b]

1 EXECUTIVE SUMMARY

This report presents a holistic approach to marine spatial planning taking both human uses and environmental information into account, while operating within the multi-national context of the Baltic Sea Region. The BALANCE approach is build around three key elements: 1) The combination of ecological information with information of multiple human uses, pressures and impacts, 2) a spatial planning template describing the steps towards marine spatial planning, and 3) a simple, balanced zoning approach allowing space for all human uses, while minimising the impact on the marine environment. The work was undertaken because marine spatial planning is essential for the implementation of a transnational and ecosystem-based approach to the management of human activities in the marine environment, and thus for supporting the long-term sustainable development within the Baltic Sea Region.

The goal was set very high – to demonstrate how marine spatial planning could be carried out in a multinational context, here exemplified with the Baltic Sea Region. Rather than define a whole new set of legislative needs, the marine spatial planning defined by BALANCE has been build around existing international obligations, whether as defined by the regional sea convention, HELCOM and the Baltic Sea Action Plan, or EU policy-drivers and directives. For example, the marine spatial planning relies heavily on spatial information and Geographical Information Systems (GIS) and that there exist an infrastructure that make marine information available. Such an infrastructure will, in principle, be delivered by the EU INSPIRE Directive. Similarly, the EU Marine Strategy Framework Directive already requires the Member States to characterise and map the marine environment, human and environmental pressures and impacts. All that is really missing is to join these elements into a spatial plan.

Here we provide the reader with guidelines on how to join and use spatial information in all steps of marine spatial planning. We describe a systematic approach structured similar to an EU Directive, the BALANCE template for marine spatial planning, and provide a set of quantitative GIS tools, guidelines for how to communicate with stakeholders and GIS data layers that can be used in marine spatial planning. One of the tools described is a simple, yet balanced zoning approach, consisting of four zones 1) The General Use Zone, 2) The Targeted Management Zone, 3) The exclusive Use Zone, and 4) The Restricted Access Zone. Correct application will contribute to deliver a coherent spatial plan that ensures space for all human activities, while minimising the pressure and impact on the marine environment.

Hopefully, these tools will inspire marine spatial planning in the years to come and encourage others to continue to develop these guidelines, tools and harmonise data layers further.

2 INTRODUCTION

The marine spatial planning part of BALANCE had the benefit to build on the marine spatial planning experiences from Australia, the Irish Sea and Belgium as well as other parts of the world. Despite some differences in the definition of zones the similarities are obvious. We have tried to apply similar terminology where possible but also introduced new terms and definitions. These are all discussed in the following. Finally, as a reader you should be aware that this report is the joint product of the BALANCE marine spatial planning work but useful information is also included in separate reports, *e.g.* on Stakeholder Communication, e-participation, and the use of GIS tools as well as a broad range of reports focussed on delivering ecological relevant spatial information.

2.1 Key definitions

Bioregionalisation: The process of creating bioregions that include biological as well as physical data analysed to define major regions, or sub-regions/marine landscapes, of the marine environment. (Australian Government 2005)

Ecosystem approach: A strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. Ecosystem based management is the comprehensive integrated management of human activities, based on best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of the marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity. (HELCOM and OSPAR Commissions 2003)

Marine landscapes; the results, displayed in a form of biogeographical maps, of the BALANCE approach, create an ecologically meaningful and useful basis the bioregionalisation and further to marine spatial planning

Marine spatial planning is a strategic plan (including forward looking and proactive) for regulating and managing human uses, while protecting the marine environment, including through allocation of space, that addresses the multiple, cumulative and potentially conflicting uses of the sea and thereby facilitates sustainable development (ABPmer 2005).

Zoning is a spatial planning tool that acts like a town planning scheme that allow certain activities to occur in specified areas but recognizes that other incompatible activities should only occur in other specially designated areas and in this way zoning provides area-based controls and separate conflicting areas (Day 2000). Zoning is built upon information about the marine biodiversity. The zoning process aims at preserving the marine biodiversity, assuring a sustainable use of marine resources along with an equal and fair use of marine areas, resources and services.

2.2 Keeping the CBD, EU, HELCOM and other initiatives in mind

BALANCE is a first attempt to answer the present need for marine spatial planning framework applying zoning for the preservation of the biodiversity and the sustainable use of resources in marine areas in the Baltic Sea. We build our work partly on the ex-

periences from similar initiatives carried out in other marine areas, such as Australia (the Great Barrier Reef), Canada (Nova Scotia), and Ireland and UK (the Irish Sea). The primary target groups for our outputs are planners, managers, practitioners and decision-makers involved in marine spatial planning, but also experts within the EU, HELCOM, and NGOs. However, the purpose of our examples is only to show how the work technically can be accomplished, but these are not to be regarded as actual plans. We strongly recommend that the examples from BALANCE pilot areas are not for real zoning and that new datasets are compiled for such purpose. BALANCE is not taking any responsibility for misuse of our examples. The purpose of BALANCE is not to produce legally binding zoning plans and does not include any implementation of such plans.

Our marine spatial planning work is built on activities done in other parts of the BALANCE project, much in the same way as the actual zoning process requires the preliminary steps of gathering, mapping and analyzing data. The lessons learnt from the process itself will be a significant first step forward for future MSP initiatives and promotion of sustainable use of resources in the Baltic Sea.

In our work we have carefully considered the existing EC directives and recommendations, activities, and plans for the future that involve marine spatial planning, made by the CBD, EU and HELCOM, in order to assure that our results and final products are useful internationally (by/for these organisations), as well as locally. Furthermore, we have also considered recommendations from earlier regional initiatives, e.g. the BaltCoast project.

2.3 Goal, aim and rationale

Our goal is to illustrate how marine spatial planning could be an essential tool in implementing a long-term sustainable, ecosystem-based approach to management of human activities in the marine environment. It is focussed around three key concepts: 1) The combination of ecological information with information of multiple human uses, pressures and impacts, 2) the BALANCE spatial planning template describing the steps towards marine spatial planning linking spatial planning to existing EC directives and international policy-documents, and 3) a simple, balanced zoning approach allowing space for all human uses, while minimising the impact on the marine environment.

Our goal is also to provide a first set of tools, advice on stakeholder involvement, and illustrate how these tools can be applied through zoning examples. Our approach and methods can be applied locally, regionally, nationally and internationally.

The main objectives of the marine spatial planning and zoning done within the BALANCE project are therefore:

- To create a framework on how to apply marine zoning in management of marine areas,

- to develop methods applying spatial information (protocols, mostly GIS based) for management of marine areas with emphasis on the development of indices that quantify management efficiency,

- to produce a template and guidelines for zoning,
- to present a template and methods for stakeholder involvement,
- to provide examples on how to use the framework, template and tools.

The BALANCE framework process includes a series of stepwise considerations including integrating a range of information on natural resources, habitats and environmental pressures; conservation targets (established by an objective decision-support system); human activities of which several are potential pressures on the marine environment and user interests identified through stakeholder consultations; current national and international legislation and agreements. In our examples, we demonstrate possible management scenarios, including principle considerations of candidate managed areas or 'user zones', allowing or regulating different types of human activity in the Baltic Sea.

2.4 Applying marine spatial planning in the Baltic Sea Region

At present zoning of marine areas in the Baltic Sea has not been practiced in a comprehensive overarching manner as done on land in regional and land use plans. Instead various uses of sea areas has been established in areas most suitable for the activity at hand, without giving too much consideration about other interests to use these areas, the sustainability of the activity or whether or not the biodiversity is preserved. Consequently, multiple uses of sea areas are common in many areas, in particular close to densely populated areas, and the numbers of conflicts between stakeholders occur frequently. The pressures on the marine biodiversity have increased through careless use of sea areas *e.g.* by increased fragmentation of landscapes and habitats. Such conflicts are also common elsewhere. In some regions of the world, efforts to find ways to solve this type of conflicts has developed further than in the Baltic Sea, *e.g.* in the Great Barrier Reef (GBR, in Australia) and the Irish Sea (Ireland/U.K) where zoning is used. Zoning, defined by Day (2002) is "*a spatial planning tool that acts like a town planning scheme*" that "*allows certain activities to occur in specified areas but recognizes that other in-compatible activities should only occur in other specially designated areas and in this way zoning provides area-based controls and separates conflicting uses* ".

Marine spatial planning is by Boyes *et al*. (2007) defined as "*plan-led framework, which enables integrated forward-looking consistent decision-making for the use of the sea*". Marine spatial planning advances in a step-wise fashion *e.g.* including setting of goals, stakeholder communication, map compilation, zoning and monitoring of performance. Zoning, as defined by Day (2002) is hence a part of MSP and the main tool of it. The zoning plan (should) facilitates the marine spatial planning process by providing an easily comprehensible way to manage human activities in marine areas. The overarching goal for the marine spatial planning and the zoning is to ensure that the use of marine areas, resources, ecosystem services and nature conservation are met.

The bioregionalisation and the zoning carried out at the Great Barrier Reef (Day 2002) possess a lot of advantages that support the use of zoning in the Baltic Sea as a basic approach in management of marine areas. We identified three reasons for applying zoning in the Baltic Sea:

1. First, zoning in the GBR is based on the ecological information from the area (the bioregionalisation) and this is a precondition for the ecosystem-based approach to management of human activities – one of the obligations put forward by the CBD, the EU and Regional Sea Conventions *e.g.* HELCOM and OSPAR

2. Secondly, the GBR zoning, by applying less than ten categories of zones, is one of the simplest ways to describe which activities are allowed or restricted in certain zones in a way that can be easily understood by anyone, as long as the number of zones is kept small (preferably lower than in the GBR example).

3. Thirdly, zoning can be applied at various spatial scales, thus ensuring its applicability in the entire Baltic Sea area, at national and sub-regional scale as well as sub-national and local scale. The GBR is approximately of the same size as the Baltic Sea and face a large variety of uses in a relatively small area; many of which are similar to those in the Baltic Sea. The GBR zoning approach has also inspired the marine spatial planning work recently done in the Irish Sea (Boyes *et al.* 2007).

However, zoning can not be applied in the Baltic Sea in exactly the same manner as in the GBR. The main reason is the fact that the Baltic Sea is surrounded by nine independent states, of which eight EU members, whereas GBR is situated completely within the borders of one country. Within the Baltic Sea countries, management of sea areas is split between several authorities. Difficulties in reaching political consensus frequently arise and their legislation differ, *e.g.* in some Baltic Sea areas part of the near shore marine areas are privately owned while in other countries all waters belong to the state. Also, the Baltic Sea is one of the most eutrophicated, polluted and heavily used regional seas in the world with very little pristine marine nature left causing a challenge when selecting areas for nature conservation. Consequently, in order to fit the current use of the Baltic Sea into zones is likely to require more simplicity than the otherwise clear approach used in Australia, while taking the multiple national and sectoral interests in account (with less than ten zones).

2.4.1 Marine spatial planning and the implementation of EU Directives and HELCOM recommendations and action plans

The CBD, the European Commission as well as HELCOM, have all promoted the application of an ecosystem-based approach to the management of marine activities. Marine Spatial Planning, being a strategic, forward looking and proactive process for regulating, managing and protecting the marine environment, is the main tool for improving decision-making and delivering a long-term sustainable and ecosystem-based approach to the management of human activities in the marine environment.

The EC Water Framework Directive

The EC Water Framework Directive (European Parliament and European Council 2000) changed the EU water policy from strict regulations and standards towards a framework-of environmental targets, leaving the decision on means for achieving them to the Member states. It reflects the ecosystem approach to management by taking into account ground waters as well as fresh waters, rivers and coastal marine waters, thus acknowledging entire watersheds instead of individual water bodies. These waters, subdi-

vided to "*water districts*", should achieve a "*good ecological status*" by the year 2015. This approach has implications and possibilities for the spatial planning of marine areas as well.

The EC Birds Directive and the EC Habitats Directives

The main objective of the EC Bird Directive is the protection of wild birds (European Council 1797) while the objective of the EC Habitats Directive (European Council 1992) is the protection of the biological diversity through conservation of habitats and species of community interest so that they will have a "*favourable conservation status*". No specific time limit for this goal has been set. The directives are applicable in all European waters on the seaward side of the baseline to the limit of the EEZ. The two directives have a clearly scientific nature conservation approach and economic, social and cultural needs as well as regional and local conditions should not be considered when selecting sites. The management of existing protected areas, ecological coherence of the protected area networks, and the potential future enlargement of the protected area network should be embedded in marine spatial planning initiatives.

The EC Marine Strategy Framework Directive

EU-Commission has submitted a proposal for a "*Thematic Strategy on the Protection and Conservation of the Marine Environment*" along with a proposal for a "*Directive on establishing a Framework for Community Action in the field of Marine Environmental Policy*", *i.e.* the "*Marine Strategy Directive*" (European Commission 2005) and in July 2007 proposed changes that also included a change of the name into "*the Marine Strategy Framework Directive*" (European Commission 2007d), here shortened into MSFD. The main objective of the MSFD is to promote sustainable use of the seas and to conserve marine ecosystems by achieving "*good environmental status*" in the marine environment by the year 2021. The directive is applicable to all European waters on the seaward side of the baseline to the limit of the EEZ 200 nm from the baseline. The MSFD forms the environmental pillar of the European Union's Maritime Policy (European Commission 2007b and 2007e). It is a framework directive, leaving the strategies, targets, monitoring programmes and programmes of measures to be developed by and for each Marine Region. In the Baltic Sea region, HELCOM has recently agreed upon its Baltic Sea Action Plan, which will acknowledge marine spatial planning and promote the use of zoning (HELCOM 2007a). This work is supported by a new recommendation on large scale marine spatial planning (HELCOM 2007b). HELCOM is currently developing its HELCOM GIS system and received all available GIS layers compiled by BALANCE not restricted by copyrights and immaterial rights.

ICZM Recommendations of the European Union and HELCOM

The European Union, in 2002, agreed on a recommendation on Integrated Coastal Zone Management in 2002 (European Commission 2002a). Despite the fact that the recommendation does not accommodate the same legal status as EU Directives it has nevertheless initiated a significant development of national structure for carrying out the responsibilities recommended, such as the protection of the coastal environment by ecologically responsible measures, sustainable economic opportunities and employment options, improved coordination of the actions taken by all the authorities concerned

both at sea and on land, in managing the sea-land interactions. Especially the last point is highly relevant for marine spatial planning as well.

The EU Maritime Green Paper & the EU Blue Book

The European Commission has presented a "green paper" under the tile "*Towards a future maritime policy for the Union: A European vision for the oceans and seas*" (European Commission 2006). This paper suggests some general principles for maritime policy making. It emphasises the effective sustainable use of marine resources but it also emphasise the application of the ecosystem approach to spatial planning. The ones relevant for marine spatial planning include *e.g.* the consultation of all relevant stakeholders in planning processes and strong coordination between institution and policies, and continuous evaluation of the performance of management activities against targets. Later, in October 2007, the comprehensive consultation process is completed (European Commission 2007b) and the Integrated Maritime Policy for the European Union, the "Blue Book" (European Commission 2007c) along with its Action plan (European Commission 2007a). The consultation process revealed that trans-boundary continuity in spatial planning and dissemination of best practice is favoured. European Union's Maritime Policy and the Action plan are likely to have a big influence on European Union's use of its sea areas. The actions include a "*roadmap towards maritime spatial planning by Member States*" by 2008. Failing in delivering an effective environmental pillar would undoubtedly have catastrophic consequences on the environment. Therefore we hope our results from BALANCE will prove useful for the MSFD implementation as for the Blue Book actions.

HELCOM

The Baltic Sea Protection Commission (Helsinki Commission or HELCOM) has given several recommendations regarding the protection and use of the Baltic Sea (www.helcom.fi). For the aims of the BALANCE project, in particular the marine management applying zoning, are recommendations 24/10 (Implementation of integrated marine and coastal management of human activities in the Baltic Sea area) and 15/5 (Baltic Sea Protected Areas, BSPAs) the most important (HELCOM 1994/2005 and 2003). The need for large scale marine spatial planning is emphasized in the newest HELCOM recommendation (HELCOM 2007b). The BALANCE marine spatial planning template will hopefully prove itself useful for implementing this recommendation.

HELCOM's ICZM recommendation 24/10

The most important issues stated in the HELCOM recommendations 24/10 are the identification of stakeholders with (conflicting) interests concerning the marine areas and their obligations and activities; identification of management issues in offshore areas and developing criteria for their management, identifying essential data gaps, improving assessments of biodiversity and human activities, and finally, the development and implementation of an overall management plan for human activities for marine areas (HELCOM 2003) .

HELCOM's BSPA (Baltic Sea Protected Areas) Recommendation 15/5
The main goals of the 15/5 Recommendation is to develop (the BSPA system) as new knowledge and information becomes available, especially including additional coastal terrestrial areas and to including marine areas outside the territorial waters. In addition, BSPA management plans should consider (in management plans for BSPAs) the impact of all possible human pressures on the marine environment. Zoning system will be an appropriate means to facilitate the achievement of satisfactory protection and balancing different uses of the sea. It also ties up the BSPA management in a single site with that of the whole Baltic Sea (HELCOM 1994/2005).

VASAB and BaltCoast recommendations
VASAB (Visions and Strategies Around the Baltic Sea) is currently the intergovernmental frontrunner in the BSR concerning ICZM and prioritise in its strategies many of its goals coincide with those of the upcoming EU's Maritime Policy's (VASAB 2005). In order to avoid double work and develop widely agreed ways to plan the use of the Baltic Sea HELCOM's and VASAB's activities on coastal and marine spatial planning should be more integrated. BALANCE has also considered the recommendations of the BaltCoast (Integrated Coastal Zone Development in the BSR), an Interreg IIIB project, with the aim to seek balance between different demands in land/water areas in the Baltic Sea offshore areas (BALTCOAST 2005). It has emphasised the following issues in its recommendations:

- The use of specific scales for spatial planning offshore
- A GIS –based fact bank
- Define basic national policies for offshore development which are conducted between sectors (sectors of administration)
- Improve the effectiveness of cross border consultation for offshore development plans
- Prepare indicative guidelines for content and procedures of offshore spatial planning,
- Apply ICZM principles in offshore planning,
- Ensure wide involvement of stakeholders in planning for offshore development
- Conduct a continued dialogue with HELCOM, BALIC21, VASAB and the EC regarding principles of offshore spatial planning
- Seek continued consultation with the EU regarding recommendation on ICZM EIA and SEA Directive
- Develop trans-nationally concerted plans for offshore infrastructure corridors
- Promote transnational research and pilot projects
- Promote experience exchange with other regions

As will be demonstrated in this report most of these recommendations are integrated in the BALANCE work and results.

2.4.2 Applying MSP in protecting marine nature

Issues concerning nature conservation are among the most driving forces behind the practice of subdividing marine areas into regulated zones. As defined, MSP has a broad remit, providing an overall framework for managing activities in marine areas and zoning is the main method by which regulations are presented spatially. One of the most important decisions we made in BALANCE was to have four regulative zones, but not to have any buffer zones or specific nature conservation zones. Nature conservation is regarded as one category of sea use and since there are many different types of marine protected areas (nature conservation regulations) it is therefore logic to practice this use in more than one zone – just like many human activities also will occur in several zones. Nevertheless, it is important to understand that we give nature conservation high priority, as one should, when applying the ecosystem approach to management of human activities.

2.4.3 Applying MSP to achieve sustainable sea use

The main objective of the MSP is to find a balance between nature conservation and other uses of the sea in a sustainable way. If successful, then this can be achieved simultaneously with equal use of sea areas. The variety and socio-economical value, if measurable, of the different uses is large and may demand both prioritizing and compromise. In the long run, however, all stakeholders should benefit from a long-term approach to planning and establishment of co-operation. For example, coastal tourism and recreation (leisure-boating, fishing, diving, etc.) is a large industry that is heavily dependent on healthy marine ecosystems for its survival. Consequently, human activities that destroy habitats or increase eutrophication or coastal waters such as mining, dredging, bottom trawling, maritime traffic or aquaculture in shallow archipelago areas, should be planned and zoned in a way that minimise their harmful effects on habitats and species. For example, marine traffic is one of the most sustainable ways to transport large quantities of goods but if not planned, heavy maritime traffic may seriously affect the water quality, especially in shallow archipelago areas. Marine spatial planning can increase the sustainability of maritime traffic, e.g. by taking the ecosystem approach to planning of ship-lanes, harbours and by introducing speed limits if necessary. The performance of this planning should be followed and changes in the plans should be made when necessary.

When enforced, zoning helps to prevent some threats before they do their damage, or simply by locating them in a way that minimizes the impact on the environment to an acceptable level. This will reduce the costs required to restore the environment to the state prior to the impact. Also, successful marine spatial planning is a way to making room for everybody in a way that does not force anyone to loose, nor nature or man. Innovative MSP solutions can dispel the myth that conservation and use of resources are incompatible.

2.4.4 Application of MSP for regional socio-economic benefits

Marine spatial planning provides the following ecological and socio economic benefits:

- It prevents many conflicts among stakeholders and/or between stakeholders and the environment from taking place by being an easily understandable process tailor made for the area and its user groups

- If conflicts do arises MSP helps in sorting out the problem in a logical, open and straightforward manner while the planning process is still taking place, thus reducing tension between stakeholders (Australian Government 2003).

- Marine spatial planning makes it possible to follow up the performance of the plan and actions by applying indicators and set targets. This increases the efficiency of the MSP, nature conservation as well as the effective, informed and just use of sea areas. Using performance indicators and targets make adaptive management possible, *i.e.* changes can be made before/when repeating the MSP process.

- It reduces costs from correcting expensive mistakes by applying an open, easily understandable and easily usable planning process.

- It makes it possible to use and integrate all of the existing background data in thematic maps. Information or maps become a common "language" that can be easily understood by everybody involved, *e.g.* by applying web-based solutions. This is much faster and more efficient than a series of meetings only among experts, which, in a worst possible scenario, is rejected in the very end by the large public. The latter alternative is also the more expensive one.

- It identifies the human activities that use the areas, resources and services in a sustainable manner and this makes it easier to identify business opportunities that can meet the set ecological targets. It also make it easier to follow up if the business actually is sustainable and if not, then it allow the business to correct its mistakes faster than without the targets and performance monitoring.

- It makes the governance of the marine area logical, easy, fast and cost effective

- It makes it easier to focus and prioritize the data collection on the datasets that are most useful for the marine spatial planning process and also to fill data gaps

- When applying a data portal it also allows for quicker and fair use of all available background data

- Considering all the arguments above, MSP is, if applied correctly, the most democratic way to agree on the use of marine waters.

Consequently, when carried out successfully MSP solve "problems" before they occur and, when successful, create a solution where nobody loses, neither the environment nor man.

2.5 The need to develop new tools

The need for new approaches, tools, performance indices and targets for marine and coastal spatial planning of the environment and its associated human activities has been identified as priority concerns by many recent global fora status reports and guidelines (CBD *et al.* 2004, UNESCO 2006 & European Environment Agency 2006) as well as by the Baltic Sea Action Plan (HELCOM 2007a). In BALANCE the focus has been to develop a set of quantitative (GIS) tools and to demonstrate the use of these tools in this report and its attachments. The set of tools used is not intended to be complete but more to suggest the way forward in developing MSP tools.

2.6 Potential limitations

Our aim is to provide useful approaches, frameworks, tools, and guidelines for implementing the marine spatial planning and conservation related obligations of the European Union's directives, recommendations and proposals. We also acknowledge the current progress in CBD, HELCOM and initiatives taken by VASAB 2010 concerning marine spatial planning and ICZM.

The user of this report should be aware of certain facts concerning our report:

- Make yourself familiar with the existing literature on marine spatial planning, *i.e.* do not rely on this report alone. Pay specific attention to the Australian Great Barrier Reef and Southern Australia, Belgian and Irish Sea MSP/Zoning examples.

- BALANCE is a *demonstration project* that aims at providing guidance in marine spatial planning applying zoning, GIS methods and stakeholder communication; we also provide examples of how to put things together. However, the guidance, methods and examples provided are *not comprehensive*. The idea is to show that the BALANCE MSP approach and methods works and each step can technically be carried out. Our intention is to show you the way but you need to walk it yourself.

- The development of methods for marine spatial planning, in particular GIS methods, develop rapidly. Be on a constant lookout for new useful products and changes in the common practices, not only within Europe, but also globally, in particular products from IUCN, WWF, regional seas conventions, EU, UN (CBD/SBSSTA, UNESCO/IOC)..

- Take active part in the development of new practices and methods since this broadens your scope and make you better in identifying faults and deficiencies in existing practices and also allow you to get your hands on the new methods best suitable for your purposes.

- Realize that you are dealing with a planning process that must be renewed at regular intervals (the process cannot and will never be finished).

- It is important that end users are aware of the inherited limitations of the developed marine landscape maps. Some of the considerations done are presented below.

- The resultant map is no better than the information with which it was developed. For some areas data are scarce and/or only available in low resolution with large distances between points with actual data and such maps are poorly suitable for fine scale planning unless further improved. However, regional scale maps, *e.g.* marine landscape maps, are good when planning sea use of the entire Baltic Sea.

- It should be noted that expert judgement (and to some extend availability of data) has been applied in deciding which environmental parameters should be included in the identification of the Baltic Sea marine landscapes. It could be argued that other factors should have been included or different categories chosen and this should be kept in mind when applying marine landscape maps. The work on marine landscapes must continue to identify their applicability and limitations. .

- For these reasons a confidence rating of the map was developed providing the end user with information about the usefulness and inherited limitations of the map and the layers used to develop it.

2.7 The way forward

The use of sea areas in the Baltic Sea will increase in the future. Multiple uses of some marine areas are already a reality and will be even more so in the future. Conflicting sea use will consequently increase as well. It is in the interest of all of us, and our obligation, to prevent the harmful impact of the sea use on the marine biodiversity and the non-sustainable use of marine resources and services. This can only be achieved with a holistic approach applied by all the countries around the Baltic Sea. The EU maritime strategy emphasise the effective use of marine areas but expect it to be carried out in a sustainable way. This sustainability depends on a successful implementation of its environmental pillar, the EC Marine Strategy Framework Directive. We hope that the BALANCE MSP work prove itself useful for this purpose. The tools presented in this report are only showing some options and examples of how to tackle the problems with increased sea use. We hope our examples spur further development of quantitative GIS tools. We also hope that our decision to emphasise the important of stakeholder involvement in the MSP template presented (in the next chapter) is making it clear that stakeholder involvement is not something one does for "ticking off a box". Stakeholder involvement is the chain and anchor by which everything else is kept in place. The strength of this "chain" depends on the commitment put into the stakeholder work and the weight of this "anchor" depends on the trust earned.

Although many of the stakeholder recommendations we provide here are based on experience from real life situations, much of what we describe here regarding zoning has not yet been tested in practice in the Baltic Sea. The factual applicability of our products can only be proven when using them in real situations. To make it all work we need a sufficient supply of good spatial data coverage on marine biodiversity, resources as well as existing and planned human use of sea areas. We need to improve our understanding about the cause and effect relationships between human activities and nature to be able to set targets against which we can judge the performance of our actions. We need a more widespread recognition that we all share the same sea and that without a consistent and commonly agreed marine spatial planning process we cannot ensure the preservation of its biodiversity or a just and sustainable use of its resources and services.

3 THE ZONING TEMPLATE – FLOW CHART AND ELEMENTS

3.1 A starting point for our zoning guidelines

This zoning template, developed by BALANCE, is inspired mainly by the Great Barrier Reef Australia (Day 2002) zoning process, the Iris Sea Pilot and Marine Spatial Planning process (MSPP Consortium, Vincent *et al*. 2006 & Boyes *et al*. 2007), the South Australia case (Day *et al.* In Press) and, to some extent, also the experiences from Belgium (Douvere *et al.* 2007). We have also looked closely at guidelines published by IUCN and WWF (Pomeroy *et al.* 2004), CBD (CBD *et al.* 2004) and VASAB (VASAB 2005). Lastly, but most importantly, it has a similar structure as key marine EC directives enabling marine spatial planning to act as a support tool to the implementation of key existing marine European legislation e.g. the Marine Strategy Framework Directive. We have followed the approach used in the Great Barrier Reef and the Irish Sea and listed all the main types of human activities allowed or regulated in each of the zone types. The necessary level of spatial detail in each of the four zones is achieved by defining as a separate GIS layer (on top of the layers with zones) where the existing or planned human activities take place, or shall take place (as geo-referenced points, lines or polygons). This is necessary especially when dealing with a broad zoning category with several conflicting human activities taking place. The principles we advocate for are described in detail in Step 4 of the MSP template.

3.2 The design of the BALANCE marine spatial planning template

The following section will describe the reasoning behind design and individual steps of the BALANCE marine spatial planning template.

3.2.1 The cyclic structure fits well into adaptive management

Marine spatial planning and management applying zoning, is an ongoing, adaptive process. After completing a zoning plan once the process must be repeated at regular intervals due to the changes that has taken place, identified by the performance monitoring or other sources. Users of marine areas change their habits and consequently also the pressures change and some of these may cause changes in the marine environment. In some cases can changes in nature take place without any particular connection to the uses of the marine area, *e.g.* due to climate change, changes in the general level of eutrophication and this might require changes in the zoning of the area. From time to time the whole process or at least parts of may be started again or at least revised. Many EU directives have a 6-year cyclic reporting period, and it would make sense if marine spatial planning were linked directly to existing initiatives. The most logic way to describe the process is to present it as a cyclic step-wise exercise since this design is easy to use and it emphasises the need to repeat the process.

3.2.2 Implementing EU directives and acknowledging EU terminology

The framework should, to the extent possible, strive to build upon existing EU and national legislation, international policies and on mutual transnational and cross-sectoral cooperation and understanding.

Throughout the template the terminology, definitions and requirements are, where relevant and practicable, as close as possible to existing official documents, such as *e.g.* the EC Marine Strategy Framework Directive, the EU Water Framework Directive, EC Habitats Directive and EU INSPIRE, as these will be the policy-drivers for EU European waters in the coming decades. It has been done in order to show that integrated marine spatial planning can:

- Build, to a certain extent, on existing international and national legal obligations, and
- Form an overarching umbrella for implementing these requirements through identifying synergies and convergence, thus providing a cost-efficient approach to our management of human activities in the marine environment.
- Use common terminology as far as possible, e.g. *marine landscapes, zoning*.

3.2.3 The life span of the spatial plan

The life span of a spatial plan in the Baltic Sea would depend on three things:

1) The time table set out by the EU directives e.g. 6-year cyclic event.
2) The geographical conditions and extent of the plan.
3) The resources and operational culture of the country (of authorities and stakeholders).

To present the exact time needed for each step proved to be difficult. None of the Baltic Sea countries start their work from scratch, but each country differ in their starting point and the speed by which they can compile harmonized data required for the MSP work. Some of the countries have a very large and complex marine area *e.g.* Sweden, Finland, while some of the countries have a less complicated and much smaller marine area *e.g.* Lithuania.

3.2.4 A step-wise procedure

The easiest way to assure that users of the template carry out the work in a logic way without forgetting anything, and without getting distracted by less important issues related to the work is to present the things to be done as a *sequence of steps*. This is also an easy way to explain the outline of the work in a clear and concise way.

3.2.5 Stakeholders and transparency

In the design of the template specific attention is given to the way by which the stakeholder involvement is drawn in the template (and done in practice). We placed it in the inner circle to highlight its importance. We also gave careful consideration of when stakeholder communication should be carried out. In the beginning of the process

should the authorities responsible of the marine spatial planning have the vision and objectives sorted out before going public. If going public too early then there is an apparent risk that authorities create disarray when not being able to explain clearly the point with the exercise at hand, its limits and its flexibility. It should also be noted that the stakeholder involvement, in particular in steps 6 to 11 and 12 to 18, should be done alongside all these steps, not only at the specific step indicated in the template. Stakeholders should be encouraged to contribute with input data, *e.g.* pointing out natural harbours, fishing grounds, unofficial boating routes, bird migration areas, waterfowl hunting areas, etc. Without participation will it be impossible to acknowledge these sites and consider them as elements in the planning process. Stakeholders should also be encouraged to use the compiled data and point out errors or data gaps they find. Everybody in the process benefit of constructive participation since it builds trust and makes the final plan more realistic, *i.e.* it anchors the plan. However, the responsible authority should clearly state that the implementation of spatial planning is not out for debate.

