



ARCTIC COUNCIL

**ARCTIC OFFSHORE
OIL & GAS GUIDELINES**

PAME
Protection of the Arctic Marine Environment

The **Arctic Council** was established on September 19th, 1996 in Ottawa, Canada and succeeded the *Arctic Environmental Protection Strategy*. It is a high-level intergovernmental forum that provides a mechanism to address the common concerns and challenges faced by the Arctic governments and the people of the Arctic.

The members of the Council are Canada, Denmark, Finland, Iceland, Norway, the Russian Federation, Sweden, and the United States of America. The Association of Indigenous Minorities of the North, Siberia and the Far East of the Russian Federation, the Inuit Circumpolar Conference, the Saami Council, the Aleutian International Association, Arctic Athabaskan Council and Gwich'in Council International are Permanent Participants in the Council. There is provision for non-arctic states, inter-governmental and inter-parliamentary organizations and non-governmental organizations to become involved as observers.

The main activities of the Council focus on the protection of the Arctic environment and sustainable development as a means of improving the economic, social and cultural well-being of the north.

PAME is the Arctic Council Working Group on Protection of the Arctic Marine Environment. The primary goal is to prevent, control and remediate marine pollution from land and sea-based activities.

Cover Photo: Concrete Island Drilling Structure (CIDS) in the Beaufort Sea, Alaska.

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**PROTECTION OF THE ARCTIC MARINE ENVIRONMENT
WORKING GROUP**

ARCTIC OFFSHORE OIL & GAS GUIDELINES

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Table of Contents

ARCTIC OFFSHORE OIL & GAS GUIDELINES

PREAMBLE	6
1. INTRODUCTION	7
1.1 <i>Background</i>	7
1.2 <i>Goals</i>	8
1.3 <i>General Principles</i>	10
1.4 <i>Existing Impacts and Future Threats</i>	11
1.5 <i>Potential Impacts of Oil and Gas Activities on Environment and Society</i>	11
1.6 <i>Institutional Strengthening in the Regional Context</i>	12
1.7 <i>Periodic Review</i>	13
2. ENVIRONMENTAL IMPACT ASSESSMENT	
2.1 <i>Purpose</i>	16
2.2 <i>Technique and Process</i>	17
2.3 <i>Preliminary Environment Impact Assessment (PEIA)</i>	18
2.4 <i>Environmental Impact Assessment (EIA)</i>	19
2.5 <i>Consultations and Hearings</i>	18
2.6 <i>Decision/Implementation/Project monitoring/Modification</i>	20
3. ARCTIC COMMUNITIES, INDIGENOUS PEOPLES, SUSTAINABILITY, AND CONSERVATION OF FLORA AND FAUNA	
3.1 <i>Living Resources</i>	20
3.2 <i>Cultural Values</i>	21
3.3 <i>Other Human Activity</i>	21
3.4 <i>Arctic States should:</i>	21
4. SAFETY AND ENVIRONMENTAL MANAGEMENT	22
5. MONITORING	26
5.1 <i>Aims and Objectives</i>	26
5.2 <i>Monitoring Targets</i>	27
5.3 <i>Monitoring methods</i>	28
5.4 <i>Monitoring Standards and Practices</i>	29
5.5 <i>Compliance Monitoring and Review</i>	30
6. OPERATING PRACTICES	30
6.1 <i>Waste Management</i>	30
6.2 <i>Health, Safety and Environmental Supervision</i>	34
6.3 <i>Design and Operations</i>	35
6.4 <i>Human Health and Safety</i>	37
6.5 <i>Transportation of supplies and transportation infrastructure</i>	39
6.6 <i>Training</i>	40
7. EMERGENCIES	41
7.1 <i>Preparedness</i>	41
7.2 <i>Response</i>	42
8. DECOMMISSIONING AND SITE CLEARANCE	45
9. ABBREVIATIONS AND DEFINITIONS	46
10. REFERENCES AND BIBLIOGRAPHY	50
ANNEX A: DEFINITION OF THE ARCTIC	72
ANNEX B: CRITERIA FOR THE OSPAR DEFINITION OF BEST PRACTICES	74
ANNEX C: ENVIRONMENTAL ASSESSMENT FLOWCHART	76
ANNEX D: OFFSHORE ACTIVITIES & POTENTIAL ENVIRONMENTAL EFFECTS	77

ANNEX E: ENVIRONMENTAL RISK ANALYSIS FLOW DIAGRAM	79
ANNEX F: ELEMENTS OF SAFETY AND ENVIRONMENTAL POLICIES AND OBJECTIVES	80
ANNEX G: EXAMPLE OF GENERALIZED MONITORING PLAN	82

*TRANSSHIPMENT OF OIL WILL BE ADDRESSED BY PAME IN ITS WORK ON ARCTIC SHIPPING.

Preamble

The Ministers of the Arctic States, Canada, Denmark, Iceland, Finland, Russia, Sweden, Norway and the United States of America, originally adopted the Guidelines at the Fourth Ministerial Conference on the Protection of the Arctic Environment, 11-12 June, 1997 in Alta, Norway by declaring: “**We receive** with appreciation...the “Arctic Offshore Oil and Gas Guidelines” developed under AEPS, and **agree** that these Guidelines be applied”.

The 2nd Ministerial Meeting of the Arctic Council 9-10 October 2002 in Inari, Finland recognized the updated version of these Guidelines by the following statement: "We... endorse the updated Offshore Oil and Gas Guidelines and encourage the concerned stakeholders to apply them."

The endorsement of these Guidelines recognizes a uniform understanding of the minimum actions needed to protect the Arctic marine environment from unwanted environmental effects caused by offshore oil and gas activities. The Ministers, however, acknowledge that further steps can be taken nationally as a part of the environmental and natural resource management policies of the Arctic States.

The users of these Guidelines will find that all stages of offshore oil and gas activity are included. The Introduction sets forth the background for the Guidelines and important general concerns. The chapters that follow set forth the specific operational steps which should be followed when planning for Arctic offshore oil and gas activities.

1. Introduction

1.1 Background

The Guidelines were originally written in response to the *Report of the Third Ministerial Conference on the Protection of the Arctic Environment (Inuvik, Canada, March 20-21, 1996)* which expressed concern regarding the potential impacts related to future increases in offshore petroleum activity in the Arctic. The Report requested PAME:

...(to develop) “guidelines for offshore petroleum activities in the Arctic, in particular guidelines for timely and effective measures for protection of the Arctic environment. In this regard, the Ministers welcomed the initiative of the United States to conduct a government designated expert meeting to develop such guidelines, in cooperation, as appropriate, with other AEPS Working Groups” (Paragraph 2.3.5(ii)).

In addition, the Inuvik Report requests AMAP to “...review the feasibility of developing sub-regional cooperative oil-related monitoring and assessment activities, as appropriate.” (Paragraph 2.1.2.1).

Finally, the Report requests EPPR to “...continue their work on contributing to development of preventative, mitigating and response measures for oil and gas accidental releases in the Arctic” (Paragraph 2.4.5).

Although PAME had the overall responsibility for developing the 1997 guidelines, they were the result of a group effort and reflect coordination within the Arctic Council working groups that the ministers emphasized in the 1996 Inuvik Report.

The 1997 Guidelines stated in Section 1.7 Periodic Review, “*These Guidelines should undergo periodic review and amendment, as necessary, to take into consideration experiences in the management and control of offshore oil and gas operations. The Guidelines must remain current if they are to support timely and effective measure for protection of the Arctic environment. An Experts Meeting should be held after the third anniversary of the adoption of the Guidelines to review and update them.*”

With establishment of the Arctic Council on September 19th, 1996 in Ottawa, Canada, and the Arctic Councils adoption of the existing four Working Groups of the AEPS in Alta, Norway in June 1997, and with the subsequent addition of the Sustainable Development Working Group, has strengthened the incentive of PAME and its members to continue to cooperate in and pursue support for efforts to protect the Arctic marine environment—such as providing an updated and improved Arctic Offshore Oil and Gas Guidelines.

The current updated and improved guidelines were completed by PAME under the Arctic Council but represent the combined efforts of PAME, EPPR, AMAP, CAFF and attempts to incorporate the principles of sustainable development. This review and update was greatly assisted by the involvement and comments received from representatives of

Arctic, regional and other governments, non-governmental organizations, industry, indigenous people, and the scientific community to provide agreed guidelines for offshore oil and gas activities in the Arctic.

It is acknowledged that a number of legal instruments related to offshore oil and gas activities exist, *e.g.* United Nations Convention on Law of the Sea; the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) and the London Convention 1972. It is assumed that Arctic petroleum activities will be conducted in compliance with applicable international law.

