

Short communication

The Norwegian ecosystem-based management plan for the Barents Sea

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Olsen, E., Gjørseter, H., Røttingen, I., Dommasnes, A., Fossum, P., and Sandberg, P. 2007. The Norwegian ecosystem-based management plan for the Barents Sea – ICES Journal of Marine Science, 64.

In April 2006, the Norwegian government launched a White Paper on a new holistic management plan for the Norwegian part of the Barents Sea, including the fishery protection zone around Svalbard. Following international guidelines for ecosystem-based management, the plan provides an overall framework for managing all human activities (oil and gas industry, fishing, and shipping) in the area to ensure the continued health, production, and function of the Barents Sea ecosystem. The primary function of area-based management is the identification of areas of special importance from either ecological or human perspectives. In each area, access for different human activities is to be carefully managed. The plan is based on an assessment of the current and anticipated impact of human activities and of the interactions between them, taking into account deficits in current knowledge of ecosystem state and dynamics. To monitor the overall development of the Barents Sea's state of health, a set of indicators with associated environmental quality objectives has been developed.

Keywords: area-based, EAF, ecosystem approach, management plan.

Received 21 July 2006; accepted 9 January 2007.

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Introduction

The ecosystem approach (EA) to management has gained growing international acceptance at the policy level (UN, 2002; Ridgeway and Maquieira, 2006), and the scientific level (Browman and Stergiou, 2004, 2005; Garcia and Cochrane, 2005). Sustainable use of the whole ecosystem is at the heart of the EA (FAO, 2005). By 2006, the EA had been included in several national (O'Boyle and Jamieson, 2006) and multinational management strategies and plans, but few countries had developed detailed holistic multidisciplinary plans for entire ecoregions.

In June 2006, the Norwegian parliament passed a comprehensive integrated EA-based management plan for the Barents Sea and the sea areas off the Lofoten Islands (Anon., 2006), covering all areas offshore of 1 nautical mile of the coast within the Norwegian EEZ, as well as the fishery protection zone around the Svalbard archipelago (Figure 1). The main aim of the plan is to safeguard the marine ecosystem to ensure long-term value to mankind. In contrast to higher-level legislative implementations of the EA (e.g. Canada's Oceans Act; O'Boyle *et al.*, 2005), the Barents Sea plan contains detailed aims and regulations in addition to high-level goals. Major revisions are planned every 4 y.

Development of the plan, 2002–2006

The work was led by a government-appointed steering group chaired by the Ministry of the Environment, with representatives

from other relevant ministries. Cooperation across management sectors was a basic challenge faced throughout the process because, traditionally, the responsibility for the marine environment has been split between several ministries.

To achieve transparency, all reports and other documents were made available through the Internet, and stakeholders were invited to comment at several steps in the process. Their comments frequently resulted in modifications to the documents. The process attracted much interest because decisions based on this plan would affect future EA developments.

Development followed a three-step process (Figure 2), not unlike the Eastern Scotian Shelf Integrated Management project (O'Boyle *et al.*, 2005). In Step 1, status reports were prepared by governmental management and research institutions or by consultants, covering the state of the marine environment, the coastal zone, fisheries, aquaculture, especially valuable areas, and shipping. The initial reports uncovered major gaps in current knowledge. Therefore, a key principle was to use caution in the face of uncertainty. Also, the plan had to be dynamic to allow the evaluation of new knowledge as it became available. Determining the boundaries was another important issue, which included considerations of the ecosystem, economics, and politics, and examining discussions within ICES and other organizations. However, the process was not finished in time for the status reports to be produced as planned.

