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Panel on "Protecting Vulnerable marine ecosystems"

Protecting the environment of the Arctic ecosystem

by
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Introduction

Thank you, Mr. Co-Chairman, for this opportunity to present my perspective - as director of the Norwegian Polar Institute - on issues related to the Arctic marine ecosystem. The Arctic is a wonderful place, with enormous contrasts both within the region and through the seasons. I have just come from Tromsø at 70ºN, where the 60 000 of us that live there now experience midnight sun for two months, while the winter sometimes results in more than 2 m of snow in the city.

The Arctic is a region of vast natural resources and a clean environment compared with most areas of the world. But it is also the end point for contaminants transported by atmosphere, ocean and rivers. Some of these become highly concentrated as they move up in the simple arctic food chain. This can cause impacts on animals that are well adjusted to the natural conditions but not to these new factors.

In totality, the Arctic is a region of contrasts, challenges and opportunities, and I will now briefly discuss these themes in the context of this meeting. Two days ago the distinguished Chair of Senior Arctic Officials, Ambassador Gunnar Palsson, presented the Arctic Council's work on ocean issues. To avoid repetition I will build on this presentation, touching only briefly on issues well covered while expanding on others.

What is the Arctic?

The Arctic is commonly defined as the area north of the Arctic Circle (66°32'N), which includes the area of the midnight sun. However, life follows climate rather than the sun. This paper uses the AMAP (The Arctic Monitoring and Assessment Programme) delineation for the Arctic. This definition gives an Arctic region of 33 million km^2 - larger than Africa or Asia. The marine boundary of the Arctic is formed where the water of the Arctic Ocean, cool and dilute from melting ice, meets warmer, saltier water from the southern oceans. This covers 20 million km^2, eight times the area of the Mediterranean Sea.

Altogether about 4 million people live in the Arctic parts of eight countries: Canada, Denmark (Greenland and the Faroe Islands), Finland, Iceland, Norway, Russia, Sweden, and the United States (Alaska).

The Arctic marine environment.

The area of continental shelf under the Arctic Ocean is huge. Exploration for petroleum resources is underway in parts of the continental shelf, and the pace of exploration seems to be increasing.

Sea ice is the most striking feature in the Arctic Ocean. The perennial pack ice covers about 8 million square kilometres, while the total area covered by sea ice at its maximum in spring is nearly twice that area. The ice covers most of the continental shelves most of the year, and is in constant motion caused by wind and currents. The movement from one end of the Arctic Basin to the other can take up to six years, allowing the ice to grow as thick as three meters or more.

Most of the water in the Arctic Ocean comes from the Atlantic Ocean via the Fram Strait (between Greenland and Svalbard) and the Barents Sea. Rivers account for about two percent of the input; a high proportion compared with other oceans. Similar to its inflow, the main outflow from the Arctic Ocean is through the Fram Strait.

In the Arctic Ocean, the surface water temperature is close to the freezing point year-round because of the ice. In the shelf areas, the sun can warm the water to 4-5°C during summer.

Arctic biological systems are young. Recent periods of glaciation at high latitudes in some parts of the Arctic mean that some flora and fauna have a residence time in the Arctic that is counted in the thousands of years rather than the millions typical of many tropical or temperate life-forms. Biological systems in the Arctic are characterised by low species diversity and a high relative number of endemic species, species found no where else on the planet. The species that are adapted to Arctic conditions are generally very well adapted to the harsh climate, including the highly variable weather conditions.

Round-the-clock solar radiation in spring and summer and stable water stratification with melt water on top, lead to high biological productivity in the marginal ice zone. Lipids (fat) are accumulated up the food chain to the top predators, such as polar bears, foxes and sea birds. One result of this biomagnification is a concentration of certain contaminants. The ecosystem is not adapted to the constant stress they are now experiencing from such external sources.

Key environmental challenges

The international management challenges facing the Arctic countries include on-the-spot human interaction with the ecosystem such as commercial fisheries, petroleum exploration and exploitation, oil transport and dumping of radioactive waste as well as more indirect aspects such as long-distance transport of contaminants and the potential impacts of climate change. I use examples from the Barents Sea as this is in most respects the most dynamic marine region of the Arctic, and therefore illustrates well these challenges.