1.2 Goals

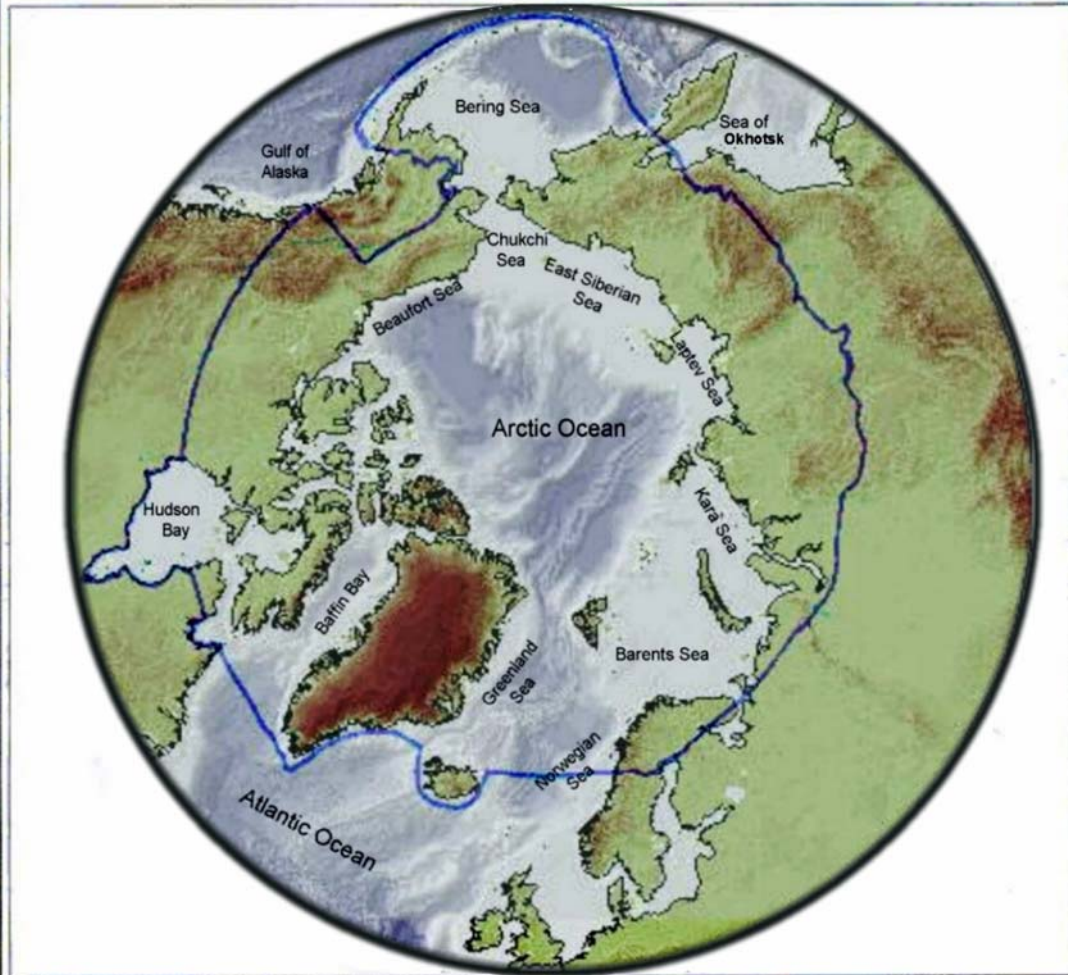
Purpose of the Guidelines

These Guidelines are intended to be of use to the Arctic nations central and regional authorities at all stages during planning, exploration and development of offshore oil and gas activities. They should be used to secure common policy and practices. The target group for the Guidelines is thus primarily the national authorities, but the Guidelines may also be of help to the industry when planning for oil and gas activities and to the public in understanding environmental concerns and practices of Arctic offshore oil and gas activities. While recognizing the non-binding nature of these Guidelines, they are intended to encourage the highest standards currently available. They are not intended to prevent States from setting stricter standards, where appropriate.

Policy development should take into account the domestic situation with respect to political, economic, legal, and administrative conditions, as well as technical competence. Consideration should be given to macro-economic effects, regional effects, and potential environmental impacts. Such consideration should result in a staged opening plan, and ensure protection of areas of special environmental concern. While these guidelines do not address socio-economic aspects in any detail, nor do they set standards for assessment of potential socio-economic effects of offshore oil and gas activities, these are nonetheless important to consider and integrate into the planning and conduct of exploration and development.

The Guidelines are intended to define a set of recommended practices for consideration by those responsible for regulation of offshore oil and gas activities (including transportation and related onshore activities being an integrated part of the offshore activity) in the Arctic (see Figure 1 and Annex A). It is hoped that regulators will identify the key issues related to protection of human health and safety and protection of the environment, while at the same time remaining sufficiently general to permit alternative regulatory approaches. It should be recognized that the eight Arctic nations have different systems with different emphasis on the division of responsibility between the operator and the regulator. This document attempts to present alternative approaches or general guidance where there may be a difference in approach. The goal is to assist regulators in developing a set of standards, which are applied and enforced consistently for all offshore Arctic oil and gas operators. Sensible regulation will vary to some degree

Arctic Council Working Group on the Protection
of the Arctic Marine Environment (PAME)



Note: The area of application of these Guidelines is described in Annex A

Figure 1
The Arctic Region

Scale: Approximately 1:45,000,000
Projection: Lambert-Azimuthal Equal Area

Neither the delineation of boundaries nor the use of any name in the publication implies an expression of opinion on the part of UNEP or Arctic Council concerning the legal status of any country or territory, or of its authorities, or concerning the delimitation of the frontiers of any country or territory.

based upon local circumstances. Thus, it is expected that, based on the outcome of environmental impact assessment procedures, regulators will establish policies such that offshore oil and gas activities are conducted so as to provide for human health and safety and protection of the environment.

Goals for Environmental Protection during Oil and Gas Activities in the Arctic Area

Offshore oil and gas activities in the Arctic should be planned and conducted so as to avoid:

- adverse effects on climate and weather patterns;
- significant adverse effects on air and water quality;
- significant changes in the atmospheric, terrestrial (including aquatic), glacial or marine environments in the Arctic;
- detrimental changes in the distribution, abundance or productivity of species or populations of species;
- further jeopardy to endangered or threatened species or populations of such species;
- degradation of, or substantial risk to, areas of biological, cultural, scientific, historic, aesthetic or wilderness significance; and
- adverse effects on livelihoods, societies, cultures and traditional lifestyles for northern and indigenous peoples.

1.3 General Principles

Arctic offshore oil and gas activities should be based on the following principles:

Principle of the Precautionary Approach

In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

Polluter Pays Principle

National authorities should endeavor to promote the internationalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment.

Sustainable Development

In permitting offshore oil and gas activities Arctic governments should be mindful of their commitment to sustainable development, including, *inter alia*:

- protection of biological diversity;
- the duty not to transfer, directly or indirectly, damage or hazards from one area of the marine environment to another or transform one type of pollution into another;
- promotion of the use of best available technology/techniques and best environmental practices (See some examples in [Annex B](#));
- the duty to cooperate on a regional basis for protection and preservation of the marine environment, taking into account characteristic regional features; and
- the need to maintain hydrocarbon production rates in keeping with sound conservation practices as a means of minimizing environmental impacts.

1.4 Existing Impacts and Future Threats

When considering near-shore oil and gas activities, interaction between existing contaminants and expected discharges should be assessed. Threats to marine Arctic areas from activities within Arctic countries at present mainly affect coastal areas. Impacts on offshore areas are mainly due to long-range transport by wind and sea currents, but also include sediment transport in sea ice.

The coastal areas of the Arctic may be contaminated by direct runoff from industry or mining, through river discharges, from dumping and from nuclear tests. Hot spots have been identified by [AMAP](#), but few of these are relevant in the context of these guidelines. Based on the results of the AMAP assessment persistent organic pollutants seem to be the main present threat to the Arctic environment. In addition, there seems to be some uncertainty concerning mercury that should be more closely monitored. Artificial radionuclides seem to pose only a nominal threat to the environment.

Based on AMAP results the most prominent future threats to the Arctic marine environment are persistent organic pollutants (POPs) and petroleum exploitation and transport.

1.5 Potential Impacts of Oil and Gas Activities on Environment and Society

Natural environment

Offshore oil and gas activities entail considerable inputs of gases to the air from power generation, flaring, well testing, leakage of volatile petroleum components, supply activities and shuttle transportation. Air emissions may have effects on the climate. They

may cause acidification on nearby land and contribute to emissions of any number of hazardous substances. Discharges of drill cuttings with associated oil and chemicals may have effects on sea floor flora and fauna and reduce both their abundance and diversity.

Discharges of produced water and chemicals to the water column appear to have acute effects on marine life only in the immediate vicinity of the installations. However, recent laboratory experiments on cod ([Meier, et. al, 2002](#)) suggest that small amounts of alkylphenols, found in produced water, had sub-lethal effects on the fish that might lead to disruption of the endocrine system in exposed animals.

Human environment

Oil and gas activities may have pronounced positive effects on a nation's employment and economy. They also have socio-economic effects, both negative and positive, on local communities and indigenous people. Where oil leasing revenues and/or oil industry-related employment opportunities go primarily to local communities, they can make a substantial difference in living standards and the community's ability to provide essential services. Exploration and development activities may affect traditional lifestyles of indigenous people.

1.6 Institutional Strengthening in the Regional Context

Management of Arctic oil and gas activities and their effects on the Arctic offshore and near shore areas requires participation of governments, the public and operators. Institutional mechanisms or capabilities are required at the local, national and regional levels to implement these Guidelines to:

- ensure the openness, transparency and consistent application of regulatory regimes;
- ensure that government agencies, local communities and non-governmental organizations are able to participate in their roles in environmental management;
- ensure that scientific and traditional knowledge are available to the processes and are effectively used; and
- facilitate regional activities and mechanisms that best suit the regional physical, biological and socioeconomic environments, and potential regional impacts.

To ensure that the above needs are addressed, Arctic States should:

- review their own needs, and regional needs, for institutional strengthening and capacity-building in these areas, and identify priority needs with schedules for addressing them; and
- cooperate in and facilitate bilateral and multilateral initiatives to address the needs, in concert with the public and with oil and gas industry operators.

1.7 Periodic Review

These Guidelines should undergo periodic review and amendment, as necessary, to take into consideration experiences in the management and control of offshore oil and gas operations. The Guidelines must remain current if they are to support timely and effective measure for protection of the Arctic environment. On the occasion of the third anniversary of their adoption, as prescribed in the 1997 edition, PAME under the Arctic Council reviewed and updated the Guidelines, resulting in the current document. On the third anniversary of the publication of the second edition, the guidelines should undergo another review and update.

1. Offshore Arctic oil and gas operations may result in a variety of related onshore activities and/or impacts. Individual governments should determine the extent to which these Guidelines apply when evaluating these activities.
2. Neither PAME nor the full Arctic Council has established a single geographic definition of the Arctic. This is left for Arctic states to determine. For the purposes of these Guidelines, the definition of the Arctic is contained in Annex A.

[Back to Table of Contents](#)

2. Environmental Impact Assessment

Environmental impact assessment procedures should be used to determine the impacts of offshore oil and gas exploration, development, transportation and infrastructure. Arctic countries use a variety of methods and approaches. Assessments may have a broad scope or be project specific. The responsibility for conducting the environmental impact assessments (EIA) or preliminary impact assessments (PEIA) varies from country to country. In some countries the State assumes the responsibility for the PEIA and the operator is responsible for the EIA for specific projects or activities. In other countries all environmental assessments are conducted by the State (See Annex C).