3.2.6 The arrows indicating inputs and outputs to the MSP

The MSP process can not be accomplished without environmental and socio-economic data from the entire area to be planned. This data must be harmonized, *i.e.* modified so that it fit together and can be used in analyses. This is indicated by the arrow for "input of harmonized mapping data" since this process has been explained in detail by the other parts of the BALANCE project. Nevertheless, it is important to understand that this data input is crucial for the MSP process. Input of harmonized data is a time consuming and labour intense process that should run before and parallel to the MSP process. To make the data harmonization successful there should be free and easy access to all relevant data sources and the data should be detailed enough, have a good quality and cover the entire area without any gaps. In BALANCE the problems with data availability, access and high data costs were surprisingly frequent when considering that data produced by governmental funds should be free and easily available (taxpayers have already paid once for the data), as stated in the INSPIRE directive. Similarly, the EC Marine Strategy Framework Directive list and number of environmental characteristics as well as human pressure and impacts which shall be collated and made available during the implementation of the directive.

There are also outputs from the template, one for the draft zoning plan, and the other for the finalised MSP. The reason for showing these as outgoing arrows is simply to indicate that these products are disseminated to the large public, outside the core of the MSP process. The feedback from these disseminations should be acknowledged in the MSP, especially the draft zoning plan, which is later included in the final plan and management process.

3.3 Zoning as a part of a larger marine spatial planning process

So what is the relationship between marine spatial planning and zoning? Simply put Marine spatial planning is the entire planning process described in the template figure, including the vision and objectives, initial assessment (require input of processed datasets), planning (including zoning), implementation, the final assessment and reporting and all stakeholder involvement. Zoning is consequently only a part of the process, albeit a very important one. Each step in the template (figure 3.1) is numbered and de-

scribed in detail in this chapter and serve as guidance for how to carry out the marine spatial planning and zoning.

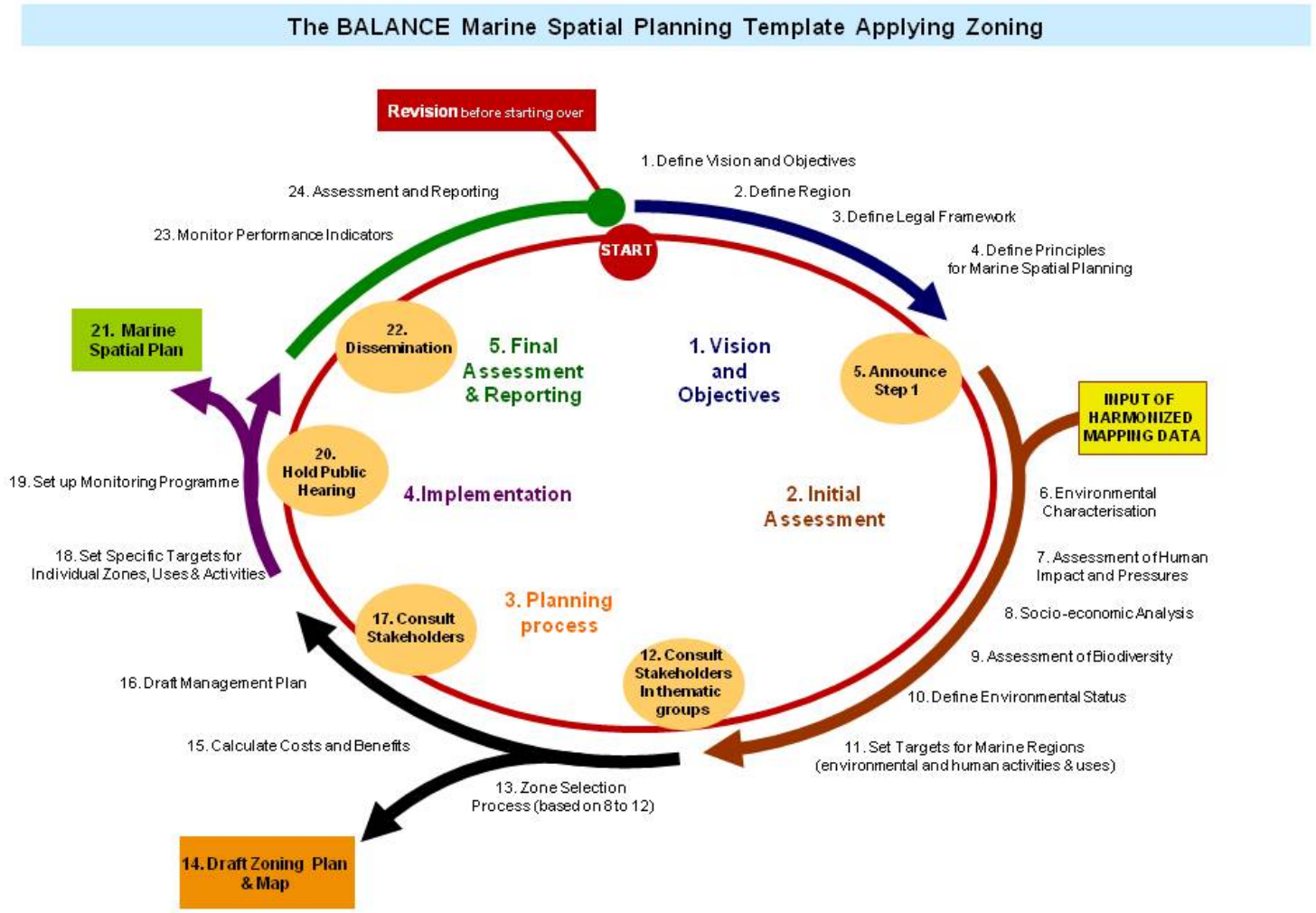


Figure 3.1 Schematic illustration of the zoning template

3.4 Steps of the cyclic marine spatial planning zoning template flow-chart

A true ecosystem-based approach to integrated marine spatial planning ought to be based on cross-sectoral and transnational co-operation and understanding with the common goal of a long-term sustainable development. Hence, the initiative for beginning and integrated marine spatial planning process should preferably be taken up by the national authorities, by the EU (for EU Member states) or HELCOM. Naturally, also NGOs and private citizens can take the initiative to the MSP process although the national authorities must take their responsibility in leading and organising the process.

3.5 Vision and Objectives

The first phase of an integrated marine spatial planning process is the setting of vision and objectives and to define the overall framework in which to operate. It includes steps 1 to 4 and set the overall planning framework. If MSP is compared to building a house then the Vision and Objectives phase of the construction work is the selection of the building site, checking the rules for building, selecting the type of house, agreeing with everybody that will be involved (authorities, neighbours, contractors etc.) that the house will be built.

The marine spatial planning process should be started up by the authority in charge of this type of exercises, nationally or regionally and this authority must have the necessary expertise for carrying out MSP. Preferably this authority should be defined by the national legislation. However, this type of exercised should be carried out in an integrated fashion which usually requires a joint leadership in the form of a steering group, chaired by the authority in charge. The first task of the steering group is to identify if there is a real need to carry out the MSP process (or not[1]) and then define the overall vision for the MSP process.

The reasons for starting up the MSP process are for example:

- Changes in the environment or changes in pressures and human activities
- Legal reasons, *e.g.* changes in the EU or national legislation
- New demands on the use of marine areas
- The suggested renewal time for the plan has been exceeded

3.5.1 (1) Define vision and objectives

The reasoning behind setting up an integrated marine spatial plan is based on the fact that the sum of human and environmental pressures on the natural marine resources has been steadily increasing. At the same time the Baltic Community needs to reduce the

[1] The answer could be “no” if there is only a short time since the previous MSP for the area or none of the indices used for monitoring the performance of the previous plan or for measuring change, give a reason for restarting the process.

sum of impacts on the marine environment if a long-term sustainable development in the region is to be achieved.

The vision and objective should apply the ecosystem approach to management of human activities. It should include considerations of the protection, preservation and where practical, restoration of the natural resources of the marine environment with the ultimate aim of maintaining biodiversity and clean, healthy Baltic Sea. At the same time it should strive towards a balanced long-term sustainable development (use and exploitation) of the sea based on cross-sectoral planning and transnational co-operation.

STEP 1. DEFINE VISION AND OBJECTIVES

When defining vision and objectives the ecosystem approach to management should be acknowledged and the balance between nature and sustainable use of marine areas, resources, and services.

3.5.2 (2) Define Region

This step defines the geographical boundaries of the appropriate marine region and sub-regions that should be considered when seeking an ecosystem-based approach to integrated marine spatial planning.

The marine waters considered here should be defined, where practical and appropriate, in accordance with existing institutional structures in the Marine Regions or Sub-Regions, such as in particular the Regional Sea Conventions. As the approach is striving to contribute to an ecosystem-based approach to management of the marine environment subdivisions of a Marine Region should be ecological relevant. It could build upon *e.g.* existing water districts as defined under the EU Water Framework Directive art. 3.1 (European Parliament and European Council 2000) as this would enable a link between land-based pressure e.g. nutrient load which contribute to eutrophication etc. It could also be based or adjusted accordingly to step 6 “Environmental characterisation” of the template. The important point being that the definitions of the individual sub-regions should be ecologically relevant to enable meaningful environmental assessments rather than be based on *e.g.* specific sectoral interest.

“Marine waters” here means the water column, the seabed and subsoil on the seaward side of the baseline from which the extent of territorial waters is measured extending to the outmost reach of the area where a Baltic State has and/or exercises jurisdictional rights in accordance with UNCLOS. The delineation of specific Marine Regions is defined in the proposed Marine Strategy Framework Directive art. 4, as well as Ecoregions in the EU Water Framework Directive Annex XI (European Parliament and European Council 2000).

For the Baltic Sea Region any implementation of a transnational integrated spatial plan should aim to clean up the mess in the definitions of the different regions among the International Convention for Exploitation of the Sea (ICES), the Helsinki Convention area (HELCOM), the Oslo-Paris Convention (OSPAR), the EU Water Framework Directive and the proposed Marine Strategy Framework Directive and aim for neighbouring boundaries between the Ecoregions, Marine Regions and Convention areas, and where relevant, with no overlap in the area covered. The current state of affairs appears to be inefficient and hinders an efficient and sensible management.

STEP 2. DEFINE REGION

In the marine spatial planning examples presented in this report we have defined the Baltic Sea as a region but also present examples from its sub-regions and local areas. In this way our examples are also useful for the implementation of the international conventions and EU legislation.

Figure 3.2 The fact that the Northern Baltic Sea regularly get a thick ice cover pose a challenge for the human activities at sea

3.5.3 (3) Define legal framework

The legal framework sets the minimum requirements for MSP process. Marine spatial planning should hence acknowledge existing legislative framework, such as international conventions (CBD, UNCLOS, HELCOM, OSPAR, IMO), EU Directives, policies and national legislation, to the extent possible.

In order to achieve the best possible and most cost-efficient spatial plan a throughout analysis of the existing legislative framework for activities at sea should be conducted. The aim should be on identifying overlaps, potential synergies, gaps as well as obvious conflicts in the legislative framework. This will in return help to define the legal framework of the spatial plan and provide input to illustrate the added benefit from initiating integrated marine spatial planning. It will also show that marine spatial planning is the tool to link the numerous human activities occurring in the marine environment together

under one cross-sectoral and transnational umbrella. The legislative framework should provide an overall for a spatial plan and the actions to be coordinated, consistent and properly integrated with actions under other Community legislation and international agreements.

The BALANCE partnership has not included a legal expertise to conduct such a comprehensive analysis, but nevertheless focussed upon the EC Habitats Directive, the EU Water Framework Directive and the EU Marine Strategy Framework Directive as well as HELCOM recommendations, when referring to the existing legislative/regulative framework (the ones we are more familiar with). At the time of writing this report the first official documents on the EU Maritime Policy had just been published (European Commission 2006, 2007a, 2007b, 2007c). We have acknowledged the main issues concerning marine spatial planning in these documents.

Other Directives *e.g.* EU Nitrates Directive or other international conventions besides the ones mentioned here were not relevant for designing the MSP template or for shaping in the various steps of the template, even if many of these may have an important role in carrying out MSP, e.g. the ESPOO Convention (Convention on Environmental Impact Assessment in a Transboundary Context (UNECE 1991), and the EU Common Fisheries Policy (European Commission 2002b).

STEP 3. DEFINE LEGAL FRAMEWORK

The legal framework is defined as a thorough analysis of the existing international and national legislative/regulative framework for activities in the marine area to be planned. The analysis should identify the international obligations concerning MSP, it should help to prioritise the work at hand and help to set limits for the work. Finally, the legal framework should in the later steps of the MSP template be reflected in the actions and targets set up. There should not be any conflict between the legal framework and the visions and objectives set up in step 1.

3.5.4 (4) Define principles for Marine Spatial Planning

Plan in balance with the environment by applying the ecosystem approach

The Ecosystem approach, or Ecosystem-based management of human activities[2], is "*a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. The application of the ecosystem approach will help to reach a balance of the three objectives of the CBD: conservation, sustainable use and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources*" (CBD *et al.* 2004). This approach rely on information on the ecosystems in the area (components, structure and functions) and applies this information for regulating and controlling human activities in the managed area to assure a sustainable and equal use of the marine areas, resources and services. Consequently, the application of this principle will lead to an "*ecologically sustainable development (ESD)*", which by Day *et al.* (In Press) is separated into a principle of its own. The Ecosystem based management to human activities and ESD is "*planning in balance*

[2] Ecosystem based approach to human activities = Ecosystem approach (CBD *et al.* 2004), Ecosystem-based management (Day *et al.* (In Press).

with nature". The Ecosystem based management and ecologically sustainable development are also applied in South Australia (Day *et al.* In Press).

Be adaptive

Adaptive management is a rational way to build the upcoming planning on the results from the previous planning exercise, in particular the monitoring of indicators against set targets. Identified changes should then be acknowledged by decision makers and ultimately lead to changes in how things are planned in the future This principle is currently promoted by several authorities, *e.g.* Day *et al*. (In Press). It will also consecutive planning periods to learn and develop accordingly to sectoral needs and political agendas, *i.e.* adopt to climatic changes etc.

Apply the precautionary principle

If a human activity is suspected to cause an apparent and/or increased pressure to the marine biodiversity then changes to the environment should be monitored and the possible cause-effect relationships between the pressure and the marine biodiversity should be investigated. If this can't be done, *e.g.* within the timeframe given or with the resources given, then the *precautionary principle* should be practiced, forcing the ones practicing a human activity to prove that this activity is not causing pressures on the biota. This principle is commonly recommended by several conventions *e.g.* HELCOM.

Keep it simple

The MSP process should be kept simple in order to achieve the clarity, the strength and the practicability that will make it work in all types of situations. The marine spatial planning system should:

a) Be applicable at various spatial scales (large regions (*e.g.* the Baltic Sea or sub-regional areas such as the Riga Bay or local areas such as the Stockholm archipelago)

b) Be the primary (main) plan of the marine region into which all other management plans can be integrated, *e.g.* Natura 2000 management plans, WFD drainage area plans, EU ICZM plans, EIAs, HELCOM Large Scale MSPs, and plans/strategies implementing the Marine Strategy Framework Directive.

c) Use as few zones as possible to ensure a clear, robust, practical and easily planning and management of zoning but make sure that you also understand the limitations of using only a few zones To use only a few zones also makes it easier to apply these internationally in all nine countries around the Baltic Sea.

d) Use existing regulation as far as possible and avoid the invention of new ones.

Figure 3.3 The algae within the Charaphyceae used to be characteristic for the Baltic Sea. It is highly sensitive to the effects of eutrophication.

While not official principles as such the following policy rules are worthwhile keeping in mind when carrying out MSP.

Be serious about stakeholder communication
Build trust among those participating in the MSP by making sure that stakeholders communication and cooperation is a fully integrated and functional part of the process, not just something done for "ticking off a box" Do not gamble with this trust by relying on top-down one-way communication of any reason, in particular resource reasons (time, money, lack of personnel). Make sure that you do not forget any of the stakeholder groups.

Be open and listen
There MSP process must be open in order to create and uphold trust among the group planning the MSP, stakeholders and the public. The process is then "anchored" in the large public and in particular in the people living in the planned area. Please, check the chapter 5 on stakeholder involvement for further details and recommendations on the principles for stakeholder communication. Sharing data, preferably free of costs (or charging only costs for handling data), is an important part of the openness. Sharing information calls for a polite and open mind of the information provider but also the receiver. Listening to others is as important as providing information.

Maintain your integrity
Experts planning the sustainable use of marine areas are sometimes threatened by groups or persons that believe that they have a superior right to use common marine areas as they please, and they also challenge and fight other users or the nature conservation goals in the area. In threatening situations experts must maintain their integrity, and explain their reasoning behind the planning decisions as clearly as possible, repeatedly if necessary. To give in for such threats would result in irreparable damage to the entire planning process and, it would decrease the trust in the experts by everybody in the region and in the worst scenario destroy the ongoing MSP. Scientific and technical advice and support from national and international colleagues are in such circumstances of great help.

Calculate costs & benefits
Include a cost & benefit calculation of the almost finalised MSP in order to ensure that the process gets the funding it need and that its benefits get the attention needed for initiating a positive attitude towards MSP.

Apply maps and zoning as a common language in MSP
Apply broad scale zoning as fundamental part of the work (key component) for deciding what can be done, where and how (planning and regulation). Thematic maps and the Zoning maps is the "common language" that everybody can understand regardless of their background and education.

STEP 4. DEFINE PRINCIPLES FOR MSP

The principles (plan in balance with nature, adaptive management, the precautionary principle, keep it simple) and the policies described above are intended to make planning as well as day-to-day management clearer and easier for everybody involved in the MSP.

3.5.5 (5) Announce steps 1 to 4

Defining the overall vision for a certain area is an issue of public concern and interest. But besides public interest it is also a political decision taking into account international policies. In order to raise awareness and commitment of the vision for a certain area, it is necessary to undertake intensive communication activities. Communication activities have to aim at the understanding of the reasons for carrying out the MSP process and acceptance of the MSP *visions and objectives* by people. At the same time authorities should explain the reasoning behind the decisions and outcome from steps 1 to 4. This should then lead to public support and involvement in the upcoming planning process.

This step (5) is explained in more detail in chapter 6.2.2.

STEP 5. ANNOUNCE STEPS 1 - 4

When announcing the overall vision for the MSP of a marine area, assure that you are able to explain the reasoning behind the decisions and outcome from steps 1 to 4. Make sure that the role of stakeholders in the process and the role of the administration are clearly explained. The message should be that everybody is invited to participate in the MSP process and strive for a common goal. To succeed in step 5 is crucial for the entire MSP procedure. This step (and the entire process) can be ruined by an arrogant, secretive and authoritarian attitude of the administration in charge of the MSP process.

3.6 Initial assessment

The second phase of an integrated marine spatial planning process is the initial assessment of the marine region for which a spatial plan should be developed. It includes steps 6 to 12 and provides the basis for developing an informed marine spatial plan. If the input of information fails due to lack of cooperation between countries, among authorities or stakeholders or even political backing, then chances are that the spatial plan will fail to deliver its main goal and fail to solve stakeholder conflicts or contributing to a long-term sustainable development. If MSP is compared to building a house then the Initial assessment phase of the construction work is the selection and quality of the building materials, professional expertise of the builders etc.

3.6.1 Input of harmonized spatial information

A long-term sustainable development is dependent upon an informed approach to the management and planning of human activities in the marine environment. Considering the amount and complexity of marine spatial data there should be an infrastructure for this that ensures easy, fast and reliable data management.

At the present, the problems regarding the availability, quality, organisation, accessibility, and harmonisation of marine spatial information are common to a large number of policy and information themes and are experienced across various levels of public authority. This is especially true for matters regarding the marine environment in the Baltic Sea Region. In order to accommodate these problems various EU legislation aim to establish an infrastructure for sharing information within the European Community, *e.g.*:

- The EU INSPIRE Directive (art. 1) "*…to lay down general rules aimed at the establishment of the Infrastructure for Spatial Information in the European community, for the purpose of Community environmental policies and policies or activities which may have an impact on the environment.*" (European Parliament & European Council 2007)

Marine spatial planning should build upon and around such an infrastructure with the national responsible authorities functioning as national focal point ("hub") within a distributed network of databases within a Marine Region. Such "hub" or network could be coordinated and run by Regional Sea Conventions, e.g. as required by the Marine Strategy Framework Directive (art. 5.2, art. 6), in order to enable a coherent and harmonised

assessment for an entire Marine Region. This is also a good argument for the need of harmonising the boundaries between Regional Seas Conventions and *e.g.* the Marine Strategy Framework Directive (as mentioned under step 3). Please notice that this directive also mentions a number of human uses (pressures and impacts) against which the environmental status shall be assessed.

INPUT OF HARMONIZED DATA

Input of harmonized mapping data and the analysis of this data is the foundation upon which the MSP will be built. The quality of this data and the analyses based upon it determines the success of the entire plan. The rule "garbage in – garbage out" is unfortunately true. The quality of the data used can be significantly improved by following systematic data collection, storage and management according to internationally agreed guiding principles. This also speeds up data retrieval and data use

3.6.2 (6) Environmental characterisation

The aim of the environmental characterisation is to provide ecologically relevant maps for marine spatial planning against which environmental pressures and human activities can be measured. This will facilitate the ecosystem-based approach to the management and planning of human activities in the marine environment. An environmental characterisation of the marine environment should encompass the seafloor, the water column and the coast (adjacent terrestrial areas).

All EU Member States are required to implement the EU Water Framework Directive, the EC Habitats Directive, and the EU Marine Strategy Framework Directive. These all require a more holistic or ecosystem-based approach to the management of the marine environment, which should, directly or indirectly, be based upon a broad-scale characterisation of the marine environment as stated in *e.g.*:

- The EU Water Framework Directive (art. 5.1, Annex II) "- *an analysis of its [river basin district] characteristics*".

- The Council's Habitats Directive (art. 3.2, Annex I): "- *shall contribute to the creation of Natura 2000 in proportion to the representation within its territory of the natural habitat types and the habitats of species…*". (European Council 1992) The EU Marine Strategy Framework Directive art. 8.a, Annex III "- *an analysis of the essential characteristics and current environmental status of those waters… …and covering the habitat types, the biological components, the physico-chemical characteristics and the hydromorphology*" (European Commission 2007e). The EU maritime "Green Paper" "*Consideration should also be given to setting up European programmes to develop the comprehensive mapping of European coastal waters for purposes of spatial planning, security and safety. The mapping of existing and planned activities in the water and on the seabed area essential*" (European Commission 2006).

All three directives (WFD art. 5.1, Annex II; MSD art. 3.2, art. 4.a; HD art. 1.c), and the Maritime Green Paper, also require a transnational approach covering entire ecoregions such as the Baltic Sea; Marine spatial planning should be based on these requirements and include ecologically relevant maps that seamlessly span an entire Marine Region, though interregional efforts striving to ensure compliance for entire European Territory

should be encouraged. The maps should be developed within a hierarchical classification system to allow comparisons among nations and Marine Regions. Marine landscape maps (Connor *et al.* 2006, Al-Hamdani & Reker 2007, HELCOM BSAP) could be applied for issues involving an entire Marine Region, while the high-resolution habitat maps are more relevant for detailed local or sub-regional marine spatial planning or management of individual zones (see chapter 3.7.1).

Where relevant and practicable synergies between the various requirements for environmental characterisation should be developed and encouraged even to the extent of adjusting or revising the existing legislative framework *e.g.* the EC Habitats Directive Annex I. Furthermore, it should include a hierarchical habitat classification and an evaluation/ prioritisation of which habitats should be mapped for an entire Marine Region to allow comparisons between nations and Sub-regions – where possible and practicable it should also be linked to essential fish habitats in order to maximise the applicability of the maps. It makes little sense to develop several parallel broad-scale characterisations, as it will influence the overall planning and management efficiency.

STEP 6. ENVIRONMENTAL CHARACTERISATION.

The aim of the environmental characterisation is to provide ecologically relevant maps for marine spatial planning against which environmental pressures and human activities can be measured. This will promote an ecosystem-based approach to the management and planning of human activities in the marine environment.

3.6.3 (7) Assessment of human impact and pressures

In order achieve the goal of a long-term sustainable development an integrated marine spatial plan should include a comparison of ecologically relevant information with existing environmental pressures and the impact of the human activities in order to assess the sum of impacts on the marine ecosystem, preferably quantitatively.

The EU Member States are required to prepare such assessments through implementation of *e.g.*:

- The EU Marine Strategy Framework Directive (art. 8.b, annex III) " – *an analysis of the predominant pressures and impacts, including human activity, on the characteristics and environmental status of those waters…*" (European Commission 2007e)

- The EU Water Framework Directive (art. 5) " – *a review of the impact of human activity on the status of surface waters…*" (European Parliament & European Council 2000)

- The EU Maritime Green Paper "*The Commission believes that a system of spatial planning for maritime activities on the waters under jurisdiction of or controlled by the Member States should be created. It should build on the ecosystem-based approach laid down in the Thematic Strategy for the Marine Environment, but should also deal with licensing, promoting or placing restrictions on maritime activities*" (European Commission 2006).

The DPSIR approach

A marine spatial plan should be based on such an analysis and aim to omit or minimise the negative impact on the marine environment, while still enabling a broad range of human activities. The DPSIR approach (Driving Force – Pressure – State – Impact – Response) (European Environment Agency 1999, Elliot 2002) is a step-wise approach often applied for conceptualising the different elements and to provide an overall framework for analysing environmental issues within the EU, *e.g.* in Integrated Coastal Zone Management (Gubbay 2004). This approach is useful when carrying out the MSP process since it help to conceptualise several of the MSP planning steps such as the reasons for starting up the process. *Driving forces (D)* are *e.g.* the need for raw material, increased land runoff or global warming. The intensified or increased driving forces increase the *pressures (P), e.g.* increased uptake of sand and gravel, elevated concentration of nutrients in the water, warmer water, on the marine biota which in turn show changes in the *state (S)* of the marine nature, *e.g.* increased amount of filamentous algae, increased turbidity *impact (I)* are the identified and quantified cause-effect relationships between pressures and the biota. These cause-effect relationships should be applied as arguments for improving the *response (R),* which can take place by new regulations, such as zoning. The links between the parts of the DPSIR process should be understood before starting up the process.

The data identification process is started here by putting the potential interaction of sea uses and interests in the area in the context of the DPSIR. Normally, biological features are viewed in respect to their state against pressure factors. Although conservation initiatives are governance aspects of a marine area, the underlying biological features for that initiative may constitute pressure on other sea uses, such as socio-economical values. Acknowledging and understanding these interrelationships among sea interests is crucial for successful MSP. We strongly promote the use of pressure evaluation matrixes (see Appendix B and the info-box right after chapter 3.6.4). Besides the ones shown in the Appendic B and the info-box also a matrix with various types of sea use plotted against each other are useful when identifying potential conflicts.

STEP 7. ASSESSMENT OF HUMAN IMPACT AND PRESSURES

This step (7) is a very important part of the MSP process. If this step is poorly executed then unsustainable human activities harmful for the environment will prevail with the inevitable deterioration of the environment and biota as a result. If the conservation actions are too rigorous then it would result in a serious constipation of all socio-economic development in the area. Acknowledging and understanding the interrelationships among sea interest is crucial for successful MSP.

Figure 3.4 Dredging is a common activity in marine areas such as harbours but dredging should not be carried out without a permit and a work plan.

3.6.4 *Example – human use, environmental pressures and the ecologic map*

This example is illustrating how ecological relevant maps, here benthic marine landscapes, can be applied in regard to assessing the footprint of important offshore anthropogenic activities in combination with environmental pressures such as oxygen depletion. It relates to steps 6 to 10 of the MSP template. The example include both marine aggregate extraction[3] and offshore wind-farms[4] in order to illustrate that anthropogenic activities should not be handled as stand-alone activities, but as part of a diverse set of anthropogenic activities and environmental pressures occurring in the marine environment. This example (and others) is along with a full description of marine landscapes are available in Al-Hamdani & Reker 2007.

The example includes data on marine aggregate extraction sites and existing and potential offshore wind-farms from the Danish EEZ delineated by the Helsinki Convention area to the north and by the available oxygen to the east. No data on marine aggregates extraction sites nor on offshore wind farms were included from the German or Swedish EEZ though this will not influence the illustrative value of the example. If sufficient data were available broad-scale integrated spatial planning and management could be done for an entire ecoregion.

For many of the marine landscapes only a small proportion, if any, is influenced by these offshore anthropogenic activities. More specifically, only a few of the marine landscapes are targeted by these activities, such as e.g. Non-photic sand at 7,5-11psu. Thus, individual anthropogenic activities do not, in a marine landscape context, appear to put the marine environment under a significant threat, except for the local adverse disturbance or, in the case of marine aggregates, the damage caused by the exploitation of the natural resource.

However, if an ecosystem-based approach to the management of the marine environment in Kattegat is desirable, then individual anthropogenic, or sectoral activities, should be compared not only with the ecologically relevant marine landscape or habitat maps, but also with environmental pressures, such as eutrophication or the effects hereof e.g. oxygen depletion (which influence 45% of the total area in the example). In the example it becomes apparent (visually) that the marine aggregate and the offshore wind-farming are focussed (with 68%) on the more shallow areas with little or no oxygen depletion, thus increasing the pressure and impact on specific elements of the marine ecosystem that are already under pressure.

Each individual anthropogenic activity is of little spatial extent if compared to the entire Danish marine area. However, if these anthropogenic activities are added with an environmental pressure such as the oxygen depletion, it becomes apparent that it is the sum of activities and pressures that should be considered when making environmental assessments, not the impact of each sector separately. This would be even more apparent if more anthropogenic activities were added such as e.g. fisheries for Norwegian lobster (*Nephros norvegicus*), fish or mussel farms, cables, shipping, dumping of dredge mate-

[3] The information was provided by the Danish Forest and Nature Agency.

[4] The area included for the potential offshore wind-farms have been set to 44 km^2 after contact with the Danish Energy Authority. The specific area for each potential wind-farm has not defined nor has it at this point in time been decided if these wind-farms will be established at all. The area of the existing offshore wind-farms was based on delineating the area around the individual windmills on the web GIS at the Danish Energy Authority at www.ens.dk.

rial etc. For example, the non-photic sand at 7,5-11psu covers a total of 145,24km^2 of which 50,27km^2 is proposed as an offshore wind-farm while 35,98km^2 is influenced by oxygen depletion. Thus a total of 76km^2 or more than 50% of a specific marine landscape is under pressure[5].

It could be argued that the economic expenses of extracting marine aggregates or establishing offshore wind-farms increase with depth, and that some sectors are unjustly required to pay for a problem concerning the society as a whole. Such considerations could be handled as part of a socio-economic analysis defining the economic costs of each human activity compared to the impact on the marine environment, thus taking multiple anthropogenic activities and environmental pressures into account. Similar the environmental benefits should also be included in such an analysis. For example, what would the consequences for the marine ecosystem, the long-term sustainable development and the general economy if too large a proportion of a specific marine landscape is exploited or is under severe environmental pressure? Would the loss of a too large proportion of a marine landscape or habitat influence important fisheries and thus local communities/economy adversely due to loss of e.g. juvenile habitat or forage area? This example relates especially to steps 8 and 15 of the MSP template.

Likewise, it could also be argued that e.g. the establishment of an offshore wind-farm does not necessarily impact adversely on the marine environment i.e. the structural foundations could be shaped to provide cave-forming hard substrata and thus provide a habitat for cave depending species in a sea area, such as the Kattegat, where these habitats previously has been targeted by marine aggregate extraction for harbour jetties and coastal defence. These areas or habitats might also function as a sanctuary for some species if access is limited to the management of the wind-farm. In general, such cross-sectoral synergies should be an important element of marine spatial planning, as it will help to enhance sectoral understanding and minimise potential stakeholder conflicts.

Similarly, old extraction sites could, besides being restored, be utilised for other purposes such as the establishment of e.g. a mussel or fish farm in the area (depending on the specific environmental requirements of such farms) or for storing of dredge materials. If these activities were undertaken with long-term spatial planning in mind, it would probably result in less anthropogenic pressure upon the marine environment. Only a true integrated, cross-sectoral approach to offshore management can answer such questions.

Basically, if a sustainable development of the marine environment is desired, then all anthropogenic activities need to be handled as part of a holistic, integrated offshore spatial planning taking natural values and environmental pressures into account. The impact of one or two anthropogenic activities might not adversely influence the ecosystem, and it is the sum of all occurring anthropogenic activities and environmental pressures, that push ecological thresholds to the point of a continued, irreversible degradation of the marine ecosystem. The pressure evaluation matrixes (see Appendix B and the infobox right after chapter 3.6.4) ar good tools for identifying and assessing all relevant pressures.