Fisheries

The Barents Sea, the Northeast Atlantic and the Bering Sea are today some of the most important seas for commercial fisheries on a global scale. The rates of spawning, growth and mortality in the populations are influenced by changes in the marine environment, as well as by the fisheries.

The fish stocks are sensitive to ocean temperatures, and small changes can result in major shifts in the geographic locations and productivity in the stocks with results that may be difficult to predict. Changes to the system may result in the need for modifications in fisheries management regimes.

Major commercial fisheries operate in the Barents Sea. Stocks that are shared between Norway and Russia are harvested according to international management agreements, and such international cooperation on the management of fish stocks is fundamental. While the Norwegian-Russian bilateral management regime is well functioning, we are concerned about the unregulated fishing in the areas that are not under national jurisdiction. In the European Arctic waters there are two such areas.

Persistent organic pollutants and heavy metals

Of particular concern for the Arctic environment are releases of persistent organic pollutants (POPs). As most of you will be familiar with, these chemicals are highly toxic, persistent, highly mobile in the environment, and they bioaccumulate up food chains. Examples of POPs are PCB, DDT and dioxins. POPs may persist for decades.

POPs accumulate in the Arctic environment even if their sources are scattered elsewhere around the globe. Volatile compounds, which also include mercury, are lifted by the atmosphere at lower latitudes and dumped as the air cools over the Arctic. POPs that are fat–soluble are concentrated in a disproportional manner in the fat and blubber of animals at the top of the food chain. This happens because Arctic animals have a highly seasonal intake of food and consequently build up fat reserves in order to survive the periods of low food abundance. When animals fast they use their body reserves to meet their metabolic and activity needs, thus mobilising an energy source that has concentrated contaminant levels. Thus these animals are much more exposed to pollutants than what is suggested by the general levels of these compounds in the environment.

New chemicals are making their way into the Arctic food chain, including brominated flame-retardants. These compounds are used extensively in computers and textiles, for obviously valuable reasons. The problem is that we do not know the long-term effects these chemicals and their breakdown compounds have on the environment. We are seeing lowered life expectancy and indications of hormonal disruption in polar bears on Svalbard.

It is also now clear that the Arctic acts as a global sink for mercury and that the levels are increasing within the region.

Petroleum development

Petroleum exploration has been going on for over 20 years in the Barents Sea. In Russia oil exploitation is now taking place offshore in the Timan-Pechora complex. On the Norwegian side only one gas field is under development thus far. Oil has been found in several wells but the companies involved seem uncertain whether exploitation is economically viable. Following many dry exploratory drillings during the mid-1990ies, the industry refrained from further exploration on the Norwegian side for several years. However, interest is once again being expressed in exploration. So, Norway now faces the issue of how to manage the Barents Sea so that it is possible to have simultaneous industrial development and safeguard the environment. This is an issue of high political concern. As part of the decision making process the government has initiated the establishment of an integrated management plan for the Barents Sea. The concepts in this plan may have value for other marine areas, and so this is dealt with in more detail below.

Shipping activities.

There was little oil transport from the Eastern Barents Sea prior to late 2001. In 2002 it increased sharply to a total of 5.9 million tons, carried on altogether 190 tankers. This volume is expected to grow to more than 8 million tons in 2003. The oil is transported out of several Russian ports and terminals. Most of the oil is first transported by smaller ships and then loaded over to 40.000 – 100.000 ton capacity tankers for further shipment to Europe and the USA.

Russia has recently announced plans for building a northern export oil pipeline from West Siberia to Murmansk. If this pipeline is built, it will result in a substantial change in the geography of oil export. It is expected that by 2015 the annual oil shipment along the northern coast of Norway will be 30 million tons. This means that every day there will be a continuous stream of several tankers along the coast of Northern Norway, raising obvious environmental concerns for this area which is home to some of Norway's most important fisheries, and which has an unspoilt nature that is highly valued by both local residents and visitors.

