

# Oil and Gas Development in the Barents Sea – A Knowledge Base and Integrated Approach for Safeguarding the Environment

a report by

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## The Barents Sea Ecosystem

The Barents Sea and the areas off the Lofoten Islands contain one of Europe's last large, clean and relatively undisturbed marine ecosystems. The high primary production of the Barents Sea supports a rich biological diversity including some of the world's most numerous colonies of seabirds, such as little auk, puffin and guillemot, rich seafloor communities with kelp-forests, and a unique variety of marine mammals such as walrus, seals, bowhead whales and polar bears. The seasonal ice in the northern part plays a key role in the ecosystem function by providing a habitat to highly specialised sea ice animals, and sea ice algae appear to provide an important part of the diet to the benthic communities. The southern part of the Barents Sea is characterised by sponges aggregation, presence of fish nursery grounds and numerous and large deepwater coral reefs, which can be seen as Norway's underwater rainforest. The entire sea is situated well north of the Polar circle and can be seen as a world heritage.

The Barents Sea is also a place of high economical interest. The fisheries resources in the area are amongst the world's richest, generating a considerable level of economic activities. With an increasing global energy demand and high oil price, the Barents Sea has become a main centre of attention of the oil industry. The world's largest offshore gas reserve, Shtockman, has been discovered in the Russian sector of the Barents Sea. Discussions are on-going on how and when to develop the giant field. Starting in 2007, LNG gas from the Snøhvit field will be produced in the Norwegian sector to supply the world market, while the Goliat oil field also in the Norwegian sector will enter its production phase in the coming decade. Additionally, with an increasing offshore oil and gas industrial activities, there will be an increasing maritime transport along the coast of Russia and Norway.

As the anthropogenic activities gain momentum in the Barents Sea

numerous challenges need to be tackled to ensure that this marine ecosystem is protected and passed on to the future generations in good shape. The main challenge is to guarantee that existing fisheries activities, together with increasing maritime transport and new petroleum activities, do not constitute a threat to the environment. Therefore, a set of environmental measures need to be taken to protect the Barents Sea for the future as a basis for sustainable welfare and wealth.

## Barents Sea Integrated Management Plan

On 31 March 2006 the Norwegian government presented its integrated management plan for the Barents Sea and the sea areas off the Lofoten Islands. This is the first regional management plan for a Norwegian Sea area, and a milestone in the work towards establishing an ecosystem-based management in all Norwegian seas. The management plan sets the overall framework for both existing and new activities in these waters, and facilitates the co-existence of different industries, particularly the fisheries industry, maritime transport and petroleum industry. The aim of the plan is to establish an holistic and ecosystem-based management of the activities in the Barents Sea and Lofoten area. This means that all activities in the area should be managed within a single context and that the total environmental pressure from activities should not threaten the structure, functioning and productivity of the ecosystems. The management of the sea area will be based on ambitious goals that have been set for the desired environmental quality of the area.

## The 'Zero Discharge' Policy for the Oil Industry in the Norwegian Barents Sea

Among the goals set to guarantee the protection of the northern seas, the Norwegian authorities promulgated a 'zero discharge policy' in the Norwegian part of the Barents Sea, from Lofoten northwards. Therefore, environmental concern is related to accidental discharges (well blow-out, boat wreckage, pipeline leaks) and no increase of contaminants related to offshore oil and gas activities is expected. The operating companies have worked systematically for many years to reduce the discharges to sea to a minimum, and to answer to the regulations for the Norwegian shelf of 'zero harmful discharges'. The stricter 'zero discharge' requirements in the Barents Sea mean that efforts must be intensified with regard to developing and implementing new techniques that remove discharges to the sea. The wastes have to be reinjected or transported to the shore for treatment.

## Protection of the Particularly Valuable and Vulnerable Areas

The Norwegian authorities have implemented a 'no go zone' to the oil industry in Nordland VI and VII, Troms II, by the ice edge and the polar front, along the edge of the continental shelf from the Tromsøflaket bank area and northwards, and in a 65km zone around the Bear Island. There should not be any new petroleum activity



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undertaken in a 50km zone from the coastal baseline along the coast of Troms and Finnmark. In the area between 35 and 50km from the baseline the following exemptions will be made: petroleum activity in already awarded licences will be carried out, and development of additional resources to existing production licenses will be permitted. The above described restrictions for oil and gas activities will be reevaluated again in 2010, when the Norwegian government will decide if the given restrictions should be kept or if more acreage should be opened for oil and gas activities. New mandatory shipping lanes for high risk transportation at around 30 nautical miles from land will be established. At the end of January 2007 a traffic central for Northern Norway was established in Vardø for better monitoring of sea transport.

