



**Het Pand
Ghent University
Belgium
January 16-17 2004**

**REPORT OF THE WORKSHOP
ON
MARINE SPATIAL PLANNING**



Sponsored by Belgian Science Policy



Renard Centre of Marine Geology



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Foreword

This report gives an overview of the input and output of the workshop that was organised within the framework of the GAUFRE project*. The workshop itself was used as a crucial step within our project. It was meant to be the finishing touch for the collection of data reflecting the state of the art on the use of the Belgian part of the North Sea. On the other hand, it was an introduction to the confrontation of different user functions with the aim of balancing these uses as an input for a future spatial structure plan for the Belgian part of the North Sea.

The contribution of the international team of experts was a major input of this workshop. This is reflected in their abstracts and slides, included in this report. The actual summary of the workshop and the results flowing from these discussions reflect the output of the workshop. Different subjects have been arranged in as clear a manner as possible. Although a very broad range of topics was discussed, not all of them were touched upon in more detail.

The main lessons to the GAUFRE team are: 1. spatial planning at sea is a dynamic process and an ongoing exercise; 2. get started even though you do not feel very comfortable as an academic, due to lack of required data (e.g. impacts); 3. use operating principles or decision rules that apply to the planning process even in case scientific data are not available to support them fully; 4. translate those principles and decision rules in a visionary perspective; 5. more emphasize should be laid on social-economic interactions of the user functions; 6. apply public participation in general and in particular stakeholder participation in case of uncertainties (e.g. oral mapping); and 7. consider spatial planning in this small part of the North Sea in interaction with the North Sea under jurisdiction of the other coastal states.

We do hope that all the participants to the workshop – as mentioned in the list – enjoyed these two brainstorming days as much as we did. On behalf of the organising and academic team behind this workshop, I would therefore like to thank you for your contribution and wish to meet you all soon again.

Prof. Dr. Frank MAES
Project co-ordinator

* GAUFRE means "Towards a Spatial Structure Plan for Sustainable Management of the Sea". The project is financed by the Federal Science Policy in the programme "Second Multiannual Scientific Support Plan for a Sustainable Development Policy – SPSD II: Global Change, Ecosystems and Biodiversity - Mixed Actions". Partners are: Renard Centre of Marine Geology (Ghent University); Department of Biology – Section Marine Biology (Ghent University); Environmental Consultancy and Assistance (ECOLAS); Maritime Institute (Ghent University – Co-ordinator). The project started in January 2003 and will end in December 2004.

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Programme of the workshop

Day 1 (16 January 2004)

Morning session

8.30 Registration of workshop participants (upon invitation)

9.00 Opening of the workshop

Dr. Frank MONTENY, Belgian Federal Science Policy Office

Ms. Cathy PLASMAN, cabinet of Ministry of the North Sea

9.10 Welcome to participants and introduction to the workshop

Prof. Dr. Frank MAES, co-ordinator GAUFRE project

9.30 Short presentation by participants: their experience, background and contribution

Chair: Prof. Dr. F. Maes

Prof. Dr. Hans BUCHHOLZ

Dr. Paul GILLILAND

Dr. Charles EHLER

Dr. Anamarija FRANKIC

Prof. Dr. Richard KENCHINGTON

Dr. Grant MURRAY

10.45 Coffee/tea break

11.15 Short presentation by participants: their experience, background and contribution

Chair: Prof. Dr. F. Maes

Drs. Bart KORF

Dr. Jon LIEN

Prof. Dr. Hance SMITHE

Drs. Hans LEINFELDER

Dr. Kevin St. MARTIN

Dr. Eike RACHOR

12.30 Lunch

Afternoon session

13.30 Session I: Non-living resources

Moderator: Dr. Jan SCHRIJVERS

15.30 Coffee/tea break

16.00 Session II: Living resources

Moderator: Dr. An CLIQUET

18.00 End of day 1

Day 2 (17 January 2004)

Morning session

9.00 Session III: Data, zonation and interaction (1)
Moderator: Dr. Bart DE WACHTER

10.30 Coffee/tea break

11.00 Session III: Data, zonation and interaction (2)
Moderator: Dr. Bart DE WACHTER

12.30 Lunch

Afternoon session

14.00 Session IV: Strategic vision
Moderators: Prof. Dr. Frank MAES, Dr. Jan Schrijvers, Dr. Bart De Wachter

15.30 Coffee/tea break

16.00 Session IV: Evaluation and conclusions
Moderators: Prof. Dr. Frank MAES, Dr. Jan Schrijvers, Dr. Bart De Wachter

17.30 Conclusions and closure of workshop

18.00 Closing reception

Part One: Presentations

Sustainable Management of the North Sea
Cathy PLASMAN

Towards a Spatial Structure Plan for Sustainable Management of the Sea (GAUFRE)
Frank MAES

**Proposal for a Spatial Offshore Plan -
the German North Sea Coastal Zone as an Example
Hans BUCHHOLZ**

Traditionally the oceans - the marginal seas in particular - are mainly used by navigation and fisheries and sometimes by tourism in short distance from the high water mark. For these purposes there is not much demand for spatial offshore planning.

The new planning challenge appears from the introduction of fixed offshore installations. There are already many of such installations: platforms for the exploration and exploitation of oil and gas, cables and pipelines. However, they were perceived as individual measures, and they have been planned accordingly. At present times we have to understand that we are at the beginning of a comprehensive and manifold use of the ocean. Therefore we need a comprehensive spatial planning with a holistic approach following the principles of ICZM because each limited resource needs pro-active planning.

A simple transfer of the well organized spatial planning system from the land to the marine area is not possible due to the different character of the water: it is highly mobile, it cannot be shut off by boundaries, it is more or less uninhabited, and it is widely unknown etc. However, some principles of the land oriented spatial planning principles may be transferred to the marine area in order to meet the usual national administrative procedures. Consequently there will be several different spatial planning systems of the respective states, at least for the time being.

The following steps to a spatial offshore plan should be considered:

- to define the planning region which should contain land and sea
- to map the relevant data of the living and non-living nature as well as of human uses
- to elaborate a vision (Leitbild) for the coastal zone, for the marine area in particular, and to get a political decision on this vision
- to arrange spatial plans on two levels of generalization: (i) a General Plan for the Coastal Zone of smaller scale, with appropriate area categories; (ii) Regional Plans for the Coastal Zone of larger scale with respective area categories. These plans should be the base for decisions by authorities.
- In order to achieve a sustainable development the planning procedure should follow the three main elements of an Integrated Coastal Zone Management: (i) management instead of hierarchic administration; (ii) participation of the stakeholders from the beginning; (iii) iterative planning process instead of final decisions.
- Coordination with neighbouring constituencies and states is essential.

The paper will discuss the application of these considerations to the German North Sea coastal zone.

Toward Integrated Management of Ocean Uses Through Zoning **Charles EHLER**

Designating areas of the ocean for specific oceanic uses, as a method for setting priorities for the use of marine areas or their resources, is not a new idea. Specific areas of estuaries and coastal waters have been set aside for fisheries management for hundreds of years, both in the developed and developing world. However, planning and managing ocean space in any comprehensive or integrated way through the use of zoning is relatively new. Since the early 1970s Australia's Great Barrier Reef Marine Park Authority has used a zoning approach to manage multiple uses of the world's largest marine protected area. Other countries, including the United States and the Philippines, have adopted similar zoning approaches in the management of their marine protected areas. Even more ambitiously, China has recently passed national legislation that requires development of multiple use zoning plans for its entire territorial sea.

