ENVIRONMENTAL IMPACTS OF OFFSHORE OIL AND GAS DEVELOPMENT IN THE ARCTIC

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INTRODUCTION

WWF welcomes the Arctic Council initiative to develop a strategic plan for the arctic marine environment. Arctic seas stand on the brink of major challenges:

- Fisheries constitute the human activity with the greatest impact on the arctic marine environment. In the Bering Sea, for example, commercial fisheries have already had significant effects on species and ecosystem dynamics.

[1] The content of this paper is the responsibility of the author(s) and does not necessarily represent the views of the PAME Working Group as a whole, or it's member countries.

- Contaminants from both southern and regional sources pose an unquantifiable but nonetheless serious threat to arctic residents and marine mammals in areas such as eastern Greenland, Baffin Island and Svalbard.
- Climate change is likely to have severe, not to say catastrophic impacts on sea ice-dependent ecosystems and species.
- Over the next ten years, offshore oil and gas development, including the marine transport of hydrocarbons are likely to become a very significant threat to arctic marine and coastal ecosystems in Alaska, Canada, Norway and Russia.

Given the scale of these threats, a long-term, strategic and proactive approach to conservation and management of arctic marine ecosystems is essential. All of these threats have transboundary, regional and even global aspects. Thus, international cooperation and action will be key. With respect to offshore oil and gas development, WWF believes that an important first step is a strategic approach to energy policy in general. A second, essential step is proactive identification and protection of key areas for biodiversity conservation, before large-scale development starts.

STATUS OF OFFSHORE OIL AND GAS DEVELOPMENT IN THE ARCTIC

A number of factors are driving a rapid increase in exploration and development of arctic energy reserves. These include continued turbulence in the Middle East; the rise of international terrorism; a corresponding focus in the US and EU on energy security, including the security of supply lines; and a "friendly" government in Russia that is determined to build out the country's energy reserves. Add high oil and natural gas prices, and reserves in the remote but relatively secure north become both more attractive and more economically feasible to exploit. In short, the current geopolitical climate is creating market conditions that override the Arctic's natural barriers to entry: lack of infrastructure, high costs of production due to a forbidding natural environment, and distance to market. The situation in the Arctic's oil-producing countries reflects this picture.

ALASKA

Alaska's Beaufort Sea currently has two offshore fields in production: Endicott, which consists of two gravel islands connected to the mainland by a gravel causeway, and Northstar, which lies six miles offshore with a manmade, gravel island and a buried seafloor pipeline to shore. Ice conditions and technical difficulties have limited production at Northstar. Two other Beaufort Sea projects, Liberty and McCovey, have been put on ice.

The current US federal and Alaska state governments have the explicit goal of developing hydrocarbon reserves in northern Alaska, including the Beaufort Sea. To that end, the federal Minerals Management Service (MMS) recently held a lease sale of interests in the Beaufort Sea, encompassing some 9.4 million acres on the Outer Continental Shelf and including economic incentives to encourage bidding. This was the first sale since 1998, and the 34 sales brought in approximately 8.4 million USD. While MMS has also offered blocks in the Chukchi Sea, there was little interest because of the lack of transportation and support infrastructure in the area. MMS plans further, repeated rounds of leasing for both the Beaufort and Chukchi Seas.

CANADA

91 exploratory wells have been drilled in the Canadian Beaufort Sea and it is estimated that the area holds some 50 tcf of gas. Nonetheless, there has been no drilling there since 1990 due to lack of transportation infrastructure. This is about to change dramatically, in large part because of the

proposed Mackenzie River Valley gas pipeline. So far, ConocoPhillips, ChevronTexaco and Devon Energy Corporation have announced plans to resume drilling in the Canadian Beaufort Sea.

FAEROE ISLANDS AND GREENLAND

There have been both seismic surveys and exploratory drilling in the coastal waters of the Faeroe Islands and Greenland. No hydrocarbon resources have been found, though industry analysts continue to believe that structures around the Faeroe Islands may hold reserves.

NORWAY

Since 1980, a total of 61 exploration wells have been drilled in the Norwegiain Barents Sea. These have resulted in the discovery of 14 small- and medium –sized gas fields, two oil and gas fields and one oil field. The first discovery, Askeladd, was made in this basin in 1981, and was later joined by the Snøhvit gas, condensate and oil field and the Goliat oil discovery. Total oil and gas reserves in the Norwegian part of the Barents Sea are estimated at 7.67 billion boe, distributed on 2.83 billion boe of liquids and 4.84 billion boe of gas. Out of this, some 90% are yet to be discovered.