In conclusion, while the examples on application of ecological maps outlined above are fairly simple and without all the considerations necessary for proper spatial planning

[5] The sum is less than the addition of two figures, because ~11km^2 of the wind-farm area is oxygen depleted.

and management of the marine environment, they still remain illustrative of an important point - integrated offshore planning based on ecologically relevant information, environmental pressures and anthropogenic activities is a major challenge the EU Member States must face if an ecosystem-based and long-term sustainable approach to the management of our marine natural resources is desired.

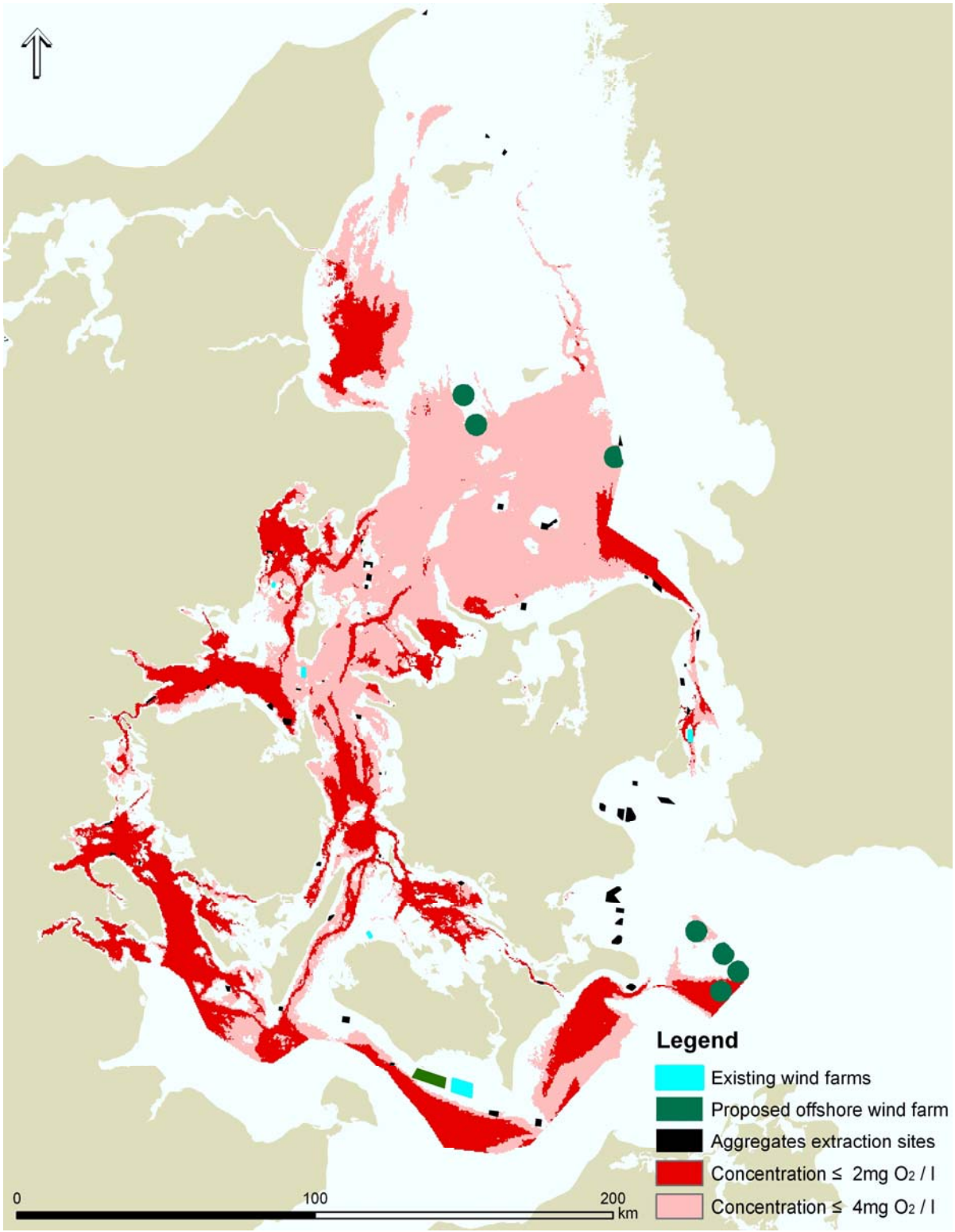


Figure 3.5. Offshore wind-farms and marine aggregate site with the Danish EZZ. Data source: The Danish Forest and Nature Agency and the Danish Energy Authority.

APPLYING PRESSURE EVALUATION MATRICES (PEMS)

A "Pressure evaluation matrix (PEM)" is a collective name for spreadsheet templates that makes it possible to compare the relationship of various categories of marine biodiversity vs. human activities (*i.e.* potential pressures) and their degree of impact on the biodiversity. This approach to pressure assessment has been successively used in several regions globally. One of the best examples is provided by the MarLIN web application developed by the Marine Biological Association of the UK and Ireland (MarLIN 2007).Our PEMs build to a large extent on the MarLIN experiences. Many of the GIS tools developed within BALANCE make it possible to identify the area covered by specific of human activities and hence support the use of PEMS.

These PEMs provide an easy way to grasp the essence in assessing the potential pressures caused by human activities at sea and serve as decision support tools in MSP. In the BALANCE project we have developed the frame of three PEM templates that:
PEM1: Show the relationship between specific human activities (vertical axis) and the way by which these may affect the environment (horizontal axis). The degree of impact is marked by specific colours or patterns.

PEM2: Show the relationship between specific human activities (vertical axis) and the estimated degree of impact of these activities on specific landscapes, habitats and species (horizontal axis). The degree of impact is marked by specific colours or patterns.
ZONING MATRIX: Show how specific human activities should be acknowledged when designating zones, *i.e.* the zoning matrix presented in step 13 of the MSP template. This template is based on the information in PEM1 and PEM2.

(In addition to the three PEMs, BALANCE has also developed a template for compiling the most essential information on key habitats needed for compiling the PEM templates. This template is called "Pressure Evaluation Card (PEC)". We present only draft versions of PECs for the Baltic Sea with the hope that these are developed further, e.g. within HELCOM and by other Regional Seas Conventions. A set of draft PECs on key habitats are presented in Appendix X. A set of key information provided in the draft PECs are the estimates on how far the impact from these pressures stretc.h from their source of origin. These impact distances in the PECs are very subjective! Therefore, we hope that the draft PECs and PEMS can be investigated further, e.g. by targeted research projects and within HELCOM.

NB! We have not tried to list all possible pressures in the PEC example, only the most apparent ones. Also, the estimated distances for the reported pressures in the PEC should only be regarded as indicative since local wind/current conditions and topography/bathymetry may affect the distance of impact. Also, the intensity by which human activities take place may vary. For example can a large volume dredging of soft sediments for a gas-pipe in offshore areas may have a different impact on the marine biodiversity and over a larger area, than dredging of a small semi-isolated harbour.

The PEC is mainly intended as a tool when compiling the PEM but may also serve as a tool when carrying out EIAs or for the management of human activities in marine areas in general.

When discussing with stakeholders the PECs and PEM should illustrate clearly which human activities may cause a pressure for certain landscapes, habitats and species and it should also give an estimate of the distances at which the pressure may occur. Our intention with the PEC and PEM is to provide information in a concise and easy to use form.

3.6.5 *(8) Socio-economic analysis*

The purpose with the socio-economic analysis (step 8) is to improve the cost-effectiveness of marine spatial planning in the area to be planned. The economic values present in the area, *e.g.* the use of the area, the use of the resources in the area or the value of the ecosystem services in this area should all be assessed. For example, what is the value of a specific area of sandy seafloor when all the various uses of this sandy area and the seawaters above it is considered? In this case the value of the following features and uses are relevant:

Table 3.1: Human activities in the marine environment. The table is non-conclusive.	
Maritime Traffic	
	Large & small vessel traffic, boating, kayaking, sea-planes (acknowledge maritime accidents in connection to traffic)
Infrastructure & Constructions	
	Shoreline buildings Wind Energy Parks Harbours Jetties Underwater cables and pipelines Nautical Support Structures Bridges
Biodiversity	
Cultural heritage	
Marine Protection	
	Natura 2000 sites¨ National MPAs
Fisheries	
	Bottom trawling Pelagic trawling Fixed gillnet fishing Driftnet fishing Salmon traps Aquaculture Recreational net fishing Recreational angling/spinning
Hunting	
	Waterfowl Seals Mink (an introduced species)
Dredging/Extraction/Mining	
	Dredging Extraction of sand and gravel Mining of iron manganese concretions Oil and gas extraction
Military areas	
	Military practice areas Military base areas
Scientific & Administration activities	
Tourism	
Recreation	
	Recreational fishing Other types of recreation (boating, kayaking, wind powered recreation, hiking)

An adequate analysis of the value of the human activities listed in the table above (Table 3.1) should also include an analysis of the future trends associated with these values and their total time span. Also, the cascading economical impact of these features and uses should be assessed, *e.g.* the value of fishing grounds is more than just the value of the fish caught since it provides a source of income of professional fishermen, restaurants, boat service companies etc. Also, compatibility of these values (which go well together and which does not) and the costs for losing some values completely or partially should be considered as should the additional non-material value of cultural and recreational use of an area.

Natural and cultural values as well as the sociological values are very difficult to convert to economic units (Euro) and consequently these values are frequently overlooked in socio-economic analyses. It would in fact be better to regard these values as priceless if nothing can bring back these values if destroyed.

The total or partial loss of natural or cultural values or degradation of these should not be tolerated as a common practice. Instead, the norm should be to safeguard natural and cultural values by using the means provided by marine spatial planning and research. Nature values have evolved over thousands of years and landscapes, habitats and species are in their particular locations because the current spatial arrangement is the best possible at present environmental conditions. To safeguard the nature is in our best interest and the cases where our own existence truly depends on the deliberate destruction of nature are extremely few since there is often a possibility to avoid the problem or a way to work around it.

The use of GIS as a tool when carrying out the socio-economical analysis is recommended. It makes it easier to visualise the economic hot-spots and it makes it easier to plan for alternative solutions together with stakeholders.

Figure 3.6. Sailing in the archipelago areas is a valued leisure activity among the public throughout the Baltic Sea Region.

STEP 8. SOCIO-ECONOMIC ANALYSIS.

Assessing the socio-economical value of a specific marine area is a difficult and often also time consuming operation. The point with the exercise is to better understand the significance of planning alternatives. These results make it possible to categorise the alternatives which is a considerable help when discussing alternatives jointly with stakeholders. However, the point is not to automatically give priority to the most valuable alternative!

3.6.6 (9) Assessment of biodiversity

The ecosystem approach to management of human activities described earlier in this report ideally should be based on comprehensive knowledge of the spatial distribution, abundance and dynamics of the marine biodiversity and/or living resources in the area to be planned. Also the holistic perspective is important to keep in mind when assessing the biodiversity since species or habitats that appear to be very common locally in one area may in fact be rare when taking into account the entire Baltic Sea.

Scientific published studies are commonly regarded reliable sources of information. It is hence a great advantage if such studies, dealing with biodiversity issues relevant for MSP, are available from the marine area to be planned. It is even better if these studies include real observations from the area. However, it is not that common to have recently published scientific papers that cover the entire area and all aspects of the biodiversity from the area to be planned. Data gaps are still common, in the Baltic Sea, and elsewhere. Useful datasets must in such cases be obtained by other means, *e.g.* by utilization of local knowledge, by remote sensing, by environmental modelling or by carrying out new research in the area. Make sure that the resolution of the data you use for assessments fit the question you try to solve.

GIS make MSP easier and faster

While not a prerequisite for a successful marine spatial planning it is nevertheless an advantage if the information concerning the marine biodiversity can be used in GIS. The assessment of marine biodiversity for the purpose of marine spatial planning does benefit of the GIS datasets provided by the environmental characterisation (MSP template step 6). These datasets can be used as such, as in the case of information on the distribution of habitats and species, or analysed further by applying GIS modelling. GIS modelling is a cost-efficient ways of gathering comparable information with an extensive geographical coverage. The downside is sometimes the lower accuracy than what can be obtained through direct observations in the field. In BALANCE we have developed GIS tools, such as the heterogeneity GIS tool described by Snickars & Pitkänen 2007. The advantage of GIS modelling has also been demonstrated in a BALANCE case study from Sweden, where local fishermen where interviewed in order to obtain data on essential fish habitats. The study is described here only shortly (in the attached box in this chapter); the full report has been published as separate report (Bergström *et. al.* 2007). Practical guidelines on how to compile a range of biological (step 9) and socio-economical features (step 8) in the various BALANCE Interim Reports.

MARXAN – a decision support tool

However, a more versatile tool is the MARXAN software applied by BALANCE. The MARXAN software is a decision-support tool for the identification of a network of areas that combine to satisfy a number of ecological, social and economic goals (Ball & Possingham 2000). The use of MARXAN enables an objective and transparent process that is repeatable and driven by quantitative goals. MARXAN can be used to offer planning scenarios on conservation needs that are alternatives to existing protected area networks. It can also be used where the input of local stakeholders is important in order to achieve compromises. This also makes it a valuable tool not only for nature conservation purposes, but also for the entire zoning process as it provides scenarios including ecological information as well as human uses or interests. It thus provides scenarios for discussions among involved stakeholders.

Inputs to MARXAN are digital spatial information created from GIS data. MARXAN evaluates biological features, targets in terms of percentage protected sites, and pressure factors and provides alternative scenarios with portfolios of sites to be considered in terms of conservation. The suitability of individual sites can be evaluated in appropriate ways such as using a measure of threat/conflicting interests from other sectors, or management practicality.

The portfolios are assessed according to how efficiently they meet representation, suitability and spatial targets such as connectivity and site replication. The planning criteria are flexible, *e.g.* in order to improve connectivity between sites ensuring the existence and efficient migration of certain species. The flexibility allows expert knowledge to be utilized in case a suite of portfolios that meet the targets are found, and is the main reason why MARXAN can prove to be particularly useful in marine spatial planning.

The application of MARXAN results is described in detail in the zoning example later in this report while the use of MARXAN is comprehensively described in the BALANCE Technical Summary Report no. 3 (Andersson *et al*. 2008).

MARXAN is one of many tools available for site selection and zoning and new tools are likely to emerge in the future which make it also possible to acknowledge the complicated population dynamics and the vital migration routes (blue corridors) of marine species in the marine spatial planning concerning the marine biodiversity and apply the output of the software more easily for zoning.

STEP 9. ASSESSMENT OF BIODIVERSITY

The point with the exercise is to better understand where the areas are that are most valuable for the marine biodiversity in the region, as well as sub-regionally and locally. These results should be made available in GIS in order to facilitate the use of the results. In the Baltic Sea species abundance should be used with caution if used for judging the importance of an area because the sub-regions species diversity varies considerably due to the salinity gradient. Salinity gradients also affect the species abundance in archipelago areas and in estuaries.

USING STAKEHOLDERS IN FISHERIES RESEARCH

In order to gather information on spawning grounds of some commercially important fish species along the Swedish east coast, covering the Bothnian Bay, the Bothnian Sea, and the Baltic proper coasts, an interview study directed mainly towards local fishermen was carried out. The spawning areas pointed out by the interviews were digitised in GIS. For each of the areas information on spawning time, bottom substrate and water depth was gathered and assembled as attribute data to each of the GIS polygons representing a spawning area. In total 2200 areas along the Swedish east coast were pointed out as spawning grounds for sander, whitefish, Baltic herring, flounder, turbot and vendace. This kind of information can be used for drawing general conclusions regarding spawning behaviour and spawning habitat characteristics of fishes, and for GIS modelling of spawning habitats. It can also provide a spatial overview of a living resources and thus the collective amount of pressures upon it (Bergström *et. al.* 2007).

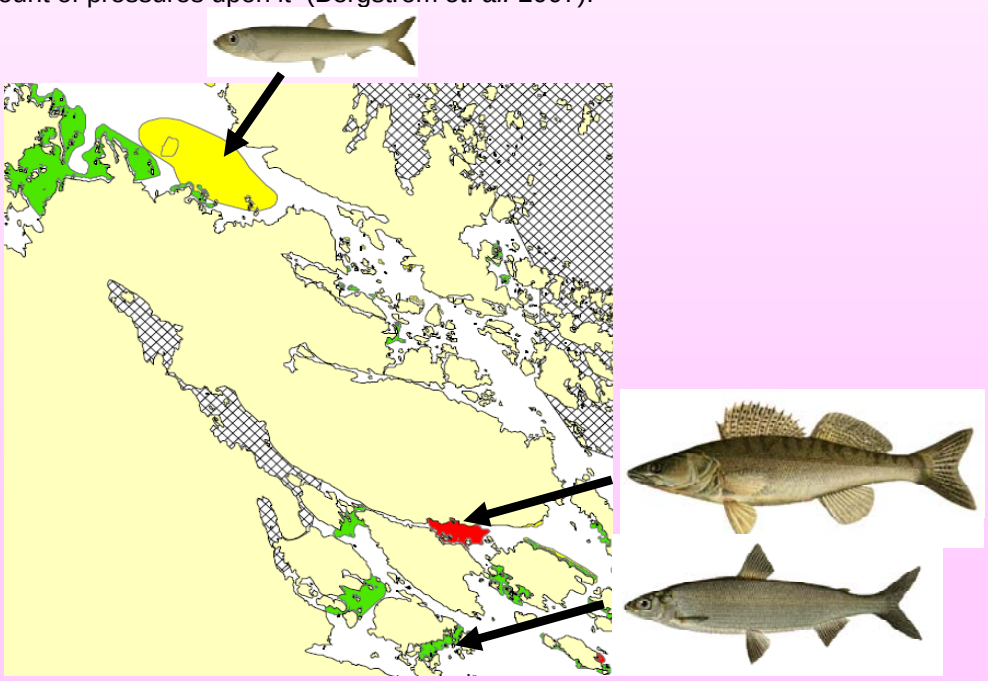


Figure 3.7 An illustration of spawning areas of herring (yellow), sander (red) and whitefish

3.6.7 *(10) Define environmental status*

The environmental status is judged based on the previous steps 6, 7, 8 and 9 categorised and presented in a simple way that can be easily understood. This is critical since some stakeholders lack ecological knowledge and may have problems finding experts in their own area. Assessment tools that make it possible to define the environmental status in a few categories are to be preferred, for example:

1. Poor
2. Moderately Poor
3. Intermediate
4. Good
5. Excellent

Such categories are commonly used for defining water quality but these can also be used for categorising marine biodiversity. However, the information for defining these categories should be used in a logic and consistent way. Categorisations, such as this division in five categories, are strong oversimplifications of complicated ecosystems. Consequently the limitations of such categorisations should be considered carefully before applying these more widely. It is better to rank the categories with terms (such as above), while numerical values would wrongly give the impression that the scoring card results can be used scientifically, *e.g.* as variables in calculations. However, the alternative, to present the ecological status only by published scientific papers, is nor realistic or successful when dealing with decision makers. It is important to note that this activity should be closely linked to environmental assessments performed by e.g. the regional sea conventions or periodically as part of the implementation of the marine EU directives.

The definition of environmental status is tightly coupled with the targets set up in step 11 and steps 18, 19 and 23.

STEP 10. DEFINE ENVIRONMENTAL STATUS

The point with the exercise is to categorise the environmental status in a way that can be easily understood by stakeholders. It integrates the results from the biodiversity assessment and the socio-economical analysis.

3.6.8 (11) Set targets for Marine Regions

The targets set up in this step should be based on the results from the steps 6 to 10 and these targets should reflect the goals and objectives set up by the EU and HELCOM concerning the desired state and human use of their marine regions. The targets should be clear and applicable in each part of the region. Such targets have been described in the HELCOM Baltic Sea Action Plan and the EU Biodiversity Action Plan. Actions, that describe how to reach the targets are met, and kept, are often described for each target specifically. To follow up how well targets are met, monitoring programmes should be set up (described in steps 19 and 23). Marine Spatial Planning and the use of zoning are new concepts for the Baltic Sea and it is likely that new targets specifically for this purpose will be defined within the next decade by HELCOM and/or through an EU related process. Regional targets make it possible to check if sub-regions or local areas are performing well or not.

Again such targets need to closely linked to existing socio-economic interests and environmental targets rather than defining a new parallel set of goals.

STEP 11. SET TARGETS FOR MARINE REGIONS

The point with this step is to acknowledge the need and use of regional targets that illustrate the performance of marine spatial planning in the entire Baltic Sea. The regional targets are set by HELCOM and the EU, in the case of the Baltic Sea. These regional targets make it possible to follow up how well targets are met sub-regionally or locally.

3.6.9 *(12) Consult stakeholders in thematic groups (parallel to steps 6 to 11)*

This step should be applied simultaneously with all the steps from 6 to 11.

The environmental assessment described in steps 6 to 11 are mainly done by the experts of the leading authority. However, the discussion of the findings and validation of the conclusions should be discussed with the stakeholders. Input and data from stakeholders should be used if available.

It has proven best to divide the stakeholders in different thematic groups in order to maintain the focus of such discussions *e.g.* people involved or concerned about fishing, hunting or boating should be invited in separate groups discussing only one topic. The result is to understand the different views on a certain situation and to exchange these views in order to create mutual understanding about the situation. This step also reveals gaps of knowledge and data. Stakeholders can as well identify these gaps and add open questions which need input or research activities to clarify. For example, fishermen can contribute by verifying GIS analysis data *e.g.* GIS modelled spawning grounds. On the other hand stakeholders can also feed in their own local and specific knowledge into the process and directly contribute with it, *e.g.* by providing historical knowledge on fish stocks or water quality. This input should be further processed by the leading authority. This step also ensure transparency of the MSP process and provide advice on how to present the data from steps 6 to 11 in order to be understood by everybody involved.

This step (12) is explained in more detail in chapter 6.2.2.

STEP 12. CONSULT STAKEHOLDERS IN THEMATIC GROUPS

The point with this step is to show that stakeholder involvement must be carried out alongside the steps 6 to 11.

Figure 3.8. WWF and NABU organise voluntary monitoring excursions at the Baltic Sea coast near Rugen in Germany.

3.7 Planning process

The third phase of an integrated marine spatial planning process is the Planning process itself, and includes steps 13 to 17. It describes a balanced approach to marine spatial planning based on four zones adoptable by all sectors and applicable across national boundaries. It ensures space for all human uses, involvement of all interested stakeholders while taking care to minimise impacts and multiple pressures on the marine environment. If MSP is compared to building a house then the Planning process phase is the actual construction of the house.

3.7.1 (13) Zone selection process (based on steps 6-12)

The Zoning matrix
The rule "do not plan on a blue background" i.e. by only applying a nautical chart but no information on the biodiversity, applies when making decisions concerning the zoning.

The matrix in this chapter show the four zones suggested by BALANCE for the Baltic Sea, along with the main human activities that should be acknowledged in the zoning plan as defined in the Table 2 of Annex III in the resolution text of the Marine Strategy Framework Directive as adopted by the European Parliament in December 2007 (European Commission 2007e). The zoning is a necessary tool to plan the multiple use of sea areas in a way that balances the various human activities and sea use with environmental protection objectives. The overall goal of the zoning presented here is to make it possible to implement marine spatial planning in a consistent way within the Baltic Sea, while building upon existing statuary obligations from the EU directives (Marine Strategy Directive, Habitats Directive, ICZM recommendation and the Water Framework Directive). These directives include targets that can only be reached in the marine area by applying an informed, comprehensive decision-making tool that allows for a consistent and comparable way to plan the multiple uses of sea areas.

This marine spatial planning approach, including the four zones, can also be applied in other parts of European seas.

It consists of I) The General Use Zone. II) The Targeted Management Zone, III) The Exclusive Use Zone, and lastly IV) The Restricted Access Zone. It is important to realise that different management plan typically will be associated with the individual zones i.e. the will be a Natura 2000 management plan for each Natura 2000 site just like there will be different permits for human use in designated within the i.e. Exclusive use zone. This could be marine aggregate extraction with different allowed amount extracted, size of production within a fish farm or number of individual wind-mills within an offshore windfarm.

General description of the four zones
The zoning approach can, in principle, be applied at various spatial levels ranging from local to national levels up to a transnational approach covering an entire Marine Region.

However, the minimum area for which a zoning plan should be developed should be ecological relevant in order to link human uses to the environment in an ecosystem-based approach to spatial planning *i.e*. a catchment area. It would also enable to assess the total impact of multiple human and environmental pressures on specific elements of the marine environment as illustrated by Al-Hamdani & Reker (2007). Furthermore it would enable the zoning plan to link marine spatial planning with land-based activities and pressures. If this were done correctly, it would provide valuable insight on the origin of pressures and impacts. It would also ensure that human activities on sea are not hold responsible for land-based pressures. Such local plans made typically by local and regional authorities could then be merged into regional and national spatial plans. Lastly, the national plans could be merged or reported at the regional sea level or even on a pan-European level.

Similarly, such a hierarchical approach would enable assessment of various targets and objectives whether they are sector specific *i.e*. a certain amount of space is available for offshore wind-farming, fish and mussel farming, provide an overview of non-living resources such as marine aggregates etc. or related to environmental status assessments.

A zoning plan is, in principle, temporal in nature as the entire spatial plan is of a cyclic process, but the individual zones are as such not temporal within the duration of the plan period. If *e.g.* fisheries management of an area requires temporal closures, then this would be part of the management plan of an area designated as *e.g.* a targeted management zone.

The four zones is fully applicable by all sectors and is generic terminology ought to make it usable by independent nations, while allowing for transboundary comparisons.

Location of the zones (application of the zoning approach): All four zones are located within the national area of jurisdiction, but not the EEZ. The zoning can be applied in the EEZs of the Baltic Sea if the countries can agree to this, *e.g.* within HELCOM (including HELCOM contracting countries) or within the European Union but then covering only the EEZs of the EU member states (*i.e.* excluding Russia).

Coverage: These four zones should cover the entire sea area (where used) but should not overlap with each other.

Principles of defining zones and zone hierarchy: The hierarchy of the zones follows the strictness/amount of regulations within the zones, *i.e.* the restricted access zone is the strictest (posing the strongest set of regulations), followed in descending order by the exclusive use zone, targeted management zone and general use zone. The zones in a particular area must be defined in detail (in a publication or report), as has been done for the Great Barrier Reef marine spatial plan (Australian Government 2003). This is very important since the four zones are broadly defined and must be complemented detailed with information on the objectives (why the zones are established), regulations, temporal restrictions, permissions etc. For example, the targeted management zone may include several types of human use or nature conservation areas and it is very likely that these need to be marked on the maps on top of the zone shown in yellow colour and explained further in text form.

No *Buffer Zone* or specific *Nature Conservation Zone* is needed: The coverage of the zones should be extensive enough to safeguard the target uses within the zones. Consequently, there is no need for a buffer zone and no buffering should be applied. Nature conservation is regarded as one form of human sea use/activity, and considering the various degrees of restrictions applied in nature conservation it would not have been logic to propose a specific zone for nature conservation. Instead, nature conservation is given high priority in the marine spatial planning process and biodiversity and conservation issues should be considered together with other human activities, and prioritised when possible, in order to ensure the long-term sustainable, ecosystem-based approach to management of human activities.

Demarcation of the human activities: Within the zoning map the human activities can be presented on top of the zones to give a more detailed map of where exactly the most important human activities take place.

Identification of the relationship between main human sea use/activities and their potential pressures and the zoning: The matrix also includes columns for each of the pressures and another column where the impact of these activities has been quantified. The scale used (1 being the lowest pressure and 3 being the highest or most harmful degree of pressure) is estimated (subjective) but based on the table included in the decisions from the CBD COP7, which is identical to the similar pressure table included in the Annex of the EU Marine Strategy Directive.

Using ecological spatial information: Coherent ecological information is included as a basic layer along with human use and activities, and thus help to minimize the impact on the environment. No marine zoning or spatial planning should be done on a "blue background" or with a simple Navigational Chart. Marine landscape and habitat maps should be considered as the "aerial photographs of the sea"

The four zones are as follows:

The General Use Zone

The General Use Zone is by far the largest of the four zones, and it covers all marine areas not covered by the other three zones. It is the least restrictive of all the zones, where most human activities are allowed (Figure 5.1). Please refer to the zoning matrix (Table 3.2) for details.

Objective for the General Use Zone:

The purpose with the General Use Zone is to provide equal opportunities for reasonable use within a specific defined sea area. It makes it possible to define the spatial extent of the sea area subject to the existing international and national legislation but without any other specified restrictions. This also makes it possible to show the areas where zoning has been applied, in contrast to areas where zoning has not been applied.

Restrictions:

The General Use Zone allows all types of human activities or sea use to take place with exception of those specifically prohibited by law (Figure 3.9). Some activities may require permission and some also an EIA. These are not specified here because of the dif-

ferences in legislation between the countries around the Baltic Sea[6]. There might exist general or sectoral related management targets, objectives and restrictions for an area designated as a general use zone *i.e.* water management plans as defined under the EC Water Framework Directive, fisheries related issues such as restrictions for gear etc.

It is important to note that general restrictions applying in the general use zone, would also be in place in the three remaining zones unless an activity in a higher level zone is specifically excluded from those restrictions e.g. there might exist different environmental objectives for a harbour or mussel farm than in the general marine environment. In the general use zone there are for example general restrictions against dumping and release of waste water but the authorities may in special circumstances permit this.

The Targeted Management Zone

The Targeted Management Zone is applied for areas where the use is restricted further, where an authorisation (permit, licence) has been granted for one or several activities or where the area includes nature conservation targets that require that the use of the area to be regulated, either permanently or temporarily. An example of a human activity designated within this zone are many Natura 2000 sites where the objective to protect specific habitats and/or species is not in conflict with other types of sea use e.g. maritime traffic unless threatening the habitats and species in the area. However, the restrictions in this zone may for example be that special shipping rules takes precedence over other uses i.e. such as in the Sound (Between Skåne in Sweden and Sealand in Denmark) where trawling has been banned due to maritime safety. It could also be spawning areas for commercial fish species, which requires management part of the year to ensure sufficient stock size (Figure 3.10).

Objective

The objective with the Targeted Management Zone is to ensure the sustainable use of marine areas and resources, to ensure the protection of the biodiversity in the area, shipping priorities etc. The area can be subject to multiple uses, though some uses not compatible with the other types of sea use may be prohibited.

Restrictions

The Targeted Management Zone is an area subject to restrictions that extend further from the existing national and/or international legislation (*i.e.* more than in the general use zone). In most cases the access to the area is not restricted, although the maritime traffic may have restrictions *e.g.* reduced speed, the size of the ship or the ships draft (vertical distance between the waterline and the keel) of the vessel are restricted. The targeted management zone is likely to be the most challenging to define. Various types of sea use must hence in the zoning map be drawn on top of the area defined as Targeted management zone (in yellow) e.g. as hatched areas.

[6] *The international and national legislation applying to various types of human activities and sea use is a topic that should be addressed by a separate legal study. Within the EU the legislation harmonization allow for a general definition of the restrictions and regulations that apply to each activity or type of sea use but the legislation of non-EU countries, e.g. Russia, would require a more detailed study that what can be accomplished within the BALANCE project.*

The Exclusive Use Zone
The Exclusive Use Zone is the second most stringently regulated zone. It should be as small as possible without compromising the purpose of having the zone in place, to prevent posing the public with more restrictions than necessary (Figure 3.11).

Objective

The Exclusive Use Zone shows the extent (cover) of the marine area reserved exclusively for a single use, which prevents the sea area to be used by most other types of sea use. Examples of exclusive sea use in this zone are, *e.g.* wind energy parks, harbours, aquaculture (fish farms, mussel farms), marine aggregate extraction sites or areas set aside for nature protection e.g. vulnerable Habitat Directive Annex 1 habitats or nationally important areas for bird protection (often identified by several protection measures such as the Birds Directive, IBA, Ramsar, HELCOM or national programmes). In some cases can exclusive use be paired with nature conservation interests although such areas do not fulfil the criteria of MPAs.

Restrictions

Within this zone only one type of human activity or sea use is allowed at a time. The activity or sea use can be permanent or temporary (a part of the year, a certain amount of years) and it always requires permission and in some cases also an EIA. Some human activities such as recreational activities and research can be allowed within this zone without specific permission, as long as there is no conflict with the purpose of the zone. These issues will be handled in the management plan, code of conduct or business plan for the individual zone.