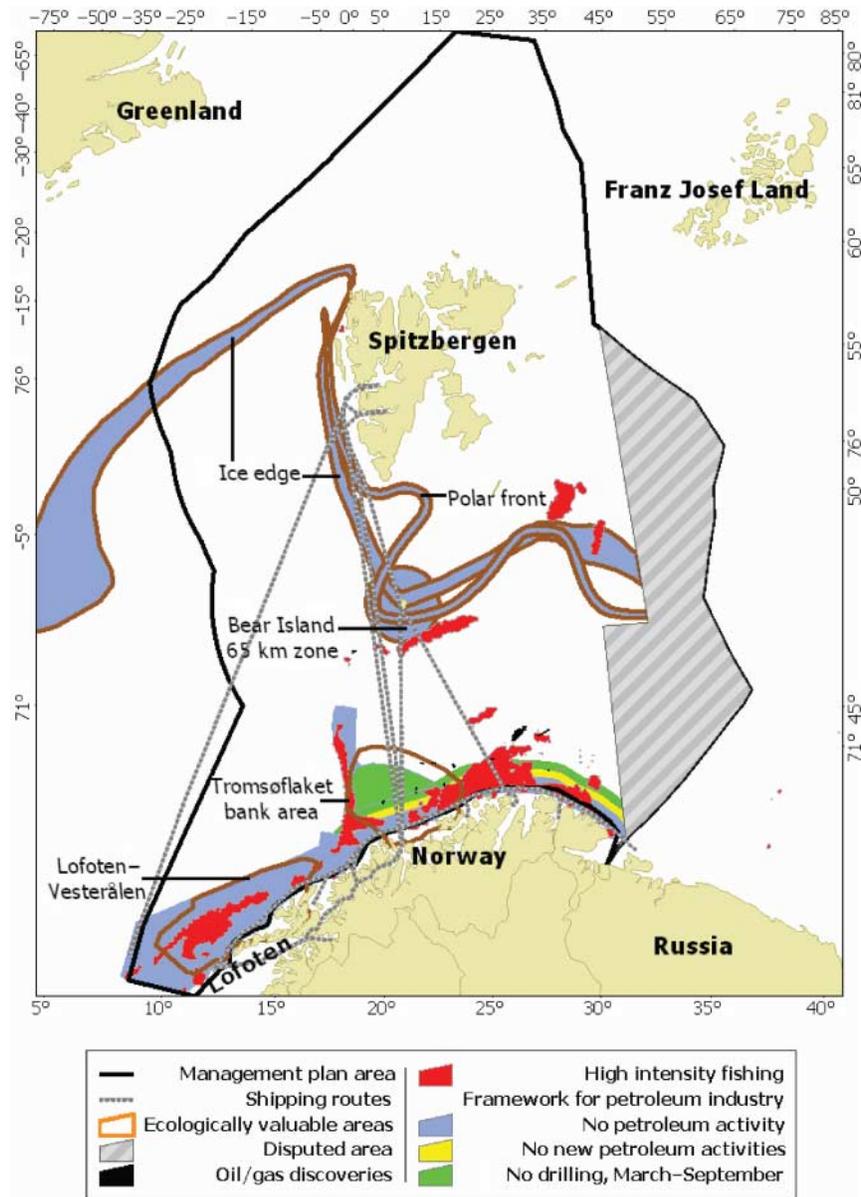


Figure 1. Area covered by the ecosystem-based management plan for the Barents Sea, showing the main fishing areas, shipping lanes, and the area-based framework for hydrocarbon extraction (2006–2010), together with the particularly valuable and vulnerable areas.

2002		2006	
Phase 1	Phase 2	Phase 3	Management plan ratified by parliament
Status reports <ul style="list-style-type: none"> • Environment and resources • Valuable areas • Socio-economic aspects • Economic activities 	Assessment of impacts of <ul style="list-style-type: none"> • Oil and gas • Shipping • Fisheries • External influences 	Aggregated analyses <ul style="list-style-type: none"> • Total human impact • Management goals • Gaps in knowledge • Vulnerable areas and conflicts of interest 	
Scoping <ul style="list-style-type: none"> • Area covered by the plan • Overall aims 	Public consultation on mandate and final reports Development of EcoQOs (with participation of Russian scientists)		

Figure 2. Three-phase development of the management plan for the Barents Sea, 2002–2006. The work was led by a steering group with representatives of four ministries, and the analyses and assessments were carried out by government directorates and research institutes.