Coastal and ocean managers throughout the world now recognize the importance of setting aside areas of marine waters for specific uses. For example, over 4,000 marine protected areas have been designated—an exponential increase over the past 10 years. Numerous other examples of areas designated for particular activities exist, in which other uses are excluded or restricted to eliminate conflicts. Historically these include, among many others, navigational channels, pipeline/cable corridors, dredged material disposal areas, fisheries closure areas, military firing ranges, and oil and gas drilling leases. Almost always, these “zones” are established through a variety of mechanisms under different authorities, and typically lack any inter-sectoral considerations or integrated planning and coordination.

The management or “governance” of human activities within specified coastal and marine space can have many objectives:

- Allocation with society and among government organizations of rights of use, ownership, and stewardship of marine resources within the space;
- Regulation of these rights of use, ownership, and stewardship;
- Separation of conflicting human activities;
- Protection of natural and/or cultural qualities of the space while allowing a range of other reasonable human uses;
- Designation of suitable areas for specified human uses, e.g., fishing, waste disposal, and transportation, while minimizing the effects of those uses on the quality of the entire space;
- Protection of critical or representative habitats, ecosystems and ecological processes;
- Monitoring and enforcement of these regulations by the appropriate authorities; and
- Provision of effective means to prevent and adjudicate disputes.

Ocean zoning is more complex in that it needs to address and manage activities on the ocean's surface, throughout the water column, and on and beneath the seabed. It is conceivable that one area of the ocean could support multiple uses (by different sectors) or several management objectives simultaneously, and it is also possible that one use or management objective would preclude all others. Ocean zoning may also have a temporal dimension, prohibiting uses of a period of time or on a seasonal basis.

This paper and presentation will examine existing examples of the application of zoning as one tool in a number of “incentives” that can be used to manage marine space in an integrated, multiple-use framework. Differences between zoning on the land and in the marine environment will be identified, e.g., mobile resources v. static boundaries, as well as problems of “open access,” but the benefits of marine zoning will be highlighted.

The Environment Sets the Limits for Sustainable Management of the Sea **Anamarija FRANKIC**

The health and sustainable use of coastal and sea resources are of critical importance given their role in food production, economic activity, genetic biodiversity and recreation. In addressing integrated coastal management it is essential to strike a balance between the need for economic development and the need for natural resources conservation within the same management plan. Therefore, integrated coastal management and sustainable development should include careful consideration of a multiplicity of parameters and their interactions. Planning for sustainable uses is a process that comprehensively and holistically analyses natural resources conditions, human uses and socio-economic aspects. Through effective research, monitoring and incentive programs that maintain ecosystem integrity and balance human values, economic development can be attained in an environmentally and socially sustainable manner. The proposed approach for sustainable use of coastal, marine and land resources is that '*the environment sets the limits for sustainable management and development*'.

One of the most critical challenges is to find suitable sites for different sea -based activities and maintain healthy ecosystem functioning. The first step in this process is to identify the environmental conditions necessary for each activity to succeed. In the case of the Belgian part of the North Sea, the activities/uses include: shipping, fisheries, aquaculture, coastal defense, tourism and recreation, sand and gravel extraction, dredging, energy production, nature protection, cables and pipelines, wrecks, off-shore bunkering, and military use. Determination of suitability involves an evaluation of natural and anthropogenic limitations of a certain area in order to decide if the locality can support the activity (finding "an optimal allocation for user functions"). Developed protocols for each coastal/sea activity can be used as environmental quality standards that will help guide and control activities within certain environmental limits. Ultimately, through guidance of monitoring programs (environmental and socio-economic), better information can be incorporated into the analytical protocols. This will improve evaluations, and complete the feedback loop for the sustainable management planning of the sea and the coast.

Adequate policy addresses the resolution of potential use conflicts, which is often hindered by lack of information or appropriate methodologies. Management choices will be required when certain activities can appear in the same locations based on suitability analysis of the area (e.g. aquaculture vs tourism/beach area vs sand/gravel extraction). In these instances, choice has to be based on environmental requirements for the activity and the activity's interaction with the environmental resources (environmental impact assessment, EIA). First priority should be given to the activity with the highest environmental suitability level and the lowest adverse impact on the respective land/water ecosystem. In addition, implementation and decision-making must incorporate socio-economic suitability and cultural factors. Involving the community in the planning and decision-making process is an important step toward acceptability and success of the sustainable management. The use suitability and use conflict analyses (Geographic Information System, GIS models) support the interdisciplinary aspects of sustainable coastal management planning, and decision-making processes addressing where, how and why different uses will mostly succeed in sustainable manner.

Paul GILLILAND

The author has worked for English Nature for over 10 years on marine protected areas, monitoring, advice on a range of marine developments and use, and most recently as Marine Policy Adviser. English Nature's focus and interest in marine spatial planning has increased over the last 18 months. This has been mainly under the auspices of a developing Maritime Strategy in response to our report report "*Maritime State of Nature: getting onto an even keel*" which was launched on 6 November 2002. The strategy has two key objectives:

- To set English Nature's objectives for our coasts and seas
- To act as a catalyst for implementation of government initiatives, in particular the [Marine Stewardship](#) Process and the maritime elements of the [England Biodiversity Strategy](#).

Our Strategy is considering three key areas - Better planning and integration, Recovery of our coasts and seas, and Working with the sea. The former is particularly focussed on Integrated Coastal Zone Management, Marine Spatial Planning and Regional issues.

At a national and international level the UK is committed to investigating some form of marine spatial planning and the need for such planning at sea appears to be widely accepted, including across parts of government. There are however relatively few examples of effective spatial planning in the marine environment around the UK to draw on. The principles such planning needs to be based on, the scope of such planning, options for achieving it, what a spatial plan might look like, and what should be aimed for in the short, medium and long-term have been and continue to be the subject of discussion and development.

Over the last few months, English Nature has explored these issues with a wide range of stakeholders initially through one to one discussions followed by a national conference on 1st October 2003. Important messages from the conference include:

- General and widespread support for some form of marine spatial planning
- A range of data needs to inform various aspects such as broad scale spatial information, boundaries and cumulative effects
- The challenge of integrating sectors, not least those with an international dimension to their management such as fisheries and shipping
- Integrating policy and management across marine and terrestrial components of particular sectors, such as aggregates and energy
- The need to clarify what legislation is required to underpin any system.

English Nature has been working to identify and develop practical solutions to some of these issues, co-hosting a small workshop on "The practical implementation of marine spatial planning – understanding and addressing cumulative effects", undertaking a short analysis of the relevance and lessons of the land use planning system to marine spatial planning and implications for what the latter might look like, and developing a proposal to provide a simple, interpreted geophysical map of marine seabed and water column features ('countryside map for the sea') as one fundamental information layer to underpin marine spatial planning.

The debate about marine spatial planning includes a regional dimension. 'Regional' can refer to both naturally defined regions and political-administrative boundaries such as government regions. During 2003 we consulted on and progressed the concept of Marine Natural Areas as a potentially ecologically relevant framework at a regional scale around England within which to consider planning and management. Much of our effort to develop a regional approach has been directed through a pilot project in Irish Sea. Whilst that project is not producing a marine spatial plan it has made practical progress on a number of topics that would be essential elements of a spatial plan.

The presentation will provide details of the above projects and initiatives to help practical progress in the development of marine spatial planning in England and the UK.