The Restricted Access Zone
The restricted access zone is, as the name implies, the zone subject to the most rigorous regulations. The purpose is similar to the Exclusive Use Zone but the main difference is the very strict restricted access. The Restricted Access Zone should be as small as possible, without compromising the purpose of having the zone in place, to prevent posing the public with more restrictions than necessary (Figure 3.12).

Objective

The objective is to ensure satisfactory protection of the area covered by the restricted access zone. Irreparable damage could occur if access to the area is permitted or the visitor could be in danger or may cause a dangerous situation to others. The purpose can be to ensure safety, such as when restricting access to military areas or oil platforms where the risk of accidents does not allow access into the vicinity of oil platforms. The zone can also be applied to ensure the protection of historical artefacts such as in the case of valuable shipwrecks that run a risk of being looted or destroyed. Furthermore, the purpose can also be to protect wildlife such as seals or to guarantee that an area can be used as a reference area for biological research, e.g. seal sanctuaries or areas for protection of White tailed eagles.

Restrictions

All entry is prohibited, except in an emergency or when first receiving a permission to enter, *e.g.* linked to the specific purpose of having the zone in place or for carrying out research which can not be conducted elsewhere.

This step (Step 13) feed into the next steps, in particular steps 14 and 16.

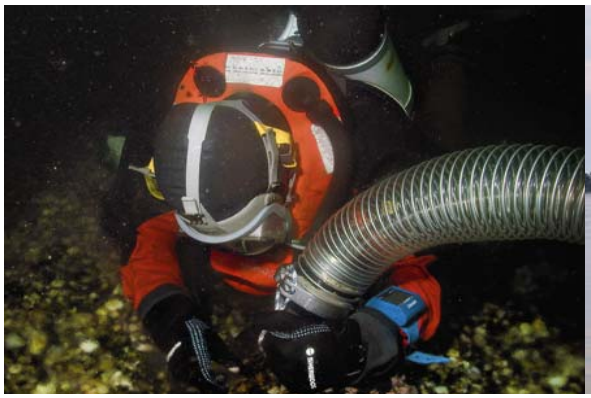


Figure. 3.9. The General Use Zone is basically open for all uses unless specifically prohibited.. Photo: Karsten Dahl.

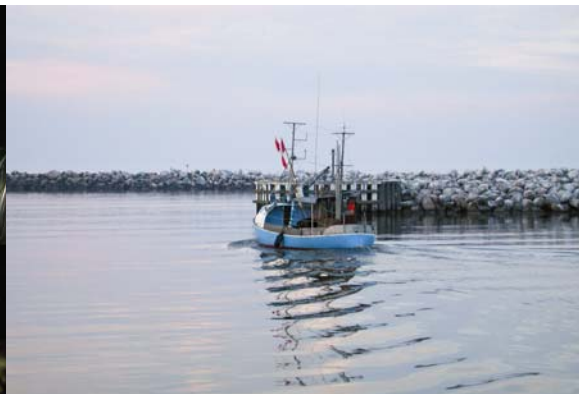


Figure. 3.10. The Targeted Management Zone could include areas temporally opened for fisheries. Photo: Karsten Dahl

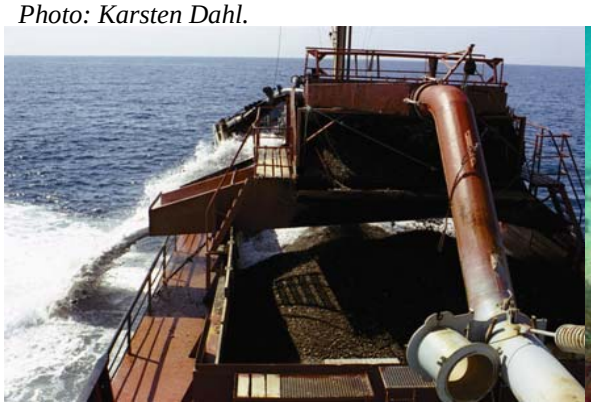


Figure. 3.11. The Exclusive Use Zone could include areas dedicated to a single purpose such marine aggregate extraction, fish farming or offshore wind-farms. Photo: Karsten Dahl.

Figure 3.12. The Restricted Access Zone could be a vulnerable cultural heritage site or areas closed for military purposes- here a large anchor from a ship wrack, Kattegat. Photo: Jan Nicolaisen.

Table 3.2 The Zoning Matrix. For explanation of the zones and restrictions please, see report text.

HUMAN ACTIVITIES AND USES WITHIN ZONES	**PRESSURES AND IMPACTS** (as defined in table 2 in Annex III of the Marine Strategy Framework Directive)							**ZONES**			
See zoning plan and zoning maps for full details	PHYSICAL LOSS	PHYSICAL DAMAGE	OTHER PHYSICAL DISTURBANCE	INTERFERENCE WITH HYDROLOGICAL PROCESSES	CONTAMINATION BY HAZARDOUS SUBSTANCESN	NUTRIENT AND ORGANIC MATTER ENRICHMENT	BIOLOGICAL DISTURBANCE	1. GENERAL USE ZONE	2. TARGETED MANAGEMENT ZONE	3. EXCLUSIVE USE ZONE	4. RESTRICTED ACCESS ZONE
MARITIME TRAFFIC											
Large Vessel Traffic		***	**		***	***	***	YES	YES, if no conflict	NO or Restricted	NO
Small Vessel Traffic		**	***		**		*	YES	YES, if no conflict	Restricted	NO
Kayak/Canoe Traffic								YES	YES, if no conflict	YES, unless in disagreement with the exclusive use (then NO or Restricted)	NO
Sea-plane Traffic			***		*			YES	YES, if no conflict	NO, Except when in agreement with the exclusive use (then YES or Restricted)	NO

HUMAN ACTIVITIES AND USES WITHIN ZONES	PRESSURES AND IMPACTS (as defined in table 2 in Annex III of the Marine Strategy Framework Directive							ZONES			
See zoning plan and zoning maps for full details	PHYSICAL LOSS	PHYSICAL DAMAGE	OTHER PHYSICAL DISTURBANCE	INTERFERENCE WITH HYDROLOGICAL PROCESSES	CONTAMINATION BY HAZARDOUS SUBSTANCESN	NUTRIENT AND ORGANIC MATTER ENRICHMENT	BIOLOGICAL DISTURBANCE	1. GENERAL USE ZONE	2. TARGETED MANAGEMENT ZONE	3. EXCLUSIVE USE ZONE	4. RESTRICTED ACCESS ZONE
INFRASTRUCTURE & CONSTRUCTIONS											
Shoreline buildings	***	***			*	**	*	Permit	Restricted + Permit	No, except when part of the exclusive use (Permit)	NO, unless part of the agreed use (Permit)
Windmills & Wind energy parks	***	**	***	*				EIA/Permit + map, if no conflict	EIA/Permit + map, if no conflict	NO, except when part of the exclusive use (EIA/Permit + map)	NO
Harbours	***	***	***	*	***	***	***	EIA/Permit + map	Permit + map, if no conflict	NO, except when part of the exclusive use (EIA/Permit+map)	NO, except when part of the agreed use (EIA/Permit+map)
Jetties	***	***	***		***		*	YES	YES	NO, except when part of the exclusive use	NO, unless part of the contract
Underwater cables	*	**			**	*		Permit	Permit	NO, except when part of the exclusive use (Permit)	NO

Underwater pipelines	***	***			***	***		Permit + map	Permit + map	NO, except when part of the exclusive use	NO
Nautical Support Structures	*	*			*	*		YES + map	YES + map	YES + map	YES + map but can be restricted
Bridges	***	***		*	*	*		Permit	Permit	NO, except when part of the exclusive use	NO
MARINE PROTECTION											
Natura 2000 SPA sites								NO	YES	YES	YES
MARINE PROTECTION											
Natura 2000 SCI sites								NO	YES	YES	YES
MPA, IUCN Category 1A								NO	NO	NO	YES
MPA, IUCN Category 1B								NO	NO	NO	YES
MPA, IUCN Category 2								NO	NO	YES	YES
MPA, IUCN Category 3								NO	NO	YES	YES
MPA, IUCN Category 4								NO	YES	NO	NO
MPA, IUCN Category 5								NO	YES	NO	NO
MPA, IUCN Category 6								NO	YES	NO	NO
FISHERIES											
Bottom trawling		***	*				***	Permit	Permit, if no conflict	NO, Except when in agreement with the exclusive use	NO

HUMAN ACTIVITIES AND USES WITHIN ZONES	PRESSURES AND IMPACTS (as defined in table 2 in Annex III of the Marine Strategy Framework Directive							ZONES			
See zoning plan and zoning maps for full details	PHYSICAL LOSS	PHYSICAL DAMAGE	OTHER PHYSICAL DISTURBANCE	INTERFERENCE WITH HYDROLOGICAL PROCESSES	CONTAMINATION BY HAZARDOUS SUBSTANCESN	NUTRIENT AND ORGANIC MATTER ENRICHMENT	BIOLOGICAL DISTURBANCE	1. GENERAL USE ZONE	2. TARGETED MANAGEMENT ZONE	3. EXCLUSIVE USE ZONE	4. RESTRICTED ACCESS ZONE
FISHERIES											
Pelagic trawling		*	*				***	Permit	Permit, if no conflict	NO, Except when in agreement with the exclusive use	NO
Fixed Gillnet fishing		*	*				***	Permit	Permit, if no conflict	NO, Except when in agreement with the exclusive use	NO
Driftnet fishing (*Core-gonus sp.)*		**	*				***	Permit	Permit, if no conflict	NO, Except when in agreement with the exclusive use	NO
Salmon traps (standing gear)		*	*				***	Permit + map	Permit + map, if no conflict	NO, Except when in agreement with the exclusive use	NO
Recreational net fishing		*	*				***	YES + Permit	YES + Permit	NO, Except when in agreement with the exclusive use	NO

Recreational angling/spinning			*				**	Permit	Permit	NO, Except when in agreement of the exclusive use	NO
HUNTING											
Seabird Hunting			*		*		***	Permit	Permit if no conflict	NO	NO
Seal Hunting			*				***	Permit	Permit, if no conflict	NO	NO
DREDGING/ EXTRACTION /MINING											
Dredging	***	***	**	*	***	***	**	Permit + map	Permit + map	NO, Except when part of the exclusive use (then permit + map)	NO
Extraction of Sand and Gravel	***	***	**	*	***	***	*	Permit + map	Permit + map	NO	NO
Mining of iron-manganese concretions	***	***	**		***	***		Permit + map, if no conflict	Permit + map, if no conflict	NO, Except when this is the exclusive use (then permit + map)	NO
Oil and Gas extraction	**	***	**		***	***		Permit + map	Permit + map, if no conflict	NO, Except when this is the exclusive use (then Permit + map)	NO
MILITARY ACTIVITIES											
Military practice areas		*	**		**	**	*	NO	NO	Contracted, if this is the exclusive zone + map	Contracted, if this is the reasons for protection + map
Military base areas	**	**	**		**	**		NO	NO	Contracted if this is the exclusive use + Permit + map	Contracted + Permit, if this is the reason for protection + map

HUMAN ACTIVITIES AND USES WITHIN ZONES	PRESSURES AND IMPACTS (as defined in table 2 in Annex III of the Marine Strategy Framework Directive							ZONES			
See zoning plan and zoning maps for full details	PHYSICAL LOSS	PHYSICAL DAMAGE	OTHER PHYSICAL DISTURBANCE	INTERFERENCE WITH HYDROLOGICAL PROCESSES	CONTAMINATION BY HAZARDOUS SUBSTANCESN	NUTRIENT AND ORGANIC MATTER ENRICHMENT	BIOLOGICAL DISTURBANCE	1. GENERAL USE ZONE	2. TARGETED MANAGEMENT ZONE	3. EXCLUSIVE USE ZONE	4. RESTRICTED ACCESS ZONE
SCIENTIFIC & ADMINISTRATION ACTIVITIES		*	*					YES	YES	YES + Permit, Except when part of the exclusive use	Contracted, if this is the reason for protection + map
UPSTREAM AND DRAINAGE AREA ACTIVITIES AND AREA USE RELAVANT TO THE MANAGEMENT OF ADJACENT MARINE AREAS				*	***	***		YES, if no conflict	YES if no conflict, NO/Permit if conflict	YES if no conflict, NO/Permit if conflict	YES, if no conflict, NO if conflict

3.7.2 (14) Arrow out: draft zoning plan

The draft zoning plan is illustrated as an arrow out from the marine spatial planning template because at this stage the result should be brought to a wider audience for review.

This is a straightforward approach how to draw a draft zoning map based on data derived from the *initial assessment* (steps 6-12) of the MSP template, and by using the zoning matrix of the *zone selection process* (step 13). The aim is to provide a basic GIS-assisted procedure that may be completed without advanced resources and skills, given, of course, that the appropriate data sets are available. Thus, more sophisticated methods may be used in parallel or in addition to this, *e.g.* applying MARXAN results (used in step 9), or corresponding decision-support tools. Such a tool would contribute to the visualisation of different scenarios optimising the space needed for meeting the needs of each sector, while minimising conflicts and the impact on the marine environment.

As a common rule for zoning, the result must be general enough in order to be practical and simply understood. NB! In our examples the presented draft zoning maps are not legally binding plans or proposals or parts thereof, and have not been presented to any stakeholders. The draft maps only exemplify the use of selected input data sets for a BALANCE pilot area (SW Finland, Åland and Stockholm region, Sweden).

TO DRAW A DRAFT ZONING MAP

The rationale for drawing a zoning map is that the marine area is first defined as a least stringent zone, and thereafter the more stringent zones are one after another built on where required using the GIS-based data sets derived during the *initial assessment*. The draft zoning maps presented later in this report are only examples to illustrate what the zoning map may look like (and that it can be technically done). These zoning examples from Finland and Sweden are not discussed with the national authorities, or stakeholders and the selection of GIS layers used for selecting the zones is inadequate. This is due to the fact that the BALANCE project could not get hold of all the GIS data sets it requested from various data suppliers while other datasets would have taken too long to build up within the projects time frame. Consequently, we do not provide detailed descriptions on the datasets used for defining the zones borders due to the high risk of giving the wrong impression of what actually is needed to perform the zoning process for real. The drawing of the zones are explained in general in the four steps (14.1, 14.2, 14.3, 14.4) and also illustrated in the figure 3.13.

Step 14.1 Begin with delineating the coverage of the marine area to be zoned and draw the boundaries using a GIS program (normally, boundaries are known already after MSP template step 2). Here it is important that the area to be zoned is ecological relevant and, if possible is linked to land e.g. if the area to be zoned is similar to a catchment area, then it would be possible to link land-based pressures to the marine spatial plan. Similarly, the size of the marine area to be zoned needs to have a certain minimum size to enable ecological relevant zoning. If the area is too small there will be too few different planning scenarios available as e.g. all the nature components are unique, there is only one site for wind-farming or fish farming etc. Name the marine areas falling inside the boundaries as *general use* zone – the requirements for more stringent regulations will be elaborated in the next steps. As default, an area will remain as a

general use zone if there are no reasons to change its status (some feature or specific use requiring a more stringent regulation).

Step 14.2 Visualise the data sets and assessments related to the marine environment on the screen, *e.g.* important habitats and species that need protection, and other information indicating conservation targets, *e.g.* results of a MARXAN-analysis. The data derived from steps 8-10 are used as a basis to balance the sea uses with the nature.

Known locations or assessments of the range of factors potentially affecting the state of the environment (*e.g.* dumping sites or dredging locations) may be included to the same view. By investigating the overlaid data sets, try to find the essential areas where some activities may need to be restricted to protect the nature, and the probable biodiversity hot spots that help to maximise the results and minimise the efforts involved in nature conservation.

Digitalise the most applicable areas to be included into zones other than *general use* based on their sectoral or natural values, and be sure that they fit into the definitions of the *zoning matrix*. Remove these areas from the *general use* layer and name a new zoning status for them. Finally check that there are no overlaps on the zoned area.

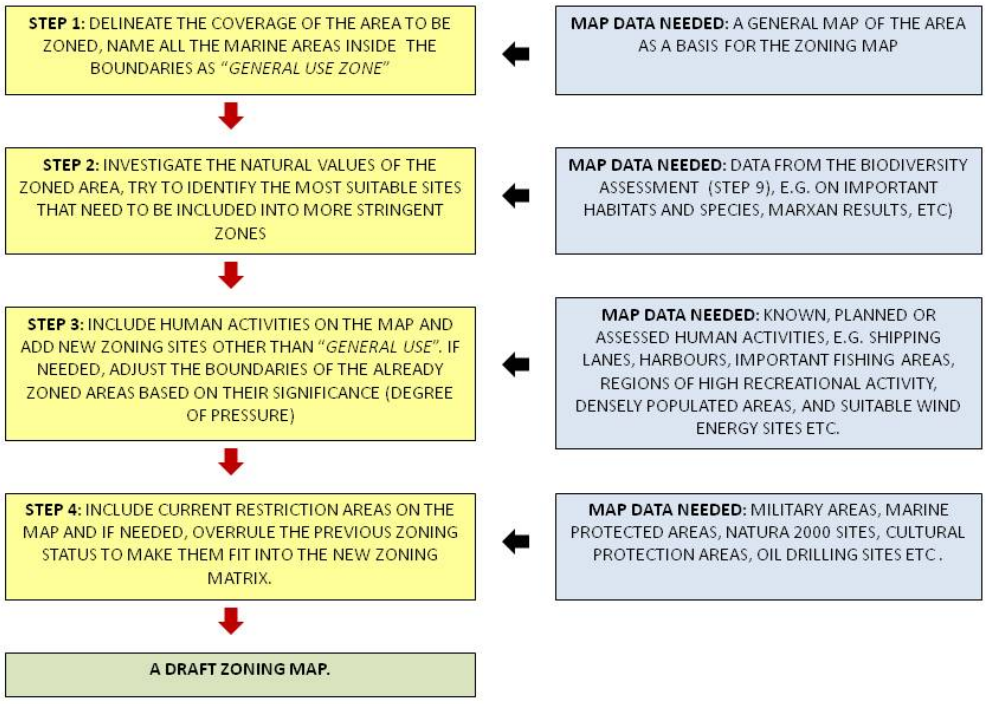


Figure 3.13 Schematic illustration of the process of making a draft zoning plan & map

14.3 Next, visualise all the GIS layers indicating known, planned or assessed human activities on the zoned area – these are *e.g.* shipping lanes, harbours, important fishing areas, regions of high recreational house concentrations and densely populated areas, as well as sites suitable for wind energy production or seafloor mining.

By using the information provided by these data sets, adjust the zoning result from Step 2 by delineating new regions and altering the outlines of the already zoned areas based on their anthropogenic significance, and check that there will be no conflicts with the definitions of the *zoning matrix*. Aim at recognizing regions where the cost of restrictions would be major and public resistance might be expected, and if found necessary, make the more restrictive areas smaller or include them completely to a lesser restrictive zone. Finally, check again that there are no overlaps on the zoned area

14.4 Include the current and probated restriction areas that must be included into the zoning draft, *e.g.* military areas and cultural heritage sites. Overlay them with the zoning map from Step 3 and if necessary, overrule the previous zoning status to make the areas to fit into the *zoning matrix*. Make sure that there is no overlaps between the zones and that all the marine areas have been given a zone status. The draft zoning map has now been drawn, and it offers a visual tool with which one can continue in connection with stakeholder consultation.

The draft zoning plan must be accompanied by a text from step 13 explaining each zone, as done for the Great Barrier Reef (Australian Government 2003).

It is important to realise that while BALANCE have used the decision support tool for marine nature conservation purposes, this tool could equally well be used for defining the individual zones for each and every sector as long as their needs are described in a spatial context. The only reason that BALANCE has not done this is mainly because of the lack of access to sectoral data, but also because the BALANCE partnership expertise was in the area of nature conservation and fisheries management.

3.7.3 (15) Calculate costs and benefits

This step is closely related to step 8 (the Socio-economic analysis) and it applies the results from step 8 for assessing the overall costs and benefits for different zoning alternatives.

The cost and benefit analysis should apply the ecosystem approach to management of human activities as a guiding principle, and plan "*in balance with nature*". Guidelines for the assessment ecosystem services values have been published by IUCN, Nature Conservancy and the World Bank (2004) and this publication also provide general advice on how to deal with nature conservation and stakeholder interests when carrying out cost and benefit analysis. Similarly, it must expected that some guidance will be developed to support the implementation of the EC Marine Strategy Framework Directive,

When in this step applying the results of the socio-economic analysis in step 8 the point is <u>not</u> to "automatically" give priority to the activity that has the highest economical value. The point of carrying out the socio-economic analysis is to better understand the significance of all the marine spatial planning alternatives. The various types of human activities can also be categorised *e.g.* according to their value, impact on local economies, time span or sustainability, which help when choosing among alternatives together with stakeholders. The cost and benefit calculations make it easier to choose economically valuable human activities that are not a threat to the natural or cultural heritage prior to activities with a similar economic value that cause a serious threat. It

also makes it possible to judge the economical impact of human activities for the local community.

Some activities that quickly exploit a non renewable resource but does not support the local economy (where the profits go to a company outside the local area) might be less attractive to local stakeholders compared to less valuable but more long lasting and more sustainable activities that also support the local economy.

At present there are no databases that would make it possible to easily access comprehensive datasets that would allow for a thorough cost and benefit analysis in the Baltic Sea Region, *e.g.* of the features and uses listed in step 8 (Socio-economical analysis). Clearly, this is a serious data management deficiency and data gap. A lot of useful data exist though it is not made available for the public and not much of this is geo-referenced. AIS/VMS data that would make it possible to estimate the value and impact of maritime traffic in an area. In particular the value of coastal constructions (wind energy parks, bridges, harbours, recreational houses, cables, pipelines etc..) should be made available. The fisheries data is geo-referenced but should be much more detailed than the current data provided form the Baltic Sea states through ICES or the EU CFP catch data reporting system. In the GIS tools report included in the CD attached to this report show a simple way to calculate the value of recreational activities. The analysis should also include considerations on what the cost will be if a spatial plan is not set in place.

The outcome of step 15 should be a clear evaluation of the costs and benefits associated with the main zoning alternatives. The focus should be on areas with multiple uses and within these in particular areas with conflicting uses. The development of tools for step 15 would be very important for the MSP as a process.

STEP 15. CALCULATE COSTS AND BENEFITS

The ecosystem approach to management of human activities should be used as a guiding principle when calculating costs and benefits of various planning alternatives. NB! Human activities with the highest economical value should not automatically give be the primary choice of sea use. This step should apply results from step 8 (Socio-economic analysis) .

Figure 3.14 Seal safe salmon traps (a Swedish invention) are effective in preventing seal damage on the fish as well as the fishing gear but still fish effectively as well.

3.7.4 *(16) Draft management plan(s)*

The zoning plan and the zoning map will be the key documents steering the use of marine areas, acting as an umbrella for linking other plans in the same area. Since the relationship between all plans in the area must be clarified should all existing management plans (*e.g.* for Natura 2000 sites), development plans, EIAs and other plans for the area be presented concisely in a general management plan. It should also show how updates of the existing plans and new plans should acknowledge the zoning plan. The need to acknowledge other regulations, plans of management or policies of the authority in force, besides the zoning plan, is also recognize in the zoning plan for the Great Barrier Reef (Australian Government 2003).

It should be mentioned that the purpose of the zoning plan is not to act as an extra legislative tool for something that is already regulated, but rather link these existing activities together in an efficient and cost-effective way, while closing and bridging any gaps between the sectoral legislation.

STEP 16. DRAFT MANAGEMENT PLAN(S)

The zoning plan (and zoning map) will be the key document steering the use of marine areas, acting as an umbrella for all other plans in the same area. It must nevertheless be supported by a general management plan that draws together all existing management plans from the area to be planned (or parts thereof). This plan should clarify the relationship between the zoning plan and all the other plans.

3.7.5 (17) Consult stakeholders

This step should be run alongside all of the steps 13 to 16.

The planning process part (part 3) of the MSP is crucial for the zoning process since at this stage the stakes are negotiated, *i.e.* which activities will be allowed, where, which restrictions will be established, how will these affect the planning area, etc..

Several participation options may occur simultaneously in the planning process (part 3), including formal top-down (the presentation of a draft plan for comments), round table discussions, thematic meetings or electronic forms (e-based participation) and co-management approaches where the stakeholders have a say in the final decision about the zoning result. In any case the process has to be well structured and the comments have to be considered (approved or rejected, answered). Decisions should be defendable (justified). E-based participation through electronic forms and the use of databases is an effective method especially when dealing with several thousand stakeholder responses. This makes it possible to categorise and analyse responses and then reply to these much faster and more consistently than if dealing with these case-by-case.

The decision about the zoning again has the character of an information campaign. It is meant to inform, create awareness and ownership and understanding for the zoning decision that was taken. Hence the zoning plan must be firmly "anchored" to the large public that use the area in order to be effective, *i.e.* the stakeholders should be committed to the plan.

This step (17) is explained in more detail in chapter 6.2.2.

STEP 17. CONSULT STAKEHOLDERS

The step 17 should be run alongside all of the steps 13 to 16. The goal is to commit all stakeholders to the zoning plan by involving stakeholders in the planning process.

3.8 Implementation

The fourth phase of an integrated marine spatial planning process is the Implementation itself, and it includes steps 18 to 21. It describes how the target for specific uses are set and agreed upon through stakeholder involvement. It also includes setting up monitoring programmes related to ecological, sociological or economic and political impacts of the zoning initiatives are a prerequisite for a successful management of marine areas.

If MSP is compared to building a house, then the Implementation phase is where the inhabitants actually move into the house and start to use it for their daily lives.

3.8.1 (18) Set up specific targets for individual zones, uses & activities

The targets in this step should be more specific than the general targets for the region set up in step 11 and should be specific for the objectives set up for each zone, each type of sea use (potential or actual pressure on the marine biota) and nature conservation. Targets in this step should be echoed in the monitoring programme in step 19 and the monitoring actions in step 23.

When possible, targets for specific pressures should be based on internationally or nationally agreed levels (acceptable/unacceptable) and should also specify the desired levels or degree of reduction. Targets set up for the marine biota can be used to define good environmental and ecological status (ICES 2003 & 2006, HELCOM 2007a), or the desired level of nature conservation *e.g.* a certain percentage of the sea area should be protected, the number of red-listed species abundance increase to a defined number, etc.. This approach has been used successfully in monitoring programmes for water quality *e.g.* Dixon *et al.* 2003.

In some cases zone specific targets must be set up more explicitly for the locality or sub-region, *e.g.* for measuring the performance of nature conservation, sea-use or socio-economic development, without any international reference values. Examples of such targets are:

- BIODIVERSITY: Nature conservation targets *e.g.* cover of key habitats and key species, sites with red-listed species, abundance and cover of alien species etc..

- SOCIOLOGY: Demographical targets *e.g.* target values for permanent residents, summer residents and visitors in the area. These make it possible to follow up how well the demographic structure in the area has been maintained but also allow for economic assessments or assessment of user related pressure on nature values.

- ECONOMY: Economic targets *e.g.* target values of jobs categories related to marine areas such as MPAs, professional fishermen, marine traffic, tourism etc..

- GOVERNANCE: Targets for measuring the performance of the MSP process and the governance of the planned marine area may include temporal targets *e.g.* the entire MSP process, or its parts, should be completed within a certain time frame. Targets can also be spatial, *e.g.* the surveillance should cover all zones at all times or legal, *e.g.* the number of filed legal cases in the MSP area should be lower than a given threshold value.

STEP 18. SET UP SPECIFIC TARGETS FOR INDIVIDUAL ZONES USES AND ACTIVITIES.

The step 18 should acknowledge international or specific targets for biodiversity, sociology, economy and governance.

3.8.2 (19) Set up a monitoring programme

Monitoring programmes for monitoring ecological, sociological or economic and political impacts of the zoning initiatives are a prerequisite for a successful management of marine areas. The successful application of the adaptive management principle depends also monitoring since it provides a feedback mechanism through which management action can be adjusted (Secretariat of the CBD, 2004). When setting up and carrying out monitoring programmes the role of government authorities, research institutes and NGOs is essential, although local communities and the private sector also may have a role to play (Secretariat of the CBD, 2004).

A good basic advice on monitoring Natura 2000 sites (SAC's) is provided by Baxter (1998) who suggests both compliance monitoring and condition monitoring. Compliance monitoring makes it possible to assess whether the management measures are being complied with while condition monitoring assess the status of the site (*i.e.* answering the question "*is what is there what should be there*"). This approach can also be applied for any other marine area for which a management scheme is developed since the objectives for the monitoring is always the starting point when setting up a monitoring programme.

Compliance monitoring can for example follow up if the set targets for improvement of biodiversity conservation are met, if restrictions of certain human activities are followed.

Condition monitoring programmes should detect the status and changes of the biota/environment in the managed marine area, *e.g.* by applying commonly accepted indicators. Such programmes should also take into account long term change (baseline data) that can *e.g.* be linked to assessing the conservation status (Davies 2001, Vreugdenhil *et al*. 2003), global warming (European Environment Agency 2007), eutrophication (HELCOM 2008), the invasion of alien species, or socio-economical indicators (trends in human activities, potential pressures and threats) OECD 2004, European Environment Agency 2007). Reporting can be annual such as the marine climate change monitoring in U.K., or periodical (European Environment Agency 2007). When setting up the monitoring programme, consideration should be given to the purpose (goals and objectives) the quality of baseline information, the available monitoring methods, and the response alternatives that can be used to rescue the environment (Baxter 1998).

STEP 19. SET UP A MONITORING PROGRAMME

The steps 11 and 18 should be taken into consideration when setting up the monitoring plan.

3.8.3 (20) Hold public hearing

The public hearing should be prepared extremely carefully since a failure to communicate the main message of the MSP process at this point could have a significant economic impact (at least the costs for the MSP process), sociological (the lost confidence by stakeholders is difficult to patch up) and possibly also legal consequences (penalties will follow a failure to fulfil international and national obligations). Run through the following set of questions:

- Is the key messages clearly presented?
- Can everybody access the MSP information easily?
- Are all legal aspects covered and fulfilled?
- Are all language questions solved, including those for minority languages?
- Is the system for public feedback in place and does it work sufficiently?

In order to fulfil the legal criteria for a public hearing should the MSP be put on display at least in a public place, *e.g.* regional environment authorities facilities, town hall) but preferably also via web pages, printed leaflets distributed by surface mail or by public events where somebody present the MSP. See step 17 for suitable methods for communication. Give extra care for ensuring that the feedback from the public is adequately taken into account and pointed out in the revised MSP.

This step is explained in more detail in chapter 6.2.2. See also the separate BALANCE Stakeholder Communication Guide for further advice (Feucht & Lamp 2006).

STEP 20. HOLD PUBLIC HEARING

When carrying out step 20 the aim should be to communicate the key messages from the MSP plan as clearly as possible and to respond to the feedback from the public. Consult the separate BALANCE Stakeholder Communication Guide for more detailed advice.

3.8.4 (21) Arrow out: Marine Spatial Plan

Based on the feedback from the previous step (step 20), make the appropriate adjustments in the MSP. Make sure that these adjustments are defendable and clearly shown in the revised plan.

3.9 Final assessment and reporting

The fifth and final phase of an integrated marine spatial planning process is the Final assessment and reporting, and it includes steps 22 to 24. It describes how the zoning plan and targets for specific uses are disseminated to the broader public as well as monitoring activities and assess and reports on progress in order to feed into the next planning period.

If MSP is compared to building a house, then the Final assessment and reporting phase is where the inhabitants of the house do the day to day maintenance of the house.

3.9.1 (22) Dissemination

The dissemination of the revised marine spatial plan (from step 21) should apply all relevant dissemination methods. See the separate BALANCE stakeholder Communication Guide for more detailed advice (Feucht & Lamp 2006)

3.9.2 (23) Monitor performance indicators

The monitoring of performance indicators should follow the monitoring programme set up in step 19. The results from the monitoring should be acknowledged when carrying on or when revising the MSP process, according to the principle of adaptive management. Reporting should preferably be carried out annually and then feed into each step of the MSP process s in order to improve the performance of each step and to make the entire MSP process more efficient, by identifying places for improvement.