The area covered was the offshore continental shelf of the Barents Sea, the adjoining slope towards the Norwegian and Greenland Seas, and the continental shelf and slope off the Lofoten Islands (Figure 1). The inner border was set to 1 nautical mile off the coast because water inshore of that is managed according to the EU Water Framework Directive. Transboundary threats are treated under both plans. From an ecological perspective, only part of the Barents Sea ecosystem is covered because the remaining area is within the Russian EEZ or jurisdiction is still being disputed. Therefore, improved cooperation with Russia on ecosystem-based management has been an important issue throughout the development process.

Step 2 represented an analytical phase based on Step 1. Four extensive government-funded Environmental Impact Assessments (EIAs) were carried out, covering the impact of fisheries, shipping, hydrocarbon extraction, and external pressures (e.g. pollution) on the environment, resources, and local communities. To ensure compatibility among the EIAs, a set of common variables was used to compare impacts among sectors, largely an *ad hoc* approach compared with the hierarchical process used by Canada (O'Boyle and Jamieson, 2006). Impacts were assessed in relation to the starting situation (i.e. 2003) and in relation to expected future impacts up to 2020, with uncertainty obviously increasing over time.

In Step 3, the EIA results were brought together and analysed in more detail, focusing on: (i) the total impact of all human activities combined, both for the current situation and up to 2020; (ii) area conflicts among human activities, and between human use and ecologically valuable areas; (iii) the definition of high-level management goals required for implementation; and (iv) identification of gaps in current knowledge.

The analysis of total impact proved difficult, because knowledge of the cumulative ecological impact of several interacting human effects is limited. Parallel with Steps 2 and 3, a set of operational environmental quality objectives (EcoQOs) was developed (Von Quillfeldt and Dommasnes, 2005), based on high-level management goals. These covered climate, ice edge, phytoplankton, zooplankton, commercial fish species, non-commercial fish species, benthic organisms, marine mammals, seabirds, alien species, threatened and vulnerable species, and pollutants. Possible operational objectives were also clarified. The EcoQOs will be monitored annually.

Main management tools

Measures for protection are essentially temporary tools to prevent negative consequences of human actions on an area, ecosystem component, or species when threats are severe, but do not necessarily provide permanent refuge. A central concept of the plan is that it is based on science and takes a precautionary approach, implying a need for revision as new knowledge becomes available. The plan represents a synergy of previously separate management regimes: management of fisheries, shipping, and the hydrocarbon industry are brought together under one umbrella to coordinate efforts and to achieve a healthy ecosystem. In practice, achieving measurable improvements in all these sectors is the main challenge, and these are envisaged by implementing: (i) area-based management to resolve conflicts between activities and protecting the environment; (ii) continuation of established management measures regulating the various activities; (iii) implementation of EcoQOs; and (iv) increased focus on international cooperation, regionally and globally.

Fisheries will not experience further growth, whereas increased growth is anticipated in hydrocarbon exploitation and shipping for some time to come. In the Barents Sea, fisheries have already been subjected to a strict management regime that has been developing continuously for several decades. Recently, harvest control rules based on the precautionary approach have been implemented for the major commercial stocks. Shipping and the oil and gas industry are also strictly regulated. In all cases, ecological considerations are taken into account. The plan does not provide detail on managing specific activities because that is the responsibility of the relevant ministries and management bodies.

The plan aims at sustainable use of the ecosystem, within acceptable levels of pollution, with reduced risk of accidental spills, with sufficient capacity and readiness to deal with accidents, and seafood that is safe for consumption, while safeguarding biodiversity. More specifically, the plan calls for:

- the hydrocarbon industry to operate under a zero emission policy;
- shipping lanes outside territorial waters to reduce the risk of collision and to allow increased time for remedial action;
- further preventative measures against pollution, both locally and regionally;
- ecosystem-based fisheries management;
- the implementation of ecological measures in fishery management based on an increased use of multispecies assessment tools, and aimed at a reduced bycatch of fish, seabirds, and marine mammals, and fewer effects on bottom fauna;
- an increase in the number of target species managed sustainably and under a precautionary approach;
- measures against illegal, unregulated, and unreported (IUU) fishing;
- a global ban on selling IUU fish;
- closer cooperation with the EU, Russia, and others to enhance surveillance, and including the prosecution of fishers violating existing rules (e.g. discarding, catching undersized fish, unacceptable modifications to gear);
- prevention of the introduction of alien species;
- the protection of valuable and threatened habitats.