**Sustainable Management of the Sea – the Importance of Clear Objectives –
Perspectives from the Great Barrier Reef
Richard KENCHINGTON**

The social, economic and environmental importance and the needs for sustainable management of marine ecosystems are now widely understood and increasingly reflected in legislation and institutional structures.

Designing management systems to respond to the needs poses difficult challenges. In marine ecosystems the biology of plants and animals, and the consequent issues of scale, variability and linkage in space and time, limit the effectiveness of terrestrially derived concepts of spatial planning. Many uses with different levels of impact may occur in the same area. It is important to understand the issues of cumulative and interactive impacts on the natural system and on each other. Unless planning can be conceived to reflect the issues of uses and sustainability at an ecosystem scale, territorial boundaries or fences to delimit different uses are of limited value. Recruits, nutrients and food for plant and animal populations may come from distant spawning areas and impacts such as pollution may come from distant areas and different jurisdictions..

The biophysical foundation of marine management is not the major constraint to planning. With current technologies seabed habitat mapping is relatively easy and, depending on the general applicability of the inherent assumptions, modelling can provide a reasonable understanding of biophysical constraints and opportunities for management. The issue is to devise the most effective contemporary solution to sustainability in the face of multiple uses and impacts, natural variability and resilience of the ecological system in the face of individual and cumulative impacts. A fundamental issue is that we do not manage the sea or marine environments. We have no means for significant management of most of the ecosystem processes. We can hope to manage human behaviours to influence what people do, or do not do, to marine resources and habitats. There is a challenge in this because the concept that human activity can damage the sea is very recent. Most people were brought up with notions of the seas as vast, remote, dangerous - a source of food and resources for the brave, and a limitless sink to absorb the wastes of life on land. The fact that we are holding this workshop demonstrates that we are in transition but the process of achieving the necessary changes in behaviour must go beyond experts telling the rest of the community what to do. It has to involve a process of collective development of reasonable decision rules.

Management plans can address the purposes and conditions of use and entry to areas of a marine ecosystem but to do so requires an open approach to planning. It requires broad involvement of interested, affected and impacting parties in the development of decision rules or operating principles. These should lead to the identification of reasonable constraints and opportunities for managing impacts and achieving objectives subject to an overarching objective of sustainability. The process should be far reaching because quite frequently impacting parties may be unaware of their impacts or connection to the marine ecosystem. Where they operate in a different jurisdiction these problems are compounded.

The operating principles should identify areas of common agreement for overarching management principles. They will also clarify matters where different sectors have conflicting objectives that may be addressed by limitations to contain impacts within demonstrably sustainable levels or by spatial or temporal separation. A process based on broadly discussed and understood operating principles can help to achieve the best feasible contemporary solution to manage human behaviours. It should also provide the basis for ongoing adaptation and revision as understanding of management and perceptions of reasonable behaviour evolve in the light of actual experience.

Approaches to support planning and management of the Belgian North Sea **Richard KENCHINGTON**

This is an overview of the output of the workshop as compiled by Dr. Richard Kenchington.

1 Overview of resource and use issues

- 1.1 The Belgian sector of the North Sea is very heavily used by Belgium, its neighbours and the international community.
- 1.2 Major longstanding uses are shipping, fishing and sand and gravel extraction.
- 1.3 The Belgian North Sea has a major section of the northern part of the English Channel designated shipping lanes and dredged access channels for Belgian and southern Dutch ports. Disposal of dredge spoil and demands for deeper channels to service competing ports are substantial issues for the central and northern nearshore areas of the Belgian North Sea
- 1.4 The area is fished by Belgian and other fishers. Information on the relative importance of areas for particular fisheries is not available. The romance of fishing ports is an element of local cultural and recreational significance. The real economic significance of fisheries in the local inshore seas (within 20 km of the coast) is not known neither is the economic and resource demand significance of the same area for recreational fishing.
- 1.5 The 68km coast is a largely developed area of substantial significance for recreation and tourism. While many of the activities are urban/resort based recreation there is continuing and probably increasing demand for recreational fishing and environment based activities including summer swimming, beach walking and natural environment appreciation.
- 1.6 A new and potentially major use flowing from national energy policy is the establishment of windfarms. As a new activity the probable extent of real demand and the policy framework for windfarm establishment and operation are unclear. An area has already been designated for windfarm development but there are debates about location of windmills in relation to visibility from the shore and in relation to bird migration routes.
- 1.7 The Belgian North Sea is part of the much larger system of the southern North Sea/Northern English Channel. A coherent understanding of its biodiversity and of any specific ecological significance will involve working with neighbouring countries, probably in the context of the EU environmental policy framework. There is demand for Marine Protected Areas establishment but the extent to which these would serve functions of broad ecological system or biodiversity conservation as opposed to nature based cultural or recreational objectives would need to be evaluated.

2 Possible contributions of planning methods

It is always difficult to evaluate options and priorities for methods without a clear understanding of the policy framework for the planning application.

From my understanding of the papers and discussion at the workshop it appears that the current management framework is predominantly sectoral with generally minimal communication between sectors. Where they are specifically considered, environmental issues are dealt with through prediction and regulation of environmental impacts. Cross sectoral and broader community benefit matters are dealt with on an issue by issue basis within the normal flow of cabinet-based government.

Against this background, it appears that there is a reasonable understanding of the physical/biological context of the Belgian North Sea. The major issues that need to be addressed in order to apply this information in planning and policy are social and economic and these need to be understood in a cross sectoral and broader policy context.

Briefly planning and regulation of the public commons of marine areas and resources carries an requirement to consider the best public benefit from those resources. The burden of proof is conceptually on the user of those resources to demonstrate that the use is reasonable, sustainable and that it does not bring unreasonable detriment to other current and future uses. Such considerations relate largely to social and economic values. This differs from the general context of terrestrial resource management where the majority of the resources are owned or leased and the owner or lessee is free to do what they will unless constrained by laws and regulations that protect the interests of the public or neighbouring property owners. The burden of proof for introduction of limitations is on the community. This is clearly reflected in the language of land based planning – where a plan is produced by experts and may be advertised for a period to enable the public or interested parties to make objections.

On this basis, planning for allocation and management of access to public marine resources and areas – including the licensing of uses - should be carried out in the context of a systematic and generally open process to determine the purposes for use and entry to parts of the area being planned. The requirements for such a process include:

- 2.1 Legislative authority – that sets out as clearly as possible the objectives and scope of planning and management to implement plans
- 2.2 Operating principles or decision rules that apply to the planning operation in question. These will obviously include the requirements of the legislation but, particularly in a multiple use planning context, they should identify the operational context of all allowable uses so that clashes, conflicts and synergies can be clearly addressed. Because some decision rules will clash – for example having a 5 km exclusion zone around a wind mill and not closing any are currently used for fishing – it is generally necessary to preface the rules by “as far as practicable”. The task of the planning process is to identify possible solutions within those constraints and in doing so to clearly identify the winners and losers so that the overall balance can be reviewed. It is important in an open political process that the decision rules are developed and canvassed publicly very early in the planning process.

- 2.3 Best practicable understanding of the social and economic context of uses and values of the area. Industries and government agencies often have substantial information on the sectors but there is typically a lack of information on cross-sectoral issues and community views. In particular the values of recreational uses and cultural associations are typically very poorly understood. Local ecological and usage knowledge techniques described at the workshop have an important role in collecting such information.
- 2.4 GIS technologies. Multiple use planning of marine areas involves many types of information much of it geographically referenceable to describe the distribution of uses and values and options. There are many commercially available packages. The key elements are a geographic base that can accommodate specific small site information and can aggregate information at scales from the local to the whole of the area.
- 2.5 Decision support technologies. Again there are several packages available. An absolutely critical consideration is the openness and relevance of the assumptions in the algorithms and the ability for the package to run with the decision rules or operating principles for your application and to report the extent to which rule is satisfied in any proposed solution. Ideally it should enable suggested changes to be entered in the field and stored as evaluated options for the later decision making process.