3.9.3 (24) Assessment and reporting

ARROW IN: Revision (before starting over). The final revision (step 24) should assess the monitoring results over the lifespan of the marine spatial plan and identify its strengths, weaknesses, opportunities and the threats towards the individual elements of the plan, *i.e.* a SWOT analysis. The revision should come up with clear suggestions for how to improve the next planning process, when renewed.

The challenge for European seas will be to link the various policy initiatives together in marine spatial planning, and to ensure that all regional activities are harmonised. This will no doubt be a challenge that will take many years (and several planning schedules), but the cost to society and for the environment for not starting up this work would be many times higher.

4 GIS TOOLS FOR MARINE SPATIAL PLANNING AND ASSESSMENT OF MANAGEMENT PERFORMANCE

Geographic Information System (GIS) can be applied in several ways in the marine spatial planning process. Firstly, all management needs assessment concerning the performance. GIS tools can be used as biophysical, socio-economical and governance indicators of the management performance. The indicators should monitor the state of factors in different areas or the change of state over time. Secondly, spatial information of the features and uses is essential for the planning process and GIS can be an efficient tool for visualising the cover and distribution of sea resources and uses as maps. Overlay maps may be used for showing uses and their effects on sensitive habitats and species of marine areas. These two sides of the tools are of equal importance for the MSP.

Biophysical features and socio-economic use of coastal and marine areas are closely interconnected. The concepts of both sustainable use and ecosystem approach to resource management recognise the relationship in declaring that a healthy ecosystem and a sustainable socio-economy in many ways are interdependent.

Description of developed GIS tools for the delineation of coastal and marine resources and uses are provided in the attached cd. The instructions are written so that users with at least basic GIS skill should be able to use the tools. Tools of biophysical, geophysical, socio-economical and governance aspects of marine management are presented. Each tool includes information how to be used as indicator for quantifying the factor in space and time.

4.1.1 Biophysical tools

These tools are mainly used at steps 6,9,10 and 23. Biophysical tools provide a basic information layer and/or tool for marine spatial planning. The goals and objectives for the ecosystem are identified with the information that they provide. A prime goal is to maintain or restore ecosystem components for a long-term sustainable use. Marine landscapes and bioregions are the fundament for habitats, which support a variety of communities, some of which are widely distributed and others more habitat-specific. Examples of habitats are; habitats for focal species, Habitats Directive Annex I habitats, recruitment, rare, vulnerable and essential fish habitats. The identification of these habitats is crucial for a successive management, both legally and ecologically. Biophysical tools should cover ecosystem components such as presented by IOC (2006).

- The organisation of an ecosystem, which is the fundamental ecological structure, such as species diversity and composition and the spatial distribution of species assemblages.

- The vigour or function of an ecosystem which can be *e.g.* predator-prey interactions, trophic structure expressed as food-web properties and productivity.

- Water and habitat quality, which are the physical and chemical properties of ecosystems.

Table 4.1 is a summary of one of the developed tools, the Habitat heterogeneity indicator. It is widely understood that heterogeneous areas with varying conditions normally support more habitats than homogeneous ones. Real biological data is not always available and indicators of biodiversity may thus be needed. This tool uses four sets of widely available data to create an indicator of marine biodiversity of near shore areas. The principle behind the design is to account for the spatial variation and use the information as an indicator of biodiversity.

4.1.2 Socio-economical tools

These tools are mainly used at steps 7,8,10 and 23. Tools for the identification of various sea uses (human activities) include approaches for assessing both state and pressure factors. The monetary values of habitats may also be assessed; an example exists *e.g.* on evaluating the economic benefits for estuaries or seagrass-habitats was evaluated and transferred to monetary values (Firn Crichton Roberts Ltd & Graduate School of Environmental Studies University of Strachclyde 2000) This sort of inclusion of socio-economic data can foster a better understanding of the importance of these values of habitats and be used in the zoning process, mapped and brought to discussion.

Table 4.2 is a summary of one of the developed tools, the Human influence on coastal lagoons and large shallow inlets and bays. Coastal lagoons normally have a long shoreline and restricted water exchange and are typical examples of sensitive habitats that are associated to and influence by activities on land. They are subject to natural change as they gradually become cut off from the sea in land-uplift areas. Buildings near shore often have indirect effects on these sensitive habitats by facilitating activities such as dredging and boating, which may deteriorate habitats and prevent the natural succession. Assessing the extent of pressure provides an opportunity to model the ecological state (conservation status) as well as the vulnerability of the habitats.

4.1.3 Governance tools

It is important to include tools that can be used both for the planning as well as for the actual management plan. Governance tools are used both during the planning and when the plan is in place These tools are thus used during the whole template cycle, and thereby substantially differ from the two other groups of tools described above, which mainly are used for the assessment of the performance of the management plan and during specific steps of the template.

Management decisions result in altered patterns of the uses and activities at sea, and nature conservation through marine spatial planning applying zoning needs to ascertain that all interest are accounted for in a balanced planning process. Stakeholder involvement may increase the performance of the plan if the input of stakeholders is dealt with properly and if the stakeholders are satisfied with the situation. Governance indicators may cover a magnitude of management aspects, including the stakeholder participation and compliance. Whereas the communication interaction may be relevant throughout the whole planning process, compliance analysis may focus on the outcome stage (performance) of the process. Although one could argue that a high enough quality of the communication interaction would result in a very high compliance by affected stakeholders, in reality separate analysis of compliance may be needed as a result of possible resource conflicts. The reader should acknowledge that governance tools and indicators are highly connected with stakeholder aspects and should be used and red parallel with chapter 5.

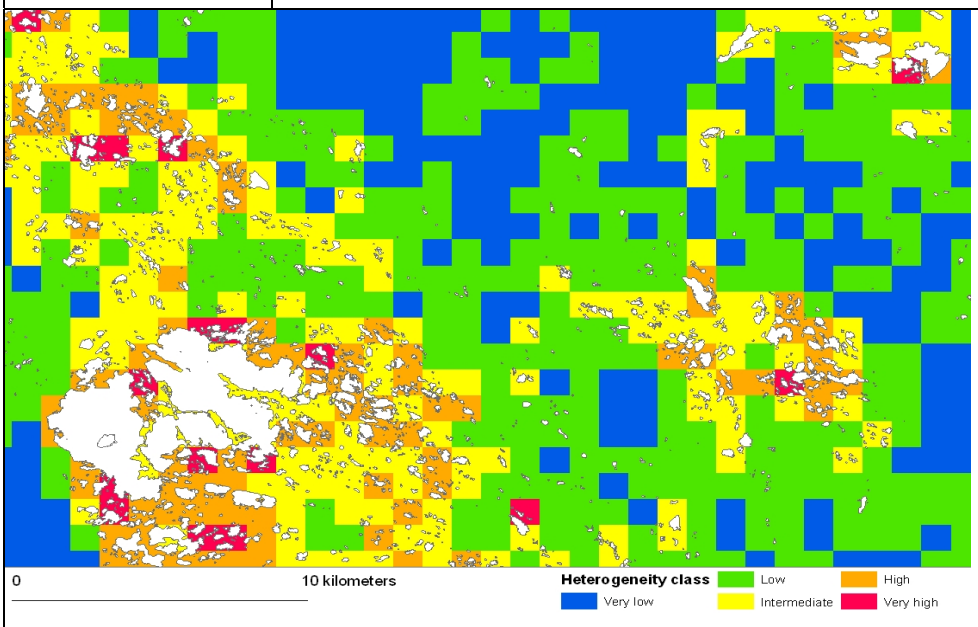
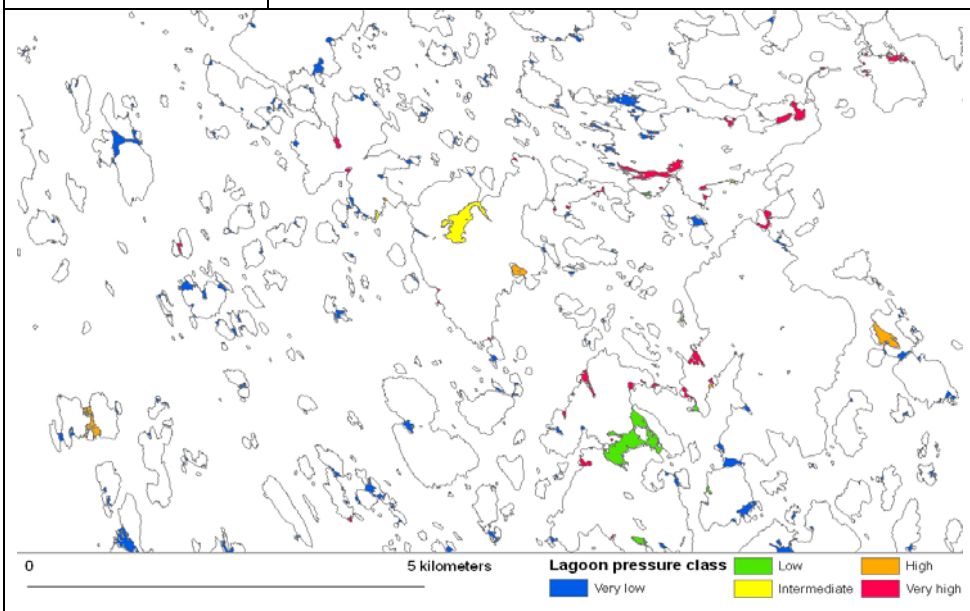
Table 4.1 A summary of the Habitat heterogeneity indicator.	
Description	Predicting habitat heterogeneity with depth, wind exposure and shoreline information.
Zoning purpose	To provide a measure of the variation in conditions, acknowledging the paradigm of diverse conditions supporting more habitats and species thus being an indicator of biodiversity. May be used for focusing further field studies of 'hot spot' areas
Target use / feature	Marine nature conservation / areas with diverse habitats and species
DPSIR indicator	Environmental state
Assessment indicator	Biophysical assessment of the coverage of areas regarding heterogeneity.
Data used	Water mask (Polygon data of sea areas), shoreline (in vector format), depth model in raster format and wind exposure model in raster format
Principal steps	Create a polygon grid, calculate and classify the water/land ratio, the ratio of depths <3m, shoreline length, depth variation and wave exposure variation in each grid cell. Combine the results.
Accuracy	Highly dependent on the accuracy of depth and wind exposure data and on the scale of the grid
Difficulty, 1-5	3
	The final result derived from the tool indicating benthic habitat heterogeneity at a 1x1 km grid scale and with a five-level classification. Shown is a small part of Pilot Area 3, the Archipelago Sea.

Table 4.2 A summary of the anthropogenic influence indicator.	
Description	Predicting anthropogenic influence on coastal lagoons (Habitats Directive habitat 1150) and large shallow inlets and bays (1160).
Zoning purpose	To identify pressure on these sensitive habitats highlighting that a '0-level' indicates low vulnerability and a favourable conservation status (fcs)
Target use / feature	Marine nature conservation, recreational use, boating / flora and fauna
DPSIR Indicator	Environmental state and socio-economic pressure
Assessment indicator	Biophysical in assessing the fcs and Socio-economic in assessing the level of pressure. Preferable assessment of change: 5-10 years interval
Data used	Polygon data of sea and lagoons and shallow inlets and bays, location of buildings (points or polygons), location of road network (polyline) format, divided in different road classes if available, location of navigational lanes (polyline), including channel depths if available.
Principal steps	Calculate the area of each site, buffer roads, buildings and navigational routes for overlap with the sites, classify end-result according to the pressure
Accuracy	Dependent on the attributes available for the input data
Difficulty, 1-5	3 – 4



The result of the tool indicating vulnerability and site-specific pressure of coastal lagoons from very low level (no pressure suggesting natural conditions) to very high level. Shown is a small part of the Archipelago Sea.

4.1.4 *How to assess management performance*

A challenge for any monitoring is to separate the natural variation of a fluctuating environment from the change in state resulting from pressures driven by man. Management must identify pressures and their potential effects on the state of the environment. Measures of activities may be used as proxies of the potential pressure on various ecosystem components, which is regarded effective (Rogers & Greenaway 2005) and should be conducted parallel with monitoring the state of the environment to safeguard ecosystem health. Biophysical indicators measure the state and change of the state of the ecosystem in order to assess the management performance. These tools may quantify the impact from pressures in terms of spatial extent (compared with agreed reference

conditions and / or areas, such as core areas, no-take zones) or over time as a temporal change in an area. The management should be assessed against the objectives and targets of the plan and consider the compliance of all activities inside as well as outside the zones. The assessment should provide information of the effects on both resources and uses, because the management of *e.g.* nature conservation initiatives will have effects on a range of uses in different zones by directly restricting uses and indirectly by affecting the quality of the environment.

Vulnerability is a central term in the assessment of management performance. By combining spatial information of *e.g.* a biophysical feature and a use causing pressure on the feature the vulnerability of the feature may be indicated. The vulnerability can be assessed by combining any feature -pressure pair, given that the spatial distribution is available. A pair can 'change side' meaning that a pressure may be viewed as a state factor and *vice versa*. An assessment can use a range of measures (Table 3.3).

Table 4.3 Examples of measures, which can be used in evaluating the management performance.

Measure	Example
Area	How large area is covered by a habitat, species or use?
Depth	What is the depth distribution of macro-algae, photic layer?
Duration / Frequency	For how long period of time / often is a zone used for an activity?
Location	Where does a specific sea-use occur (in relation to habitats and other uses)?
Distance	What is the distance between a sensitive feature and a pressure
Length	What is the length of unaltered (non-exploited) coastline, erosion sensitive shores
Number	What is the number of complaints over a management decision
Overlap	What is the degree of overlap between uses
Volume	What is the volume of water suitable for cod spawning

Pomeroy *et al.* (2004) provide useful considerations for the assessment:

- Select indicators that are flexible enough to meet specific requirements of different marine areas

- The written plan should include calculations of costs and resources and have a detailed budget. Who conduct the evaluation and who will get the result?

- The practical assessment should include instructions how to collect, manage and analyse data, and how the quality of the information is checked and guaranteed.

Figure 4.1 Filamentous algae cause serious harm to Bladder wrack habitat and ultimately destroys it

Figure 4.2 A near-pristine Bladder wrack habitat has a high biodiversity of animals and other plants.

5 ZONING EXAMPLES

5.1 Study areas

The two pilot areas were selected using predefined criteria with the aim to cover a substantial range of the variation in the biogeophysical features, socio-economic uses and management in the Baltic Sea (Table 5.1). Detailed description of the pilot area selection process is given by Lindeberg (2006). In PA2, the focus is on offshore pelagic habitats and reef habitats, whereas inshore, coastal shallow habitats and fish nursery areas are predominant in PA3. The differences in the two pilot areas are reflected by the sea use interests on international, national and regional levels, which put different demands on the sea area management. Fisheries issues and trans-national economic interests is a central part of the zoning plan examples in PA2. In PA3, smaller scale, diverse coastal issues are important.

Table 5.1 Criteria for selection and brief comparison of the two PAs.

Criterion	*Relevance*	*PA2*	*PA3*
Geography	Located in a south-north gradient and possess differences in salinity, wave exposure, ice coverage, etc.. PA2 is offshore, PA3 near shore	Southern BS, Adler Ground and Bornholm Deep	Northern BS, Archipelago Sea - Åland – Stockholm, Uppsala
Habitat	Biotic features - reflecting the biological differences in *e.g.* species composition and habitat properties	Sandbanks, reefs and pelagic areas with flora and fauna more of marine origin	Shallow soft and hard bottoms with flora and fauna of limnic origin
Socio-economy	Activity and interest in the sea area	Offshore industry and fishery	Coastal small-scale fishery, recreational activities
Management	Legislative focus in the sea area	EEZ: International. Territorial: Denmark and Germany	Territorial: Sweden, Finland and autonomous Åland Island

5.2 Data compiled & maps applied

The guidelines and examples are based on thematic maps and results produced by the project activities, which are based on data compiled from the project's partner organisations. The data acquisition has not run as smoothly as expected since the use of many datasets are held back by copyrights (*e.g.* topographic maps, nautical charts), high prices (*e.g.* property lines, AIS data) or military or company security reasons (*e.g.* detailed bathymetric data, under water power lines, fisheries and shipping data). This has pre-

vented us from using all desired examples and some of the example maps on zoning may appear less clear due to data gaps.

The below illustrates a straightforward approach how to draw a draft zoning map based on data derived from the *initial assessment* (steps 6-12) of the marine spatial planning template, and by using the zoning matrix of the *zone selection process* (step 13). The aim is to provide a basic GIS-assisted procedure that may be completed without advanced resources and skills, given, of course, that the appropriate data sets are available. Thus, more sophisticated methods may be used in parallel or in addition to this, *e.g.* applying MARXAN results, or corresponding decision-support tools.

As a common rule for zoning, the result must be general enough in order to be practical and simply understood. An example of the draft zoning map is shown for the pilot area 3 (SW Finland, Åland and Stockholm region, Sweden). An application of area-based fisheries management, with examples from pilot area 3 in the offshore Bornholm Deep, is presented by Nielsen & Kvaavik 2007.

5.3 Applying zoning in a complex near shore coastal area

The objective for the zoning in pilot area 3 is to balance multiple sea uses, while minimising the impact on the marine environment, which possesses requirements on integrated approach applying an Intersectoral scheme to the marine spatial plan (Table 4.2). Relevant uses include navigational and recreational activities and near shore fishing, while there also are a range of relevant biological values and cultural aspects in the area.. PA3 is densely population with a long shoreline and numerous islands, which is reflected in the many pressures on the marine environment originating from land. Authorities from Finland, Åland and Sweden govern the area and NGOs related to fisheries and private water owners are significant in the area. Future concerns for the marine environment include, extraction activities and wind-farming off shore.

It is important to note that the draft zoning maps are not indicating any legally binding plan or proposal, as it only exemplifies selected input data sets, and especially as these plans have not been presented to stakeholders!

The draft zoning map for pilot area 3 (*Fig 5.1.*) was developed using the methods described above. The focus of the map was mainly to detect present uses and regulations in the area, including important shipping channels, restriction zones posed by military activities or exclusive uses (*e.g.* wind energy production) and probated nature conservation areas (Natura 2000 sites, national parks, seal sanctuaries *etc.*). The GIS assessment layers developed during the BALANCE project were used to support the zoning process but, as mentioned earlier, the draft zoning map should only be seen as an example not been fully circled through all the crucial phases of the zoning template presented in this document.

Apart from only including the current status of the area, the potential future uses such as new areas for fish farms, offshore wind-farming and nature conservation areas can be included in the zoning process. The most potential candidate sites for the PA3 were selected in a case study using the computer-based decision support tool MARXAN (version 1.8.6: Ball and Possingham, 2000).

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Table 5.2 The zoning attributes of the pilot areas.		
Attribute	**PA2**	**PA3**
Zoning objectives	Zoning for Nature Conservation and Fishery	Zoning for Nature Conservation and multiple use
Need for management	Intersectoral and integrated management and transnational zoning scheme	Intersectoral and integrated management and zoning scheme for multi-use zones
Biological values	Bird wintering and spawning and nursery (cod) areas, Harbour porpoise, Habitats Directive features, EUNIS features, Habitat forming features	Bird breeding areas, Habitats Directive features, EUNIS features, Habitat forming features, fish nursery areas
Other values		Man-made objects, Natural heritage
Relevant uses, frequent issues	Fishing, sand and gravel extraction, wind parks, navigational activities, gas pipeline	Navigational and recreational activities, fishing, aquaculture, , dumping of dredged material
Pressures and conflicts on biodiversity	Fishing, sediment extraction, wind parks, navigational activities	Coastal development, navigational activities, fishing, by-catch and seals
Stakeholders governmental bodies	Government and ministries of 3 nations and their authorities	Government and ministries of 3 nations and their authorities
Stakeholders non-governmental	Fishery Associations Fishing industry Extraction and energy industry	Fishery Associations Fishing industry Private water owners
Future concerns	Pipeline, off shore wind farms	Sand extraction Off shore wind farms Oil and gas extraction

The selected sites were complementary to the already designated Natura 2000 SACs ("locked in" planning units), and together they formed a representative sample of all the marine landscape types and important habitats. Sites that were found unsuitable for MPA designation, *e.g.* areas with a high level of threat or several conflicting interests, were avoided when equal conservation values could be found elsewhere. Using a decision support tool such as MARXAN in the selection of candidate sites for conservation will increase the likelihood that the selected sites fulfil the whole range of predefined ecological and socio-economic targets in the most suitable locations while simultaneously securing a spatially efficient design of the network (Andersson et al. 2008).

The use of MARXAN is illustrated for a small part of the pilot area in an example (*Fig 5.2.*), where the output from the MARXAN analysis was included in the zoning process, initially performed without the MARXAN results. The original zoning map (left) was improved by including some of the MARXAN suggestions to the map (middle), leading to a more efficient and consistent zoning scheme (right). As a result, some *targeted management zone* areas were expanded by including new "selected planning unit" sites. Also, a potential fish spawning area, initially defined as a *targeted management zone*, was relocated to an area which also was selected as a potential candidate for protection by MARXAN – the idea was to demonstrate a situation when the expansion of the *targeted management zone* would be difficult but some minor changes, based on approxi-

mately equally-sized area units, might be possible to be performed. As comparing two spawning sites of approximately same size, of which one is marked as "selected planning unit" in the MARXAN results and the other is not, the selected one is likely to be more "valuable" from the point of view of nature conservation simultaneously fulfilling more assets than the other one thus justifying the relocation of the *targeted management* area if no further matters will prevent it.

5.4 Zones identified

The area selected was large enough to encompass all four zones as well as cover several national territorial waters. As the idea of linking marine spatial planning to land-based pressures emerged in the very end of the BALANCE project period, it was not possible to add the criteria of acknowledging or carrying out spatial planning of the catchment area (upstream). Furthermore the purpose of this map is only to illustrate that the use of the four zones work as intended. The data we used is not as coherent or as comprehensive as it should be in a real (legally binding, agreed) marine spatial plan. However, as illustrated here the BALANCED zoning is applicable for all sectors and across national boundaries. The total area zones in Figure 5.1 cover the entire PA3 while the examples illustrated by Figure 5.2, including MARXAN data, is covering only the marine areas of Stockholm County.

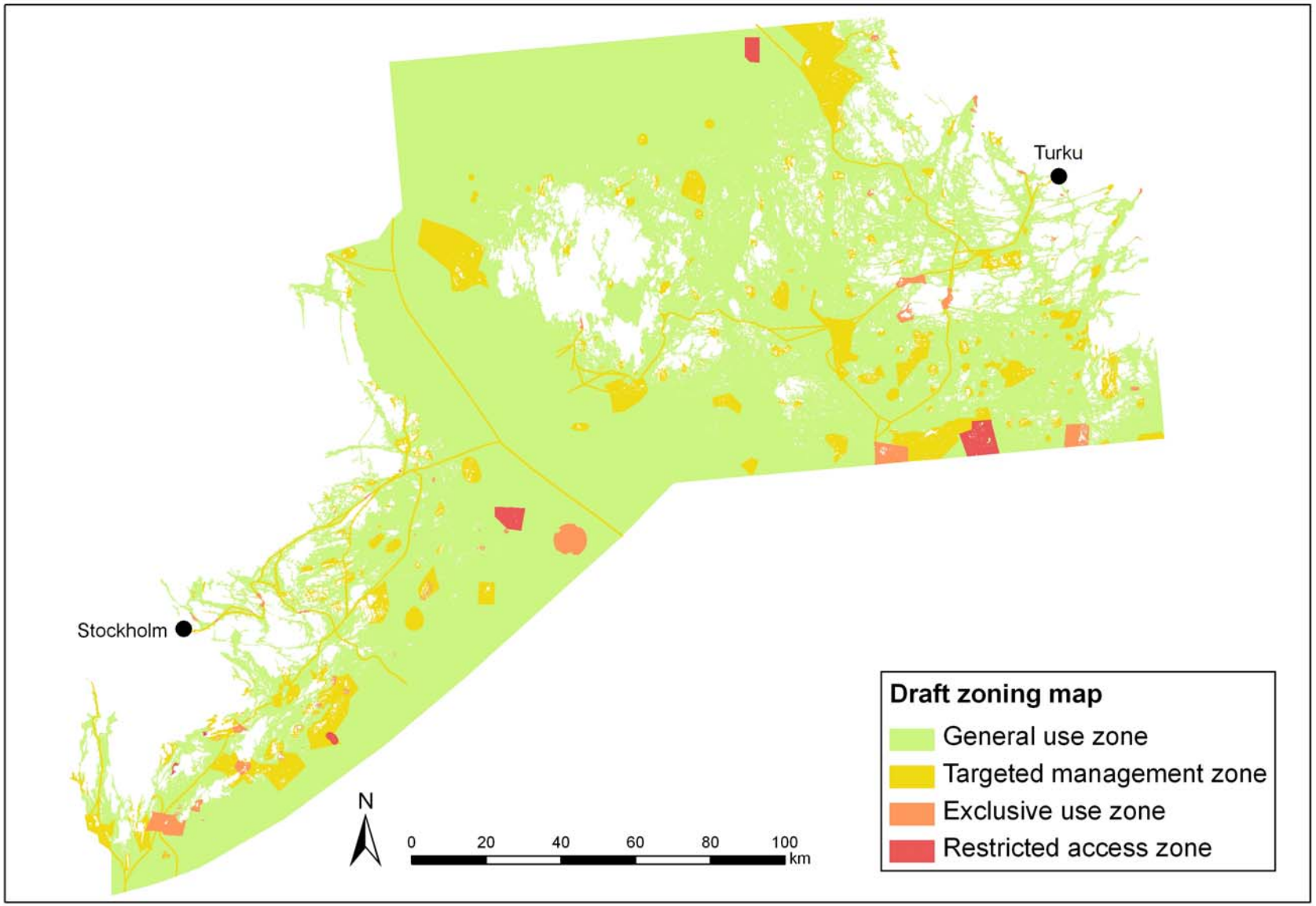

Figure 5.1The draft zoning map for the PA3.

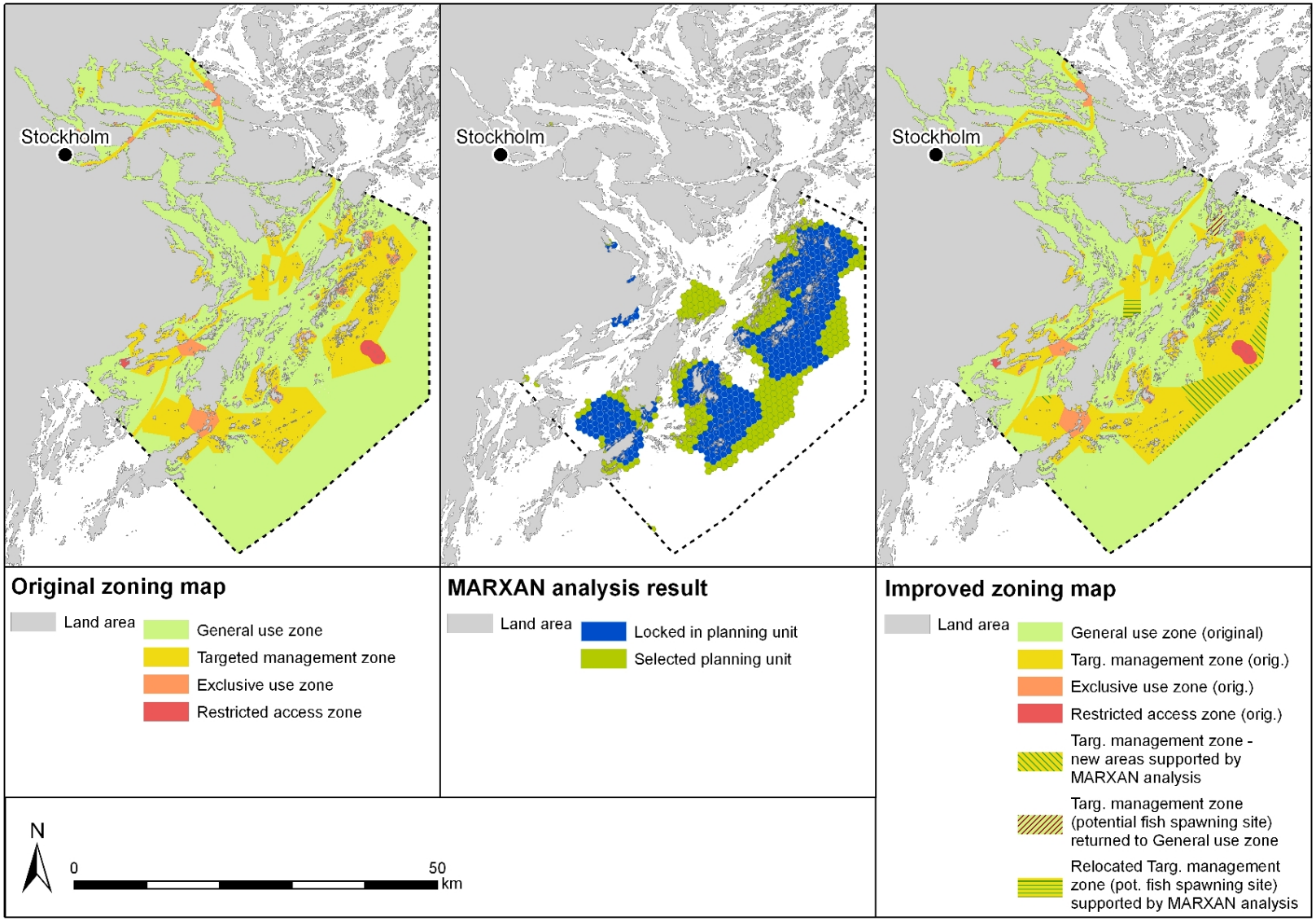

Figure 5.2 An example of the usage of MARXAN analysis results in the zoning process to improve the resulting map.

6 STAKEHOLDER ENGAGEMENT IN MARINE SPATIAL PLANNING

Protecting and conserving nature is by definition a political process that limits or prohibits human activities. However, contrary to terrestrial areas, restrictions for users in marine areas are relatively new. According to the age-old concept of the "freedom of the seas", also reflected in the International Law of the Sea (UNCLOS) for fisheries and shipping, people are used to freely using marine areas for business or leisure activities. This may now changing, as commercial and recreational users of marine areas are likely to face stricter restrictions on their activities as well. The need for closer cooperation between those planning and managing regulations (public authorities) and those being affected by regulations (stakeholders) is determined by several factors.

6.1 Introduction

First, besides international arrangements for the management of the Baltic Sea that have been in place for many years (*e.g.* UNCLOS, MARPOL, HELCOM), the political situation in the Baltic Sea Region has recently experienced crucial changes. Except for Russia, all riparian states of the Baltic Sea are now EU members and are obliged to comply with EU legislation. The new EU Marine Strategy Directive will require EU member states to establish strategies and plans for a more integrated, ecosystem-based management in European waters. A new tool for satisfying this obligation is marine spatial planning (MSP), a well-established planning tool in terrestrial areas, yet so far a black box in marine areas. Spatial planning has socio-economic implications that will probably affect all "unsustainable" sectors of economy and the people who depend on them. In order to raise awareness among affected stakeholders and to be able to consider their concerns and future perspectives, the provision of fora for consultation is vitally important.

Second, public participation is an important and often mandatory part of environmental decision-making. Most democracies maintain systems that allow citizens to participate in decision-making processes. On the EU level, there are two general provisions for the information of the public concerning environmental issues: the "Århus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters to Community Institutions and Bodies"; and Directive 2003/4/EC on public access to environmental information. For coastal and marine areas, the EU ICZM recommendations, the EU Water Framework Directive and the EU Marine Strategy Directive – and regional agreements such as HELCOM accordingly – stress the need for stakeholder integration. Furthermore, any citizen of an EU member state has the legal right to interfere with national plans that are not in line with EU legislation by lodging an official complaint with EU authorities.

Third, a fully top-down approach to marine planning and management is unlikely to succeed, as responsible authorities face a range of important obstacles in the governance of marine areas. Although member states have the obligation to protect the marine environment, they have only limited competence for managing marine areas due to overriding international regulations. Also, authorities can often not fully control and monitor

marine activities due to the remoteness of some areas and the difficulties in detecting damages to the marine environment. Finally, little public awareness of the marine environment and the impact of uses combined with low levels of stakeholder integration in planning necessary regulations are likely to lead to a lack of compliance and commitment.

It becomes obvious that provisions for integrating stakeholders are of vital importance in any planning process in the Baltic Sea. Yet, issues of stakeholder engagement have so far not been widely addressed in the discipline of marine planning. Therefore, a strong focus in the work of BALANCE has been to offer ways for taking this aspect of planning properly into account in the Baltic Sea Region and also in other European regional seas in the future.

