

## **A SPATIAL ECOSYSTEM-BASED MANAGEMENT PLAN OF HUMAN ACTIVITIES IN THE BARENTS SEA**

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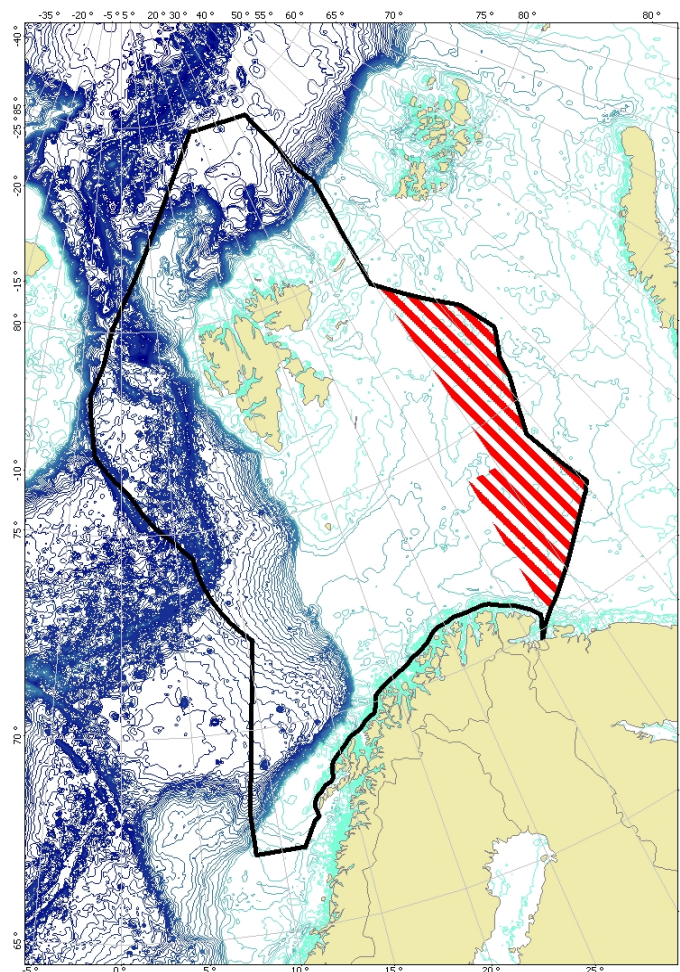
### **ABSTRACT**

Earlier this year a White Paper from the Norwegian Minister of the Environment presented a new, holistic, area-based management plan for the Norwegian part of the Barents Sea, including the Fishery protection zone around Svalbard. The plan will provide guidelines for managing human activities in relation to their use and impact on the ecosystem, and for handling conflicting interests between different activities and between use and conservation. The plan is thus a practical example of an ecosystem approach to the use of the oceans, and the paper describes the process of how the plan was developed. Spatial analyses and area based management have been used both in the development of the plan and as a tool for managing human activities. Key biological areas of the Barents Sea ecosystem were identified and possible anthropogenic threats to these were described. Similarly, existing human activities like fishing, shipping, aquaculture, and external influences (pollution etc.) were described in a spatial context. Possible areas of conflict between existing and future (oil and gas) human activities, and between human activities and the need for conservation were identified and classified. The consequences of human activities were assessed by the use of environmental and socioeconomic indicators. The socioeconomic indicators were related to revenue, investment, employment and settlement, and these were classified as large, medium or small. Based on these analyses the management plan has divided the Norwegian part of the Barents Sea into areas. In each area a set of regulations has been proposed, governing human activities in relation to each other and in relation to the ecosystem. Among the measures being considered are the limitation of bottom trawling in sensitive habitats, non-opening of ecologically sensitive areas to petroleum activities, and seeking IMO permission for moving shipping lanes to 35nm offshore. <P>