3 Information needs

The common problem at the start of a planning process is that there is a lot of information but little of it is immediately relevant to the tasks of allocating uses to areas or setting conditions on the conduct of uses. It is important to develop a data base or meta-database so that the information is accessible for the planning process but it is particularly important to identify gaps in available information. This is a task for the planner as information client and should generally be done in parallel with the process of clarifying decision rules because that is the point at which specific information requirements are most obvious. It is the nature of most planning processes that by the time there is a decision to make a plan there is a very limited time period for collection of new information. It is important to identify immediate research priorities that can contribute to the plan decisions on purposes and conditions of use entry. The process will also identify longer term research activities that should be conducted in order to assess the effectiveness of the plan and ensure that information not available in the initial planning can be available for plan revision.

To illustrate the process I attach a list of some possible decision rules noted during the workshop and the information needs they generate. My recommendation to the University of Gent would be to conduct a research project to develop a set of suggested decision rules or operating principles in a consultative process with government, sectors and the public and use this to identify research priorities for the eventual planning process. When the planning process starts it is almost certain that the research derived decision rules will be revisited. But it will probably be the case that the revisions will be relatively minor and any further research done to address information gaps identified by decision rules will be a major contribution to the actual planning process.

A second recommendation would be to develop the research partnership with agencies in neighbouring countries so that the ecosystem and EU usage contexts of the Belgian North Sea are clearly understood by all countries with primary responsibilities for the ecoregion.

Table of some decision rules and information needs noted during the workshop. Some of the information needs may relate to several decision rules

Decision rule	Information need
Provide for at-sea disposal at levels similar to current	Social and economic costs and benefits of dredging. Likely future demands, economic justification and costs for deeper dredging.
Reduce impacts of dredge spoil disposal to minimum practicable	Current flows, spawning areas, linkages
Maintain current shipping traffic management corridors	Map shipping corridors
Make provision for expanded level of marine gravel/aggregate extraction	Extent of natural replenishment of gravel/aggregate and comparison to rate of extraction
Minimise impacts of marine gravel/aggregate extraction	Comparison of dredged and undredged areas
marine gravel/aggregate extraction should never expose seabed clay strata	Map of thickness and grades of sediments overlying the clay/rock substrate of the Belgian North Sea
Provide marine wind farm sites sufficient to provide ?% of Belgium's power needs	Intended role of wind generation in national energy strategy
The seabed at sites allocated for wind farm development should not consist of mud or fine sands	Map of suitable areas
Some areas suitable for wind farms should be set aside as control or reference areas for determining the impacts of wind farms	Map ecological values of all wind farm potential areas to help identify reference and protection values
Maintain local fishing communities	Identify and evaluate social and economic characteristics and viability of local fishing communities
Maintain sustainable commercial and recreational fisheries	Identify areas of usage, catches trends and economic values of commercial and recreational fisheries.
Allocate a defined percentage of relevant fish stock/fishing areas to recreational fishing	Cost benefit analyses of commercial and recreational use of fish stocks
In consultation with the Government of Flanders, make reasonable provision for development of coastal marine recreation and tourism	Map areas used currently for recreation and tourism activities, areas with potential for Recreational and tourism use. Map of Flanders coastal plan and implications for use of marine areas.
Protect representative areas of the seabed from activities such as trawling and dredging that disturb benthic communities	Map of areas of seabed use by activities. Map relative usage importance of parts of the area. Map relative ecological importance of components of the area

Legislation, Policy and Long Term Developments in the Dutch EEZ **Bart KORF**

Our North West European society has lots of wishes to be allocated in the North Sea: not only the more traditional uses of fishing, shipping and maritime defence, but also oil and gas drilling, sand dredging, wind energy and the allocation of marine protected areas are forms of present day use. Even making an artificial island off our coast to be used as an airport has been considered. By these developments it is becoming more and more crowded at the North Sea. The appearance of the sea will change drastically in the decennia to come. Even in the seemingly endless vastness of the sea competition for space for the accomodation of the different human uses will come into being in the next years. We cannot foresee when this will happen exactly, but inevitably competition will come into being in the next future.

We may consider if our legislation is able to cope with these developments. The present day legislation for the EEZ of the Netherlands consists of a set of different sectoral laws: Mining Law, Sand and Gravel Extraction Law, and the Law for the Management of Public Works. Also the Environmental Impact Law and several other environmental laws apply to activities in the EEZ. These are adequate for the time being.

So there is no general, more integrated law in force. Recently our government has decided to enforce the Nature Conservation Law and the Flora and Fauna Law in the EEZ. At the same time she has decided that there is no need for a special North Sea Law.

At the moment some relevant policy documents are in process in my country: a.o. the “Nota Ruimte” (National Policy Document on Spatial Planning) and the Integrated North Sea Management Plan 2015; the latter is a plan of the directorate North Sea of the Public Works Authority. Furthermore in January 2004 a workshop on Spatial Planning of the North Sea is organized by the OSPAR secretariat in order to deal with section 76 – 79 of the Bergen Declaration (containing the conclusions of the Fifth International Conference on the Protection of the North Sea, march 2002, Bergen, Norway). So the national and international North Sea policy is beginning to move slowly towards a more integrated approach. In my opinion international cooperation and tuning is very important in this process.

Methodological Input from Flemish Spatial Structure Planning for Marine Planning **Hans LEINFELDER**

Introduction

Since the start of the 1990s Flanders has developed a new spatial planning policy, called structure planning. In 1996 and 1999 it resulted in new legislation that replaced the existing national law, already dating from 1962, and in 1997 the first Spatial Structure Plan for Flanders was approved by the Flemish government and parliament.

Although without doubt spatial planning on land differs fundamentally from marine planning, input from the experiences with the Flemish structure planning methodology can be useful for marine planning.

First my presentation will focus on the procedural aspects of spatial structure planning in Flanders which, until now, have showed succesful in developing public support for the spatial policy plan. Second I shall highlight the content of a structure plan, or better said, the successive steps in building up a coherent plan. Because of the fundamental differences between spatial and marine planning I shall try to give an initial translation of the terms/jargon of spatial planning in – may be – useful terms for marine planning. Finally I shall briefly center on the necessary steps for implementation.

Procedural aspects of spatial structure planning

Spatial structure planning is considered as a form of strategic planning. Fundamentally this means that spatial structure planning is not comprehensive. It is no longer possible to cope with all the problems and qualities in our complex society. The sectoralisation in vertical, quasi isolated departments in government structure on the one hand and the increasing ambitions at the different policy levels (European, national, regional, local, transborder, ...) on the other hand, don't improve the conditions for the former technical planning approach, typical for the 1960s and 1970s (fordism).

As a result of these changing planscape, starting a spatial structure planning process is defining the scope (problems, qualities, opportunities, ...) of the planning process to focus the research, the analyses and the debate. The scope is defined through discussion between relevant stakeholders who will get involved more deeply in and will be convinced of the necessity of the planning process by a common sense of scope.

The planning process itself is being developed on three simultaneous and coinciding tracks.