Several approaches may be used for environmental assessments with a broad scope. Examples of these approaches follow:

- Regional assessments for oil and gas activities.
- Ecosystem based approach
- Integrated oceans and coastal management,
- Strategic Environmental Assessment (SEA)
- Regional cumulative impact assessment and studies
- Land use or spatial planning

The EIA Process for Norwegian Offshore Oil and Gas Activities

The Norwegian Petroleum Act requires an EIA to be carried out before any new area is opened for petroleum activities. This EIA is administered by the Ministry of Oil and Energy and is in its latest versions similar to a Strategic Environmental Impact Assessment. At present plans for a SEA of the Barents Sea is on hearing. As the whole of the Barents Sea is considered environmentally sensitive, a condition for further petroleum activities in this area is that there shall be no discharges of produced water or waste from drilling and that all other discharges should be minimized. When finished, and after a substantial hearing process, the EIA/SEA has to be approved by the National Assembly which also decides on which parts of the area to be opened and the condition for activities in the opened parts.

When licenses have been awarded and oil and/or gas resources have been found the operating company has to carry out a new EIA for the field in question as part of their plans for development and production. Operating companies furthermore cooperate to carry out regional EIAs. Regional EIAs are based on the exploration and production history of the region, but also include a certain number of fictive fields as a basis for prognoses of expected development and discharges. Regional EIAs have at present been developed for regions in the North and Norwegian Seas.

All EIAs/SEAs in the Norwegian sector have a stepwise development similar to the ones shown in the flowchart in [Annex C](#).

The Norwegian Ministry of Environment is at present putting great emphasis on developing management plans for the sea areas. The plans are made to avoid conflict between different users of the sea (fisheries and oil and gas development, for example) and to ascertain sustainable development and protection of sensitive resources. As a basis for the management plans SEAs are developed for all sectors having activities in the area, primarily fisheries, oil and gas activities and transportation. The first management plan will be developed for the Barents Sea which is considered particularly environmentally sensitive.

The EIA Process for U.S. Offshore Oil and Gas Activities

United States law requires an EIA process for major actions that are proposed, approved, regulated, or funded by federal agencies. In the United States this process is called an Environmental Impact Statement (EIS). Federal regulations implementing this law require that the EIS be integrated early with the planning for proposed activities. For offshore oil and gas plans or activities, the Minerals Management Service (MMS) initiates the EIS process early in the planning for proposed five-year oil and gas leasing programs, proposed lease sales, and requests from industry to approve oil and gas plans or permits. The MMS assumes full responsibility for funding and conducting the EIS.

The EIS for the proposed Five-Year OCS Oil and Gas Program analyzes alternative leasing configurations in all regions of the U.S. Outer Continental Shelf. This EIS is broader in scope and has less detailed analysis than subsequent EISs that are prepared for lease sales in particular regions. An EIS may also be prepared that provides a site-specific analysis for an individual development proposal. The scope, level of detail, and issues of concern for each EIS are tailored to the actual proposal. The programmatic EIS examines issues broadly, while a development plan EIS focuses on more immediate, geographically focused concerns. In all cases, the EIS analysis addresses only those issues that have a bearing on the decision at hand. For example, only the Five-Year Program EIS discusses alternative energy sources, while only a development plan EIS would analyze alternative pipeline routes within a particular area.

The EIA Process for Greenland Offshore Oil and Gas Activities

Opening of new areas for exploration

In Greenland areas are opened for oil exploration without an EIA. Exploration activities Prior to all major exploration activities (seismic-surveys and exploratory drillings) an EIA shall be carried out and approved in conjunction with the approval of each of the individual activities by the Bureau of Minerals and Petroleum (BMP), according to the Act on Mineral Resources in Greenland. The prepared EIA is usually in a preliminary form, as the activities are temporal, and the EIA is prepared in close cooperation with the BMP.

Exploitation activities

Prior to the initiation of a production phase an elaborate EIA covering all activities (development, production, storage, transportation, abandonment) shall be prepared and subsequently approved by the BMP.

The approval process

Prior to the approval of an EIA, the BMP will consult, among others, its environmental advisers in the NERI (the National Environmental Research Institute, Roskilde, Denmark).

Contact the BMP

For further information on telephone number +299 346800/telefax +299 324302 or search for information at our homepage on www.bmp.gl. On our homepage the Act on Mineral Resources in Greenland and the Standard Application and Requirements Concerning Offshore Seismic Operations in West Greenland, among other documents, can be found. Further information about NERI's can be found on www.dmu.dk.

EIA System in Finland

The Act on Environmental Impact Assessment Procedure came into force 1 September 1994. A new Act on EIA came into effect in 1999. The aim of the legislation is to further the assessment of environmental impacts and public participation in planning and decision-making. In the EIA procedure environmental consideration is integrated into the existing planning and permit procedures. In the EIA Decree there is a detailed list of different project types requiring EIA. The list is based on the lists in the EIA Directive (85/337/EEC as amended by)//11/EC) and the UN ECE Convention on EIA in a Transboundary Context (1991). In the Finnish EIA procedure the developer investigates the environmental impacts and prepares an assessment programme that contains information on the project and how the assessment will be carried out. On the basis of further studies and opinions given on the assessment programme, the developer prepares an assessment report where information on the project and of its various alternatives is presented, together with a comprehensive evaluation of their environmental impacts. The report will be appended to the decision-making material. The authorities are not allowed to make any decision on a permit procedure or a plan until the assessment procedure has been concluded. Co-ordination of the assessment procedure and related duties rests with a coordinating authority, the Regional Environmental Centres and with the Ministry of Trade and Industry in projects involving nuclear power plants as referred to in the Nuclear Energy Act (990/87). The citizens and authorities in the affected area will take part in the procedure and express their comments first on the assessments programme (scoping) and later on the assessment report itself. The act also includes provisions on assessing the environmental impact of projects whose effects extend into the territory of another state. The EIA procedure can also be applied in individual cases to a project not included in the list or to the modifications of a completed project that will be probably

have significant adverse environmental impact. The decision to apply the assessment procedure in the cases is made by the Ministry of the Environment. In the case of nuclear power projects, the Ministry of Trade and Industry makes the decision. The main tasks in the near future relate to promoting the effectiveness of EIA and the integration of Strategic Environmental Assessment (SEA) in the preparation of policies, plans and programmes. The new Environmental Protection Act and the new Land Use and Building Act have adopted features from EIA.

Many of these approaches address common elements. They assess environmental impacts on the ecosystem and social and economic effects. They include a long-term focus that addresses both effects and planning. They include a discussion on cumulative effects of oil and gas activities with the effects of other activities. They address competing interests.

Assessments may be either comprehensive or strategic.

This chapter should be read in concert with the AEPS Guidelines for Environmental Impact Assessment (EIA) in the Arctic.

Assessments should consider alternative development options and any impacts that alternative activities may have, including cumulative impacts of other existing and known planned activities.

PEIAs and EIAs should consider, in particular, the following effects (for example contamination, habitat disturbance and alteration) on:

- human communities including indigenous ways of life;
- cultural heritage;
- socio-economic systems;
- other human activities (e.g., tourism, scientific research, fishing, and shipping);
- overall landscape (e.g., fragmentation);
- subsistence lifestyles (e.g. harvest practices and availability of food supply);
- oil spill preparedness and response in sea ice conditions;
- permafrost and transition zones;
- climate;
- sustainability of renewable resources;
- flora and fauna including marine mammals;
- air, water and sediment quality;
- ports and shore reception facilities;
- ice dynamics; and
- the interaction among any of the above.

(See the table showing an overview of offshore activities and potential environmental effects in Annex D.)

2.1 Purpose

Environmental impact assessment aims at protecting the Arctic environment, its flora and fauna, abiotic components, and human health, security and well being from deleterious effects. It does this by improving understanding of the possible effects of human activities. A main purpose of the environmental impact assessment process is to integrate environmental considerations in the overall planning from the beginning.

2.2 Technique and Process

The EIA process

The EIA process is a series of interactive steps, including feedback mechanisms and quality assurance procedures. Some of the main features are:

Organization: A single organization should be given responsibility for coordination of the EIA process, including arrangements for logistical and financial support. A first task of this group should be to define the boundaries of the assessment area and reach agreement on the timetable to be followed.

Scope: The scope of the assessment should be comprehensive. However, it may be decided that initial assessments should give priority to environmental sectors considered to be most at risk from the planned activities. In the context of offshore petroleum activities this may for instance be particularly sensitive nesting or feeding habitats for seabirds, or spawning grounds for commercially important fish species, etc.

Data Quality Assurance: A system of quality assurance for data and their collection should be in place.

Timetable: It is essential that the EIA process is performed according to a realistic time table agreed upon at an early stage of the process. The time frame will vary depending on the extent and type of assessment to be carried out.

Sources of Information: Data for EIA purposes may be gathered from existing sources (scientific literature, databases, registers, traditional knowledge, etc.) and necessary additional information may be obtained through baseline investigations or monitoring programs.

Risk Assessment and Environmental Risk Analysis:

The reason for a risk assessment or analysis is to determine if an action has an acceptable level of risk. Both regulators and industry use the information gathered through an EIA and risk analysis to make decisions on whether a proposed activity or development should go forward as planned, to institute mitigating measures to reduce risk, or to choose another alternative action.

Prior to carrying out an environmental risk analysis, risk criteria should be defined. The risk criteria should be documented and the regulator and/or operator should update the

criteria during the course of operations as appropriate and necessary for enhancing the safety level and as an effort to achieve the objectives defined for the activities. Risk or acceptance criteria must at a minimum incorporate national and international laws and standards. They also should incorporate the precautionary principle.

The environmental risk analysis should be initiated as soon as practical to allow time if needed for public consultation. The analysis should be valid for the period of the year the operations will be carried out. If there is uncertainty of the timing of operations, the analysis should be valid for a longer period.

Risk associated with offshore oil and gas activities has two main elements--the risk that an event might happen, such as an oil spill, and the risk that something will be impacted, such as ecologically sensitive areas. A risk assessment should be carried out in order to estimate the risk (or probability) of an acute oil spill or other event. An environmental risk analysis should be conducted to identify impact sensitivities from an acute spill or event. As well as, spills that result from routine operations, including approved discharge of drilling fluids or cuttings. The analysis of each affected environmental resource should clearly distinguish between the risk of oil spills or other accident and impact severity. The risk of contact in an acute spill does not influence the impact severity. Probabilities related to acute oil spills should be estimated or modeled based on geological studies on resource estimates and distribution, development scenarios, site-specific and regional considerations, exploration and production plans, and historical data.

The analysis also should identify the need for risk reducing and contingency measures. Requirements stipulated by or in law or regulations, including requirements for risk reducing measures and the operator's safety objectives, should form the basis for defining an acceptable level of risk.

A flow-chart depicting an environmental risk analysis scheme is represented in Annex E.