6.1.1 Governance of marine areas in the Baltic Sea Region

According to the World Bank and the UN, good governance can be understood as a set of characteristics to which "participation", "transparency", "responsiveness", "consensus orientation", "equity and inclusiveness", "effectiveness and efficiency" and "accountability" belong.

In the Baltic Sea Region, governance takes place at three spatial scales

- Pan-Baltic scale
- Transboundary scale
- Site scale

In the task to protect and improve the quality and services of ecosystems, manifold international agreements and EU legislation are already in place. However, it is recognised that ecosystem protection is most adequately applied regionally. In the Baltic Sea Region, HELCOM serves for all contracting parties as well as for all stakeholders holding a Pan-Baltic vision as a forum and a tool for the sustainable development of the Baltic ecosystem. Besides governments and their subordinate agencies, the target audience for involvement includes non-governmental organisations and other groups representing public opinions as well as sectoral and economic interest groups. Engagement and exchange at this scale is important for considering all present and future concerns regarding the management of the region.

The transboundary scale is relevant when cross border features are concerned or plans and activities are carried out that have an impact on the territory of other countries. Within the "Convention on Environmental Impact Assessment in a Transboundary Context" (ESPOO), affected countries have to be informed about projects and be given the opportunity to express their opinion. Usually, non-governmental stakeholders are not invited to participate in such processes. However, when a transboundary feature of natural value is to be protected or when a zoning scheme is to be applied in parts of a marine area, there are no legal obligations for cooperation in place. In such a case the result depends solely on the commitment and communication between responsible authorities and the governmental policies of the countries involved. Often no framework exists that allows acting beyond the borders of national or sectoral competence. Here, engaging

non-governmental stakeholders or user associations can trigger better cooperation and enhance outcomes, especially if public interest and pressure is apparent and the possibility of voluntary agreements exists as a management option.

Although international and multinational aspects have to be taken into account for managing marine areas at the site scale, within the territorial 12 nautical mile zone, each country is essentially sovereign in its management decisions. However, the distribution of national competences for management may not be clearly defined and beheld sectorally. Adequate interagency coordination and cooperation is a prerequisite for an encompassing and sustainable management plan. . Consequently, governmental authorities may also be considered as stakeholders in a site management process. Yet, the site scale is most challenging in terms of non-governmental stakeholder integration, since many different groups might be affected by regulations and measures. For example, the consequences of zoning decisions may relate to individual persons and demand changes of their behaviour. Obviously, stakeholder engagement plays an important role because management will only work with widespread understanding, engagement and consent of the people that will ultimately implement the planned recommendations and management measures.

Figure 6.1 A Belone belone angler fishing at the entrance of Strahlsund, in Germany. Angling for Belone is very popular among sport fishermen in Strahlsund.

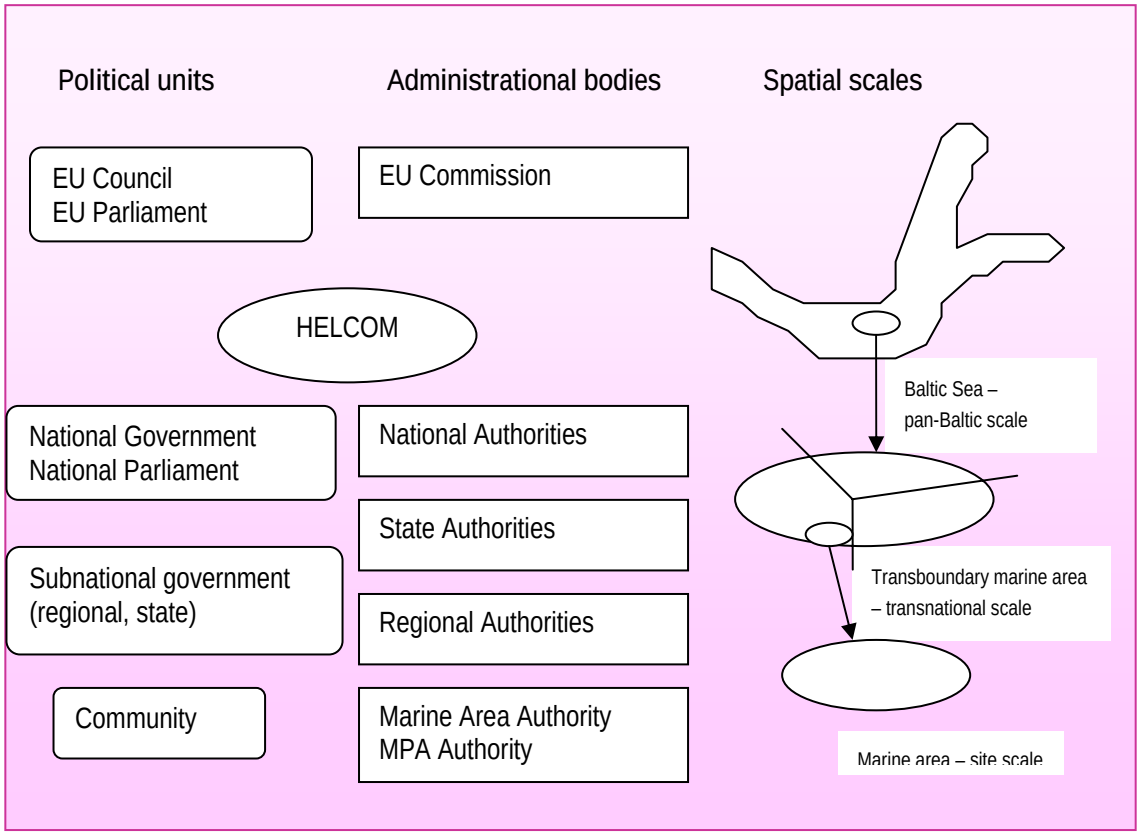

Figure 6.2 Baltic Sea Area on different levels with the respective authorities and political bodies. HELCOM is an intergovernmental organisation and does not legally stand above national governments, but provides recommendations agreed upon by the contracting parties. HELCOM recommendations have no legally binding status.

Corresponding to the different spatial scales, there is a hierarchy of administrational bodies with management competencies, including

- EU-Commission and international conventions
- Regional, state and national authorities
- Protected Area authorities

For a sound management and governance of the Baltic Sea Region, agreed competencies, good cooperation and effective, bi-directional communication mechanisms between these hierarchical levels have to be in place. Additionally, there has to be an awareness that the marine area is subject to many different activities and interactions between them, and that the legal basis for marine management varies from state to state. The more effective and encompassing the hierarchical administration and planning system works, the easier and the more likely it will be to achieve a good environmental status of the Baltic Sea.

6.1.2 *Types of stakeholder integration – use of terms*

There are many different ways and types to include stakeholder elements in planning processes. The terms to describe those are often used interchangeably. In this context, the term stakeholder "integration" is used for the rather technical aspect of integrating

stakeholder elements in the planning procedure, while "engagement" is used as overarching term covering both "involvement" and "participation".

While these both terms refer to methods for the engagement of affected people in any kind of process, "stakeholder involvement" stands for a rather consultative approach based on legal requirements that exist to different degrees in all Baltic Sea countries. It is a top-down approach to planning that is characterised by informing stakeholders about a planned project or legal act and considering their opinions. Yet, there is little opportunity for stakeholder to directly influencing process outcomes, and how decisions are made depends solely on the policy of the managing authority.

"Stakeholder participation", in contrast, can be characterised as a cooperative approach that offers more possibilities for the engagement of stakeholders than legally required. "Participation" includes the mutual exchange of information and knowledge and a commitment to open discussion by all those involved. Ideally, stakeholders and the authority agree on terms of reference for their cooperation. Active participation of stakeholders has a great influence on the MSP process outcomes and their contributions are more likely to be seriously considered in the decision-making process.

6.1.3 General principles for sound stakeholder engagement

For effective stakeholder engagement the following principles are requirements for a smooth process and successful outcome:

- Commitment and adequate resources

  The backbone of a sound stakeholder engagement process with good results is the commitment of authorities to acknowledge and adequately consider the role of stakeholders. Open-mindedness and will for compromises are requirements for a participation process, in which stakeholders are enabled to influence the decisions-making. Therefore, also adequate resources are needed for this.

- Clear targets and outlines of the process

  It is important to plan and design the goals and activities of stakeholder engagement clearly and to consider adequate timelines. Engagement in early planning stages has proven to be beneficial in many projects. It is vital to choose the type of engagement that is appropriate and to consider which participation elements to apply. Defining the role of stakeholders in the planning process (rules, chances, limits) fosters a clear communication base.

- Information and transparency

  Providing access to all relevant information and ensuring good submission facilities for stakeholder input is important. Ensuring transparency of the planning process by documenting and justifying decisions publicly avoids mistrust.

- Education and awareness raising

Planning for education activities in order to create understanding and knowledge about the marine environment is the fundament for the acceptance of management regulations and compliance.

6.2 Stakeholder integration in the marine spatial planning template

According to the principles of ecosystem-based management and sustainable development of marine areas, which is endorsed by the new EU Marine Strategy Directive, all maritime activities have to be reconciled with and adapted to the protection of a sound ecosystem. Planning such activities does on the one hand require comprehensive knowledge about the functions and status of natural processes in the affected area and on the other hand, an understanding of the pressures arising from human activities. User groups, non-governmental organizations (NGOs) and other interest groups are knowledgeable and may be capable of achieving a reduction of pressures. It is obvious, that those groups are to be integrated in a planning process that defines and sets a new framework for the future use within an area.

In the MSP Template cycle, both, involvement and participation elements are integrated. Since legally required involvement elements are different in each country, the elements and their placing is just recommended and not considered as compulsory. Stakeholders are engaged at various points. Specific activities are described for each phase of the planning cycle. These activities are not just steps to be taken one after another. Stakeholder involvement, and even more so participation, must be addressed as an integral part of the whole planning process.

Figure 6.3 A voluntary monitoring exercise organised by WWF Germany and Nabu has proven to be a successful way to engage the public for the benefit of nature and the local community.

6.2.1 Mechanisms of stakeholder integration in the MSP template

Zoning is a new approach to spatial planning and unknown to many people, but it may affect all activities within a marine area. Establishing a dialogue between different interest groups and conservationists can help dissolve unfounded fears about the impact of zoning and management. Marine management is the result of an interactive process among competent authorities, users and interested stakeholders. In such an interactive process, communication is critical to any exchange of ideas and solutions.

The pathways of communication differ according to the intensity and purpose of engagement:

- One-way communication: Mainly written or visual materials, also oral presentations – *e.g.* for initially announcing and informing about the framework of the planning procedure, timing, purpose and degree of engagement.

- Two-way communication: Implies interaction between the planning body and stakeholders, facilitated through in-person discussions in sectoral or thematic groups, personal consultations, or participation in electronic form – *e.g.* for requesting and processing submissions in various forms to comment on draft zones or draft measures.

The proposed spatial planning cycle suggests forms of stakeholder integration that are either common in legal planning and decision-making procedures in international frameworks (Espoo, HELCOM, consultations in EU regulations), established in national planning practice in Baltic Sea states in marine or terrestrial areas or that have been successfully applied in other parts of Europe or globally.

6.2.2 Stakeholder elements in the MSP template

This chapter give a more detailed description of the steps 5, 12, 17, 20 and 22 of the MSP template.

Phase 1: Vision and Objectives - Step 5 Announcement

In the initial phase of a marine spatial planning process, it is the task of the planning body or lead authority to announce the upcoming planning process to the public/ to stakeholders and communicate its vision and objectives. This also includes the spatial scope, timeframe and principles of planning.

Such an announcement can be part of a wider communication campaign, which informs people publicly about the upcoming planning process, including its purpose, needs and benefits, and how people are affected by and can contribute to the process.

The main purpose of announcement is to create awareness for the process and to enhance active interest and engagement. Many surveys, also carried out within BALANCE, showed that stakeholders want to be informed and involved already at the beginning of a planning process. At the announcement stage, the authority determines

its “stakeholder policy”. By communicating the planning principles including decisions on the extent and degree to which stakeholder engagement is enabled, the authority clearly signals to stakeholders whether their participation is wanted, welcomed or just handled as an obligatory part of the planning process.

For communication activities, it is important to identify the target audience as well as their needs, demands and benefits from the planning results. The target audience and their interest in a planning process can be very different depending on its spatial scope and location. The difference is most obvious when looking for example at an offshore versus a coastal area. Accordingly, communication and involvement activities may vary.

Proposed communication tools: Public announcement in media, tailored information and invitation, kick-off-meeting, thematic press articles

Examples:

- LIFE-Nature Project “Marine Protected Areas in the Eastern Baltic Sea”, www.balticseaportal.net

- HELCOM Baltic Sea Action Plan Stakeholder conference: http://www.helcom.fi/press_office/news_helcom/en_GB/StakeholderConf_Outcome/

- Trilateral Waddensea Cooperation: http://www.waddensea-secretariat.org/

Phase 2: Assessment - Step 12: Stakeholder consultation in thematic groups
Stakeholder involvement is also important in the assessment phase, when the planning body prepares a status analysis and derives a work and investigation programme. Consultation and cooperation with stakeholders at this point may be necessary for exchanging information and for creating a common and reliable basis for management planning. Non-governmental organisations (research institutions, user associations, environmental organisations etc..) usually hold a lot of data, which could be valuable for the assessment. Additionally, they have experiences and competences that it is wise to draw on. Such stakeholders can often give important feedback on the data and information basis, on the status analysis as a basis for the management regime or on the conclusions drawn from the assessment phase.

There are two main mechanisms for involvement in this phase:

- Scoping

- Interaction in thematic groups

A process called “scoping” is a standard procedure in many planning processes, whereby planned work programmes and research needs are discussed with selected stakeholder groups representing publicly held opinions in order to shape the process according to public needs. In the scoping procedure, those groups are initially invited to a “scoping meeting” by the authority and provided with relevant information and background material. They have then the opportunity to contribute their concerns and representative opinions by attending the meeting or by submitting written proposals.

Figure 6.4 Wind energy parks outside Copenhagen, Denmark. Wind energy parks require a large area and block almost all other types of large scale sea use, e.g. shipping and trawling.

Examples:

- For the construction of wind farms in the German EEZ standards for the Environmental Impact Assessments of such projects were developed in a scoping procedure. http://www.bsh.de/en/Marine%20uses/Industry/Wind%20farms/index.jsp

- The transnational Nord Stream Gas Pipeline notification process includes the procedures for consultation of concerned parties as required by the ESPOO Convention. Here, the affected Baltic Sea states have used multinational scoping meetings for discussing and agreeing on joint standards and assessment methods for trans-Baltic infrastructures.
  http://www.bsh.de/en/Marine%20uses/Industry/Pipelines/Nord%20Stream%20Gas%20Pipeline.jsp

Meetings in "thematic groups" have not been endorsed as a part of official involvement procedures, but they have proven to be the most effective tool for consulting key-stakeholders. Key-stakeholders can be groups or individual persons that hold a lot of knowledge, are trusted and respected and have a significant influence on public opinion. Stakeholders are grouped according to the different "themes" that have to be discussed (*e.g.* fisheries, land owners, recreational users).

"Thematic group meetings" are conducted as face-to-face meetings and working sessions in a cooperative and constructive manner. Stakeholders are given the opportunity to give feedback on the assumptions, methods and results of the status quo analysis and conclusions. Knowledge and data gaps can be discussed. As the main outcome, a common basis for management regulations should be agreed upon. It is recommended to

hold these meetings as early as possible in order to be able to react to new aspects and to signalize that stakeholders are capable of influencing the planning process.

Examples:

- WWF Germany Project "Voluntary agreements with recreational users in the marine protected area 'Greifswalder Bodden'", www.wassersportimbodden.de

Phase 3: Planning. - Step 17 Stakeholder consultations

The need for stakeholder involvement is most crucial in the planning and zoning phase, when the location of zones and accompanying restrictions are determined and their impact on stakeholder interests becomes apparent. On the basis of Phase 2: Assessment, restrictions or permits are discussed. Intensive stakeholder involvement activities at this stage will help weighing up all concerns and interests, identifying conflicts and making appropriate amendments to the draft management plan.

Stakeholder integration in this phase can be facilitated in many ways, depending on the location (*e.g.* coastal or offshore), situation (*e.g.* other plans, commercial activities) or the attitude of the planning authority. Options range from a few authoritatively held formal meetings to frequent and cooperative round-table discussions. The type and frequency of meetings have to be chosen and adapted to the individual situation. There is no general rule as to which extent of stakeholder involvement ensures compliance. Every activity that will lead to the enhancement of transparency and commitment is worthwhile being carried out, for example:

- Public consultation is most commonly arranged in formal meetings. This platform allows affected groups and individuals to state their concern and opinion on the subject.

- Thematic round-tables on specific issues may be offered. Those can serve to clarify conflicts affecting only small groups of stakeholders. They are more personal and interactive and have been successful in many projects.

- Submission facilities should be offered to those stakeholders who are not able or willing to attend meetings. E-participation systems offer valuable facilities for remote submissions.

- Media coverage: Real time publication of information and results in the internet enhances transparency in a very cost-effective way.

Helpful tools in this phase include a good visualisation of the spatial situation, forecasts and sectoral or thematic analyses. Good visualisation maps can be prepared with GIS and additional analyses carried out with various GIS tools (see report on attached CD). Those are a real asset to stakeholder discussions because they provide the basis for concrete and precise comments. The goal of step 17 is to create awareness and ownership for the zoning plan and in this way commit stakeholders to the MSP process.

Examples:

- WWF Germany Project "Voluntary agreements with recreational users in the marine protected area 'Greifswalder Bodden'", www.wassersportimbodden.de

- Great Barrier Reef Rezoning Process http://www.gbrmpa.gov.au/corp_site/management/zoning/zoning_publications

Phase 4: Implementation - Step 20 Public hearing
All decisions on the draft spatial plan as well as on zones and their specific targets have already been taken. Now, a public hearing is held as the last platform for involving stakeholders and the public before the plan will be enforced. On this occasion, all discussions should be summed up and decisions should be justified. Most importantly, however, a concluding public meeting is a formally required part of many legal procedures. The new Marine Spatial Plan can not be finalised before the results of the final meeting are incorporated and taken into account. The aim is to communicate the key message from the MSP and to respond to the feedback from the public.

Phase 5: Final Assessment and reporting - Step 22 Dissemination
In the implementation phase, all decisions concerning the new marine spatial plan have already been made and management measures for implementing and proceeding with that new instrument has been agreed. Communicating and disseminating the new Marine Spatial Plan informs the stakeholders and the public about the final outcomes of the planning process and prepares the transition of the plan into practice.

Ideally, the choice of appropriate tools for communication should be based on a communication strategy in which the target audiences and their different information needs and channels are identified. For different target audiences (user groups, land-owners, tourists etc..) both the key-messages and the most effective tools and channels for dissemination (personal, print media, electronic media, print materials, events etc..) may differ substantially and should be applied simultaneously.

Example:

- Great Barrier Reef Rezoning Process http://www.gbrmpa.gov.au/corp_site/management/zoning/zoning_publications

6.3 Tools for stakeholder integration

Stakeholders can be integrated into planning processes in many ways. Here, we present a selection of tools that may be helpful when designing a planning process that integrates stakeholder components. Some of the tools have been tested within BALANCE and others have been found an asset to stakeholder work elsewhere.

The aim of the toolbox is to give planning authorities an idea on how stakeholder involvement can be facilitated effectively and appropriately. There is no universal recipe for the application of tools and no guarantee for their success. However, it is important to note that the achievement of objectives and the success of involvement depend first and foremost on the willingness and commitment of the planning authority. Besides

adequate resources, strong and convincing individuals will be necessary for achieving successful stakeholder integration.

The most appropriate choice of tools depends on many aspects. Before deciding on which tools to use, it is recommended to prepare a communication strategy, in which the present situation is assessed and the target audience identified and characterised.

6.3.1 Strategic Communication

Communication and education knowledge and methodology is relatively new in the environmental field (Hamú *et al*. 2004). Communication has often been improvised, using poor quality tools and not achieving its objectives. A communication strategy can be a useful tool for tackling sensitive topics and achieving envisaged objectives. It should define and prioritise target groups and standardise communication processes.

According to Sundsteht (2004) a communication strategy is a mean of planning and organising one's activities to get the maximum benefit out of limited resources. It is essentially based on common sense and helps avoid dissipating efforts. A strategy also provides an important reference point for determining whether the communication activities are having the desired effects. Is the strategy achieving its objectives or does it need to be fine tuned?

Elements of a communication strategy should include:

- Assessing background and situation
- Setting up clear communication objectives and outcomes
- Analysing the target audience
- Choosing communication channels and means
- Planning activities
- Estimating time and budget
- Monitoring and evaluating success

These elements are described in the BALANCE Interim Report No. 8 (Feucht & Lamp 2006). However, we would like to highlight one element that is important and often forgotten in communication processes: a*nalysing the target audience.*

Such an analysis includes the identification, prioritisation and characterisation of stakeholders. Guiding questions for this are "Who can provide what we want?" and "What do we know about them?". Depending on the situation and scope, the target audience may consist of a large group of people or just a few individuals (key stakeholders).

A stakeholder database is a useful tool for collecting and storing any kind of information about stakeholders. It can be used for managing stakeholder contacts or for documenting communication activities.

When characterising the target audience, several aspects could be considered: *e.g.* the degree of concern of the planning process, awareness, attitude towards marine conservation, demographics, socio-economy of the sector and potential benefits of the outcome for the target audience. This will lead to a better understanding of the crucial factors that are likely to foster or impede information flow and cooperation. This will help to find the right channels and means for reaching the target audience in the most appropriate and effective way. A survey may also help to investigate these aspects.

Results from a survey on stakeholder attitudes towards strategic communication in marine management (n =12):

- 11 respondents considered the introduction of stakeholder communication as useful or highly useful to their interests;
- All would apply strategic communication in their work;
- All believed that stakeholder involvement in management planning would either enhance good management or solve conflicts in the long-term;
- All were well informed about the benefits, methods and best practices in stakeholder participation.;
- 8 respondents reported to aim at expanding their stakeholder involvement efforts and improving their communication activities;
- Cooperation and information sharing were the desired types of involvemen

Questionnaire survey carried out at the stakeholder workshop of the LIFE-Project "Marine Protected Areas in the Eastern Baltic Sea" in Palanga/Lithuania, 8./9.2.2007

Further reading:

- BALANCE Interim Report No. 8 "BALANCE Stakeholder Communication Guide", 2006 (Feucht & Lamp 2006)

- Sundsteht, K. & European Commission. 2004. LIFE-Nature: Communicating with stakeholders and the general public – Best practice examples for Natura 2000. Edited by the Office for Official Publications of the European Communities.

- Hamu, D., Auchincloss, E. & Goldstein, W. (eds.). 2004. "Communicating protected areas". IUCN Commission on Education and Communication

6.3.2 Stakeholder surveys

Surveys can be a valuable tool for assessing stakeholder awareness, interest and capacity for involvement but also for drawing on local knowledge. This helps to find out more about the target audiences and with that information adapt the engagement process to stakeholder needs. Surveys should be applied in a standardized format in order to generate reliable, valid and generalisable results.

There are two main survey methods:

- Questionnaires

- Interviews

Questionnaires have advantages over other types of surveys in that they are cheap, do not require as much effort from the questioner as verbal or telephone surveys and often have standardized answers, which makes data compilation and analysis a relatively simple task. A limitation of questionnaires is the usually low response rate.

Interviews can be used as a vehicle for applying questionnaires or for gauging a target audience's knowledge of and attitudes towards an issue. It is an efficient way of collecting information from a large number of respondents but at a larger scale may require additional skilled interviewers. A major advantage is that questions can be clarified with the respondent in order to ensure that they are understood.

Personal interviews involve direct contact and interaction between the interviewer and the interviewee. On the one hand, this means that the interviewer has to avoid influencing the way the respondent expresses his or her opinion. On the other hand, it enhances the opportunity for getting honest and detailed information from a person.

Results from a questionnaire survey on stakeholder preferences for engagement in marine management planning (n=17)

- Most stakeholders were aware that nature conservation is necessary for maintaining the Baltic ecosystem;
- Some had doubts about MPAs being the right tool for achieving nature conservation objectives;
- All wished to be involved at early stages and as specific as possible;
- Different stakeholders preferred to be engaged in different phases of the planning process – while authorities and organisations were interested mostly in the early conceptual and assessment phases, user groups had a greater interest in the planning and decision-making phases;
- Most stakeholders preferred to be consulted in thematic groups;
- Interestingly, some were also interested in being engaged in the implementation phase (e.g. monitoring activities)

Questionnaire survey carried out during the stakeholder conference of the LIFE-Project "Marine Protected Areas in the Eastern Baltic Sea" in Lithuania, Latvia and Estonia, February 2007

6.3.3 E-participation

E-participation is a web-based tool for participation that provides the opportunity for everybody to participate regardless of time and space restrictions. Information is easily accessible and discussion processes can be documented and stored. However, a prerequisite for the use of such fora is that all stakeholders have adequate access to the internet. Previously, e-participation has usually been used in the context of web-based mapping applications. Based on Geographic Information Systems (GIS), they can be equipped with interactive interfaces for visualising and editing spatial information. Such applications can be used in many different kinds of situations, either incorporated into existing methods or forming the basis for potential new decision-making and policy processes. The most crucial point for facilitating an e-participation system that effectively achieves its engagement objectives is to provide comprehensive, yet simple guidance to the visitors of the web pages.

A literature review on case studies using e-participation techniques was carried out and published in a separate BALANCE report "E-participation - a tool in planning processes. Literature review on case studies". A summary of the most important findings is provided below:

- E-participation is an additional tool and should not replace face-to-face engagement.
- Its applicability in offshore areas may be limited, but in coastal areas e-participation is a fully applicable and useful tool.
- GIS and internet tools for stakeholder integration have only recently been introduced but may quickly become more important.
- Setting-up and preparing material for an e-participation system is laborious but worth the extra effort for demonstrating complex spatial planning issues.
- Case studies show that e-participation can result in more accurate and site-specific submissions.
- E-participation enhances fairness by enabling the involvement of all societal groups, independent of time and space restrictions.

Findings from an e-survey on stakeholder perceptions of BALANCE maps:

- The contribution of BALANCE maps to a more informed spatial planning and management of the Baltic Sea is generally highly valued.
- Stakeholders are more sceptical when it comes to an integration of BALANCE maps into their own professional activities. A thorough analysis of results points to the following recommendations:
    - Spatial information should be made available in the highest possible resolution and with the most possible detail, that is, in a GIS format that allows users to extract information according to their own needs;
    - It is recommended to indicate the links of each map within the DPSIR framework. Its relevance and interactions with other parameters should be highlighted by providing adequate background information;
    - Most BALANCE maps are easy to understand and use, but in some areas mapping could be improved at little additional cost:
    - In the classification process special attention should be drawn to: unambiguous naming of classes, transparency of classes including quantitative scaling and thresholds for class separation, fitting choice of colours;
    - Where multiple parameters are used in the modelling of a single scaled indicator, it should be clearly stated how those parameters influence classification, so that transparency to underlying assumptions can be guaranteed;
    - Map users should have access to all relevant background information, allowing them to put the maps' thematic content into context according to their working field and competence;
    - Information on the accuracy of modelling should be explicitly provided.

E-survey carried out via the BALANCE website, May 2007, published in a separate BALANCE report.

6.3.4 Voluntary agreements

Voluntary agreements are a tool for management that can be used for achieving a regulatory framework within a certain spatial area or regarding a particular issue that exceeds legal requirements. In situations where a legal basis is not in place, unclear or inadequate to the size of the problem, innovative forms of management are needed. Voluntary agreements can be an efficient mechanism for strengthening the responsibility and cooperation of all parties that would like to improve their environmental performance.

Voluntary agreements can be established between different partners *e.g.* governments or authorities and enterprises, NGOs and partners like user organisations and businesses. They can be applied in cooperation with small-scale businesses like farmers and even with recreational users. In any case, environmental conservation authorities must be involved in order to take care of achieving adequate environmental objectives.

The specific contents of voluntary agreements depend entirely on the situation to which they are applied. However, all such agreements should generate additional conservation value, measures that are not common practice, not yet covered by law or other regulatory framework. A further essential characteristic of voluntary agreements is that they

are accomplished in consensus and that participating parties have to be open to compromises.

Examples:

- WWF Germany Project "Voluntary agreements with recreational users in the marine protected area 'Greifswalder Bodden'", www.wassersport-im-bodden.de

- Voluntary agreements for the removal of hazardous substances in the Baltic Sea, Guidance Document "Implementing the HELCOM Objective with regard to Hazardous Substances", Project funded by European Communities (Subv 99/79391), Sweden and HELCOM.http://www.helcom.fi/stc/files/environment/haz_subs/npe.pdf

Further reading:

- Voluntary Environmental Agreements; Process, Practice and Future Use; 2002 Contributing Editor: Patrick ten Brink, Institute for European Environmental Policy (IEEP), Belgium

- Voluntary initiatives, lessons learnt and next steps; UNEP discussion paper based on the UNEP Multi-Stakeholder Workshop on Voluntary Initiatives 20 September 2000, Paris. http://www.unepie.org/outreach/vi/reports/voluntary_initiatives.pdf

Figure 6.5 Stakeholder workshop in Lithuania (organised by the Baltic MPA Life project).

7 CONCLUSIONS AND RECOMMENDATIONS

If just one message should be formulated from BALANCE, it would be "*Do not plan on a blue background*", i.e. apply the ecosystem approach and use all relevant datasets on marine nature in your planning. The sea is so much more than water. It has complex interlinked ecological processes spanning national boundaries and linking land and sea. Understanding this it the first step towards using marine spatial planning as a tool in a long-term sustainable development. Failure to understand this will diminish marine spatial planning to be a simple conflict management tool.

The following recommendations follow the structure of the BALANCE management template and its five phases. Recommendations in regard to stakeholder are handled separately as stakeholder involvement run throughout the entire planning cycle. Hopefully these recommendations can provide some guidance or food for thoughts for those who want to develop marine spatial planning further within the Baltic Sea Region and beyond.

7.1 Recommendations for vision and objectives phase

1. First and foremost, the need for and the benefits of marine spatial planning have to be recognised at the highest political levels, It can then bridge the gap between sectoral interests and administrative responsibilities.

   The visions should set a long-term vision for the development within the Marine Region. Regional Seas, i.e. long term planning for long term sustainable development. The objectives should take care to include elements from all relevant stakeholders, so the ownership is not only at the responsible authority, but distributed evenly among the users of the sea. Note that this is a time consuming process.

2. Define and apply a set of principles by which the MSP process will be carried out. The principles listed in chapter three (the text for step 4 of the MSP template) can serve as a basis, or used as such. These are:

   i. Plan in balance with nature

   ii. Be adaptive (apply adaptive management)

   iii. Apply the precautionary principle

   iv. Keep it simple

      1. Applicability at various scales

      2. Make the marine spatial plan to the primary plan to which others link

      3. Use as few zones as possible to guarantee international applicability

v. Be serious about stakeholder involvement

vi. Be open an listen

vii. Maintain your integrity

viii. Calculate costs and benefits

ix. Apply maps & zoning as a common language

3. The development of a marine spatial plan should be set within the frame of existing international legislation and policies, e.g. the ecosystem approach. For a marine region such as the Baltic Sea Region this would include the HELCOM Baltic Sea Action Plan as well as numerous EU directives and policies and regional initiatives such as the VASAB recommendations and the BaltCoast project. The BALANCE template builds upon such existing initiatives.

4. The area to planned need to have a certain minimum size. If an area is too small it will not allow for setting up different scenarios with different options for the involved stakeholders nor allow for minimising the impacts on the environment i.e. all the nature will be unique if to small an are is chosen or there will only be one site suitable for any given sector. The MSP template and the approach we promote here is applicable at various spatial scales

5. The selected area should be linked to up-stream catchment areas in order to link land-based pressures to the marine environment. This also links the Water Framework Directive more strongly into the MSP process. To choose differently *i.e.* from administrative boundaries (Hab.Dir., WFD, MSFD), will only complicate matters in regard to manage such pressures.

7.2 Recommendations for the initial assessment phase

6. Ensure that all relevant data are available and accessible (nature conservation areas, marine biodiversity information and sea-use interests), through making relevant information available for marine spatial planning.