The first track is the development of a long term vision on the spatial structure of a region and consists of an abstract, but strategic vision crystallised in spatial concepts. Where do we want to be within 10, 15, 20, 30, 50, ... years ?

As the development of a long term vision takes time, because of negotiations and the slowness of political decision making, short term actions are made possible on the second track. Anyhow, these actions need to fit in the long term vision under construction so a permanent feed back between the two tracks is necessary. Vice versa the experiences with and the gain of public support through the short term actions will support the development of the long term vision.

The third track is communication. Communication between different policy levels, negotiation with stakeholders, information and participation of civil society, are absolute necessities to come to a long term vision and the realisation of short term actions.

Successive steps in the development of a spatial structure plan

Of course the development of a spatial structure plan starts with the analysis of the existing situation. As mentioned before it is however impossible and desirable to make a comprehensive analysis so the scope of the strategic plan already influences the topics studied throughout the analysis. The aim of the analysis is an integrated image of the main structuring spatial elements in a certain region, also called the existing spatial structure. In practice this analysis is often

executed through, first, the morphological and functional analysis of different spatial substructures – the physical system, the settlement structure, the structure of open area functions (nature, agriculture, ...), the structure of economic activities, the traffic infrastructure – and second, the integration (which is more than an addition) of these substructures which highlights the spatial relationships between the different substructures. In marine planning the emphasis will probably be more on functional rather than on morphological features. Intuitively potential substructures for marine planning could be the physical system (currents, relief, geology), nature (bird routes and stopping places, ...), fishery, harbours, energy production, recreational activities, courses of navigation for the transport of people or freight, undersea cables, ... The territorial combination of several substructures (functions and activities) can result in the definition and characterisation of subregions in the analysed region.

The next step in the development of the spatial structure plan is the formulation of a "desired" spatial structure. Taking into account the existing spatial structure an overall vision for the region is defined. Hesitating to formulate a vision for the sea, the overall vision of the Spatial Structure Plan for Flanders, "Flanders, open and urban", illustrates that a vision is in fact a stepping stone which gives direction to the spatial concepts, the policy perspectives and the actions that are formulated later on in the plan. A spatial concept gives expression in a condensed way, in words and in images, in which way government thinks about the future spatial development. As a spatial concept can be expressed in an image, it means that the content of a spatial concept has to be locatable. The integration of the different spatial concepts results in a schematic image of the desired spatial structure. This desired spatial structure can consequently be operationalised in development perspectives and actions for the different substructures, analysed before. The step of formulating concepts and their integration in a desired spatial structure has to guarantee the coherence of the development perspectives and actions.

Necessary steps for implementation

In Flanders spatial structure planning ends with the formulation of perspectives and actions. This implies that a spatial structure plan is quite abstract and vague and as a consequence is not powerful enough to limit individual property rights. It is no more than a political vision on spatial development and thus only binds the involved government levels.

When the necessity occurs to implement certain aspects of the structure plan so far that it has consequences for decisions of individuals, these aspects have to be translated in an implementation plan. Because of the judicial statute of these implementation plans they have to be very precise, very specific in zoning, ...

Blending Information: The Use of Local Ecological Knowledge for Spatial Planning at Sea Grant MURRAY

Spatial planning at sea often involves attempting to integrate economic, social and environmental dimensions into management plans for specific geographic areas. To be effective, spatial planning requires accurate and relevant information about the marine environment as well as the dynamics of historical and contemporary marine resource usage patterns. Knowledge about past marine ecosystems is particularly important when management is concerned with restoring degraded ecosystems or areas. Resource status and usage patterns in marine areas are often difficult to gauge and scientists and managers rarely have enough, or the right kind of, information to ensure effective spatial planning. Fisheries science, for example, often only has access to quantitative, large-scale, off-shore data that can be limited to species of commercial importance.

We begin with the argument that the environmental knowledge of local resource users can be an effective complement to scientific knowledge for spatial planning at sea. It may also be essential for interpreting more traditional types of data. Local ecological knowledge (LEK) is based on the experience of local resource users, and is quite different from normal 'science' in that it is usually transmitted orally, is place based, and can have significant time depth. Although the information gathered from any one fisher is usually limited to the particular geographic area with which they have direct experience, their knowledge is often highly detailed and specific to areas not always covered by fisheries science. Furthermore, this knowledge can, at least in theory, be collected and aggregated to construct a larger scale, highly detailed picture of local fisheries extending back several decades (Neis and Felt, 2000). The qualitative, long-term, local, and coastal character of fishers' observations, in other words, can be seen as spatially and temporally complementary to more 'scientific' information (Neis et al., 1999).

The presentation will give a few examples of 'useful' information that LEK can provide (see Hutchings, 1996 and Neis et al., 1999). In managing scarce stocks or sub-populations, for example, LEK can illuminate aspects of local stock structure including movement patterns, spawning grounds, juvenile habitat and spatial patterns in fish morphology. Dates when fish are caught in fixed gear in different locations can indicate seasonal and directional movements of fish populations, while negative trends in CPUE can be quantified on a decadal scale which provides a clearer picture than landings information alone. Furthermore, harvesters may also have information on commercially insignificant but ecologically important species that may appear as bycatch. LEK researchers have developed specific methods to reconstruct historical changes in the fisheries of the northwest Newfoundland and Labrador coasts of eastern Canada. This research involves combining different types of information, including Local Ecological Knowledge (LEK), archival information contained in the historical record, and 'scientific' information from a variety of sources. In the case of LEK, sampling strategies to arrive at a sample of fishers from different areas and fisheries should attempt to reflect the social, spatial and technological complexities of current and past fisheries in our study area. In our LEK research, we actually include two different types of semi-structured interviews, including taxonomic interviews with older, retired fish harvesters and career history interviews with recently retired fish harvester experts. Both types of interviews involve verbal and chart data, where ecological (and other) information is either drawn directly on maps or remains verbal, but where the maps are used to generate and focus discussion.

Some additional challenges and advantages related to doing this kind of research include sampling issues, concerns about data interpretation and 'filtering', and finding 'linkages' between different types of data. Overall, neither system (LEK or 'normal' science) alone provides a comprehensive portrayal of environmental phenomenon and human interactions with the environment. Combining these knowledge sources with archival data has the potential to create a new knowledge system with significant potential to increase the effectiveness of spatial planning in marine environments.

**Conflicts in German Offshore Waters (mainly the EEZ) and
First Approaches for a Solution by Spatial Plannings
Eike RACHOR**

Since several years, new developments have occurred in offshore waters of the North Sea and the Baltic Sea, mainly by new plannings for wind farms (1), sand and gravel exploitation and also nature conservation (according to the European Habitats and Birds Directives). Until now, there exists no legal instrument to direct such plannings and restrict them to suited, conflict-poor areas. On land, Germany uses the instrument of spatial planning ("Raumordnung") to reduce conflicts and allow for very early decisions about suited sites for different uses, especially such of priority for specific developments.

Within the coastal waters (up to 12 nautical miles) and, becoming more important, within the exclusive economic zone (EEZ), no such instrument was applicable until now. This was recognized also by the Conference of the German Ministers for Raumordnung in December 2001, when a proposal was made to the Federal government to develop a strategy for spatial development and to investigate whether the German laws of Raumordnung can be applied to the EEZ.

The Land Niedersachsen (Lower Saxonia) has already initiated spatial planning within its coastal waters, where large areas belong to the Wadden Sea National Parc.