**Keywords: Barents Sea, Ecosystem based management, plan, integrated**

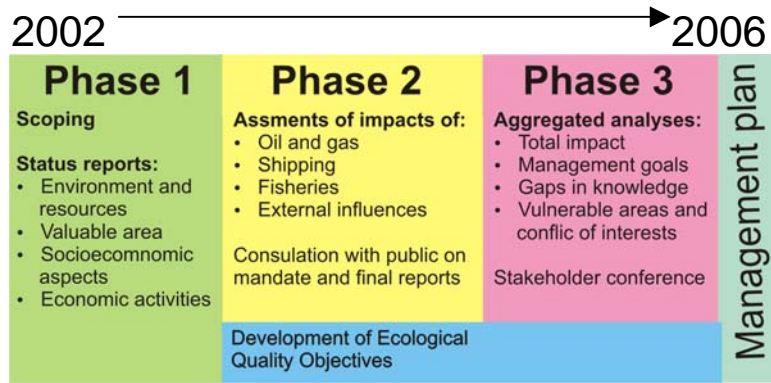
### **INTRODUCTION**

In June 2006 the Norwegian Storting (parliament) passed a government white paper for the establishment of an integrated, ecosystem-based management plan for the Barents Sea (Anon, 2006). The management plan covers the Norwegian EEZ and the fishery protection zone around the Svalbard archipelago (Figure 1). It is a bottom-up plan building on existing management structures, by bringing them together, rather than replacing existing management regimes with a new systems. In this way the management plan is an evolution of existing management rather than an evolution.



**Figure 1 The Barents Sea. Area covered by the management plan is shown by the black line. The red hatched area is the area of overlapping claims between Norway and Russia.**

Development of the plan started in 2002, following the 2001 parliament election when a new government took seat. The in their inauguration statement (Anon, 2001) the new government promised the development of an integrated management plan for the Barents Sea. The promised management plan came in parallel to the Johannesburg declaration (United Nations, 2002) where the signatory countries (amongst them Norway) promised to work towards sustainable, ecosystembased management of the marine environment by 2015. The plan was developed under the auspice of an interministerial steering group headed by the Ministry of Environment, but with the Ministry of Fisheries and Coastal affairs, Ministry of Foreign Affairs and Ministry of Petroleum and Energy. The steering group brought in their underlying research institutes and directorates to produces the scientific basis and give advice through the development process. This process started in 2002, and lasted for 3.5 years until the government white paper (Stortingsmelding) was presented in March 2006. Figure 2 gives an outline of the phases during the development of the management plan, with the main reports/analyses produced at the different steps.



**Figure 2 Time-plan for the development of the management plan from 2002 to 2006.**

Transparency and openness was a fundamental requirement for the development process, which was carried out by making all reports publically available, through public meetings at different stages in the process, and through public consultation on plans for assessments etc. Other important prerequisites for the development process was that the time frame was 2002 – 2006; by 2006 the government wanted to present the plan. With this strict time-frame there was little room for new, in-depth analyses, and therefore the plan is based on the best available current knowledge (2003).

In the following paper we will briefly describe the stages of the development of the plan and the main management tools presented in the plan.