### Strengthening the Knowledge Base for an Integrated Environmental Approach

From the foregoing account, it is clear that environmental guidelines set for the Barents Sea are challenging for both the industry and for companies dealing with environmental issues such as Akvaplan-niva. In line with the integrated management plan promulgated by the Norwegian authorities, Akvaplan-niva's environmental group proposes an integrated multi-competence strategy to ensure that the oil and gas activities do not threaten the Barents Sea ecosystem. This strategy can be described in five main points:

- fundamental knowledge base development,
- adaptation and/or development of risk assessment tools,
- understanding the biological effects of contaminants on marine life,
- developing an integrated biomonitoring plan; and,
- fostering collaboration with Russians.

First, we believe that fundamental knowledge is of prime importance for any environmental related decisions; our group of researchers and consultants has long expertise in the understanding of the Barents

Second, as a poorly known ecosystem is considered for development of oil and gas industry, the risk assessments tools need to be appraised. Most of the risk assessment tools were developed for the North Sea and may not apply for the Barents Sea. For instance, stronger emphasis should be put on the recovery time of animal populations following an oil spill rather than on the acute short-term effects as exemplified by the Exxon Valdez oil spill which took place in Alaska in 1989. Therefore, integration of long-term effects data in these risk assessment tools could complement the acute effects data already in place.

This brings us to the third point, which is the production of ad hoc data for the risk assessment tools. As no operational discharges are expected, research needs to focus on accidental discharges, notably oil spill. To date, there is a vast amount of ecotoxicology data with temperate organisms, notably from the North Sea ecosystem. Most of the data cannot be applied within the context of the Barents Sea because the animals, the biology, the physiology and the physicochemical parameters of the ecosystem are different. Therefore, the research efforts to determine the effects of the toxicity of crude oil on the organisms with specific Arctic physiological adaptations need to be intensified. For instance, the research group in ecotoxicology in Akvaplan-niva puts lot of emphasis on the interaction between crude oil component and the antifreeze protein processes in the polar cod; similarly, because eggs and embryos of crustaceans have a long incubation time during the long dark winter period, there is higher risk for long exposure time to contaminants and therefore potentially increased effects directly on the next population. At regional scale, some oil fields are located right on the nursery ground of some fish species; this is the case for the spotted wolffish in Tromsøflaket. This calls for urgent attention.

Fourth, a biomonitoring plan needs to be developed. This means testing and validating tools, notably biomarkers, on some selected species inhabiting the various key compartments of the Barents Sea ecosystem. The strategy of Akvaplan-niva is to propose an integrated approach where competences of our key personnel, such as ecotoxicology,

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Sea ecosystem structure, functions and biodiversity. Our section on 'climate change' allows us to reveal that this ecosystem is changing at a relatively fast pace and that the baseline which is to be measured prior to industrial activity may evolve drastically in the coming years. Additionally, the presence of ice in the northern part of the Barents Sea is inhabited by a variety of animals highly specialised to live in sub-zero temperature whom very little is known of their biology; for instance, scientists have never been able to locate and sample the eggs of the widely distributed polar cod. The integrated research effort indicates critical gaps of knowledge prompting for intensifying research. Knowledge is therefore to be strengthened through mapping, research and monitoring. Only this will permit optimal environmental decision to be taken.

ecology, climate change and biodiversity, can provide the authorities, the oil industry and the public with an holistic assessment of the impact of anthropogenic activities.

The fifth and final point is, if we are to promote an integrated Barents Sea management and environmental protection, we surely need to foster the communication and collaboration between Russia and Norway. The effort should be put on developing a common Russian-Norwegian scientific language for improved communication, calibrating and combining databases in order to develop a common environmental policy and training young scientists as they are the generations which will have to deal with the production phase of most of fields in the Barents Sea. ■