2.3 Preliminary Environment Impact Assessment (PEIA)

A Preliminary Environmental Impact Assessment (or similar process) is a screening level review that should contain sufficient detail to permit assessment of whether a proposed activity may have a significant impact and should include:

- a description of the proposed activity, including its purpose, location, duration, and intensity;
- consideration of alternatives to the proposed activity and any impacts that the activity and its alternatives may have, including consideration of cumulative impacts in the light of other existing and known planned activities; and
- a determination whether significant impacts, that would require further assessment, are likely to occur.

2.4 Environmental Impact Assessment (EIA)

An Environmental Impact Assessment should be based on the best available information and include:

- a description of the proposed activity, including its purpose, location, duration, and intensity. This includes the physical characteristics of the proposed activity and its land use requirements during construction and operation phases. It should state the main characteristics of the development process proposed, including type and quantity of materials to be used;
- the estimated type and quantity of expected residues and emission (including air, water, soil, vibration, light, heat and radiation pollution);
- an environmental risk analysis of impacts including sensitivity mapping, and risk assessment of oil spills including trajectory modeling;
- the forecasting methods used to assess effects on the environment and any limitations on models due to lack of data, in undertaking the assessment;
- based on the above, an identification of the area of impact;
- a description of the reference/initial state of the area where the activity is to take place;
- the likely significant effects, direct or indirect and an evaluation of their spatial and temporal scales;
- the likelihood of transboundary impacts;
- potential socio-economic effects and the effects on traditional lifestyles of indigenous people;
- a description of the measures proposed to avoid, reduce or rectify identified potential significant adverse effects, taking into consideration the slow recovery and regenerative capacity of the Arctic;
- other development options, and where authorities prepare the analysis, this may include the alternative of no action. This discussion should include an evaluation of the different alternatives and the reasons for choosing the selected activity; and
- a summary in non-technical language, assisted with figures and diagrams, of the information specified above. If need be, other means of displaying this information, based on cultural heritage of the local and indigenous residents should be prepared.

2.5 Consultations and Hearings

Consultation is an effective dialogue between and amongst regulators, potential operators and stakeholders. In general, consultation should commence at the planning stage and continue throughout the lifetime of a project. It ensures transparent interaction and minimises potential risks for all parties. Consultation also provides a mechanism to resolve disagreements and provide appeal rights to all parties. Consultation is generally thought of in terms of public hearings, but it can also work effectively through informal discussions, focus group and key interviews and questionnaires. There is no single, standard approach to consultation, however some guiding principles promote effective consultation. These include:

- ❑ Effective consultation is two-way;
- ❑ Identifying and building relationships with potential consultees can take considerable time;
- ❑ Consultation programmes are integral to project planning and decisions making;
- ❑ There are limits to the consultation process;
- ❑ Consultation should be open and transparent

Collection and review of information from publicly available sources and stakeholders is important and continuous through the life of a project. Such information, including vital traditional knowledge can enhance the understanding of the project on all sides, including its social setting, the stakeholder community and the issue and values that are important to those stakeholders.

2.6 Decision/Implementation/Project monitoring/Modification

There should be a description of monitoring programs to determine effects, assess the effectiveness of mitigation measures and provide any early warning of adverse effects. The programs should be designed with flexibility so they can be modified to respond to unforeseen effects. These programs should be elaborated in a manner consistent with Chapter 5 (Monitoring). They should also provide for the possibility of modification of an activity, where warranted.

[Back to Table of Contents](#)

3. Arctic Communities, Indigenous Peoples, Sustainability and Conservation of Flora and Fauna

Offshore oil and gas activities should be conducted so as to protect and minimize adverse impacts on living resources and the ecosystems on which they depend; to minimize adverse impacts on the traditional ways of life, resource uses and cultural values of Arctic indigenous communities; and to coordinate with other human activities in the region.

3.1 Living Resources

Necessary measures should be taken to ensure that Arctic flora and fauna and the ecosystems on which they depend are protected during all phases of offshore oil and gas activities. Special attention - particularly with regard to intrusive activities - is required for species (e.g. fish, birds, whales, seals, polar bears, and other marine mammals), which are resources for human use, particularly by indigenous people, and for special habitats (such as ice-edge zones, coastal lagoons and barrier islands, wetlands, estuaries, bays, and river deltas). Onshore features that should be considered for protection and/or avoidance during offshore exploration and production activities include areas used significantly by waterfowl (such as high-density nesting, brood-rearing, molting and staging areas), caribou (such as major calving and insect relief areas), and by musk oxen. Consistent with the interests of human safety and well-being, a primary governing policy in the Arctic should be the conservation of resources for sustainable use.

3.2 Cultural Values

In planning and executing offshore oil and gas operations, necessary measures should be taken, in consultation with neighboring indigenous communities, to recognize and accommodate the cultural heritage, values, practices, rights and resource use of indigenous residents. Arctic States, in cooperation with the oil and gas industry, should address the economic, social, health and educational needs based on equal partnership with indigenous people. All phases of oil and gas activity should avoid historic or prehistoric resources including archeological and sacred sites, historic shipwrecks and other potentially important cultural sites.

3.3 Other Human Activity

Offshore oil and gas activities should be conducted in coordination with other human activities in the region, such as tourism, fishing, shipping, and scientific research.

3.4 Arctic States should:

- Incorporate local and traditional knowledge into the decision-making process including the initial siting studies and disposition of resource use rights. For example, ethnological expert studies are being used in Russia in which scientific and local knowledge are combined;
- Ensure meaningful participation of indigenous people and other residents in the decision making process;
- Urge and, where appropriate, require industry to integrate cultural and environmental protection considerations into planning, design, construction and operational phases of oil and gas activities;
- Improve cross-cultural communication methods to ensure full and meaningful participation of indigenous residents including procedures to incorporate local knowledge;

- Identify and prohibit or restrict oil and gas activities in ecologically and culturally sensitive areas; and
- For use in planning and decisions, identify species, which are resources for human use and their ecological requirements, and identify patterns of their use as resources.

[Back to Table of Contents](#)

4. Safety and Environmental Management

Two basic regulatory approaches are available for dealing with the safety and environmental aspects of offshore Arctic oil and gas operations. They are: (A) a performance-based system and (B) a prescriptive approach.

(A) In the performance based approach, the regulator sets specific quantifiable goals but does not specify how the operator must meet these goals. This system allows the operator the flexibility to specify how they intend to comply with a regulatory body's mandate that operations be conducted safely and in an environmentally sound manner. There are a variety of approaches available to the operator to meet the intent of this alternative, including the use of technical standards, company guidelines, "safety case" initiatives, or combinations of the above.

(B) The prescriptive approach to regulation is based on a series of specific regulatory requirements, which typically represent minimal expectations on behalf of the regulatory body. This approach can be complemented by a performance-based program. Under the prescriptive system, a regulatory body normally develops requirements addressing all phases of offshore operations. The requirements are typically developed from a series of existing standards, practices, guidelines, and procedures. Compliance with these requirements are normally evaluated by a regulatory body through review and evaluation of a series of plans, permits, and related documents and through a system of field based inspections and evaluations.

Either regulatory approach, performance or prescriptive, can be modified to form a 'hybrid' system of regulation, composed of appropriate elements from both regimes. Such a system of regulation may represent a viable alternative for a regulatory body to consider adopting due to the systems' ease of operation and flexibility.

Today, there has been significant interest by both the offshore oil and gas industry and the various regulatory bodies to adopt, when applicable, appropriate international standards as a component of a regulatory system (performance, prescriptive, or hybrid). Use of these international standards addresses the fact that more often than not, regulators are regulating a global industry and there is value in using global standards wherever practical.

In either approach, before oil and gas activities are approved, regulatory bodies should require the operator to demonstrate financial capacity to carry out all aspects of the

operation, including responding to environmental emergencies and decommissioning of facilities. More specifically, a financial estimate of the worst-case environmental emergency scenario should be developed and the operator should provide evidence of financial capability to undertake remediation measures and to compensate persons who may suffer losses as a result of the activity.

There are many similarities between the two systems of regulation. An important management tool to assist the operator in meeting the regulatory objectives of either system, eliminating unsafe behavior, and achieving continual improvement in safety and pollution prevention practices is defining and communicating a culture focus on safety and environmental performance to the workforce and ensuring that they are fully motivated to implement it through a management system. This philosophy can also be applied to a hybrid regulatory program. See Annex F.

4.1 Management Systems

Proper planning to address the environmental sensitivities of a project and to ensure safety of the work force is essential. Whether required by the regulator or conducted voluntarily within industry, environmental and safety planning should be contained in a formal management system. Often referred to as EMS (Environmental Management System), HSEMS (Health and Safety and Health Environmental Management System) or SEMP (Safety and Environmental Management Program) these systems focus attention on the influences that human error and poor organization have on accidents. Certification of management systems have been developed by the International Organization for Standardization (ISO 14000 series) and the American Petroleum Institute (Recommended Practice 75) as well as in Oil and Gas Producers (OGP) and UNEP/OGP publications.

These systems all have as a common and central feature a cyclic process involving sequential consideration of:

- Policy and strategic objectives;
- Organization, resources and documentation;
- Evaluation and risk management;
- Planning;
- Implementation and monitoring; and
- Auditing and Review

Each step of the cyclic process requires leadership and commitment by the implementing body and the principal aim of the system is to deliver continual environmental, safety and health performance. This is assessed by periodic audit or review of a management system's performance to ensure that necessary components are in place and that they are effective.

The key elements of a management system can be described as follows:

4.1.1 Policy and Strategic Objectives

The operator's management should define and document its safety and environmental policies and strategic objectives and ensure that these:

- ❑ Have equal importance with the operator's other policies and objectives;
- ❑ Are implemented and maintained at all organizational levels;
- ❑ Are publicly available;
- ❑ Commit the operator to meet or exceed all relevant regulatory and legislative requirements;
- ❑ Commit the operator to reduce the risks and hazards to health, safety and the environment of its activities, products and services;
- ❑ Provide for the setting of safety and environmental objectives that commit the operator to continuous efforts to improve performance.

The operator should also take steps to ensure that all contractors engaged in operations are also able to meet the requirements of the parent operator management system and applicable laws and regulations.

A more detailed and specific list of possible objectives is set out in [Annex F](#).