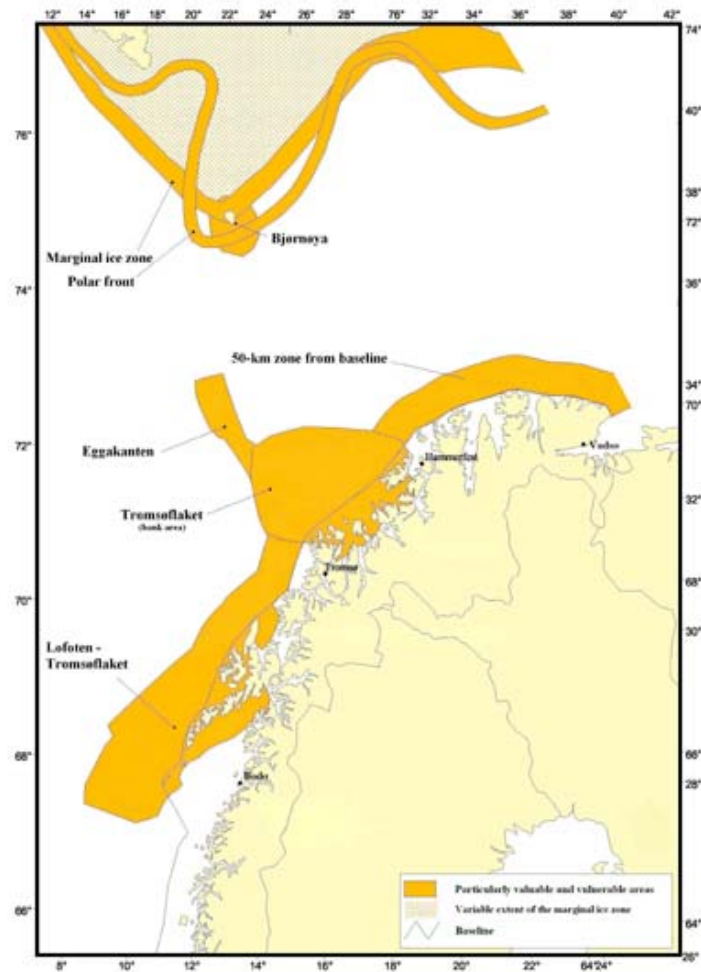
## INITIAL PHASE

Defining the extent of the management plan, both geographically and temporally together with production of status reports on the Barents Sea and surrounding area were the main tasks in the initial phase of the development of the plan. The geographic extent was (after much ministerial debate) decided to cover the Norwegian EEZ and the Fishery protection zone around the Svalbard archipelago. To the west, the plan was limited by the lower end of the continental slope, and to the south by the Lofoten Islands (see Figure 1). To the coast the plan was limited to 1 n.mi. offshore of the coast-line. This excludes bays, archipelagos and fjords from the management plan area as these coastal areas are to be managed according to the EU water directive. Thus the plan is aimed at managing an ocean area, but the effects of ocean activities on coastal areas were central issues that were evaluated during the development process.

Another decision during the scoping process was that the plan was to be based on comprehensive assessments of current and future (up to 2020) impacts of human activities on the ecosystem and the society in the region for each of the sectors: petroleum, fisheries, shipping and external influence (eg pollution stemming from outside the ecosystem). In order to achieve this a set of common variables were developed to be used in the impact analyses to ensure that all impact assessments were comparable. The variables used covered both the physical habitat, the biological components and socioeconomic factors.

Phase one also encompassed the development of a host of status reports on issues ranging from the state of the ecosystem, socioeconomic state in the region and identification of valuable areas. For the full list of status reports please see the government web site (<http://www.dep.no/md/norsk/tema/svalbard/barents/>).

The report identifying the valuable areas in the region (Olsen and von Quillfeldt, 2003) became especially important throughout the development and the following political debate. In this report several areas were identified as especially important, and this evaluation followed the development of the plan and was presented in the final plan as a map over the most valuable and vulnerable areas in the Barents Sea (Figure 3).



**Figure 3 Ecologically valuable areas identified in the Barents Sea.**

The six valuable areas identified in the report and shown in Figure 3, and cover the coastal areas of mainland Norway from Lofoten in the Southwest to the coast of Finnmark in the east. Offshore valuable areas were identified around Bear Island (Bjørnøya), along the polar front (where warm Atlantic waters meet cold arctic water masses), and along the ice-edge. All of these areas were classified as valuable based on an assessment of their importance for the biological production of the ecosystem, either as spawning, breeding or important feeding areas for several species.

## SECTOR WISE IMPACT ASSESSMENTS

Assessing the impacts of all human activity on the ecosystem and society in the Barents Sea region was a central step in the development of the plan in order to understand the present and future pressures and challenges facing the Barents Sea. This process was split into four parallel impact assessments: 1) petroleum activities, 2) fisheries, 3) shipping and 4) external influence (eg. Pollution from outside the area, alien species, climate change). The assessments were based on the best available current knowledge, but due to the time-constraints set for the development of the plan there was no room to conduct new

research to fill apparent knowledge gaps. The main findings of these impact assessments, up to 2020, were as follows:

•**Petroleum activity:** Its expansion will be the main change in human activity in this period. Possible impacts from oil spills and risks related to rising transport volumes.