7. Harmonise information nationally and internationally within a Marine Region. The criteria for harmonisation of data included in the spatial plan should, where possible, be agreed upon within the Marine Region before using it for analyses and mapping. Harmonised data enable better comparisons across national boundaries as well as Marine Regional assessments.

8. There are many technical aspects, which need further development to fully encompass the complex interactions between human uses and the marine environment. However, such considerations should not hinder the process of marine spatial planning and should be developed over a number of years in order to distribute the cost and efforts over a longer time period and to base future development upon real-life experience from the first couple of planning periods.

9. Initiatives that improve our understanding of the complex spatial and ecological requirements of key structuring and/or commercial relevant species should be encouraged since this strengthen the information basis upon which decisions are made.

10. Similarly, forecasts for use of marine areas, resources and services should be developed i.e. what is the predicted need for marine aggregates, total area needed for offshore wind-farming etc. Such input is necessary to set up an informed long term spatial plan.

11. The socio-economic analysis should both include the cost and benefits of setting up a marine spatial plan, but also the costs and benefits of not implementing marine spatial planning including both human uses and impact on the environment. The BALANCE partnership has not had the necessary expertise to perform such an analysis.

7.3 Recommendations for the planning process phase

12. Do not plan on a "*blue background*"! If ecological relevant information is not included as a basis for the planning process, then the spatial plan is only a tool for administrating human use, and it will not contribute to a long-term sustainable development.

13. Care should be taken to ensure that the spatial plan is capable of operating at three different spatial scales. 1) The local and/or regional scale, 2) the national scale, and 3) the Marine Regional scales. This will put requirements on how the spatial information is prepared, though lack of data or harmonisation should not stop or hinder the first couple of planning periods since the rough assessment tools presented in chapter four can be used as a first step. However, to start up field surveys and compilation of GIS data for the next MSP process should begin immediately.

14. The BALANCE zoning approach will enable comparisons across regional and national boundaries as well as being applicable by all sectors. It consist of four zones enabling the development of a coherent spatial plan allowing space for all human uses, while minimising the impact on the marine environment. The zones are 1) The General Use Zone, 2) The targeted Management Zone, 3) The Exclusive Use Zone, and 4) The Restricted Access Zone.

15. The planning process should include the use of decision support tools *e.g.* MARXAN (or similar software), in order to produce several scenarios on which a discussion and a regional spatial plan can be developed.

7.4 Recommendations for the implementation phase

16. The most important message is: Get started with a holistic and cross-sectoral approach to marine spatial planning!

17. The performance of the MSP process can be followed up by setting up specific targets for the zones, uses and activities and by monitoring these in order to follow up trends.

7.5 Recommendations for the final assessment and reporting phase

18. A key element is that the spatial plan is cyclic in nature and applies adaptive management. The experiences from a previous planning period and any new sectoral needs should thus be fed into the new spatial plan.

19. The final assessments should, whenever possible, be linked to the reporting format and schedules of existing EU reporting or HELCOM time schedules. For example, would a 6-year reporting schedule coinciding with the EU Marine Strategy Directive make sense in regard to the environmental impact assessments?

7.6 Recommendations for the stakeholder involvement

20. Stakeholder engagement is an essential part of good governance. In the Baltic Region governance takes place at different scales and under different legal and cultural circumstances within the Baltic Sea Region. Different target audiences have to be considered at the scales.

21. Stakeholder engagement processes need strategic planning and communication.

22. Commitment and resources are requirements for a sound engagement process

23. During the initial stages of any stakeholder process all responsibility for advancing the planning process rests with the authority and stakeholders will hold them accountable for any delays or complications. The backbone of successful stakeholder participation scheme consists of gradually transferring part of the initiative from the authority to stakeholders themselves. Openness to power-sharing on the side of the authority is therefore essential.

24. There are two opposed approaches of management: the authoritarian approach and the cooperative approach.

    - In the authoritarian approach, enabling involvement, may be quicker at first sight, the effectiveness of the management is based on legal competence and directly related to the amount of resources provided for enforcing regulations.

    - The cooperative approach, enabling participation, initially requires a lot more resources and time but considerably less once authorities and stakeholders have agreed on a cooperative framework and are working on common objectives.

25. "More is not always better" – the engagement activities have to be tailored to the specific situation. It is recommended to assess whether the effort needed for set-

ting up an engagement system is proportionate to the likely outcomes from this process. Generally, participation works best at local level, where the distance between the authority and stakeholders is short.

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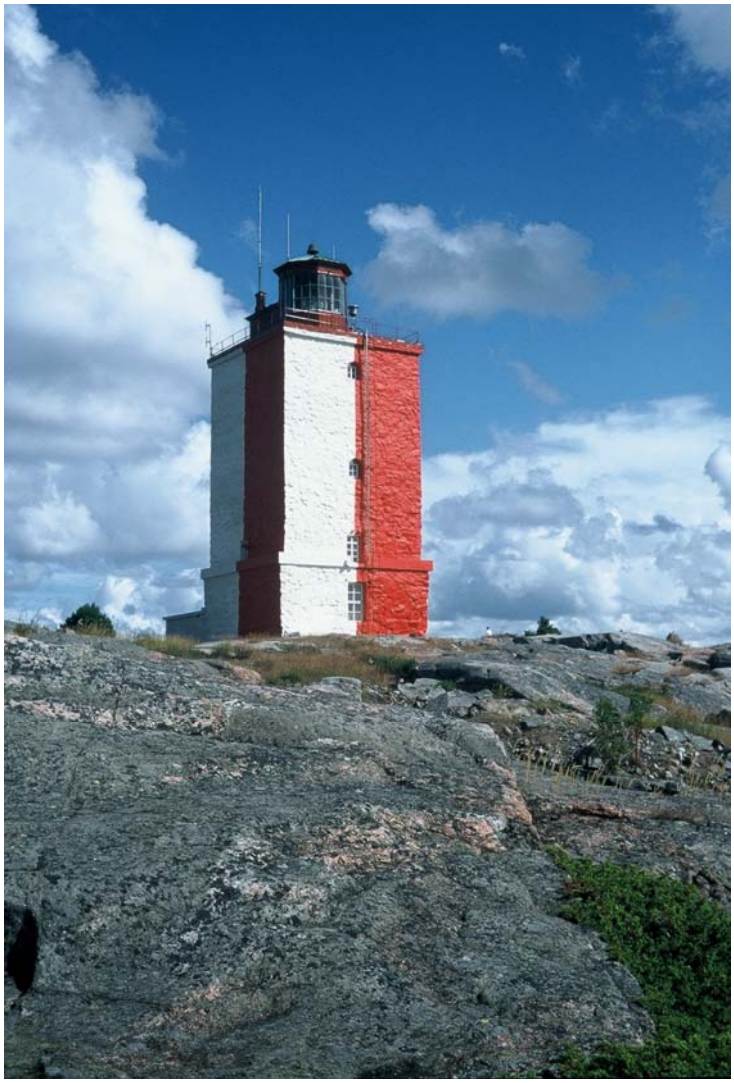

Figure 8.1 The lighthouse at Utö island in the Archipelago Sea, Finland is a famous landmark The local history should always be acknowledged in the MSP work.

9 GLOSSARY

Bioregion: Assemblages of flora, fauna and the supporting geophysical environment contained within distinct but dynamic spatial boundaries. Biogeographic regions vary in size, with larger regions found where areas have more subdued environmental gradients. These are defined and delineated at the meso-scale (large spatial unit in terms of 100s or 100s of kilometres in length). (Australian Government 2005).

Bioregionalisation: The process of creating bioregions that include biological (benthic) as well as physical (pelagic) data analyses to define regions for administrative purposes. (National Marine Bioregionalisation (Australian Government 2005).

Geographical Information System (GIS) "Geographical Information System (GIS) is a computer-based system that enables capture, modelling, storage, retrieval, sharing, manipulation, analysis and presentation of geographically referenced data"[ref: Worboys, M. & Duckham, M. 2004. GIS: A Computing Perspective (2nd ed). 426 p. CRC Press, Boca Raton, Florida.]

GIS tool/indicator: A combined term used to describe GIS methods that allow the creation and analysis of thematic datasets with the purpose of identifying and following up changes in human constructions, human activities or the status, cover and change of specific components of the biodiversity, in marine areas. GIS tools /indicators enable educated spatial assessments of digital map data.

Decision-makers, in the context of marine spatial planning, are officials that through their profession have the power to make decisions concerning a marine spatial planning process (the entire plan or parts thereof).

DPSIR is a conceptual framework that offers a basis for analysing the inter-related factors that impact on the environment. It is based on the DSR concept from the UN CSD 1996.

Driving forces is an expression in the DPSIR framework and stands for anthropogenic activities and processes that cause pressures *e.g.* production (agriculture, industry, part of transport,), consumption, recreation outside the economic system etc..

Ecosystem approach: A strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. Ecosystem based management is the comprehensive integrated management of human activities, based on best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of the marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity. (HELCOM and OSPAR Commissions 2003). E-participation is a tool that enables stakeholders and the public to participate in planning processes through the use of the internet. It can be a map-based web-application, providing facilities for viewing, editing and commenting maps and documents and therefore enables the communication between the public and the planning authority.

Exclusive Economic Zone (EEZ): An area beyond and adjacent to the territorial sea up to 200nm from the coast, which is subject to the specific legal regime of the respective state, under which the rights and jurisdiction of the specific state and the rights and freedoms of other states are governed by the relevant positions of the United Nations Convention on the Law of the Sea.

Management is an acknowledged, thoughtful and planned (informed) way to manage human activities with regard to the use of land, seabed, water and living resources considering the effects of these activities on adjacent and other ecosystems. (HELCOM 2003).

Management performance indicator is used to describe units of information measured over time that allow documentation of changes in attributes of marine area management (Pomeroy *et al*. 2004).

Managers In the context of marine spatial planning are officials who administer the MSP process which, as a part of the planning process, includes day-to-day management, and the design, implementation, evaluation and revision of projects or programmes (modified from IOC 2007)

Marine landscapes The results, displayed in a form of biogeographical maps, of the BALANCE approach, create an ecologically meaningful and useful basis the bioregionalisation and further to marine spatial planning

Marine Protected Area: Any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment. (Kelleher 1999).

Marine spatial planning is a strategic plan (including forward looking and proactive) for regulating, managing and protecting the marine environment, including through allocation of space, that addresses the multiple, cumulative and potentially conflicting uses of the sea and thereby facilitates sustainable development. (ABPmer. 2005)

MARXAN is a GIS-based computer software and so-called optimisation tool designed to assist in systematic conservation planning through MPA site selection.

Practitioners, in the context of MSP, are experts who are engaged in implementing marine spatial planning in the field (in reality), often also involved in day-to-day management.

Pressure, in the context of MSP, is the pressure on the marine biodiversity caused by natural changes or anthropogenic activities. In the DPSIR framework pressure and stands for direct stresses from the anthropogenic pressures on the natural environment: release of pollutant substances (emissions to air, to water, waste), radiation emissions, intake of natural re-sources, use of soil, other changes of the natural environment.

Pressure evaluation card (PEC), is a documentation that very concisely list the main facts of specific habitats and/or species, their preferred environments and potential threats. The purpose is to al-low environmental officials, managers or practitioners to present the

Pressure evaluation matrix (PEM) is a matrix, or set of matrixes, that allow its user to quickly com-pretend the relationships between habitats/species and the pressures on these habitats/species caused by various human activities

Stakeholders are in any way affected or interested public or private parties of public planning and management processes, *e.g.* non-competent authorities, communities, businesses, organisation, associations, groups and individuals. They can have a professional, recreational or private interest.

Template: A model/guide that aim to allow its user to follow the outlines and stages of a method or exercise in an easy way, *e.g.* gradually or by providing a frame/outline. In the case of marine spatial planning it allow its user to run through the planning or zoning process step-by-step.

Zoning is a spatial planning tool that acts like a town planning scheme that allow certain activities to occur in specified areas but recognizes that other incompatible activities should only occur in other specially designated areas and in this way zoning provides area-based controls and separate conflicting areas. (Day 2000). The zoning is built on information about the marine biodiversity and the zoning process aim at preserving the marine biodiversity and assuring a sustainable use of marine resources.

Figure 9.1 The sea on the southern coast of Finland (Western Gulf of Finland) is yet not frozen in December but the first snow has set.

10 ACRONYMS

BALANCE = Baltic Sea Management – Nature Conservation and Sustainable Development of the Ecosystem through Spatial Planning

GIS = Geographic Information System

MPA = Marine Protected Area

HELCOM = Helsinki Commission (the Baltic Sea Environmental Protection Commission)

BSAP = Baltic Sea Action Plan

PEC = Pressure evaluation card

PEM = Pressure evaluation matrix

DPSIR = Driving forces, Pressures, States, Impacts and Responses

EU = European Union

EEZ = Exclusive Economic Zone

Habitats Directive = Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (of the EU)

Birds Directive = Directive 79/409/EEC on the conservation of wild birds (of the EU)

MSP = Marine Spatial Planning

IMO = International Maritime Organisation

IUCN = The World Conservation Union

MARPOL = The International Convention for the Prevention of Pollution from Ships, IMO 1973

UNCLOS = United Nations Law of the Sea

NGO = Non-Governmental Organisation

ICES = International Council for the Exploration of the Sea

CFP = Common Fisheries Policy (of the European Union)

NATURA 2000 = EU Network of protected habitats and species established under the Habitats Directive

CBD = Convention on Biological Diversity

WFD = Water Framework Directive (of the European Union)

MSD = Marine Strategy Directive (proposal for a directive)

ICZM = Integrated Coastal Zone Management

VASAB 2010. Visions and Strategies Around the Baltic Sea 2010

OSPAR = Oslo Paris Convention for the Protection of the Marine Environment of the North-East Atlantic

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A P P E N D I X A

An approach to presenting human pressure evaluation: The ”Pressure Evaluation Cards”

BALANCE "PRESSURE EVALUATION MATRIX": SUMMARY OF THE IMPACTS OF GILL NETS

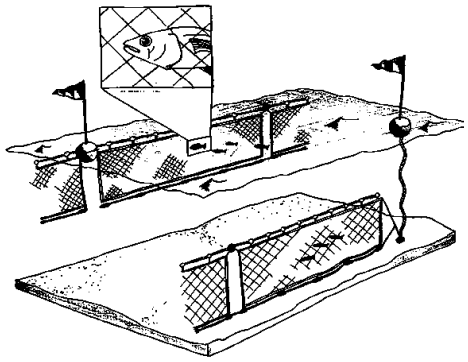
Background

The following is a concise description of *gill netting* as well as a summary of some of the environmental impacts of *bottom gill nets*.

Gillnets

Gill nets belong to the so-called *static* fishing gears, *i.e.* they are usually stationary while they are employed. A gill net consists of a panel of netting that is suspended vertically in the water by floats along the top of the net and weighted along the bottom (*leadline*) (Morgan & Chuenpagdee 2003). Gill nets can be anything from a few meters to several kilometres long.

Gill nets catch fish that attempt to swim through the net, which are caught if they are of a size large enough to allow the head to pass through the meshes but not the rest of the body. The fish then becomes entangled by the gills as it attempts to back out of the net. Gill nets are usually employed for a duration of anything between a few hours and a few days. These days, gill nets are almost exclusively made from transparent fibres that have low visibility and, correspondingly, higher catch efficiencies.



Bottom gillnet (figure from FAO 2002).

There are a number of variations of the gill net which can be roughly divided into *bottom gill nets* (incl. anchored or set gill nets) and *midwater gill nets* (incl. drift nets) (Morgan & Chuenpagdee 2003).

As the name implies, bottom gill nets have heavy sinkers on the leadline to keep them on the bottom and are set in one place by some form of anchorage. Bottom gill nets are used to catch demersal species such as cod, haddock and flounder (see fig. XX).

Midwater gill nets are usually used to catch pelagic fish species (fishes that swim in the water column) such as herring and salmon. These nets are anchored off the bottom and kept afloat in the desired section of the water column by buoys. In contrast, drift nets are simply released and allowed to drift with the current. However, large drift nets have been banned in the EU, and in the Baltic Sea drift nets will be completely phased out by the end of 2007 and will therefore not be covered here.

Bottom gill nets are among the most widely used static fishing gears employed by the commercial fishermen of the Baltic Sea, and the following will therefore focus on some of the general environmental concerns related to this specific gear type.

Physical impacts of bottom gill nets

Bottom gill nets may have physical impacts on benthic habitats and organisms, particularly if they are dragged across the bottom when they are hauled into the vessels (ICES 2006). In areas dominated by *e.g.* fragile, habitat forming species such as cold water corals or large brown algae it might therefore be argued that bottom gill nets to a larger degree be considered and managed as semi-active/mobile fishing gears.

Ghost fishing

Under most circumstances, bottom gill nets have limited impact on benthic habitats, especially when compared with *e.g.* bottom trawling. However, when nets are lost, discarded or abandoned there is a risk that the nets will continue to trap marine organisms (or *ghost fish*) for a period of time. This is also a potential impact of other fishing gears such as trawls, but the problem is mainly connected with static gears such as gill nets (ICES 2006). Ultimately, it is extremely difficult to quantify the magnitude of *ghost fishing*, as illustrated by two recent studies from the Baltic Sea (cited in Brown & Macfadyen 2007) stating that the total catch of cod by lost nets during a 28-month study period could be between 3 and 906 tonnes, *i.e.* between 0.01% and 3.2% of total weight of reported and landed cod catches from the same area and time period.

Ghost gears may also damage benthic habitats (abrasion, 'plucking' of organisms, meshes closing around them, and the translocation of sea-bed features), pose problems as a source of litter being washed ashore where it is unsightly, and can potentially entangle with active fishing gear and vessel propulsion systems, raising potential safety issues (Brown & Macfadyen 2007). In marine reserves or in areas where recreational diving is popular, lost nets may also constitute an "aesthetic" impact.

Bycatch of birds and marine mammals

Although bycatch of non-target fish species does occur in bottom gill nets, they are generally able to target fish by size and to be relatively selective for certain species, *i.e.* making them more selective than *e.g.* towed gear (ICES 2006; Smolowitz 1998). As a result, bycatch of non-target fish species usually does not make up a significant part of the catch (ICES 2006).

Gill nets (especially *midwater gill nets*) are generally considered one of the greatest threats to the survival of marine mammals (especially harbour porpoises) and some types of sea birds in the Baltic and other seas. Marine mammals and diving seabirds searching for food have difficulty seeing the transparent monofilament nets and frequently drown as a result of becoming entangled. Gill nets with a large mesh are particularly dangerous to harbour porpoises (ICES 2006). Wide-ranging tests on acoustic deterring devices, better known as *pingers*, have been shown to reduce bycatches of small cetaceans such as harbour porpoises in gill net fisheries around the world. Fisheries particularly relevant for this measure in the Baltic Sea include bottom gill nets (Anon 2004), and the employment of *pingers* are thus currently mandatory for vessels larger than 12 m in the area stretc.hing from the West of Bornholm to the East coast of Zealand (DK) as well as in defined areas of the Swedish Baltic coast (Anon 2004).

Spatial scale of impact

Under normal circumstances, bottom gill nets mostly have relatively localised *point specific* (0-25 m) effects (abrasion, bycatch, etc.). As the length of some gill nets sometimes can be measured in kilometers, the accumulated effects of a single gill net can be significant.

Time scale of impacts

Bottom gill nets are employed for periods of a few hours to a couple of days, sometimes longer. It can therefore be assumed that the impact only exists as long as the gill nets are in fact set on the bottom. However, when nets are abandoned or lost, the time scale of their impact is greatly increased. Although the catch rates (a measure of their ability to catch fish) of lost nets usually decline quite rapidly due to entangling or fouling, in some cases lost nets maintain significant catch rates (Brown & Macfadyen 2007). Together with the fact that lost synthetic nets do not decompose, this leads to the conclusion that bottom gill nets, when lost, may have impacts with substantial time scales of months or years, either in the form of ghost fishing, abrasion against habitats or as marine debris/litter.

Summary ranking/evaluation of pressure by different authors

Below are examples of studies that have been made to measure and/or rank the environmental impacts of bottom gill nets.

Authors	Scale used for evaluation	Pressure score, if any
Morgan, L.E. & Chuenpagdee 2003. Ranking made by 13 expert workshop participants.	5-step scale from *Very Low Impact* to *Very High Impact*	Physical structure: 3 (*Medium Impact*) Seafloor organisms: 2 (*Low Impact*) Marine mammals: 4 (*High Impact*) Seabirds: 3 (*Medium Impact*)
FAO 2002. A fishery manager's guidebook. Management measures and their application. Edited by Cochrane, K.L. *FAO Fisheries Technical Paper.* No. 424. Rome, FAO. 2002. 231p.	Generalized estimate of ecosystem effects of fishing for different fishing methods - ranked on a scale from 1 (non-favourable) to 10 (highly favourable) with respect to different ecosystem related factors.	Size selection: 8 Species selection: 4 Ghost fishing: 1 Habitat effects: 7

Synthetic evaluation, based on the above

The BALANCE Pressure Evaluation utilises the categories *Insignificant*, *Low*, *Moderate*, *High* and *Severe*. Based on above evaluations and taking into consideration the dependence of impact on varying configurations and conditions, the *general* pressure of bottom gill nets may be estimated to be between *Low* and *Moderate*.

Sources:

Anon 2004. Council Regulation (EC) No 812/2004 of 26.4.2004 laying down measures concerning incidental catches of cetaceans in fisheries and amending Regulation (EC) No 88/98

Brown, J. & Macfadyen, G. 2007. Ghost fishing in European waters: Impacts and management responses. Marine Policy 31 (2007) 488–504

FAO 2002. A fishery manager's guidebook. Management measures and their application. Edited by Cochrane, K.L. *FAO Fisheries Technical Paper.* No. 424. Rome, FAO. 2002. 231p.

ICES 2006. Report of the Working Group on Ecosystem Effects of Fishing Activities (WGECO), 5-12 April 2006. ICES Headquarters, Copenhagen. ACE: 05. 174 pp.

Morgan, L.E. & Chuenpagdee 2003. Shifting gears: addressing the collateral impacts of fishing methods in U.S. waters. Pew science series on conservation and the environment. pp. 42

Smolowitz, R. 1998. Bottom tending gear used in New England. In *Effects of Fishing Gear on the Sea Floor of New England*, Dorsey, E.M. and J. Pederson (eds.). Conservation Law Foundation, Boston, MA.

Photo: Thomas Kirk Sørensen

BALANCE "PRESSURE EVALUATION MATRIX": SUMMARY OF THE IMPACTS OF BOTTOM TRAWLING ON REEFS IN THE BALTIC SEA

Background

The BALANCE Pressure Evaluation Matrix aims to couple activities taking place with species and habitats of the Baltic Sea region in order to analyse any possible impacts that a given activity may have on a given species/habitat. The following is thus a concise case study description of *reefs* and *bottom trawling* as well as a summary of the impacts that bottom trawling may have on reefs in the Baltic Sea.

Reefs

Reefs are rocky marine habitats or biological concretions that rise from the seabed (Natura 2000 Code 1170). Reefs can either consist of rocks, boulders, cobble, stones, etc.. between and on which animal and plant communities develop, or they can themselves be made up of or created by living organisms such as *e.g.* cold water corals (biogenic reefs). Throughout most of the Baltic region, however, it is mainly the blue mussel *Mytilus edulis* that forms the majority of such biogenic reefs. Whether geological or biological in their origin, reefs are important habitats for a wide and variable range of biological communities. For instance, reefs provide necessary hard substrate for large macroalgae as well as shelter for crustaceans, juvenile fishes etc..

Bottom trawling

Generally speaking, bottom trawls consist of a large baglike net, wide at the mouth and narrow at the "cod end", which is towed behind a vessel. Most bottom trawls are variations of the *otter trawl*, where the mouth of the net is kept open by trawl doors (*otterboards*) made of wood or steel. The weight of the trawl doors is dependent on the size of the trawl and the vessel. A groundline (or footrope) that can bear weights (or *bobbins*) keeps the net in close contact with the bottom. In some cases, *tickler chains* are employed to scare bottom dwelling fishes and shrimp up into the water column and into the net (Watling & Norse 1998). Beam trawling, where a heavy beam is used instead of a groundline, is widely considered to have severe effects on the benthos (*e.g.* Collie *et al.* 2000; de Groot & Lindeboom 1994; ICES 2006). Beam trawls, however, are not employed in the Baltic region and will therefore not be described further.

Rockhopper gear on a bottom trawl (photo: T.K.Sørensen/DIFRES).

The presence of wrecks and larger rocks and boulders on the seafloor has always constituted a major risk to bottom trawlers, as valuable gear may be lost due to snagging and tearing of the trawl. Bottom trawls have therefore traditionally been employed in areas with soft sediments and smooth surfaces, leaving reefs and other areas of relatively high structural complexity to be fished mainly with static (passive) gear such as gillnets and traps. However, technological advancements in the construction of trawl nets have substantially reduced risks of snagging and damage of nets when employing bottom trawls to catch commercial fish species in those areas of the Baltic Sea with more complex bottom structure. For instance, the groundlines of bottom trawls may be equipped with large bobbins in the form of rollers or discs, most often made of plastic or rubber, which protect the net and groundline during fishing on the seabed. This so-called *Rockhopper* gear rolls over many obstructions and has therefore become more or less standard equipment on most bottom trawls.

Impact of bottom trawling on reefs

It is the various configurations of bottom trawls (ICES 2006) as well as the type of habitat, duration of contact, and type, width, weight, and number of units employed (ICES 2006; Morgan & Chuenpagdee

2003; Watling & Norse 1998) that all determine the degree of impact on habitat features and benthic processes. *Rockhopper* gear used in a structurally complex environment (such as an area with reefs) may thus result in relatively more severe changes in habitat structure and ecological function (ICES 2006) than in *e.g.* adjacent gravel or sandy areas.

It is evident that the increasing ability of bottom trawlers to be employed in structurally complex areas poses a threat to the reef habitat itself, as well as the biological communities that inhabit them. The main impact of bottom trawling on reefs (as well as in soft sediments) is of course major changes in habitat structure and ecological functioning that is the result of dragging such bottom trawls over the bottom (ICES 2006). Some of the main impacts of bottom trawling are stated below (*e.g.* ICES 2003, 2006; Watling & Norse 1998; Dahl 2005):

Overturned stones. Photo: Kim Lundshøj in Dahl 2005.

Benthic invertebrate mortality both in the gears and in the towpath of the gear
Removal of attached organisms such as macroalgae
Reduced habitat complexity
Turbidity/resuspension of sediments
Removal/displacement of large physical features
Reduction in structural biota
Reduced biodiversity
Unwanted bycatch of fish, invertebrates and other marine organisms

Spatial scale of impact

During towing of the bottom trawls, the effects are primarily *point specific* (0-25 m), although in some cases effects may fall within the *short distance* (25-1000 m) category.

The *point specific effects* occur when the trawl, trawl doors and the various configurations of groundline (*e.g.* rockhopper gear, etc..) have direct physical contact with the reef or surrounding substrate.

Short distance effects may include resuspension of sediments occuring during the trawling process, possibly associated with the release of contaminats and heavy metals that have previously been stabilised in the sediments (ICES 2006).

Resuspension of sediments may, as an indirect effect of trawling on adjacent soft bottoms, be deleterious *e.g.* for coldwater coral communities and other biogenic reefs, which are vulnerable to smothering.

Time scale of impacts

The ability of a disturbed reef to recover is extremely difficult to estimate, as it is highly dependent upon the species and biological communities present on/in a reef habitat, the size of the stones and boulders which make up the reef and the nature of the specific trawl used. The ability of disturbed biological communities to recover depends highly on a combination of the severity and regularity of the impact and the species and biological communities impacted. However, if structural components such as stones and boulders are displaced, or if impacted structures consist of extremely slow growing species (*e.g.* cold water corals), recovery may not be feasible in practice.

Summary ranking/evaluation of pressure by different authors

Numerous attempts have been made to measure and/or rank the impacts of fishing gears on habitats, incl. bottom trawling and reefs. Four of such studies and their results are exemplified below.

Authors	Scale used for evaluation	Pressure score, if any
Morgan, L.E. & Chuenpagdee 2003. Ranking made by 13 expert workshop participants.	5-step scale from Very Low Impact to Very High Impact	5= *very high biological and physical impact on habitats in general*
Watling, L. and Norse, E.A. 1998. Disturbance of the seabed by mobile fishing gear: A comparison to forest clearcutting. Conservation Biology 12(6): 1180.	Personal analysis and estimate.	Overall, mobile fishing gear severity is rated as *high*.
FAO 2002. A fishery manager's guidebook. Management measures and their application. Edited by Cochrane, K.L. *FAO Fisheries Technical Paper.* No. 424. Rome, FAO. 2002. 231p.	Generalized estimate of ecosystem effects of fishing for different fishing methods - ranked on a scale from 1 (non-favourable) to 10 (highly favourable) with respect to different ecosystem related factors.	Demersal trawl/Habitat effects= 2 (*note: same score as beam trawl*)
Dahl, K. 2005: Effekter af fiskeri på stenrevs algevegetation. Et pilotprojekt på Store Middelgrund i Kattegat. Danmarks Miljøundersøgelser. 16 s. – Faglig rapport fra DMU nr. 526.	No scale used. Observed overturned stones, missing macroalgae; could be attributed to fishing. Large frames located on stony seabed with simple measuring equipment showed that physical disturbance had occurred, likely caused by trawl fishery.	The physical disturbance of aluminium frames indicates that it is *likely that trawl fishing has a negative effect on the observed reef.*

Synthetic evaluation, based on the above

The BALANCE Pressure Evaluation utilises the categories *Insignificant*, *Low*, *Moderate*, *High* and *Severe*. Based on above evaluations and taking into consideration the dependence of impact on varying configurations and conditions, the general pressure of bottom trawling on reefs and their associated biological communities may be estimated to be *High* to *Severe*.

Sources:

FAO 2002. A fishery manager's guidebook. Management measures and their application. Edited by Cochrane, K.L. *FAO Fisheries Technical Paper.* No. 424. Rome, FAO. 2002. 231p.

Collie, J.S., Hall, S.J., Kaiser, M.J. & Poiner, I.R., 2000. A quantitative analysis of fishing impacts on shelf-sea benthos. *Journal of Animal Ecology*, 69, 785-798.

Dahl, K. 2005: Effekter af fiskeri på stenrevs algevegetation. Et pilotprojekt på Store Middelgrund i Kattegat. Danmarks Miljøundersøgelser. 16 s. – Faglig rapport fra DMU nr. 526.

De Groot SJ, Lindeboom HJ (1994) Environmental impact of bottom gears on benthic fauna in relation to natural resources management and protection of the North Sea. Netherlands Institute for Sea Research, Texel

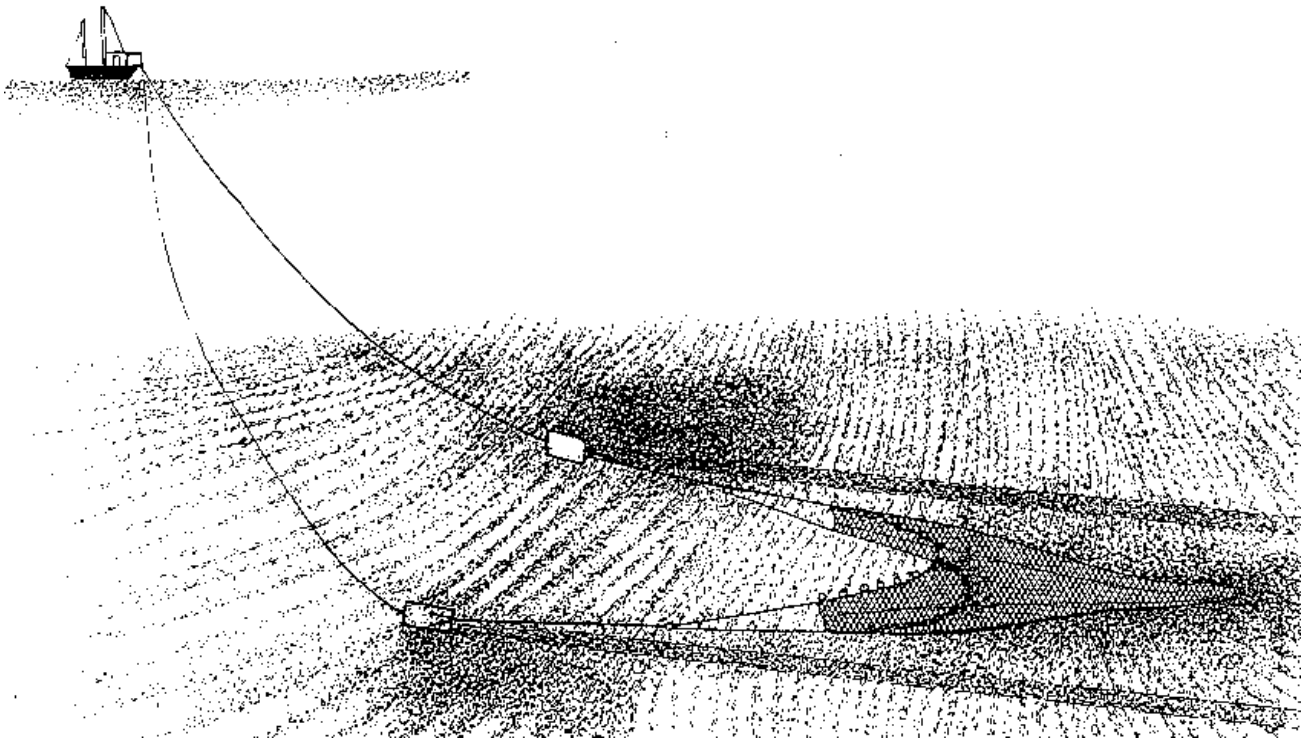
ICES 2003. Report of the Working Group on the Ecosystem Effects of Fishing Activities. ICES C.M. 2003/ACE:05, Ref. D,E,G.pp.193.