4.1.2 Organization, Resources and Documentation

Successful management of safety and environmental matters is a line responsibility, requiring the active participation of all levels of management and supervision. This should be reflected in the organizational structure and allocation of resources. The operator should define, document and communicate - with the aid of organizational diagrams where appropriate - the roles, responsibilities, authorities, accountabilities and interrelations necessary to implement the HSEMS and meet regulatory responsibilities. The operator should also stress and encourage individual and collective responsibility for safety and environmental performance to all employees. It should ensure that personnel are properly trained, competent, and have necessary authority and resources to perform their duties effectively.

4.1.3 Evaluation and risk management

The operator should maintain and implement procedures to identify systematically the hazards and effects, which may affect or arise from project inception through to abandonment and disposal. Procedures should be maintained to evaluate (assess) risk and effects from identified hazards against screening criteria, taking into account probabilities of occurrence and severity of consequences for:

- ❑ People;
- ❑ Environment; and
- ❑ Assets.

The operator should maintain procedures to select, evaluate and implement measures to

reduce risks and effects throughout the project. Risk reduction measures should include both those to prevent incidents (*i.e.* reducing the probability of occurrence) and to mitigate chronic and acute effects (*i.e.* reducing the consequences). In all cases, risks should be reduced to a level deemed as low as reasonably practicable, reflecting amongst other factors, local conditions and circumstances, the balance of costs and benefits and the current state of scientific and technical knowledge.

4.1.4 Planning

The operator should maintain, within its overall work program, plans for achieving environmental objectives and performance criteria. These plans should include:

- ❑ A clear description of the objectives;
- ❑ Designation of responsibility for setting and achieving objectives and performance criteria at each relevant function and level of the organisation;
- ❑ The means by which they are to be achieved;
- ❑ Time scales for implementation;
- ❑ Programs for motivating and encouraging personnel towards a suitable HSE culture;
- ❑ Mechanisms to provide feedback to personnel on environmental performance;
- ❑ Processes to recognise good individual and team environmental performance; and
- ❑ Mechanisms for evaluation and follow-up.

The operator should develop, document and maintain and review plans and procedures for responding to emergencies. These plans and procedures should reflect site-specific characteristics. In order to assess effectiveness of response plans, the operator should maintain procedures to test emergency plans by scenario drills and other suitable means at appropriate intervals. Plans should be revised and up-dated as necessary in the light of experience gained.

4.1.5 Implementation and Monitoring

Activities and tasks should be conducted according to procedures and work instructions developed at the planning stage and modified during the design phase. Management should ensure the continuing adequacy of the safety and environmental performance of the operator through monitoring activities.

The objective of monitoring programs will vary, depending on the activity and operations in progress, but will include some or all of the following elements to;

- ❑ Check the overall effectiveness of the design and operational procedures in protecting the environment;
- ❑ Comply with regulations, standards, planning consents and compliance programmes;
- ❑ Identify sudden or long-term environmental trends or changes;
- ❑ Measure physical disturbance and subsequent recovery following rehabilitation;
- ❑ Study impact and recovery following accidents and incidents
- ❑ Confirm that environmental protection equipment and procedures are effective

- ❑ Compare actual impacts with those predicted in the Environmental Assessment;
- ❑ Maintain a system of records of compliance with environmental policy, operational requirements and planned results; and
- ❑ Provide for internal and external reporting of performance to authorities and stakeholders.

4.2 Auditing and Reviewing

Environmental auditing is a systematic, periodic, and objective review by regulated entities to evaluate facility operations and practices. Auditing provides a means to document environmental, organizational, management, and equipment performance in order to meet environmental requirements and to serve as a quality assurance check. Audits are the fundamental verification tool to ensure that environmental management procedures are being rigorously enforced. Audits are often conducted internally, but periodic reviews involving independent, external auditors are highly suggested.

Environmental audits should be encouraged by the highest levels of management and conducted as an independent function of the audited activities. An environmental audit does not replace or substitute for direct compliance activities such as obtaining permits, installing controls, monitoring compliance, reporting violations, keeping records, or conducting independent inspections.

- procedures should be maintained for audits to:
- determine whether environmental management system elements and activities conform to planned arrangements and are implemented effectively;
- examine line management systems and procedures, field operations, monitoring practices, and data to see if they fulfill the company's environmental policy, objectives, and performance criteria;
- check the accuracy of the Environmental Impact Assessment predictions and ensure that mitigation and monitoring recommendations are being implemented;
- verify implementation and effectiveness of mitigating measures;
- review incident reporting and remedy schemes;
- identify current and potential environmental problems;
- formulate thorough documentation, feedback, and implementation procedures;
- determine compliance with relevant legislative and regulative requirements; and
- identify areas for improvement, leading to progressively better environmental management.

[Back to Table of Contents](#)

5. Monitoring

5.1 Aims and Objectives

Monitoring is an analytical tool used to assist in conserving and protecting ecological and socioeconomic resources and human health. The purpose of monitoring with respect to petroleum activities is to:

- ensure that regulatory and licensing requirements are satisfied;
- establish a basis for identifying environmental responses and trends;
- assess whether the observed environmental impacts are in line with the forecasted and accepted environmental impacts identified in the PEIA;
- detect the first signs of environmental changes, contamination or pollution;
- help assess whether the operator is meeting the goals of its environmental management plan;
- facilitate early detection of possible unforeseen effects; and
- aid future decisions about where, when, how and if oil and gas activities should be allowed to occur.

The design of a monitoring program should include a clear statement of the objectives of the program. Identification of methods utilized to assure quality control for all aspects of the monitoring process should be in-place early in the project's planning phase.

Monitoring should measure physical, chemical, biological and socio-economic conditions that may be impacted by the activities being conducted. Before petroleum activities commence, monitoring should begin with a comprehensive baseline investigation, which should incorporate existing information, and comprise as a minimum all monitoring sites and variables planned to be used in the long term monitoring program. The monitoring program should continue through the decommissioning and reclamation phase.

Monitoring should be conducted so as to distinguish between impacts due to the monitored activities and those from other sources. Monitoring should be coordinated regionally so that interactions between multiple activities may be more easily detected. The type of monitoring conducted depends on the specific type of activity anticipated and the nature of the environment that could be affected.

Prior to initiating offshore oil and gas activities, Arctic States should ensure funding is available within government and/or industry for monitoring.

5.2 Monitoring Targets

Priority monitoring should comprise the following areas during all phases of oil and gas activities to assess and minimize or mitigate adverse effects:

- environmental accounting of emissions to air, discharges to water and sea floor and emissions of noise;
- physical disturbance to sea floor, pelagic biota, ice edge communities and the sea shore, and effects on species populations, distribution and migration routes;
- levels of contaminants in bottom sediments and the water column;
- levels of contaminants and effects in living marine resources, seabirds and other wildlife, with particular attention to vulnerable life stages and areas of critical habitat;
- effects of petroleum activities on local human populations, subsistence access and harvest and other human activities; and
- environmental effects on the integrity of the infrastructure.

The primary emphasis of the monitoring will vary depending on the phase of the petroleum activity. Exploratory drilling and production activities will demand different monitoring emphasis. Similarly, monitoring will have different emphasis in the early stages of the life of a field/facility from later stages.

Monitoring programs should be reviewed on a regular basis to determine whether the results they are yielding indicate a need for changes in operational practices (for example, as a result of failing to achieve the initial hypotheses set out in the EIA or because of unforeseen impacts). Programs should also be reviewed to determine whether they should continue, be modified or terminated. Ultimately, the length and breadth of monitoring programs will be determined by the scale and duration of offshore oil and gas activities and the immediate or longer-term impacts.

The main emphasis of the baseline survey and/or EIA should be to make a complete inventory of environmental resources that may be affected by the planned petroleum activity and identify resources, areas or uses particularly sensitive to the various phases of the petroleum activities. Some resources may be more sensitive to acute oil spills, while others may be more sensitive to chronic discharges/emissions even at sub-lethal concentrations. Both types may have effects on local biological communities, directly or indirectly through effects on the ecosystems.

Programs for identification of biota particularly sensitive to pollution from petroleum activities should not only include adult stages and established communities (e.g. seabird feeding grounds, shoreline communities) but also early stages in the life cycle of plants and animals including larval stages, which are more vulnerable to oil and chemicals than adult stages. Therefore, not only vulnerable species should be identified prior to setting up a monitoring program, but particularly sensitive life stages should also be identified.

5.3 Monitoring methods

Monitoring of trends in levels of contaminants in sediment, water, ice/snow and biota has been the traditional way of monitoring impacts of pollutants on environment. This is still the backbone of most monitoring programs, since reliable trend data are needed both to document changes in the environment as the result of the activities and as a basis for the prediction of future changes.

Monitoring should not only measure the level of pollutant in sediment or biota, but also the effects that the contaminants may have on species, ecosystems and human health. These effects may be monitored by recording changes in biodiversity over time or by measuring effects on single specimens. Such methods, including the use of biological indicators, could give early warning of negative changes in the environment. Methods for monitoring effects should be an integrated part of monitoring programs.

The monitoring programs should not only be centered around field monitoring, but also include laboratory experiments and combinations of laboratory experiments and field

studies whenever relevant.

5.4 Monitoring Standards and Practices

Monitoring standards and practices should be established for all phases of offshore petroleum activities, including offshore seismic operations and marine transportation. Principal monitoring activities should occur during drilling, development, production, decommissioning, and reclamation, as well as during transportation of oil, gas, supplies and personnel.

Monitoring should have a long-term perspective showing developmental trends, and should form the basis for predicting what impacts to expect in the years to come. Monitoring surveys should be more frequent during the first years of investigation until the main impacts and trends are clarified and then as frequent as necessary in subsequent years. Environmental accounting and budgeting should be part of the monitoring system, showing the type and quantity of chemicals and substances that are used and discharged, what environmental impacts have been monitored, and what might be expected in the next few years.

Monitoring should start with a baseline survey establishing pre-activity population structure, distribution and size; habitat status; and existing level of contamination in the environment and biota. This information is essential if previous introductions of the contaminant in question have already taken place either naturally or from human activity. Usually, monitoring will be the chemical measurement of the level of the contaminant in the air, water, ice/snow, sediments, or biological tissue. The levels found are then compared to applicable criteria such as baseline data or appropriate standards. The ultimate goal, however, must be to measure the effects of contaminants on organisms.