In the EEZ, permissions for wind farms and sand and gravel extraction are given by specific laws, which consider each application as an individual act and must not regard parallel plannings in a greater distance from the site in question.

During the last weeks, the Federal Ministry for Environment had allowed for an open discussion of potential proposals for the European NATURA 2000 network, by which areas to be possibly developed to marine nature reserves were put forward (2). In addition, areas outside such prospective reserves suited for large wind farm constructions ("Eignungsgebiete" for wind energy converters) have also been proposed and are now in discussion. Such new developments are considered to be helpful also for investors and may be regarded first steps to the necessary spatial planning in offshore waters.

Naturally, such plannings should consider developments also in the neighbouring countries' EEZs, which requires international cooperation and coordination.

(1) see: www.bsh.de/de/Meeresnutzung/Wirtschaft/Windparks/index.jsp, esp. maps

(2) see: www.HabitatMareNatura2000.de/

The Belgian Sea **Hance SMITH**

The purpose of this presentation is to consider the practical implementation of a sea use planning system for Belgium. It first considers salient points regarding the geography of the 'Belgian Sea'. This is followed by a brief discussion of the vision and purpose underlying the establishment of such a system; stages of plan development; the format of the plan(s); and a brief conclusion.

From a sea use planning perspective, the key coastal and marine environmental regions involved are the Schelde, the inshore coastal area, and the open sea respectively. Key aspects of sea use patterns include the global shipping route connecting the English Channel and the North Sea; the cross-Channel ferry routes; and major Belgian port approaches. Also a high priority are aggregate dredging, demersal fisheries, coastal leisure activities, waste disposal, and conservation uses. The overall spatial plan or plans will be built on the interactions among the uses, and the relationships between the uses and the environment.

The presentation briefly considers the vision and purpose of the spatial planning approach in this case. Fundamental ideas relate to development, sustainability, connectivity and governance. There follows the specific objectives – particularly the national objectives, but also taking account of the federal structure of Belgian government and the local authority level; and EU and international dimensions which are of particular significance in the present case. The technical underpinnings of the spatial planning approach are also outlined (Matrix).

The stages of plan development are grouped into three themes. First are the information bases involved, including research, scoping of the plan(s) and formation of stakeholder networks. This is followed by development based on conferences and workshops and pilot study areas, taking due account of the influence of cultural factors such as language. Management of plan development is considered in terms of stakeholders, political aspects, implementation and monitoring.

Factors to be taken into account in formatting spatial plans include external influences: environmental, technological, economic, social, political and risk all of which have regional implications. The objectives are also considered; followed by the roles of the organisations involved and the nature and degree of integration required at various geographical scales.

Finally, concluding comments are made regarding the Belgian Sea, vision and purpose, stages and format

**Using GIS to Facilitate Public Participation in the
Spatial Management of a Marine Commons**
Kevin St. MARTIN

The marine commons is increasingly managed using spatial approaches and methodologies. For example, fisheries have been typically addressed in terms of quantities by species for numeric allocation but management bodies are now turning toward more localized and inherently spatial forms of management (e.g. rotating closures, Marine Protected Areas, areas of concern relative to endangered species or habitats, ecosystems approaches, and community-based management zones). The implementation of spatial approaches is made possible by new technologies and methods such as GIS. At the same time, these technologies are producing new ontological understandings of the marine environment as a spatially diverse “landscape” inhabited by a variety of users and interests. New categorizations of the marine environment are produced and reified via these technologies. While the marine commons has always been a heterogeneous environment, it has been difficult to represent it as such without the advent of GIS technologies and the ever-expanding collection of spatial data in digital form. Both the natural environment (e.g. benthic habitats, bottom morphology) and the social environment (e.g. fishing zones, energy production areas) are produced via maps that detail their characteristics and locations.

These newly emerging geographies of the marine environment do not typically include local and community-based understandings of space. Indeed, they often “over-write” the geography of the marine environment as understood, for example, by fishermen or recreational users. How the common marine environment is being defined via new spatial technologies employed by official agencies, etc. directly contributes to an effective dissonance between new images of the environment and those maintained by coastal communities and the public. Integrating the spatial understandings of community members/public groups as central to the formation of spatial management plans will produce a process where the public is engaged at the fundamental level of producing/defining the space of the common marine environment.

Research on the use of GIS as part of a public participatory methodology has led to the emerging field of PPGIS (public-participatory GIS), which focuses on the integration of local understandings of the environment as vital to the management of natural resources and commons spaces generally. For example, my own work maps locations of primary and secondary importance to fishing communities (defined by home port locations and gear types). These communities (in the U.S. Northeast) rely upon particular resource areas of the marine environment and have come to inhabit and intimately understand such areas. Integrating data layers depicting areas utilized by particular communities as well as the local environmental knowledge produced by such communities will contribute greatly to the spatial management of the fisheries commons. In addition, the visualization of “community spaces” on the commons provides communities with a sense of inhabitation and stewardship that is often eroded by images of the commons depicting only resources or government produced zones of management. Connecting on-shore communities to the specific off-shore locations upon which they depend provides a concrete basis for participation at a number of levels.

The PPGIS approach is clearly valid beyond the case of fisheries and might be used as a way to integrate a variety of commons “inhabitants” (e.g. recreational or other user groups) into the spatial management of common marine environments. Integrating these groups and their geographic understandings and uses of the marine environment is an important step toward avoiding the dissonance that often results from official mappings of the environment that ignore the perceptions and experiences of local communities.

Part Two: Sessions

Session 1: Non living resources

An introduction was given in terms of the Belgian state of the art for:

- transport with shipping, dredging and dredge disposal
- sand and gravel extraction, and
- energy with cables, pipelines and wind turbines

A short summary emphasised the crucial issues for some of these user functions. The user functions were also geographically pointed out using a brief map introduction. The central question was “How do we allocate marine space to this user function?”. The discussion was then built starting from certain relevant aspects and questions concerning certain user functions:

Issues on dredge disposal sites

- Small pockets with high intensity disposal based on economic issues such as distance from dredging sites and recirculation
- Long distance and long term impacts as a consequence of turbidity plumes and toxic pollution
- Opportunistic use of dredge disposal as recycling for extraction
- The establishment of ecosystem links and ecosystem indicators to reflect dredge disposal impact
- The creation of larger “waste disposal” zones

Issues on sand extraction sites

- Small pockets with high intensity extraction based on economic issues such as distance to the coast and sand suitability
- Local depressions and change in currents because of high intensity extraction pockets
- Missing data concerning sand transport and recovery of affected banks
- Long distance and long term impacts as a consequence of turbidity plumes and resuspension
- The spread of extraction intensity based on temporal closure of zones
- The establishment of ecosystem links and ecosystem indicators to reflect extraction impact?
- The creation of larger “extraction” zones in the open sea?

Issues on wind energy

- Economic issues such as distance from coast
- Environmental suitability such as geology
- Environmental limits such as impact on alongshore sand transport, benthos, seabirds and habitats
- Seascape and distance to coast
- Cabling for electricity
- Interaction with other users such as shipping, fisheries and military use
- The establishment of ecosystem links and ecosystem indicators to reflect wind turbine impacts?
- The creation of “energy” zones?