•**Fisheries:** Management is currently based on the precautionary approach. IUU fishing and insufficient control may have serious impacts on resources, environment, trade and local communities

•**External Influence:** **A) Pollution:** The situation in 2020 is likely to be unchanged from 2006. Inputs of "old" hazardous substances are expected to decrease, but they are already dispersed and degradation is slow. Inputs of "new" hazardous substances are expected to increase. **B)•Introduction of alien species:** this is a serious threat, which will increase as tanker traffic increases. May result in substantial changes in ecosystems.

•However, for a longer time-frame, up to 2080 it was clear that the greatest challenge to the Barents Sea was climate change. The most recent ACIA report shows that the Arctic, including temperatures in the Barents sea are expected to increase by ~2°C, resulting in large changes in the distribution, abundance and migration of the species living in the area.

## DEVELOPMENT OF EcoQOs

Parallel to the impact assessments a set of ecological indicators and associated objectives were developed by Norwegian and Russian Scientists. Basing their work on the OSPAR work, and the recent set of indicators developed for the North Sea a set of 40 EcoQOs for the Barents Sea covering the following areas:

- physical environment
- phyto- and zooplankton
- ice-edge
- fish and fisheries
- marine mammals
- seabirds
- benthos and benthic habitats
- vulnerable and threatened species
- alien species
- pollution

Most of these are based on existing data series, or existing analyses done for stock assessment or environmental assessment, but a large minority are new indicators requiring either new research on existing data to produce aggregated indicators, or by requiring entirely new data (eg. Monitoring of the benthic habitat).

## AGGREGATED ANALYSIS

The last analytical phase of the development of the management plan was phase 3 (see Figure 2) where the results from the sectorwise impact assessments were brought together to analyze the total anthropogenic impact on the Barents Sea. This proved more difficult than anticipated both due to the differences between the different impact assessments, and for lack of tools to combine these. Therefore this stage was mostly qualitative, with one notable exception: areas use. In this stage an in-depth GIS analysis of the area use by different activities was carried out to identify areas of potential conflict between activities, and between human activities and ecologically valuable areas. An overview of this kind of analysis is shown in Figure 4.



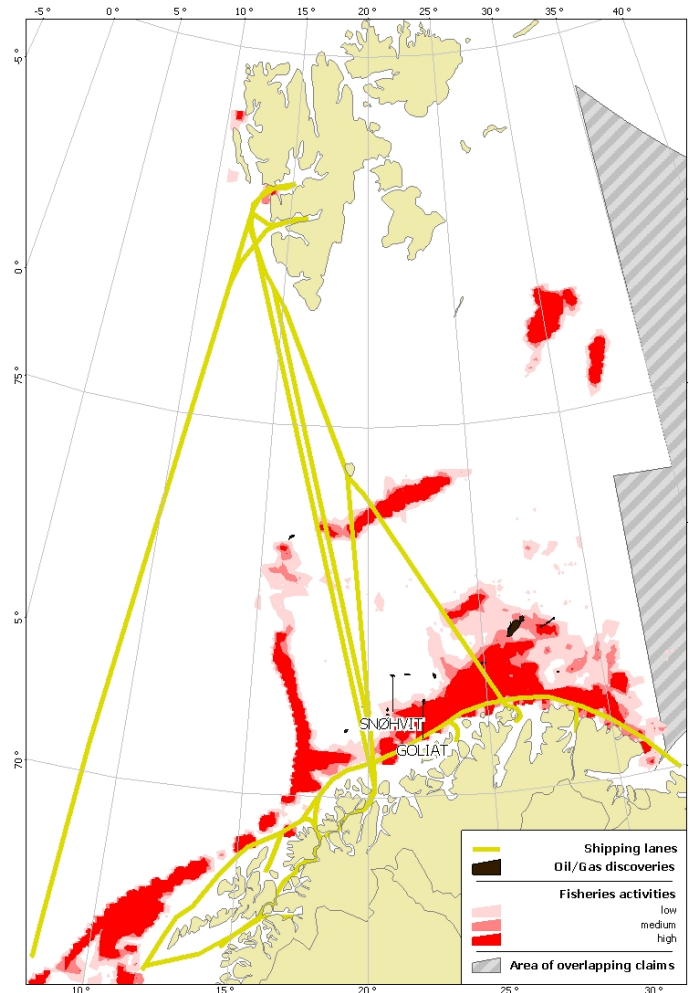


Figure 4 Map showing fisheries activities (based on data from 2001), shipping lanes and oil and gas discoveries.