Between 1995 and 2000 no wells were drilled in the Barents Sea, mainly due to disappointing results in previous wells. After changes to the fiscal system made exploration drilling more attractive, eight wells were drilled in 2000 and 2001.

Other than the Snøhvit development, which is under construction, the Norwegian Barents Sea is closed for oil and gas activities until 2004 awaiting the outcome of a holistic or strategic environmental assessment of the sea, and the development of an ecosystem-based, long-term management plan. Snøhvit itself lies 140 km northwest of the city of Hammerfest and, when completed, will consist of subsea installations with a pipeline back to a newly constructed LNG processing plant onshore.

RUSSIA

According to energy experts, Russia holds the world's largest reserves of natural gas, with proven reserves of just less than 1.700 trillion cubic feet (Tcf). It also has the eighth largest proven oil reserves in the world, estimated at 60 billion barrels. Russia has a stated goal of covering ten percent of US oil imports (11.4 million b/d in 2002, according to EIA) within a decade, with the crude to come from Siberia and the Arctic Shelf. Recent huge investments by western oil majors in Russian arctic reserves is a testimonial both to the size of the reserves and the belief that the government is making development a priority.

Russia's known arctic offshore reserves lie primarily in the Russian Barents Sea and in the Chukchi Sea, off the coast of the Chukotka Autonomous Okrug. To date there is no offshore production in the Chukchi Sea, although Sibneft temporarily installed an offshore platform for exploratory drilling and conducted seismic investigations offshore in the Bering Sea. The US Geological Service is also helping to map hydrocarbon potential in areas of the Chukchi and Bering Seas.

The recent merger of Yukos and Sibneft may speed up development in the Chukchi Sea, as may the rumored sale of Yukos shares to one of the Western oil majors. At the same time, Chukotka lacks infrastructure for export to internal and foreign markets, and in addition has sensitive, wildlife-rich coasts, native communities that depend to a large degree on marine mammal hunting, and extreme weather conditions, including sea ice.

Russia's Barents Sea shelf (including the Pechora Sea) clearly holds vast volumes of oil and gas, but estimates of reserves potential in the area tend to vary. Exploration on the Barents Sea shelf started in 1972 with seismic surveys and drilling. The first discovery, the Murmanskoye gas field, was made in

1976. In 1979 exploration efforts in the area were intensified and up to now a total of 15 significant discoveries have been made on the Arctic Shelf, eleven of which in the Barents- and Pechora Seas. In addition, another 125 fields or hydrocarbon bearing structures have been identified, although only between 9 and 12 percent of the area has been explored.

In November 2002 Russian authorities opened 22 blocks for bidding, covering an area of 70,600 sq km. The blocks are estimated to hold a total of 16.29 billion boe of reserves. First awards are planned in 2003 and international companies have been invited to bid. The Ministry of Natural Resources is planning successive rounds of bidding in the Barents Sea and finally slightly to the south and east of Novaya Zemlya.

At present, the Russian Barents Region is of more importance as a transport hub for oil and gas from Western Siberia (and partly from the Timan Pechora basin) than for oil and gas production. Plans for building a 2-3 million b/d crude export terminal in the Murmansk region, on the coast of the Barents Sea, are in the feasibility study phase.

The first offshore development in the Russian Barents Sea will be Sevmorneftegaz' Prirazlomnoye oil field in the Pechora Sea. First production is expected in 2005, with the field to reach its maximum output of some 130,000 b/d in 2008/9. The next field on the region's development list is the massive Shtokmanovskoye field. It is estimated by Sevmorneftegaz to hold 3.2Tcm of natural gas and 232m bbls of condensate and may be on stream by 2010 – or earlier.

SELECTED ENVIRONMENTAL IMPACTS OF ARCTIC OFFSHORE OIL AND GAS DEVELOPMENT

Many sources, including PAME's *Guidelines for Offshore Oil and Gas Development in the Arctic* (2002), provide an overview of the potential impacts of offshore development in this environmentally sensitive region. This paper will focus on a few, less well-covered aspects that are nonetheless essential to strategic consideration of oil and gas development in the region.

CLIMATE CHANGE

The International Panel on Climate Change has said that the global climate is changing, with temperatures increasing from preindustrial levels and likely to increase further. It further has found that anthropogenic activities, primarily the burning of fossil fuels, are to some extent responsible for these changes.