The expected increase in shipping traffic in the Barents Sea and along the Norwegian coast has an associated higher risk of accidents and associated pollution. An accident with a full tanker is probably now the largest environmental threat in this region. Another issue is import of nuclear waste to Russia from Western Europe. At this time it is unclear whether such transport will take place via Norwegian waters and the Barents Sea.

Radioactivity

The source for most anthropogenic radionuclides is fallout from weapons testing that took place between 1945 and 1980 and from the accident in Tsjernobyl in 1986. In addition discharges from reprocessing facilities in Western Europe, especially from Sellafield, have contributed to the sum of radionuclides in the Barents Sea. In general these compounds show declining levels in the Arctic. This is encouraging. There has been an increase in the concentration of Technetium-99 originates from Sellafield over the last years but levels in the Arctic are still far below those in waters further south.

There are also numerous military sources of potential impact located in the Russian Arctic. Most of these are well known, such as the storage facilities for spent nuclear fuel in Andreev Bay close to the Norwegian border and in Gremikha on the northeastern shores of the Kola Peninsula. Russia has decommissioned approximately 190 nuclear-powered submarines. A great number of these are located in bases and ship-yards in the Barents Sea area and are potential sources of contamination of the Northern seas. Hopefully the "Multilateral Nuclear Environmental Programme in the Russian Federation (MNEPR), which was signed in Stockholm on 21 May 2003 by 11 states and EU will open for substantial international financial support to secure safe handling and storage of hazardous nuclear materials in NW Russia.

Climate change and an ice-free Arctic Ocean?

With its high proportion of ice and snow, the Arctic is both sensitive to climate change and a driver and an amplifier for the global heat engine. Most climate models predict the largest changes in the Arctic, and in that sense the Arctic can be a "canary bird" for climate change. However, high climate variability may mask signals of persistent climate change, especially because observational records are short for many areas.

A major issue facing us is whether human-induced climate warming can lead to large reductions in the ice cover of the Arctic Ocean. This would have a profound influence on all life in the region, and may also have unforeseen effects on global climate, such as changing the global ocean circulation.

Both the extent and thickness of sea ice seem to have been reduced by 2-3% per decade over the last forty years. The seasonal extension of the sea ice exhibits large natural variations, but the southern limit of the ice is now probably at a minimum for the period of 400 years for which we have observations, i.e. that ships have sailed in the Arctic Ocean. A lack of well-distributed data means that there is still considerable uncertainty in the changes in thickness. However, despite the uncertainties, especially in the early data, most scientists agree that the Arctic Ocean is now showing major losses of sea ice. Climate modellers disagree on how fast a human-induced greenhouse reduction will take place, but some predict that in 50 years we will have an ice-free Arctic Ocean in the summer. This would open new shipping routes between Europe and Asia.

The issue of climate change is one example of the need for further knowledge on which to base decisions. The international science community is now discussing the establishment of an International Polar Year (IPY) in 2007/08, as a 50-year follow-on of the highly successful International Geophysical Year that among other things lead to the Antarctic Treaty. IPY has the potential to give a quantum jump in our knowledge of the polar regions.

Norwegian management approaches

With the above background in mind I will give two examples of how Norway has approached the management challenges brought about by these rapid changes, and by potential conflicts between users and different development interests.

1) Svalbard as an international show case for environmental protection.

The archipelago of Svalbard forms the northwestern boundary of the Barents Sea. Here the Norwegian government has imposed crucial environmental regulations with the aim of making Svalbard one of the best-managed wilderness areas in the world. The overriding principle is that in any user conflicts, environmental concerns will have first priority. A new Act relating to the protection of the environment in Svalbard was recently adopted, based on modern environmental principles such as the precautionary principle and polluter-pay principle. Svalbard is a centre for international Arctic research, with 12 nations having research installations on Spitsbergen, the main island. Also these activities must be in conformity with the aforementioned environmental regulations.

2) An Integrated Management Plan for the Barents Sea.