Session 2: Living resources

An introduction was given in terms of the Belgian state of the art for:

- fisheries and aquaculture
- tourism, and
- marine protected areas

A short summary emphasised the crucial issues for some of these user functions. The user functions were also geographically pointed out using a brief map introduction. The central question was “How do we allocate marine space to this user function?”. The discussion was then built starting from certain relevant aspects and questions concerning certain user functions:

Issues on fisheries

- Required data
- Oral mapping
- Optimal scale for zonation
- Allocation of fishing zones
- Environmental limits of fishing zones
- Socio-economic effects
- Interaction with other functions

Issues on aquaculture

- Allocation of aquaculture zones
- Environmental limits and suitability for aquaculture
- Interaction with tourism, MPAs and energy

Issues on tourism

- Required data and level of detail
- Data on effective location and intensity
- Allocation of tourism activities
- Differences in beach-related activities and sea activities
- Environmental limits for tourism zones
- Socio-economic effects
- Interaction between tourism and MPAs

Issues on marine protected areas

- Ecological data for designating MPAs
- Required level of data
- Data on management measures in designated MPAs
- Allocation of MPAs
- Offshore MPAs (beyond 12 miles zone)
- Optimal scale for MPAs
- Elements to be taken into account for delimitation
- Integral coastal protected areas (combination of land and sea protected areas)
- Effects of MPAs on environment: chances for restoration
- Effects of multiple-use zones
- Socio-economic effects

Session 3

The second day of the workshop (session 3 and 4) tried to address the issues as generated by the two previous sessions in more detail. The challenge is to bring the different use functions together and to actually make a plan taking into account the different data, zonation and interaction issues. Session therefore concentrated on the following issues

Data

- How to deal with missing, insufficient or incomplete data?
- How to deal with availability of data?
- How to choose the level of data? What about sampling point clustering?
- How to detect the necessity of data?

Zonation

- How to deal with spatial scale?
- How to deal with the degree of resolution and the size of the zones?
- How to deal with suitability of zones for certain user functions?
- How to define homogenous zones? On a legal basis or on a physical/environmental basis?
- What criteria should be used for environmental zonation?

Interaction

- How to deal with effects if not described in literature?
- The use of a qualitative vs. a quantitative index for effects?
- How to deal with spatial and temporal scale?
- How to deal with effects on the environment? Ecosystem level? What indicators?
- How to deal with effects on the socio-economic system? What indicators?
- How to deal with cumulative impacts?
- How to deal with hypothesised and/or delayed impacts?
- How to deal with contrasting effects of one user functions on several components
- How to compare or combine impacts from different user functions? Can we use impact classes?

Session 4

The last session aimed at summarising the previous discussions. It was meant to lead to answers on the questions as being addressed above possibly formulated as recommendations. This session however wanted to go beyond the mere scientific and analytic approach of the previous sessions. Two additional aspects were dealt with:

- Balancing environmental and socio-economic objectives
- Decision support and public participation

Part Three: Report of the Workshop

1. Introduction

- 1.1. As mentioned above sessions 1 and 2 described the different historical, current and future use functions on the Belgian part of the North Sea (BNS) and their issues regarding spatial planning. The following two sessions then introduced the GAUFRE project as a search for a strategic planning tool and a decision support instrument for spatial planning at the BNS. This emphasised the different analytical steps to be followed.
- 1.2. The workshop revealed different elements, proposals and recommendations towards the further development of the GAUFRE project. These are stated below. The issue of spatial planning at sea however is to be tackled on several levels. It is therefore important to emphasise the focus of the workshop.
 - 1.2.1. The focus was on the development of an analytical decision support system rather than on the management of political decision making as such.
 - 1.2.2. The focus was on the development of a tool rather than the actual making of a spatial plan as outcome of such a tool.

2. Strategic vision

- 2.1. The development of a strategic vision concerning a spatial plan at sea – before initiating a planning process – is very valuable and often underestimated.
- 2.2. The strategic vision and its link with a spatial plan could learn from the procedure on land in which a “desired” spatial structure plan is produced. This “desired” plan is fed by an underlying strategic vision.
- 2.3. The strategic vision should go beyond short term issues and small scale conflicts. It should optimally take into account:
 - 2.3.1. A revision of a rigid system being ruled by political and economic sensitivities;
 - 2.3.2. An integration of planning at sea with planning on land;
 - 2.3.3. An integration of national planning with regional and international planning;
 - 2.3.4. A public participation from the very beginning.

3. International framework

- 3.1. Most use functions and their space allocation on the BNS should be seen in a strategic way within an international and European network. It is obvious that marine spatial planning should go beyond boundaries.
- 3.2. The Belgian part of the North Sea is – on different levels – part of a much larger system belonging to the North West Atlantic, the EU waters and the North Sea. It links the English Channel with the southern part of the North Sea.
- 3.3. The levels that contribute to the international integrative network are varied. The most important however are:

- 3.3.1. Shipping: The BNS covers one of the busiest shipping routes in the world linking the English Channel with the southern part of the North Sea. The Belgian coast and the Westerscheldt estuary reveal harbours that are part of a larger harbour network along the North Sea nations (Hamburg-Le Havre Range).
 - 3.3.2. Fisheries: Both the economic control of the fish catches (EU Common Fisheries Policy) as well as the ecological control of the fisheries stocks (spawning and nursery areas) are to be seen on an international rather than national level.
 - 3.3.3. Environment: The EU Environmental Policy Framework stresses the need for coherent knowledge of ecological significance and biodiversity on an international scale. It is also obvious that environmental impacts are transboundary.
- 3.4. The strategic vision (see 2) will have to be rethought within this international framework and will need to break through a solid system of historical and fixed rules.
- 3.5. General recommendation that were given regarding the international framework are:
- 3.5.1. Cooperate with neighbouring countries within research partnerships;
 - 3.5.2. Cooperate with neighbouring countries making use of agencies within these countries.

4. Decision rules

- 4.1. In order to identify the operational context of all allowable use functions, decision rules per sector need to be described. These decision rules therefore are operating principles and should be a reflection of the best option and the most ideal situation for the sector. They should be based on a general strategic vision (see 2.) and should take political issues into account.
- 4.2. The decision rules can not be isolated from intersectoral clashes, conflicts and synergies. They are therefore to be identified as “as far as practicable” taking these interactions into account. These intersectoral interactions should go beyond the marine realm and also concentrate on links with land use.
- 4.3. The types of decision rules that are generated within the different sectors are varied and encompass:
 - 4.3.1. Legislative requirements: These requirements are on a single use level such as EIA or on a multiple use level. Examples are “as of right” rules and permit and licensing systems;
 - 4.3.2. Political and policy requirements on a single and multiple use level;
 - 4.3.3. Scientific requirements leading to quantitative decision rules either based on the socio-economic state of the activity or on the state of the environment.
- 4.4. The method to generate decision rules should start from already existing rules. It then makes use of public participation, expert knowledge and literature. The consultative process with government, sectors and public is very important.
- 4.5. The aim of decision rules in the planning process is to identify possible solutions within constraints. This process therefore follows 3 steps:

- 4.5.1. Define clear goals and objectives per sector i.e. outline the decision rules per sector in interaction with other sectors (see above);
- 4.5.2. Define the type and the resolution of data needed: Decision rules as generated under step 1 should lead to the identification of required information. These data gaps then make way to focused future research. Immediate research priorities should directly contribute to the planning process. Long term research priorities could eventually finetune plan revisions in a later stage;
- 4.5.3. Make a management plan with different scenarios using a multiple objectives analysis in order to balance the objectives of the decision rules per sector with the others. By the time the actual planning process has started, decision rules per sector will only show minor changes.