Monitoring of contamination levels related to petroleum activities should take into account the source of the contaminant, the potential routes of transport (e.g., aqueous, particulate, or air borne) and the potential pathways for bioaccumulation. Besides the contaminant in question and the particular processes that might be involved, other considerations may include: wind strength and gustiness; ocean currents; relevant river flow; precipitation; air temperature; ocean temperature; sea ice conditions and movement; water depth; sea surface state; subsurface geology; and other resources affected.

Data from environmental monitoring should be harmonized in collaboration with AMAP and could be collected and stored in a central Arctic database repository, such as ARIA or ADD, where it would be available freely to all national environmental protection and monitoring authorities, for circumpolar environmental assessments, and for other users.

Whenever appropriate, operators should consider local indigenous populations for contractual monitoring activities as well as drawing upon traditional knowledge for the identification of historical environmental extremes and trends. Establishment of cooperative relationships with resident indigenous communities for biological sample collection, environmental observation and monitoring, should be pursued.

Results have shown that air emissions from the offshore installations may have an impact on nearby land areas and monitoring of these impacts may be included in updated monitoring guidelines.

5.5 Compliance Monitoring and Review

Results of monitoring should also be utilized by regulators in compliance audits and on-site regulatory supervision as the basis for requiring modification, postponement, or shut-down of operations or specific components of an operation and to change laws.

Monitoring activities can be conducted in conjunction with environmental audits to assure the operator that the equipment and procedures associated with an operation are functioning within design parameters and will not lead to any significant impact on the environment. Authorities should use environmental audits to verify that the results of monitoring are used by the petroleum companies and reflected in their environmental strategy (see [Annex G](#), Examples of Generalized Monitoring Plans).

[Back to Table of Contents](#)

6. Operating Practices

6.1 Waste Management

Offshore oil and gas activities produce a variety of wastes in the form of aqueous and solid discharges and atmospheric emissions that need to be managed to avoid air and water pollution, smothering of benthic communities, and contamination of materials and food sources. Waste management is most effective when included in the overall planning from the beginning and combined with pollution prevention measures. Prevention and elimination of these discharges and emissions, which pose pollution threats to the Arctic environment, should be a targeted goal of regulatory activity. New technology makes this goal achievable in some situations. The appropriate waste management decision for each activity should also consider the feasibility of zero discharge to the marine environment in the area under review, whether the necessary onshore infrastructure exists, and whether an unacceptable transfer of pollutants from one media to another would result. If prevention and elimination of wastes is not possible, then application of best available techniques will allow for a hierarchical approach of source reduction and waste minimization to meet applicable regulations.

Examples of Recommended Preventative Management Techniques

- consider zero discharge of the main waste streams (produced water and drilling wastes) at the planning and construction stage, in particular zero discharge of drilling waste and produced water;
- reduce waste at the source by process modification, material elimination, material substitution, inventory control and management, improved housekeeping, and water recovery;
- reuse of materials or products such as chemical containers, and oil-based or synthetic-

based drilling fluids;

- recycle/recovery by the conversion of wastes into usable materials and/or extraction of energy or materials from wastes such as recycling scrap metal, recovery of hydrocarbons from tank bottoms and other oily sludge, burning waste oil for energy, and the use of produced water for enhanced recovery;
- reduce toxicity of effluents through the careful selection of drilling fluids and chemical products used in separation equipment and wastewater treatment systems;
- perform radiation surveys of equipment and sites to prevent or minimize the spread of Naturally Occurring Radioactive Materials (NORM); and
- where NORM-scale formation is anticipated, use scale inhibitors to minimize or prevent the buildup of radioactive scale in tubulars.

Management Techniques for Drilling Wastes and Production Effluents

Waste from Drilling Activities

Drilling wastes in the form of residual muds and cuttings comprise the principal wastes generated during well drilling. Initially, a determination needs to be made on whether or not to prohibit discharge based on the nature/volume of the discharge and its effect on the environment. In certain areas, due to identification of environmentally sensitive areas muds and cuttings may need to be managed in a manner that will prevent discharge. In areas where discharge is permitted, the method of disposal should be based upon careful consideration of mud formulation and specific environmental conditions at the site.

Where water-based muds are employed, additives containing oil, heavy metals, or other bioaccumulating substances should be avoided or removed prior to discharge. Persistent and toxic substances should be avoided or criteria for the maximum allowable concentration should be established. This is particularly true if cuttings with adhered mud are discharged offshore or disposed of on land. If the option of land disposal is used, then both the properties of the mud and the environmental conditions at the proposed disposal site should be carefully considered to determine acceptability of the disposal site. This is particularly important in the arctic where creation of a disposal site on land may lead to greater environmental damage.

Environmental considerations favor the use of non oil-based muds for drilling. In shallow portions of a well, saltwater and saltwater with clay are often used as the primary drilling fluid and the cuttings and residual mud can generally be safely discharged into the marine environment.

Discharge to the marine environment should be considered only where zero discharge technologies or reinjection are not feasible. Based upon site-specific biological, oceanographic and sea ice conditions, discharges should be at or near the sea floor or at a suitable depth in the water columns to prevent large sediment plumes that might affect benthic organisms, plankton productivity, or fish and marine mammal movements. These discharges should be considered on a case-by-case basis.

Where the use of non-aqueous fluids is required, for example in highly deviated wells or in certain geological formations, operators should ensure that fluids are recycled as far as practicable. Disposal of cuttings contaminated with such fluids should be assessed on the basis of a comparative assessment of alternatives, including re-use of the material, injection into geological formations and discharge on to the sea bed taking into account possible impacts on the sea and other environmental compartments.

Spent oil-based or synthetic-based muds can often be reconditioned and recycled. Injection into disposal wells or encapsulation of reserve fluid pits containing muds and cuttings, including those with acceptable levels of NORMs, and other pumpable wastes, are potential disposal techniques. Where geological conditions permit, reinjection of wastes into the reservoir achieves zero discharge to the marine environment of cuttings and drilling fluids. Management of down-hole disposal will require diligence to ensure that wastes do not migrate into unsealed or undesirable stratigraphic zones and that well integrity is maintained. Stabilized burial at approved onshore disposal sites is another potential alternative.

Production Waste Discharges

During production operations, produced water can be properly treated and discharged or may be reinjected in areas where marine discharge is undesirable. Treatment, work over, and completion fluids, which are brought to the surface in connection with production, may be commingled with waste waters from gas plants that are an integral part of production operations, unless those waters are classified as hazardous waste at the time of injection. In most cases they can be commingled with produced water for treatment and discharged within acceptable limits or reinjected.

Produced water treatment should be taken into account in the design phase and when significant modifications in operations are carried out. As characteristics of production water differ from one platform to another, there is no single system that can be applied successfully to all offshore platforms. Therefore, a site-specific combination of technologies based on the characteristics of produced water such as droplet size, stability of emulsion, ratio of droplets/dissolved hydrocarbons, other substances such as corrosion inhibitors and solids should be applied, and naturally occurring substances.

Regulators and the industry should give consideration to the options for reduction and possible elimination of produced water discharged to the sea through the application of BAT, for example, injection, down hole separation or water shut-off. The focus should be on reducing the volume of discharges of produced water with the highest loads of oil and other substances.

Regulatory agencies and industry should ensure that BAT and BEP are implemented on each platform and that BAT and BEP are regularly reviewed. In addition, regulatory agencies and industry should ensure that new offshore platforms or major modifications to existing platforms should consider design changes that minimize discharges, and preferably aspire to zero discharges of produced water.

Produced sand containing elevated levels of naturally occurring radioactive material should be re-injected, encapsulated, or removed from the site and stored in a safe and environmentally sound manner that is carefully controlled and whose risks and circumstances have been properly evaluated. Management of these wastes will require diligence to ensure that radioactive wastes taken to shore are handled and disposed of in accordance with applicable international law and in an appropriate and approved manner. Radioactive materials should be transported in approved containers with proper labeling, which identify the substance and its special transport and handling requirements. Appropriate record keeping and proper notification for shippers should be maintained.

Deck wash and chemical/fluid releases are another concern to the marine environment, especially where oil-based muds are in use. A facility plan should be developed to address these potential conditions and methods of spill control and leak minimization should be incorporated into facility design and maintenance procedures. These plans, minimization efforts and controls shall be applied to, but not limited to, material storage areas, loading and unloading operations, oil/water separation equipment, wastewater treatment, waste storage areas, and facility runoff management systems.

All washdown waters, hydrocarbon contaminated rainwater and deck wash, and machinery drainage space fluids should be either processed through an oil-water separator prior to overboard discharge, meeting MARPOL 73/78 requirements, or injected where environmentally acceptable.

Waste from Well-Testing

Flaring can be a significant source of emissions to air. If flaring is considered environmentally unacceptable or if significant amounts of liquid hydrocarbons are produced during a test (i.e. extended well-testing operations), they may be processed.

Solids and Domestic Wastes

Disposal of solid and domestic wastes should be done in conformity with international law, such as MARPOL 73/78.

Sanitary Waste

Sanitary wastes such as sewage and gray waters should be processed according to international or local government standards prior to discharge into the marine environment. Processing in an acceptable sanitary waste treatment unit will generally properly treat waste streams prior to discharge.

Air Emissions

Air emissions associated with oil and gas exploration and production activities can be generally categorized as arising from two activities: (1) the combustion of fuels for power

generation; and (2) emissions arising directly from the production, treatment, storage, or transportation of produced oil and gas. International standards for certain air emissions from platforms are covered by MARPOL Annex VI (73/78).

Overall emissions reductions can best be achieved through programs that emphasize energy efficiency and conservation in all activities, exploration (survey and exploratory drilling), development (construction and drilling), production, and transportation.

Hazardous Waste Handling and Disposal

The most effective way of protecting human health and the environment from the dangers posed by hazardous wastes is to ensure the reduction of their generation to a minimum in terms of quantity and/or hazard potential, taking into account technological and economic aspects. Minimizing the generation of hazardous wastes requires the implementation of environmentally sound low-waste technologies, recycling options, good house-keeping and management systems. Necessary measures should be taken to ensure that management of hazardous wastes is protective of human health and the Arctic environment.

The availability of adequate disposal facilities should be ensured prior to allowing an activity to generate hazardous wastes. Hazardous wastes requiring transport to a disposal site should be packaged, labeled, and transported in conformity with generally accepted and recognized international rules and standards in the field of packaging, labeling, and transport. Due account should be taken of relevant internationally recognized practices. Transported hazardous wastes should be accompanied by a movement document from the point at which movement commences to the point of disposal.