The Norwegian Parliament has recently approved the establishment of an integrated management plan for the Barents Sea. It involves comprehensive planning and managing of human activities to minimise conflicts among users, with consideration of all factors for the conservation and sustainable use of marine resources. The development and implementation of the plan is carried out through a unique process of cooperation between the relevant ministries and various stakeholder groups. Overall account is to be taken of the environment, fishing activities, oil operations and shipping.

The plan will be based on five principles:

1) *Ecosystem-based management*, including identification of management objectives and reference levels.
2) *Sustainable development*, taking into account economic, social and cultural values.
3) *The precautionary approach*.
4) *Conservation*, ensuring protection, maintenance and rehabilitation of living marine ecosystems, their habitats and supporting ecosystems.
5) *Duty to attain shared responsibility* between governments, aboriginal groups, coastal communities, industries and other persons and bodies affected by or affecting marine resources.

The goals of the management plan are as follows:

1) Evaluate conflicting interests
2) Help achieve consensus on the management
3) Set levels for acceptable influence by humans
4) Make guidelines for activities
5) Identify gaps in knowledge, and
6) Make guidelines for monitoring.

Work on the management plan started in 2002, and it is expected to be finished in 2005. One of the important aspects of the plan is to identify gaps in knowledge that must be filled to ensure the best possible decision-making. Norway will maintain close co-operation with Russia in the further development of the management plan.

International cooperation and coordination to ensure the protection of vulnerable marine ecosystems

The Arctic is tied to the rest of the world, and as has been discussed above, the most prevalent threats to the environment are not from local sources, but are transported from more populated parts of the world. Enhanced international co-operation is needed to meet these threats.

As described by ambassador Palsson, marine environment issues have been attended to by the Arctic Council through AMAP and the working groups for Protection of the Arctic Marine Environment (PAME) and on Emergency Prevention, Preparedness and Response (EPPR). The joint Norwegian-Russian Environment Protection Commission, which has been operational since

1988, also attributes high priority to marine environment issues in general and contingency plans to combat oil pollution in particular.

To reduce the high levels of POPs observed in the Arctic environment, global measures are necessary. The Stockholm Convention on Persistent Organic Pollutants (POPs) is therefore of particular importance for the improvement of the Arctic environment. This was agreed upon in May 2001 under the auspices of the United Nations Environment Programme (UNEP). In its plan for implementation, The World Summit on Sustainable Development adopted the goal that the Stockholm Convention should enter into force in 2004. Already, 30 countries have ratified this global convention, out of the 51 needed for it to become a reality.

The Stockholm Convention is a legally binding convention for the elimination of POPs. It is the first global instrument to ban the production and use of such chemicals. The convention places an outright ban on all intentionally produced POPs, and seeks the minimisation and ultimate elimination of unintentionally produced POPs (such as dioxins and furans). It further imposes obligations on the disposal of waste and stockpiles of POPs and certain trade restrictions.

Mercury is another issue of concern. A comprehensive global assessment was published by UNEP in 2002, which concluded that releases of the heavy metal mercury pose an equivalent threat to that posed by POPs and that international action is warranted. The UNEP Governing Council adopted a mercury programme at its 22nd Session in February 2003 that addresses short-term action to deal with releases of mercury. In the longer term, the establishment of a legally binding instrument to restrict releases of mercury is needed, similar to what has been achieved through the Stockholm Convention.

Climate change is of course another area where binding international agreement is absolutely vital, and the Arctic Council has underway the Arctic Climate Impact Assessment (ACIA). Its report scheduled for October 2004 will include recommendations for actions to be taken, to include both mitigation and adaptation.

Now - not all local residents of the Arctic would complain if climate became warmer! However, any benefits from milder winters will be overridden by new climate stresses if climatic conditions also become more variable, and more violent, as is currently predicted by models. There are already heavy infrastructure losses in areas of melting permafrost, especially in Alaska, and larger changes are predicted. It is clearly a difficult issue for decision makers to weigh the need for the highest possible confidence in knowledge and advice against the cost of starting remedial action too late. I believe it would be wise to tilt this balance in favour of the precautionary principle!