ICES 2006. Report of the Working Group on Ecosystem Effects of Fishing Activities (WGECO), 5-12 April 2006. ICES Headquarters, Copenhagen. ACE: 05. 174 pp.

MarLIN. The Marine Life Information Network for Britain & Ireland. Maritime and coastal activities to environmental factors matrix. *http://www.marlin.ac.uk/PDF/activities3.pdf*

Morgan, L.E. & Chuenpagdee 2003. Shifting gears: addressing the collateral impacts of fishing methods in U.S. waters. Pew science series on conservation and the environment. pp. 42

Watling, L. and Norse, E.A. 1998. Disturbance of the seabed by mobile fishing gear: A comparison to forest clearcutting. Conservation Biology 12(6): 1180



Otter trawl (screen dump from http://www.fishingnj.org)

BALANCE "PRESSURE EVALUATION MATRIX": THE IMPACT OF SAND AND GRAVEL EXTRACTION IN THE BALTIC SEA

Background

The use of extracted sand and gravel for building, filling and beach restoration started some hundred years ago and the interest has grown in past decades due to increased environmental consciousness regarding the harmful effects of extraction on land.

The benefits of sand extraction at sea include the short distances to seaside establishments as well as the high quality of sea sand and gravel due to the high degree of sorting exerted by the currents. On land the sand and gravel deposits are always found as a non-sorted mixture in moraine deposits. In general this source has been considered almost infinite but in the Baltic Sea limits of sustainable use do exist.

Of the fourteen countries currently carrying out sand extraction in the Baltic and North Sea areas, Denmark and Germany extract the largest volumes. Until the 1970s (in Denmark until 1996), practically no regulation was imposed on extraction, the effects on beach erosion being the main – and only – concern. Since then, other concerns have been raised, leading to both international and national regulation and obligatory environmental impact assessments in all countries practising extraction. Also the number of intensive studies of the effects on the whole benthic ecosystem, water chemistry and topography has increased significantly.

Environmental impact of the activity

The benthic biological communities of the sandy bottom will often consist of species of commercial relevance, primarily as prey for commercial fish species (eg. Doggerbank and the flounder fisheries), or of threatened or even endangered species requiring protection. Benthic habitats play a key role in the trophic interactions of marine ecosystems and, as permanent biogenic components of the seafloor, reflect well the changes in environmental conditions.

Besides affecting the species directly, extraction of sand and gravel can have an impact on topography as well as sediment and water quality, which in turn might affect the biological communities as well.

Sand extraction for beach replenishment is known to affect local benthic fauna and demersal fish populations (Støttrup 2006), and increased amounts of suspended material from dredging in connection with *e.g.* bridge construction is known to affect eelgrass growth (Anon. 2000).

Suspended sediment can choke adjacent bottom fauna filter feeders, and diminish the visibility of water, thereby affecting bottom vegetation as well as phytoplankton communities. The release of nutrients and/or toxic compounds from the sediments may alter water quality and sediment oxygenation dynamics, and consequently, the biota. The clouds of fine material – clay, limestone etc.. - might drive mobile species temporarily away from the area, which again may affect fish feeding or spawning hab-

its with potential serious consequences to local fisheries.

However, strict conditions for the extraction activities will limit both the temporal and the geographical ecological effects.

Spatial scale of impact

The main concern is the settlement of fine material on the seabed during the dredging process as well as in the ejected wastewater of the dredgers. The distance from the point source (the plume created by the dredging device), to which settlement of suspended material can be detected, depends on the grain size of the material and on the strength and direction of the current. In general, it can be said that coarse sand does not disperse farther than 50 m, whereas medium sand can travel a distance of 1 km and fine sand as far as 5 km. In extreme cases – in conditions much more dynamic than found in the Baltic Sea – fine-sized silt particles can remain in the water column for over 400 tidal cycles and travel as much as 20 km. In most studies the affected area has been found to be between 100-500 meters (Newell *et al.* 1998). In the studies performed in the Baltic (Gajewski & Uscinowicz 1993) the amount of material settling on the seafloor decreased rapidly beyond the 50 m limit, a measure that also reflects the average size of the dredging plume, when measured by the light extinction in the water.

The spatial scale of the biological impact is understood quite poorly. In some cases an increase both in the population density and species diversity of bottom fauna in the immediate vicinity of the dredged area has been observed, presuming that no harmful substances in the suspended sediment counteract the benefits of the additional energy sources provided by it. The negative impact on slow-growing species can still be detectable a few years after the dredging event, however.

Affected habitats and species

Of the Natura 2000 habitats in BALANCE Pilot Areas and Case Studies, sandbanks (vegetated or non-vegetated) are of course the ones most seriously affected by sand extraction, but also stone reefs and sea grass meadows can potentially suffer from the suspension of fine material through extraction activities, *i.e.* when particles drift along with currents, affecting filtering organisms and benthic vegetation on downstream habitats.

However, sandbanks rarely occur deeper than 20 m, which means that in some countries the extraction of sand is prohibited on the basis of the shallowness. In some cases also estuaries, mudflats and sandflats associated with sandbanks might be excluded from extraction.

Time scale of impacts

The durability of the direct effect is greatly dependent on the dredging methods: if only a shallow layer is removed from a vast area, the effects can be quite drastic on the short term. However, on the longer term, the effects of a smaller but deeper hole or “pockmark” are more drastic since the conditions for colonisation might be permanently weakened.

The recovery potential is greatly dependent on several factors:

- the composition of the biological communities prior to the extraction,
- water depth and water quality,
- the dredging equipment, style, depth, duration, and interval,
- the coverage and depth of the extracted area,
- the presence and quality of adjacent communities.
- the hydrodynamic conditions in the area: they may boost or hinder the arrival of new planktonic recruits.
- The potential topographic changes caused by the dredging can modify these conditions, in addition to directly affecting species dispersal.

In general, the recovery of species is faster than the recovery of biomass. If the sediment quality is altered, the species composition of the community will change permanently, even if the biomass is recovered. Recovery times for species – when full recovery has been detected - in sandy bottoms vary from 64 days to 20 years. This process is in many extraction sites aided by a continuous supply of sand from “upstream” areas.

Also strict conditions for the extraction activities will limit both the temporal and the geographical ecological effects.

Summary ranking/evaluation of pressure by different authors

Authors	Scale (of evaluation)	Distance of impact, if any	Pressure score, if any

Synthetic evaluation, based on those listed above (place this in the matrix):

The BALANCE Pressure Evaluation uses the categories *Insignificant, Low, Moderate, High and Severe*. Based on above evaluations and taking into consideration the dependence of impact on varying configurations and conditions, the general pressure of sand and gravel extraction on EU habitats may be estimated to be *High* to *Severe*.

Sources:

Anonymous. 2000. Environmental impact of the construction of the Øresund fixed link. Øresundkonsortiet, Copenhagen, 96 pp.

Støttrup, J. et. al. 2006. Kystfodring og kystøkologi (Coastal nourishment and coastal ecology). DFU report 171-07 (in Danish).

Lyngby, J. E.: Monitoring and managing dredging operations under construction of the Øresund Bridge.

Newell, R.C.. Seiderer, L.J. & Hitchcock, D.R. 1998: The impact of dredging works in coastal waters: A review of the sensitivity to disturbance and subsequent recovery of biological resources on the sea bed. Oceanography and marine biology: An annual review 36:127-178.

Keskinen, E. 2006: Merihiekan nosto: biologiset vaikutukset, niiden tutkimus ja lievennys (*in Finnish*). Morenia/Metsähallitus Publications, Finland. Unpublished. 19 pp.

Gajewski & Uscinowicz 1993: Hydrologic and sedimentologic aspects of mining marine aggregate from the Slupsk Balk (Baltic Sea). Marine georesources and geotechnology 11: 229-244.

PRESSURE EVALUATION CARD: EVALUATING THE IMPACT OF OFF-SHORE WIND MILL FARMS IN THE BALTIC SEA

Background

In the search for clean and renewable energy sources that may partly replace fossil fuels and nuclear power, wind energy has become a serious alternative during the last decade. With increasing demand for sites for windmills, interest has been directed toward erecting windmills on offshore locations, often as groups of several turbines making up a windmill farm.

Further advantages of offshore wind power include the option to erect larger plants and the opportunity to produce more energy per unit due to stronger and steadier airflows above the relatively smooth sea surface. Several Western European countries are planning a massive development of offshore windmill farms (OWFs) along the European Atlantic Ocean coast and also in the Baltic Sea area. The Danish Government launched a visionary energy policy in January 2007 with the objective to make Denmark independent of fossil fuels by 2025 and that the proportion on renewable energy shall be 30% . This could be implemented by establishing a large number of off-shore wind farms.

In Germany the goal is to have 20% of the electricity consumption made by wind power in 2020.And both Norway and Sweden have national goals for the extension of wind generated energy.

Environmental impact of the activity.

The environmental impact of an OWF can be divided into two classes of effects: Effects during the construction period and effects during the much longer operation period.

Effects during the construction period may further be divided into three categories: destruction, dredging, and disturbance. These effects, except destruction, may be considered temporary.

In contrast, effects during the operation of the windmills can be regarded as relatively permanent. They consist of disturbance, diversion of water flow, and altered habitat quality (the so called reef effect). The revolving wings of the windmills that induce noise, vibrations, and shadows, will together with the electromagnetic fields from the electric cables potentially disturb organisms both below and above the water surface. The environmental effect will always depend on local conditions.

Destruction effects can be considered small or negligible unless the structures are placed directly on the top of rare species or habitats. Dredging operations when establishing the windmills and cables, and in some locations during compensatory excavations, will result in temporary loss of habitats, release of sediment-bound substances, and increased sedimentation in the immediate surroundings. Construction operations will disturb fish, marine mammals, and bird populations.

Because few OWFs have been established, little is known of their specific impact on the marine environment. However, in Denmark two off-shore wind parks have been operating over a 3-year period (Horns Reef in the North Sea and Nysted in the Baltic), with intensive monitoring programs running parallel.

Spatial scale of impact

The main results from the two monitoring programs mentioned above, form the basis for the following assessment. As can be seen, there ***can be*** expected certain effects on the bird populations, eg. the migratory routes can be adjusted either above or beside the wind turbines. The monitoring programs have also shown, that the animals affected under the construction period, normally will adopt their previous behaviour during the following operating phase.

	Construction:	Operation:
Harbour porpoise:	1000-10.000m	0-25m
Seals:	1000-10.000m	0-25m
Fish:	25-1000m	0-25m
Local sea birds:	1000-10.000m	25-1000m
Migrating birds:	1000-10.000m	25-1000m
Sedimentation:	1000-10.000m	0-25m

One of the factors that may affect animal life - fish and marine mammals - during the operating phase, is the noise from the rotation of the wings. There is only sparse evidence about these effects, and only local monitoring programs will be able to confirm or disprove this potential problem.

On top of this "negative" list, it should also be noted that the "reef effects" of the subwater constructions have been shown to have an attractive effect on especially fish populations, due to a huge increase in invertebrate biomass, and accordingly it can be expected that this again may attract both predatory birds and marine mammals.

Affected habitats and species

It is of course of paramount importance that the wind mill foundations and scour protecting revetments are established on a relevant bottom type – that is, where stone reefs might occur. This will normally be the case on sandy bottoms or stony grounds.

However, especially on sandy bottoms other user interests might be in conflict with the wind mills, *e.g.* sand extraction, breeding or nursery sites for flatfish, nature protection (stone reefs and submarine sandbanks *sensu* Habitats Directive).Above the water, greatest concern should be given to the migratory birds, especially if they choose to change their flyways, which could introduce a problem with their energy consumption during migration.

It is also important to acknowledge the positive effects on local biomass that can be the result of establishing off-shore wind mill farms. If it is stated in the terms for the establishment of a wind mill farm that the biological consequences must be kept at a minimum, then the forms and surfaces of the underwater constructions must be constructed to avoid settlement of organisms.

If, however, the establishment of a wind mill farm can be seen as a means of increasing the biodiversity of an area, and thus creating an artificial stone reef where in former days stone reefs were or could have abundant, this will give rise to another way of constructing the basements.

Time scale of impacts

The largest impacts will, as mentioned above, occur during the construction phase, and will decrease during the operating phase. There is, however, no evidence of long-term negative effects yet, due to the fact that the oldest off-shore wind mill farms have been operating in less than 5 years, but *existing* monitoring results do not confirm the concern for long-term effects.

Summary ranking/evaluation of pressure by different authors

In the report "Danish Offshore Wind – Key Environmental Issues" the general viewpoint from the International Advisory Panel of Experts on Marine Ecology (IAPEME) is very clear:
The studies have shown that both farms have very little impact on the environment, neither during the construction nor during their operational phase.
There have been local effects on the benthic communities, primarily those associated with hard bottom substrates.
Monitoring has not yet shown any strong effects on fish communities
The construction phase has immediate negative effects on harbour porpoise and seals, but numbers of both species returned to "normal" once construction was completed.
There was observed strong differences in reaction between bird species: some avoided landing in or near the farms, some changes their flight directions over or beside. The estimates of collision risk were very low.

Careful spatial planning is necessary to avoid damaging cumulative impacts.

Authors	Scale (of evaluation)	Distance of impact, if any	Pressure score, if any
	-	-	-

Synthetic evaluation, based on those listed above.

Given the fact that many stone reefs have been destroyed over the last 30-40 years, due to stronger and stronger fishing gear and engines, one should consider the artificial basements of windmills as a means to reintroduce a stony habitat where relevant.

There are several examples of how to manage the expected negative environmental effects during the construction phase, as eg. when building the bridge over the Sound from Copenhagen to Malmö. The experience gathered from these constructions should be used when establishing new wind mill farms.

As no long-term effects yet has been documented, mandatory environmental monitoring programs must follow both the construction phase and the operation phase for years, focusing primarily on birds and marine mammals.

References:

EA Energianalyse, 2007: 50% vindkraft I Danmark i 2025 (in Danish).

Petersen, Jens K. & Torleif Malm 2006: Offshore Windmill farms: Threats or possibilities for the marine environment. Ambio vol. 35, no. 2.

Anon, 2006: Danish Offshore Wind – Key environmental Issues. DONG Energy, Vattenfall, The Danish Energy Authority, The Danish forest and Nature Agency. ISBN 87-7844-625-2.

PRESSURE EVALUATION CARD: EVALUATING THE IMPACT OF HUMAN ACTIVITIES ON ELLGRASS MEADOWS

Name: Eelgrass meadows

Characterizing species: *Zostera marina L.*

Natural distribution within the Baltic Sea: All of the Baltic Sea up until Lat 62 and east until Long 27. Salinity range 5-22 psu.

Typical habitat: In the Northern Baltic Sea on exposed or moderately exposed organically poor sandy seafloors, in the Southern Baltic Sea also on sheltered organically rich silt and mud seafloors. Depth range (m) 3-5 (range 1-9).

BELOW Possible reasons behind a natural change of cover of Eelgrass meadows

Type of change	**Reason**
Change in the salinity conditions	long term change caused by global climate change
Change in the light conditions	decreased photic depth (by increased phytoplankton or other macrophytes, or shadowing of Z. by epiphytic algae, other macrophytes or loose/sedimenting material (*e.g.* filamentous algae)
Change in substrate characteris-tics	loss of optimal growth substrate *e.g.* by ice, storms
Physical disturbance (causing loss of Z. /fragmentation of patches of Z.	loss of Z. *e.g.* by ice (freezing or ice-scouring), storms (removal of Z. plants)
Increased nutrient levels in the water (secondary effects cause changes in light conditions)	Release of nutrients caused by; resuspension of sediments due to intensive wave action or ice-scouring, erosion of shore-lines, changes in water currents

Biological relevance: Very important habitat for many invertebrate and fish species

Resilience/Recoverability: Slow, in the Northern Baltic Sea, on the fringe of its distribution, relying almost entirely on vegetative growth while in the Southern Baltic Sea sexual reproduction also oc-curs.

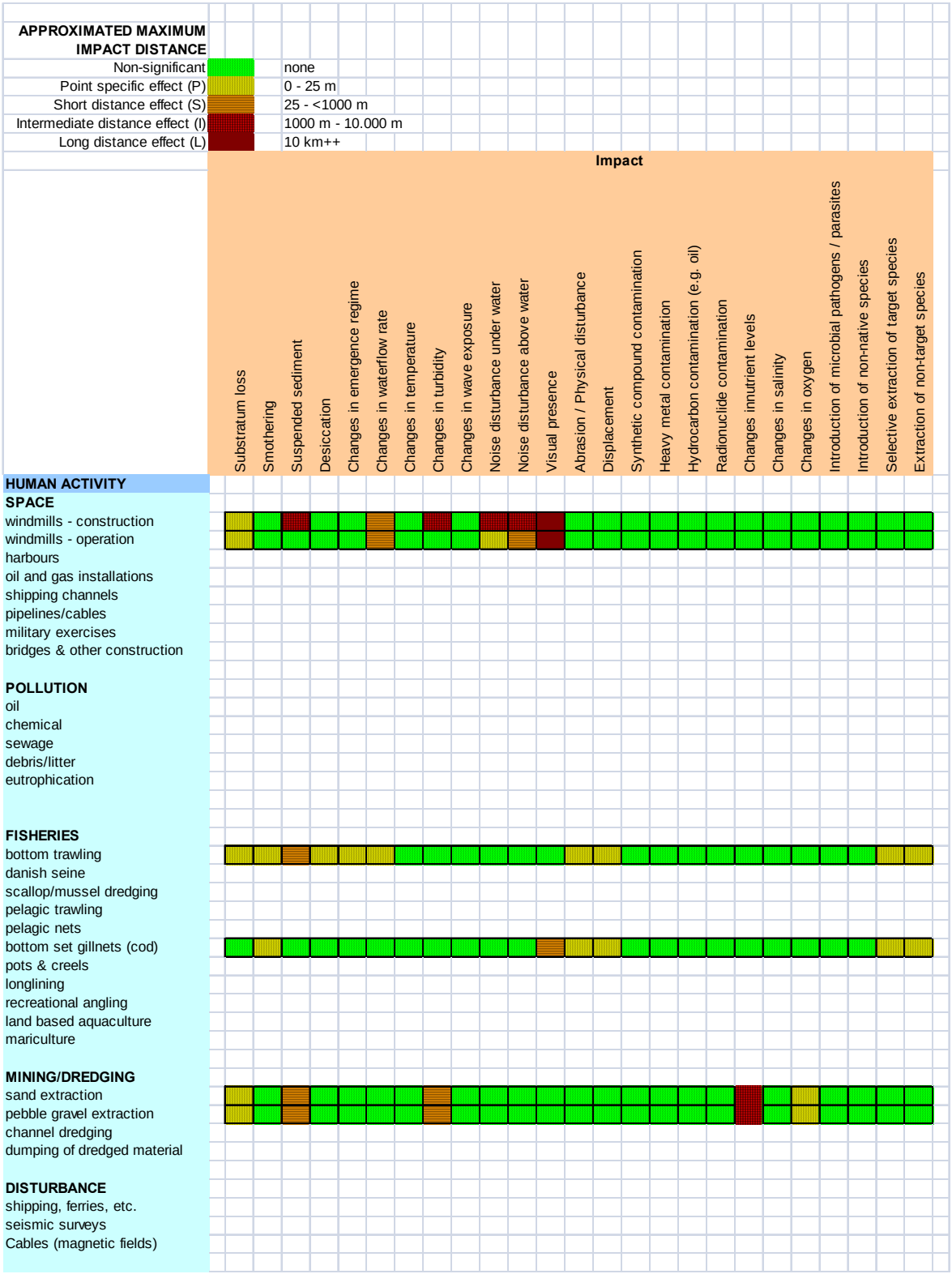
BELOW: Spatial scale (maximum distance) at which the anthropogenic threats may affect Eelgrass meadows:

Potential threat	**Maximum distance**
Eutrophication 1: increase of at site or local level if nutrient input is caused by point sources *e.g.* waste water input, re-suspension of sedi-ments, ,	< 10km
Eutrophication 2: at regional level if nutrient input is caused by multiple point sources and diffuse nutrient load affecting the entire Baltic Sea or parts thereof	from 100km – 1000km
Dredging 1 & Sand/gravel uptake: causing habitat loss or habitat frag-mentation	on site (0 km)
Dredging 2 (of various/fine material): causing increased sedimentation, release of nutrients and toxic substances from the sediment	< 10km but can be more
Bottom trawling: causing habitat loss or habitat fragmentation	on site (0 km)
Maritime traffic 1: causing re-suspension of sediments near sites with Z.	< 1 km
Maritime traffic 2: causing erosion of the seafloor where Z. occurs	on site (0 km)

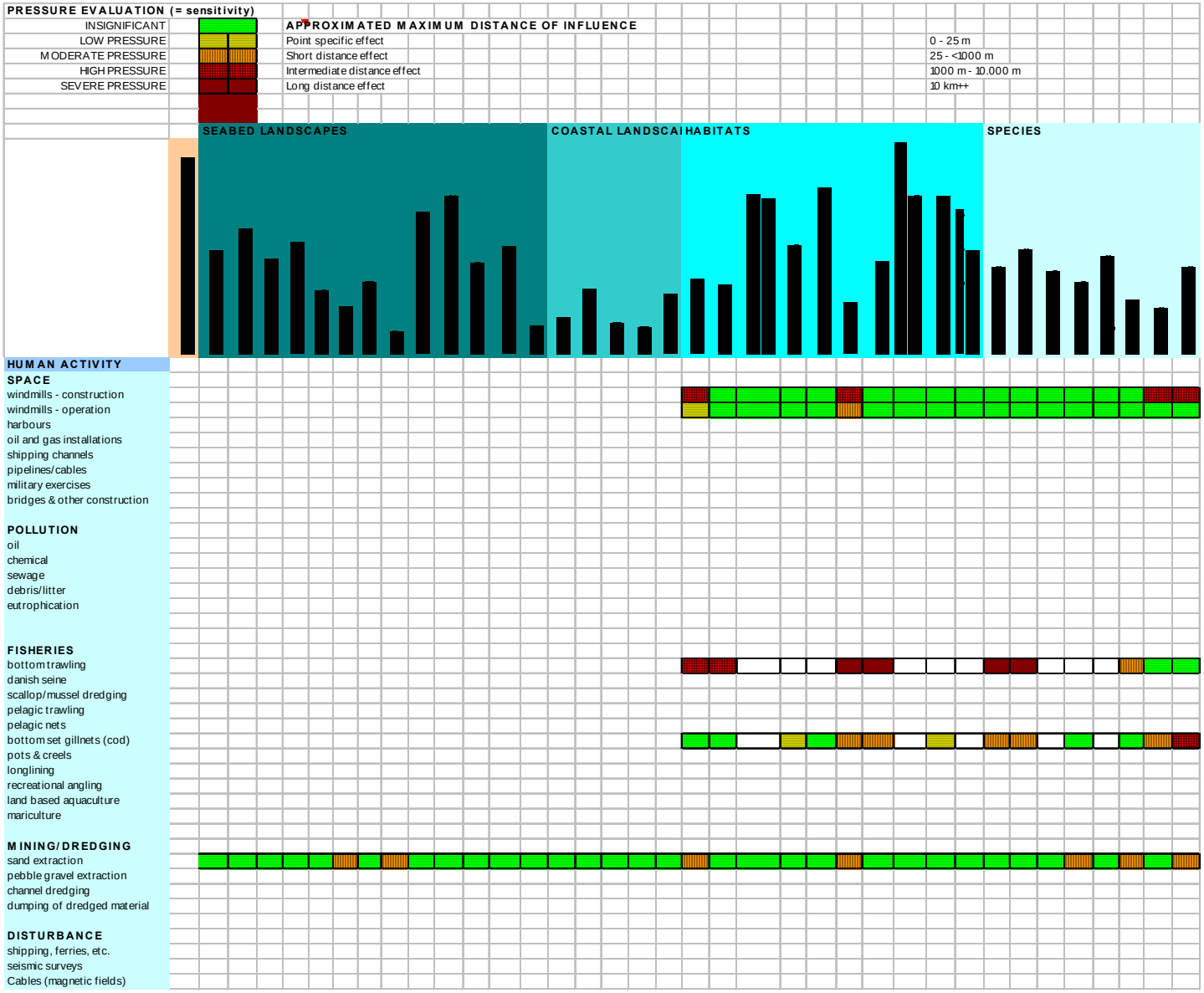
Marine construction activities 1 (building phase): effects similar to the effects of dredging and sand uptake but also include noise, visual disturbance,	< 10 km, very large constructions up to 100 km
Marine construction activities 2 (finished constructions)	on site (0 km)
Main type of anthropogenic activity causing threats: activities that increase euthrophication, locally or regionally, *e.g.* wastewater input, dredging or sand uptake.	
Trend estimate for the main anthropogenic activity causing threats:	↑
Methods for identifying potential locations with Eelgrass: GIS modelling (developed within BALANCE), aerial photography in shallow areas depth max. 3-4m)	
Methods for identifying real locations with Eelgrass: ROV or Drop Video surveys, SCUBA diving	
Indicators & Methods for assessing impact of human activities: Change in cover of Z. meadows	
Rationale for how to apply the distribution data in zoning of marine areas: Include known Z. sites in MARXAN, acknowledge Z. sites in the zoning process by not directing harmful anthropogenic activities in or close to these sites.	
Limit for favourable conservation status: not known	
International Legal status: The EU's Habitats Directive, Annex 1 types 1110 (Sandbanks) and 1160 (Large Shallow Bays and Inlets) includes Eelgrass)	
Classification use in zoning:	
References used for compiling the PEC: Anon. 2007. MarLIN the Marine Life Information Network website. www.marlin.ac.uk Davison, D.M., Hughes, D.J. 1998: Zostera Biotopes (volume I). An overview of dynamics and sensitivity characteristics for conservation management of marine SACs. Scottish Association for Marine Science (UK Marine SACs Project). 95 pp. Boström, C. Ecology of Seagrass Meadows in the Baltic Sea. 2001. Department of Biology and Environmental and Marine Biology, Åbo Akademi University. Academic PhD Dissertation.	

A P P E N D I X B

Towards a "Pressure Evaluation Matrix": presenting the pressure evaluation results



Matrix based on the work of Marine Life Information Network; www.marlin.ac.uk



Matrix based on the work of Marine Life Information Network; www.marlin.ac.uk

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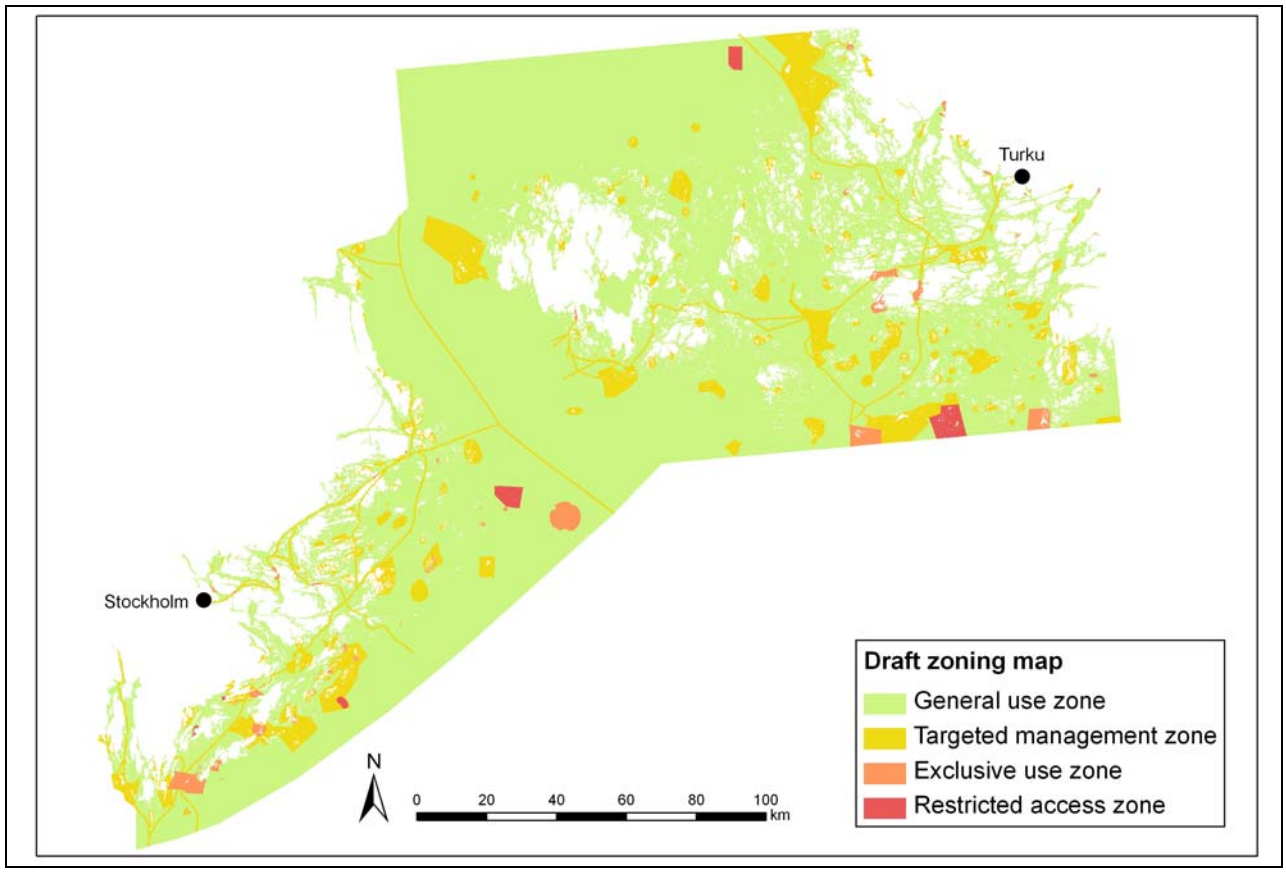
Turku
Stockholm
N
0
20
40
60
80
100
km
Draft zoning map
General use zone
Targeted management zone
Exclusive use zone
Restricted access zone

BALANCE Technical Summary Report 4/4

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About the BALANCE project:

The BALANCE project aims to provide a transnational marine management template based on zoning, which can assist stakeholders in planning and implementing effective management solutions for sustainable use and protection of our valuable marine landscapes and unique natural heritage.

The template is based on data sharing, mapping of marine landscapes and habitats, development of the blue corridor concept, information on key stakeholder interests and development of a cross-sectoral and transnational Baltic zoning approach.

BALANCE thus provides a transnational solution to a transnational problem.

The work is part financed by the European Union through the development fund BSR INTERREG IIIB Neighbourhood Programme and partly by the involved partners.

For more information on BALANCE, please see www.balance-eu.org and for the BSR INTERREG Neighbourhood Programme, please see www.bsrinterreg.net.

Geological Survey of Denmark and Greenland
Øster Voldgade 10,
DK-1350 Copenhagen K
Phone +45 38 14 20 00

www.geus.dk