The Arctic is the region of the world that is likely to be most heavily affected by global climate change. Indeed, the region is already experiencing climate change in the form of reduced sea ice extent and depth, thawing permafrost in some areas, invasion of more southern species and reduced average snow cover.

While so far the oil industry, and governments, have not considered climate effects in the evaluation of individual oil and gas projects, arctic governments are already wrestling with strategic decisions on energy policy in the face of climate change. Part of this discussion is the extent to which countries should meet domestic and international goals for cuts in greenhouse gas emissions by discouraging oil and gas development and use, for example through price and regulatory signals such as closing areas to new exploration. These larger questions about the role of oil and gas development in the face of climate change most certainly should be considered in the Arctic Marine Strategic Plan.

SPECIAL CHARACTERISTICS OF ARCTIC MARINE AND COASTAL ECOSYSTEMS

The Arctic marine environment is characterized by a short productive season, low temperatures, and limited sunlight. Biota at higher tropic levels, for example cod and seabirds, tend to congregate in

extremely large groups during the most productive time of year. This means that a single large oil spill in the wrong place and at the wrong time of year can have very serious, population-wide impacts on seabirds, fish, and some marine mammals.

ONSHORE DEVELOPMENT

While assessment of offshore development tends to focus on the marine environment, development offshore usually also means significant development and impacts onshore. These impacts range from fragmentation of frontier areas through the building of roads, landing strips and harbors, to destruction of freshwater habitats by gravel mining and drainage of water for ice roads.

All offshore developments require a means of bringing hydrocarbons to market. With one exception this means onshore infrastructure. The exception is offshore oil transfer, which is the single biggest source of oil pollution in the Arctic. For all other developments, transport to market requires a pipeline to shore that connects with a pipeline to market, to a refinery or processing plant, or to a harbor for further transport by ship.

Similarly, all responsible offshore developments require relatively rapid access to oil spill response equipment, and to facilities for pipeline inspection and repair. This also requires the presence of harbors, depots for oil spill response equipment, and potentially seasonal or permanent roads to bring staff and equipment to the site.

Specific projects offshore also have impacts onshore. For the near-shore developments Endicott and Northstar in Alaska, the building phase required barges and dock facilities, as well as ice roads to bring equipment and personnel up to the area. The building of ice roads for winter transport over the tundra in some instances depletes local freshwater systems. For example, the exploration phase for the Alaskan terrestrial field Alpine required the use of 65 million gallons of freshwater. To build Endicott itself, contractors used eight million cubic yards of gravel and other fill. Gravel mines dug during the building process will most likely never be rehabilitated to their original condition, though efforts have been made to fill some mines with water for overwintering of fish.

Even for developments farther offshore, onshore infrastructure is required. For Snøhvit in the Norwegian Barents Sea, which is more than 100 km offshore, extensive development onshore is being built, including new roads, power lines and an LNG processing plant.

SPILLS IN ICE-INFESTED WATERS

There continues to be no significantly effective method for containing and cleaning up an oil spill in ice-infested waters. Booms and lenses are ineffective in broken ice and unusable in closed ice conditions. Though new dispersants are being developed, they continue to be less effective at colder temperatures and in addition have toxic properties. In situ burning in closed ice conditions leaves a significant amount of oil in and under ice, allowing oil to later spread with the movement and melting of ice.

IMPACTS OF SEA FLOOR PIPELINES

Companies are moving increasingly to sea floor solutions, including sea floor pipelines to shore. Depending on the extent of development in a region, destruction and disruption of sea floor habitat and benthic organisms can be great. For the Snøhvit project, installation to shore pipelines will stretch for 120 km, and construction of the pipelines will require digging of trenches and excavating sufficient fill to cover the pipelines and protect them from trawling equipment.

RECOMMENDATIONS FOR AN ARCTIC STRATEGIC MARINE PLAN

WWF has the following suggestions for elements and approaches for the Arctic Strategic Marine Plans:

ECOSYSTEM APPROACH

WWF considers the application of the ecosystem approach, incorporating the precautionary principle, as fundamental to achieve the sustainable use of the seas, and in seeking truly comprehensive and integrated governance. WWF identifies the following six points as critical for the development and implementation of an ecosystem approach:

- The setting of a vision and environmental goals with stakeholder engagement
- Developing an integrated marine policy
- Assessing the resource and status of the resource (including the use of biodiversity, socio-economic and risk assessments, and threats analysis)
- Establishing a spatial planning system, incorporating mapping activities and a decision making process to identify what activities can take place where
- Identification of delivery tools, such as consents, permits and economic tools
- Developing a strategy for delivery incorporating a legislative framework to delivering an ecosystem approach, and including targets and milestones.