6.2 Health, Safety and Environmental Supervision

The appropriate regulatory agencies should supervise the compliance by the responsible companies with applicable legislation, regulations, and/or conditions. The supervision should address the management system by means of audits and be supplemented as needed by onsite verifications by qualified personnel who are authorized to act as the lead agency on behalf of all applicable regulatory entities.

The regulatory supervision should cover all stages of design, fabrication, installation, operations and removal of offshore installations. It should address the operating company's management of design, operations, working conditions, record keeping and reporting, as well as procedures for ensuring compliance with permits and approved plans. The regulatory supervision should also encompass the company's systems for pollution control and monitoring, drilling and well operations techniques, production, and pipeline operations. Representatives of the regulatory agencies should have enforcement authority to take the appropriate action in case of violations, incidents of noncompliance, or if the operator fails to react adequately to the occurrence of dangerous situations. These actions can include issuing warnings, citations, and injunctions, or ordering a shut-

in of a particular component of the operation, cessation of a specific operation, or a complete shut-down of the installation.

Representatives of the regulatory agencies should have the right of access to the installations and to all related documentation and equipment at any time. The operating company shall provide for, as far as practical, the accommodation and when necessary the transportation of regulatory agency personnel. Supervisory activities may be carried out as scheduled or unscheduled visits. The frequency and extent of such activities will be decided by the regulatory agencies.

The regulatory agencies should establish plans for these supervisory activities for each operating company. The extent and the focal points of the regulatory supervision should be decided upon the basis of parameters such as: regulatory requirements, the previous experience with the operators compliance, environmental and geologic conditions, the type of activity conducted by the operator, the type of technology applied, and reported accidents and incidents.

6.3 Design and Operations

Offshore oil and gas activities should make use of the best available and safest technologies that are determined to be economically feasible and be conducted in a manner to minimize impact on the environment. Operators should identify technologies and procedures to be employed for each step of the process from prospecting to exploration, development, production, platform decommissioning, and site clearance. Regulators should examine technologies and procedures proposed for use by operators and their adequacy to ensure that they are appropriate for the Arctic.

Of primary importance is the need to ensure that wells remain under control at all times during drilling, well-completion, production, and well-workover operations. This capability must be maintained even while operating under extreme conditions.

When planning an offshore oil and gas operation, a risk analysis may be used as a tool to identify potential hazards and prevent personal injuries, loss of human lives, and pollution of the environment. Criteria used for conducting such an analysis should be based on local regulatory requirements, local environmental conditions in the area of operation, and the planned operational activity.

A risk analyses should:

- address prevention of injuries, loss of human life, and pollution of the environment;
- include risk criteria that has been defined prior to conducting the analysis and document the evaluations forming the basis of the acceptance criteria;
- be used to follow the progress of activities in planning and implementation;
- identify risk that has been assessed with reference to the acceptance criteria, form the basis of systematic selection of technical operational and organizational risk to be implemented;

- be updated on a continuous basis and included as part of the decision making process; and
- systematically follow-up implemented risk reducing measures and assumptions made in the analysis to ensure safety within the defined criteria.

Technology

Offshore platforms and other structures used for oil and gas activities in the Arctic should be designed, built, installed, maintained, and inspected to ensure their structural integrity taking into account the site-specific environmental conditions. Standards exist for the construction of fixed offshore platforms, including those constructed of steel and concrete. Standards, such as those under the International Organization for Standardization (ISO), are under development for offshore artificial islands including those constructed of sand, gravel and ice. In iceberg-prone areas, provision should be made for the emergency removal of removable installations.

A blowout preventor (BOP) system should be installed consisting of several remote controlled closing systems and a backup accumulator-charging system. When a sub-sea BOP stack is to be used in an area subject to ice scour, it should be placed in an excavation well below the maximum depth of ice scour. The BOPs and related equipment should be suitable for operation in subfreezing conditions.

A mud program should be prepared that has as its objective the maintenance of well control at all times. Mud temperatures should be controlled to minimize heat loss to permafrost zones in order to minimize thawing, which can result in serious problems while drilling.

Wells should be completed with casing strings and cement of sufficient quantity and quality to prevent the release of fluids from any stratum either to the water column or to another stratum. Special attention should be paid to cement placed across permafrost zones.

Prior to moving a well-completion rig, wells capable of production should either be shut in, both at the surface and the subsurface, or equipped with emergency shutdown systems. Production safety equipment capable of operating in an Arctic environment should be installed on all wells and production facility equipment. Wells open to hydrocarbon-bearing zones should be equipped with subsurface safety devices capable of shutting off the flow from the well in an emergency. All production facility equipment should be equipped with devices capable of protecting the facility and the environment from pollution.

Pipelines should be installed, operated, and maintained in a manner that minimizes disturbance of sea floor habitat and does not unreasonably interfere with other uses of the sea floor in the area. Design of offshore Arctic pipelines should follow recommended practices such as those from Det Norske Veritas or the American Petroleum Institute and take into account such things as thaw settlement, near shore strudel scouring, and ice keel

gouging. For example, in nearshore areas, pipelines should be buried below the maximum depth of potential damage from ice and strudel scour processes. Strengthened pipe, instrumented internal inspection devices, leak detection systems and techniques, cathodic protection, quality control, and preventive maintenance also must be considered in the design of Arctic pipeline systems. For multi-input pipelines, leak detection systems are not as sensitive for low-volume leaks. Therefore the operator/regulator may consider alternatives such as an alarmed metering system to provide continuous volumetric comparison between line inputs and onshore deliveries, or in order to detect leak rates below the threshold, a daily or more frequent volumetric line mass-balance comparison of inflows and outflows could be considered.

Procedures

Operators should submit a summary of the proposed project at the outset, followed by more detailed information prior to the initiation of each major activity, such as the drilling of a well. The application should describe all procedures to be employed, including those necessary to prevent harm to life and the marine environment. Special attention should be paid to operations in offshore areas underlain by permafrost.

Safe work procedures should be developed for all phases of the proposed operations, including construction activities, transportation, equipment operation and maintenance, safety tests and drills. For example, well-control exercises should be conducted regularly for each crew to develop an adequate level of response proficiency to conditions threatening a blowout. Exercises should cover a wide range of situations. As appropriate, procedures should also be developed to ensure that hot work, welding, burning, cutting, and other operations with the potential to cause ignition of flammable vapors are conducted safely. Safe work procedures may also be developed for cold work such as use of radioactive material, trenching and excavating, and work on fire suppression, gas detection or emergency shutdown devices. These procedures may include issuance of a work permit.

Procedures should be developed to protect personnel from the toxic effects of hydrogen sulfide, if it is encountered during drilling and production.

Well abandonment, platform decommissioning, and site clearance are discussed in Chapter 8 (Site Clearance and Decommissioning). Operators shall incorporate into the design of an installation needed measures to ensure that removal of the installation can be accomplished without causing significant impacts on the environment.

6.4 Human Health and Safety

Threats to human health and safety including unsafe working conditions are factors contributing to accidents that could lead to environmental pollution. Possible threats or hazards affecting the health and safety of personnel in Arctic offshore oil and gas activities take many forms and comes from multiple sources. Principal sources include, but are not limited to, the harsh Arctic environment, the structural integrity of the

installation, blowouts, fire and explosions, equipment failure, the transfer of personnel and supplies, and drilling, production, well completion, and workover operations.

All offshore activities should be conducted in a safe and skillful manner and equipment maintained in a safe condition for the health and safety of all persons and the protection of the associated facilities. All necessary precautions should be taken to control, remove, or otherwise manage any potential health, safety or fire hazards.

Management System and Work Procedures

One way to manage potential risks is through the use of an appropriate management system. A management system or plan should address the identification of potential hazards, the evaluation of risks to the health and safety of personnel and procedures to eliminate or reduce health and safety risks (See Chapter 4.1 **Management Systems**). Management plans should:

- identify and recognize significant health and safety risks;
- evaluate significant health and safety risks;
- plan and implement actions/procedures to manage risks;
- review and test preparedness and effectiveness on a regular basis;
- establish clear lines of communication with personnel;
- provide training to personnel;
- identify appropriate personnel protection equipment; and
- communicate contents of the management plan to all personnel.

Operators should ensure that all contractors pursue established safe working environment objectives. Safe working procedures should be established for all persons, including contractors, to ensure safe working conditions for all offshore activities. In addition work permits may be required for specific work activities including hot work, cutting, and welding (see 6.3 **Design and Operations**).

Another useful tool to consider in the management or elimination of risks is through the use of a Health, Safety and Environment (HSE) Committee. HSE Committee meetings could be held to ensure that critical safety and environmental control information is communicated to all parties throughout offshore operations. HSE meetings would coordinate among the operator, contractors, and employees to ensure a mutual understanding of potential hazards in working environment. Meetings would allow employees an opportunity to express safety concerns to be addressed by the operator.

Control of Materials

Materials specifications, inventories, separation, confinement, and handling of toxic or hazardous materials that can affect human health and safety should be determined, documented, labeled, and communicated to appropriate person and addressed (see 6.1 **Waste Management**).

6.5 Transportation of supplies and transportation infrastructure

Offshore transportation by air and water should be planned and carried out in a manner to eliminate or minimize adverse impact on the environment. The sections in these guidelines on management systems, monitoring programs and planning for emergencies should be applied, with adaptations where necessary, to transportation activities, as should the AEPS EIA Guidelines. Information gathering and mitigation measures identified at the environmental assessment stage of project planning should be fully utilized for minimizing the environmental impacts associated with transportation of supplies and people to and from offshore operations. For example, it may be necessary to select routes, flight altitudes and/or the time of voyages to avoid impact on wildlife or the harvesting of wildlife by area residents.

The planning and implementation of supply routes involves many considerations beyond environmental impacts. The system of transportation consists of supply bases, sea-routes and vessels. Procedures involved are the safe handling of cargo and safe navigation. All these elements must be carefully evaluated and accounted for prior to the field development. Transportation of supplies, infrastructure and crude oil, shall therefore be an integrated part of the environmental impact assessment outlined in these Guidelines.

Where roads are required, ice roads, which create seasonal rather than permanent physical barriers to animal movements, may be preferable to permanent roads. Planning and environmental studies should be done to ensure the use of water from lakes or rivers to make ice roads will not significantly affect important freshwater habitat, including habitat for migratory birds.