The plan identifies ecologically valuable areas (Figure 1) and requires strict regulation of activities in these areas. To reduce conflict between fisheries and shipping, Norway has applied (through the International Maritime Organization) to move shipping lanes outside Norwegian territorial waters (its 12-mile limit). To avoid future conflict, some areas will be closed to hydrocarbon exploration and exploitation (Lofoten, Bear Island, the Polar Front, and the ice edge; Figure 1). The framework for hydrocarbon extraction has been the focus of political debate around the plan, and will probably continue to be so. Several new sector-specific area-based measures are also considered, including plans for extension of marine protected areas and the use of seasonally closed areas to protect spawning aggregations, fish eggs and larvae, and juvenile fish and shellfish.

Cooperation among government institutions has been ensured by creating three new advisory groups, all reporting to the governmental steering group: a "monitoring group" responsible

for coordinating monitoring activities and reporting annually on the state of the ecosystem, based on the EcoQOs; an operational “risk group” responsible for monitoring potential risks to the ecosystem and ensuring dissemination of information; and an “expert forum” responsible for advice on desirable revisions (the first being scheduled for 2010).

Many of the challenges facing the target area are global. Increased international cooperation on EA management and other global issues such as pollution is therefore vital to the plan’s success. Continued cooperation with Russia on management and implementation of decisions is especially important: without such cooperation, the plan would lose some of its potential merit.

Discussion

Many countries have integrated EA management on a policy level in national legislations, but only the UK, Canada (O’Boyle and Jamieson, 2006), and Australia (Scandol *et al.*, 2005) have implemented EA-based management plans for ecoregions. The Norwegian management plan is therefore at the forefront of practical implementation of EA management.

A potential shortcoming of the plan is that it does not cover the entire ecosystem (suggested as being crucial by Garcia *et al.*, 2003) and, to some extent, depends on good cooperation with Russia. A joint management plan for the entire region could be developed, but it is more likely that the Norwegian initiative would support the development of a compatible plan for the Russian sector of the Sea.

The plan follows the main principles of the FAO guidelines for EA-based fisheries management (Garcia *et al.*, 2003) and the implementation rules laid down recently by the UN (Ridgeway and Maquieira, 2006). FAO emphasizes the importance of effective control, and this requires improved international cooperation to reduce IUU fishing in the area. FAO also emphasizes the need for additional funding to support implementation. Although the EA appears simple, the need for increased cooperation across institutions and the inclusion of additional ecological considerations into management inevitably increases the cost (FAO, 2005).

Although ecosystem-based management is more complex than traditional sector-based management (Browman and Stergiou, 2004; Ridgeway and Maquieira, 2006), the call for sustainable management of marine resources is inescapable (Browman and Stergiou, 2005). The Johannesburg declaration on sustainable development (UN, 2002) calls for implementation of ecosystem-based management of global marine resources by 2010. The aims of the Barents Sea plan fit well within this international paradigm shift. EA implementation is founded on the concept of large marine ecosystems (LME) (Browman and Stergiou, 2005; Sherman *et al.*, 2005), although this initiative is necessarily limited to the Norwegian part of the Barents Sea. It is intended that similar management plans will be developed for the Norwegian Sea and the North Sea, but in those areas too, cooperation with other (national and international) administrations is desirable.

Economic and societal scope are important dimensions of sustainable development and plays a major role in decision-making on marine-resource usage (Garcia *et al.*, 2003; Ridgeway and Maquieira, 2006). So far, the Barents Sea plan is limited in dealing with these aspects, and these limitations need to be addressed in the revision in 2010. By that time, other international initiatives (revision of the UN Law of the Sea, the EU Marine Strategy, OSPAR Quality Status Report 2010) will have progressed, and no doubt, these will have substantial influence on, and reflect, the commitment of society to implement an EA as a support for management of marine ecosystems.

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