STRATEGIC ENVIRONMENTAL ASSESSMENT

Strategic Environmental Assessment (SEA) is an assessment and decision-making model with a long-term, regional or ecosystem-wide scope, and is a useful tool for achieving an ecosystem approach. It captures cumulative impacts on environmental quality and processes. Ideally, it is multi-sector, covering all human activities, and driven by environmental or sustainability goals. It has a broad-based, inclusive approach to the goal-setting, assessment and planning processes, which may minimize disputes. Finally, when coupled with monitoring, adaptive management, and a goal-driven approach, it can deliver greater certainty in long-term outcomes.

Application of SEA or processes like it to arctic frontier areas can produce significant benefits for environmental interests, communities and industry. One function of SEA is to identify protected areas where development should not take place; areas with high biodiversity or ecological value that should be protected; and ecologically valuable areas where development can proceed under certain restrictions. By identifying and appropriately zoning these areas before development takes place, the process front-loads potential conflicts over resource use and maximizes certainty, transparency and accountability.

SEA or regional assessment should include:

- the current state of the region's natural environment and human activities .
- key areas, ecosystem components, and processes that are of high value in terms of cultural or spiritual value to local people; biodiversity (many or unique species or large populations); ecosystem function (such as spawning or breeding grounds); or natural processes (such as groundwater storage or filtering).

- planned infrastructure, industrial development, large-scale resource exploitation, and other processes expected to impact the region's environment within the given time frame, (e.g. 30 years).
- cumulative effects of known and expected activities and developments, including global impacts such as climate change and long-range pollutants, on the key areas identified.
- identification of uncertainties, e.g. lack of knowledge about species, ecosystem dynamics, or global and long-term impacts.

Such assessments must involve all stakeholders. They must be long-term, e.g 25 years. They must be comprehensive, flexible and dynamic. And finally they must have political support.

CONSERVATION FIRST

Once vital areas and processes have been identified, the stakeholders must act to safeguard these against negative impacts. This can be done through a range of measures, but key to its success is the involvement of and support from all major stakeholders in the process.

Areas should be protected according to a set of criteria, including:

- Conservation value – How important is the area, component or process in terms of biodiversity, uniqueness, cultural and spiritual value, and ecosystem function?
- Representativeness – How well does the area, component or process represent the ecological and/or cultural qualities of the region?
- Size – Larger areas are of greater value as they provide habitat for larger variety and numbers of each species and for larger or wide-ranging species. They are also rare on a global scale.
- Connection – Protected areas function better if connected, thus allowing movement of species between areas. This is particularly relevant if parts of the network are seasonally or otherwise under pressure, or for example to allow movement and migration in the face of climate change.

From WWF's point of view, effective nature conservation in frontier areas, such as the arctic marine environment, requires proactive, predevelopment set-asides of protected areas – Conservation First, or conservation before development starts. This means there should be no new or expanded large-scale industrial development in the Arctic until a network of areas of high conservation value and cultural significance, including marine habitats, are identified and protected in the region where development will take place. This will safeguard important cultural and wildlife areas from industrial development for the long term. It also provides planning certainty and predictability for communities, investors, developers, government, and other stakeholders

PARTICULARLY SENSITIVE SEA AREA STATUS FOR PARTS OF THE ARCTIC SEAS

WWF believes that parts of the arctic marine environment, for example the southern Norwegian Barents Sea, should be designated as "Particularly Sensitive Sea Areas" (PSSA) to tackle the environmental effects and threats associated with increasing maritime traffic, especially oil shipping. A PSSA is an area which due to its ecological, economic, cultural or scientific significance and its vulnerability to international shipping activity needs special protection. PSSA status, designated by the IMO (International Maritime Organisation), can be used to protect a variety of marine and coastal habitats as well as marine wildlife, and to improve maritime safety.

CONSIDERATION OF CLIMATE CHANGE VULNERABILITY AND ADAPTATION STRATEGIES

WWF suggests that arctic governments assess the vulnerability of arctic marine ecosystems to climate change, and develop strategies to help the most resilient parts of these ecosystems adapt. As a strategic measure, governments should also reduce non-climate stressors on more vulnerable ecosystem components.

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