## THE PLAN

### Management goals

Also during stage three, management goals from the different sectors, from national legislature and from international agreements/protocols were brought forth in order to develop a set of over-arching management goals for the whole ecosystem. The main goal for the plan is to: *"safeguard marine ecosystems to ensure long-term value creation and ensure that activities in the area do not threaten the natural resource base or opportunities for value creation in the future"*.

The plan also specifies specific goals for each sector, eg. (the following list is not comprehensive):

- Prevent or limit pollution
  - o Build up knowledge
  - o Follow up and develop international initiatives
  - o Ensure zero discharges of pollutants and produced water from petroleum activities (*"Zero-discharge goal"*)
- Ensure that seafood is safe
- Reduce the risk off and take steps to prevent oil spills
  - o Ensure a satisfactory level of oil spill preparedness (tug capacity etc)

- Enhance maritime safety
- Mandatory routing and traffic separation schemes
- Maintain biodiversity at all levels
  - Take steps to protect particularly valuable and vulnerable areas Manage commercial resources (e.g. fish) according to the precautionary principle
  - Avoid introduction of alien species
  - Maintain and safeguard nature types and habitats
  - Survey benthic habitats and introduce measures to minimize impacts on valuable and critical habitats

### **Gaps in knowledge**

The plan is a science based plan based on a fairly good scientific understanding of the Barents Sea. Even so, there are gaps in our knowledge of the system that needs to be filled in order to handle important management questions raised by the concept of ecosystem based management. These were collated from all gaps in knowledge identified through the whole development process and were prioritized according to their importance for management decisions, especially the implementation of the management plan - being the implementation of the proposed EcoQOS. The three most important gaps in knowledge are:

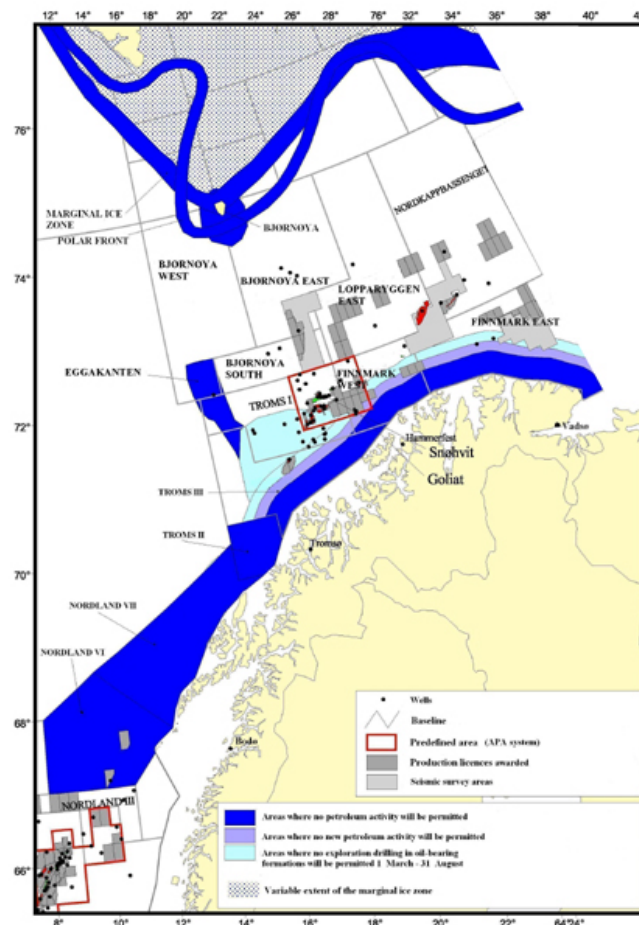
- Mapping the bottom habitat
- Studies of ecological interactions between species and components of the ecosystem
- Studies of the effects of pollutants.