5. Information

- 5.1. Information is needed at all levels of the planning process as stated under 4.5. The management of data however faces problems. Most of these problems are to be found on two levels:
 - 5.1.1. The quantity of data: Missing data or a problem with accessibility to data lead to data gaps. On the other hand, too much data can lead to a lack of overview and focus;
 - 5.1.2. The quality of data: Not all data are fit for use and metadatabases are needed to control quality.
- 5.2. Data management should go beyond the mere scientific generation of data as being published in literature and grey literature. It should therefore also make use of a thorough public participation. This can contribute to the filling of data gaps but can also narrow data if too many are available.
- 5.3. The use of public participation as a data tool can reveal historical data, local ecological knowledge and socio-economic knowledge. It should concentrate on the community as a whole, on representatives of the different stakeholders and on experts. It should be made clear that the delivery of information by the community and by stakeholders is in their own advantage.
- 5.4. Especially the fisheries sector is a valuable source of public and oral information. Specific methodologies exist to reach the fisheries community and to generate information from these interviews. This leads to the collection of historical data, to oral mapping, to fisheries hot spots, etc.
- 5.5. Information and data gathered using public participation should not be seen as unscientific. Public information is seen as an additional – scientific – source of information. Social science should be seen as an integral part of the whole process. It should eventually be combined with, rather than replaced by, “real” scientific data. “Social” data have the strength to bridge analytical gaps created by a continuous flow of “real” scientific data.
- 5.6. Besides the search for new data gathering tools – such as public participation – attention should also be given to the focus on certain data pools:
 - 5.6.1. Information on cross sectoral issues and conflicts are of the utmost importance to generate decision rules and to balance them in a planning process;

5.6.2. Monitoring and the use of carefully selected reference sites will reveal reference data to be used within a dynamic planning process.

5.7. In conclusion, it was stated that there is need for a general way of coping with data problems and learning how to deal with uncertainty and missing data:

5.7.1. It is not necessary to collect all data in order to make a decision;

5.7.2. It is important to be open and honest about data problems.

6. Public participation

6.1. Public participation aims at an active involvement of the public in the process. It can either be institutionalised or at random. The use of public participation within the planning process should start from the very beginning. There is need for a continuous exchange of information between the public and the planners.

6.2. Public participation is used on three different levels:

6.2.1. The collection of data from the public by making use of local knowledge (see 5);

6.2.2. Involving the public in the planning process;

6.2.3. Involving the public in the decision making process.

6.3. Involving the public in the planning process can be done on different levels:

6.3.1. The public should be involved from the beginning with the creation of a strategic vision (see 2);

6.3.2. The public should be involved from the beginning with the creation of decision rules (see 4). The exchange of goals and objectives among stakeholders from different sectors can lead to an acceptance of “as far as practicable” decision rules within each sector separately;

6.3.3. The public should be involved from the beginning with the generation of scenarios and their impact analysis. The risk exists that these scenarios are not politically acceptable. The actual generation of scenarios however should be done independently from politics.

6.4. The extent to which the public can actively get involved in the planning process is dependent on several factors. Some sectors such as fisheries will be more available for involvement. Also the political and cultural background of the country or community involved can play a role.

6.5. Involving the public in the decision making process can also be done. Though the actual decision making is done by the decision makers, the public can also play a role. The active involvement of the public in the scenario generation during the planning process will avoid conflicts at the end of the ride. Though the public may not be actively involved in the making of a final decision, this process will enhance the acceptance of a final plan or a decision.

7. Technology

7.1. Information management, impact analysis and decision support can all be assisted by using a variety of techniques and methods.

- 7.2. Concerning information management techniques, two issues were touched upon during the workshop:
- 7.2.1. Several techniques exist to generate information from local knowledge and usage knowledge. Most of them can be found in the social fisheries sciences;
 - 7.2.2. Geological, biological and ecological information should be expressed in a geographical way by means of validation mapping. However, these validation maps should go beyond mere data and should therefore address issues of functionality within the system (f.e. its link with hydrodynamics or its link with higher trophic levels). It is also important to put "validation" within a human value system.
- 7.3. Impact analysis can be tackled in different ways. The use of matrices is a simple way to combine different aspects of different sectors and carry out a physical conflict analysis based on best knowledge. This can only be done after a definition of objectives and priority actions of current and future use functions. Also the environment should be defined.
- 7.4. The actual decision support systems are of main importance as tools during the planning process. Possible techniques are multiple objectives analysis, cost benefit analysis and comparison methods in which decision rules of sectors and among sectors are evaluated and balanced. During the development of these decision support systems, two issues need to be taken into account:
- 7.4.1. Decision support systems should not be too sterile and analytical. Such tools will lead to outcomes that will not be accepted by the public. The public might show up with proposals that are completely different from the analytical outcomes of the tool;
 - 7.4.2. Decision support systems should not try to take every single detailed impact into account. A detailed impact analysis will lead to even more analytical gaps and confusion about reliability of outcomes.
- 7.5. There is also an increasing need for academic and educational tools in order to make the public familiar with issues concerning marine management.

8. Management instruments

- 8.1. The allocation of marine space to use functions and the concurrent marine spatial planning is a major instrument in managing the marine realm in a sustainable and productive way. Other instruments are also available.
- 8.2. Planning and regulation of the public commons of marine areas and resources carries a requirement to consider the best public benefit from those resources. The burden of proof is conceptually on the user of those resources to demonstrate that the use is reasonable, sustainable and that it does not bring unreasonable detriment to other current and future uses. An example of this burden of proof would be to demand performance data in order to extent a permit or license.
- 8.3. Financial management instruments were also addressed such as the polluter pays principle and the creation of funds by users themselves in order to finance management issues and monitoring in a later phase.

- 8.4. The limitation of accessibility to resources was briefly mentioned during discussions on fisheries. The temporal or permanent closure of areas in order to safeguard fish stocks can be done in different ways. It was stated that the protection of spawning and/or nursery areas – even if situated outside the BNS - will be more effective than the actual closure of fishing grounds themselves.

9. Planning process

- 9.1. The above mentioned aspects are all part of the actual planning process, be it on different levels and in different stages of the process.
- 9.2. The planning process however should be characterised by certain general principles:
- 9.2.1. The planning process should be a systematic and iterative process following a well developed protocol;
 - 9.2.2. The planning process should be open. This transparency should be reflected on different levels such as legislation, information gathering, impact analysis, technology as well as on generation of scenarios and the actual decision support;
 - 9.2.3. The planning process should be dynamic and continuous with a large degree of flexibility towards modification in time. Continuous monitoring within carefully selected reference sites is a way to guide this process;
 - 9.2.4. The planning process should be positive and avoid the process of exclusion. Especially on a small area such as the BNS, it is of the utmost importance to stress opportunistic and mutual use of space (such as tourism and MPAs and fisheries, windfarms and aquaculture).
- 9.3. It can be valuable to apply certain aspects of the land planning process on the process of planning at sea. This was already reflected in Decision Rules (see 4). The land use planning also starts from an existing spatial structure with baseline information on socio-economic and ecological data. The generation of decision rules within and among sectors will then lead to the creation of a desired spatial structure with different scenarios.

10. Conclusion

- 10.1. The elements, proposals and recommendations, as stated above, reveal two aspects that reshape the continuation of the GAUFRE project in two ways:
- 10.1.1. It is important that the tool for decision making in spatial planning at sea is not too rational and analytical. It is important to merge pragmatism and public participation with the development of the tool;
 - 10.1.2. The current methodology is valuable but should be applied within decision rules to be created for each individual sector and their inter-sectoral interactions. The actual tool should focus on calculating the impacts on these decision rules.