The plan calls for the following measures to fill these identified gaps.

- A better coordinated environmental monitoring system, to monitor the state of the ecosystem and environmental trends (indicators, reference values, action thresholds)
- Expansion of research activity and surveys
- Steps to fill gaps in our knowledge: activities under the Research Council of Norway

### **Framework for petroleum activities**

The framework for future petroleum activities was the aspect of the management plan most fiercely debated during the development of the plan. The most extreme points of view call for either a total closure of the area for all petroleum activities, or opening all areas to petroleum. The plan presents a compromise framework for petroleum activities in the region with the clear premise that this framework will be reassessed at the first revision of the plan due in 2010. Figure 5 shows the framework for petroleum activities. The plan closes the coastal and near-coast areas from Lofoten to Finnmark for all petroleum activities. In addition the areas around Bear Island, the ice edge, polar front and the continental shelf break (Eggakanten) area completely closed. These areas correspond to almost all the valuable and vulnerable areas identified at the start of the development process (Figure 3). The areas of the Tromsøflaket bank area (another valuable area) is only closed during part of the year, while a narrower coastal zone (grey band in Figure 5) is not open to new activities, meaning that activities that previously have been granted licenses will be allowed to take place. In the open, ice-free areas of the Barents Sea no areas are closed. This does not mean that it is free for all to go out and drill at leisure. Standard legislature, analyses, applications and environmental impact assessment must still be carried out, and only a limited number of smaller areas (blocks) are opened at any time.



**Figure 5 Framework for petroleum activities in the Barents Sea from 2006 – 2010.**

### **Implementation, cooperation and revision**

Cooperation between institutes, directorates and ministries was fundamental requirement for the plan to be developed. Ecosystem-based management requires sector-spanning cooperation, the abolishment of old “turf-wars”, and an increased level of trust between the participating government bodies and groups. Transparency and stakeholder involvement are also important to ensure, to secure a broad acceptance, interest and compliance with an ecosystem-based management plan. These factors are also of great importance when the plan is implemented, and to ensure this the Norwegian plan introduces several measures to ensure cooperation, transparency and stakeholder involvement.

The plan calls for an annual assessment of the state of the Barents Sea, using ecosystem indicators. To achieve this an advisory groups consisting of all institutions carrying out monitoring in the Barents Sea is set up to coordinate and cooperate on monitoring. Results will be published annually, and reports, analysis and data will be made available through internet portals.

Every 4 years the plan is due for a revision where the foundations for previous decisions are to be reassessed. Again, a broad groups consisting of all institutes carrying out monitoring/research in the Barents Sea is set up to give advice developments of the plan. This ensures that the plan is dynamic and that new knowledge gives basis for reassessing previous management decisions.



A forum for Environmental risk assessment is also set up between government institutions and shipping and the petroleum industry. This forum has as its task to strengthen the work on environmental risk assessments in relation to shipping and petroleum activities.

To ensure that stakeholder views are taken into account the plan calls for the establishment of a reference group where stakeholders (industry, academia and NGOs and other) can meet government to give input to the implementation and revision of the plan.

International cooperation is also fundamental for successful ecosystem-based management. Norway shares management of the Barents Sea with Russia, and a successful management plan for the Norwegian EEZ requires good cooperation with Russia on sustainable, ecosystem-based management of the whole Barents Sea. In addition ecosystem-based management requires dealing decisively with important global issues like far-transported pollution, existence of threatened species and climate change. Focus is therefore placed for Norway to participate in the global forum to develop comprehensive and effective global regulations.

## **DISCUSSION**

The Norwegian management plan for the Barents Sea is one of the first practical implementations of ecosystem-based management of a large marine ecosystem. It is a bottom-up evolutionary approach, building on existing legislature, institutions and management processes. It is a science-based plan, and science is at the focus during the implementation and coming revisions of the plan. The plan covers all sectors of anthropogenic activity in the area, but is focused on the environmental effects of human activities. It is therefore a challenge, at future revisions to include more socioeconomic and societal considerations in the plan. However, the main challenge through the development and the implementation is to ensure the necessary cooperation among participating bodies, transparency to the public and stakeholder involvement.

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