Ship-based transportation of supplies to offshore oil and gas installation are to be carried out under the administration of those requirements and guidelines laid down in the Safety of Life at Sea Convention, including in particular Chapter IX pertaining to the International Safety Management (ISM) Code, The International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC), and the International Convention on the Prevention of Pollution from Ships (MARPOL 73/78), among others. The basis of the ship owners management system should include guidelines, codes and relevant international conventions to safeguard those additional requirements of the harsh environment of the Arctic such as those established by the Marine Environment Protection Committee (MEPC) and Maritime Safety Committee (MSC) of the International Maritime Organization.

Supplies

In maintaining the activity of an oil or gas installation in every aspect, supplies of many categories are involved;

- Supplies for maintaining production;
- Supplies for installation maintenance and safe operation; and
- Supplies of domestic use.

Storage, packaging and operational procedures of handling are to be as in accordance with general rules of safe practice and to recommendations of the product manufacturer.

Supply base, routing and installations

Prior to field development, it is necessary to plan infrastructure required to serve the needs of the installation. In addition to systems for handling the production, a system is also required to secure sufficient and safe supply. Beside the installation itself, the main elements of such infrastructure are the supply bases and sea-routes. The location of such bases is often decided on the basis of compromises in which the requirements for safe transportation must compete with other possibly conflicting alternatives. This calls for an even closer focusing on safe routing. An Arctic land-offshore transport routing system might cover more than one field and therefore must be reliable. To assure safe operations, sufficient care must be taken regarding both climatic and environmental seasonal variations. In order to account for these factors, one should evaluate the possible need for ice handling and management procedures (integrated in the field operational plans if feasible) covering the installation, and the route as well as the supply base.

6.6 Training

Trained operator and contract personnel are the key to safe and environmentally sound oil and gas activities. Appropriate training plans, programs, and practices addressing offshore Arctic oil and gas activities should be established and implemented for these personnel in accordance with their duties and job responsibilities. (Refer to Chapter 7, **Emergencies**, for information concerning response training).

All personnel should be provided with training on basic safety and environmental issues and procedures specific to the offshore environment prior to assuming their duties. This training should provide personnel with the necessary skills and knowledge needed to conduct their jobs in a safe manner, provide for health and safety of all persons, and protect the environment.

Training programs should provide instruction on the operation of equipment, offshore operating practices, offshore emergency survival and fire fighting, local or regional regulatory requirements. It should include Arctic cultural, social, and environmental concerns including marine mammal interactions as dictated by an individuals job responsibilities. Where appropriate, traditional knowledge should be used in training programs.

Supervisory personnel should have a thorough knowledge of the operations and the operating procedures for which they are responsible. Individuals responsible for drilling, well completion, or workover operations should be properly trained in well control. Individuals responsible for production operations should be properly trained in production safety system operations.

A person designated by the operator to be in charge of the offshore operation should have a thorough knowledge of the operations and the operating procedures they are responsible for, and training in the following areas as appropriate:

- leadership and command ability;
- communication skills;
- team building;
- crisis management; and
- installation specific emergency training.

Periodic refresher training should be provided to personnel as appropriate. As required, procedures should be developed to monitor the effectiveness of training programs.

[Back to Table of Contents](#)

7. Emergencies

Arctic States that are party to the International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC 1990) and/or the International Convention for the Prevention of Pollution from Ships (MARPOL 1973/1978, Annex I – regulations for the prevention of pollution by oil), are required to ensure that operators have oil pollution emergency plans and that these plans are carried on board installations.

7.1 Preparedness

Operators should establish and maintain emergency preparedness so that the mitigation of an incident will be carried out without delay in a controlled, organized, and safe manner. Risk analyses should be carried out in order to identify the accidental events that may occur and the consequences of such accidental events. Hazardous situations and accidents should be defined for the operations in question. An analysis should be carried out to design the emergency preparedness requirements so as to meet the specific circumstances of the operation. The emergency preparedness required for the operation should be incorporated in the design and modification of the oil and gas installation, and for the selection of equipment. The performance requirements expected of both standby vessel and ice roads in emergencies should also be defined. This should include design criteria, equipment and manning requirements for standby vessels and design criteria and construction and maintenance requirements for roads. Emergency preparedness should be part of the safety and environmental program to ensure its integration into all phases of the operation in question.

Preparedness relating to oil pollution should ensure that the source of any oil pollution is first secured, and any release is effectively contained and collected near the source of the discharge as quickly as possible. Particular attention should be paid to response contingencies in ice conditions, where oil spill response, including containment, may require a range of techniques depending on the condition of the ice. The preparedness should also address protection of public health, environmental resources including shorelines, ice and water interfaces, and economic and cultural resources. The health and

safety of all persons who may be involved in an incident (e.g., local populations and their representatives, responders, volunteers, etc.) should be a predominant consideration, and should be integrated into the overall emergency preparedness regime.

The communication within the emergency preparedness organization should ensure effective administration and control of all response resources when abnormal conditions and emergencies occur. The means of communication and their use should ensure unambiguous and effective transmission of information.

A key factor in preparedness is ensuring that personnel involved in the response are trained and instructed in their roles and duties.

Preparedness planning of the operator should include co-ordination with any relevant municipal, local, state or federal emergency response plan.

Governments are responsible for oversight including national emergency contingency planning. Governments should also make appropriate arrangements that facilitate international coordination and cooperation.

7.2 Response

Refer to the EPPR Field Guide for Oil Spill Response in Arctic Waters for a practical introduction to oil spill response. Emergency response plans should address abnormal conditions and emergencies that can be anticipated during the oil and gas operation being carried out, including:

- personnel injury or loss of life;
- loss of well control, or release of flammable or toxic gas;
- fire, explosion or other emergencies that may occur;
- damage to the oil and gas installation;
- loss of support craft including aircraft;
- spills of oil or other pollutants; and
- hazards unique to the operation including ice encroachment; uncontrolled flooding of the installation; loss of ballast control or stability; pipeline leaks or ruptures; vessel collision; and heavy weather and difficulties with support facilities such as ice roads, aircraft or shuttle tankers.

Contents of Emergency Response Plans

An emergency response plan should contain at least the following elements:

- A Description of the Response Organization - This should clearly state its structure, roles, responsibilities and decision-making authorities;
- Policies and Procedures for Responding - This should include a summary of equipment to combat the particular condition or emergency situation, clearly stating the make and type of equipment, its capacity, location, type of transport, field of

operation and operational procedures and training for operating staff. The procedures should include each key person's duties, when and how the emergency equipment is to be employed, and the action to be carried out. Policies should state measures for limiting or stopping the event in question and conditions for terminating the action. The procedures should be designed so as to be expedient to use for the emergency;

- A Description of the Alarm and Communication Systems - This should include notification criteria, reporting procedures and policies regarding government notification. Primary and secondary communication facilities among operational components should also be identified;
- Alert Criteria - Procedures here should list precautionary measures to secure the well and evacuate personnel in the event of damage from severe weather, sea, ice, erosion or other event;
- On-Site First Aid - List available backup medical support, medevac facilities and other emergency facilities, such as emergency fueling sites. Also describe required survival equipment, including extreme weather survival gear, alternate accommodation facilities, and emergency power sources; and
- Relief Well Arrangements - The operator should outline his immediate response to a well control incident or blowout. Also, the operator should demonstrate the availability of the necessary equipment, and support systems to be utilized.
- Designated response operation center to coordinate response actions.
- "Emergency response contact list" in order to identify who and how key responders to an emergency are to be contacted.

Oil Spill Response Plan

Operators should be required to have site-specific or operator-specific plans. An oil spill response plan addresses an oil spill volume based on relevant well data, catastrophic loss of a tank ship or barge, or damage to a pipeline. The Plan should be supplemented by resource sensitivity maps arranged sequentially by month for those areas identified by spill trajectories as being potentially exposed to oil pollution. The plan should also describe the process for its development, which should include involvement by response entities, both government and private, health officials, scientists, local populations that may be affected, wildlife experts, trustees of resources, and anyone else who may be affected or who may have a role in the response. Operators should allow the opportunity for public review and comment of the Plan.

The oil spill response plan should include, in addition to the items described above, the following:

- a brief description of the operation;
- a description of the site, water depth, seasonal constraints, and logistical support;
- references to all environmental support material that would be relevant to establish cleanup priorities;
- details of the operator's capability in using real time wind and current data to implement an oil spill trajectory model both for open sea and for ice-infested areas;
- a map depicting sensitive areas to be protected;

- a description of cleanup and containment strategies required for shoreline and ice-covered areas
- a description of alternative cleanup strategies such as the use of dispersants, in situ burning, and no response;
- a strategy to respond to small spills from the installation, shore base or loading operations;
- provisions for transport, storage, and disposal of recovered oil and oil contaminated materials;
- spill response crew relief & logistics; and
- a list or inventory of spill response equipment.

Operators should have access to oil spill countermeasures equipment. The oil spill response plan should itemize equipment on-site for immediate containment purposes. The plan should also provide details of oil spill equipment and resources that are not on-site but will be mobilized in the event of a spill; the details should include type of equipment, required resources, logistics and timing of mobilizing the equipment to the site.

The oil spill response plan should include the qualifications and training of personnel responsible for the management of oil spill responses. It should clearly define their authority to take actions to respond to such emergencies.

A national preparedness and response system should be developed on the basis of protecting the health and safety, the environment, and the socio-economic interests of the nation's citizens.

Oil spill response plans must take the existence of ice conditions into account. Broken ice conditions make it difficult to respond to oil spills with conventional mechanical response equipment. With spills in solid and broken ice conditions, oil can be trapped in melting or freezing ice. However, new techniques that rely on natural containment attributes of ice allow conventional mechanical response equipment to be employed effectively to remove oil from solid and broken ice environments where, in open water conditions, it would normally spread widely over the ocean surface. Through ice movement and drift, oil can be carried a long distance from the original site of the spill. But deployment of oil tracking buoys in the ice can aid in maintaining the position of the oil and allow responders the opportunity to recover the oil once ice conditions are safe enough for removal activities. Where ice conditions exist, oil spill response plans must take these considerations into account.

Ice Management Plan

Where there may be pack ice, drifting icebergs or ice islands at the operational site, the operator should develop an ice management plan that provides for the protection of the installation.

The Plan should include details regarding ice detection, ice surveillance, data collection, forecasting and reporting of ice encroachment, multiyear ice hazards, ice loading, and structural loading. If required, the Plan should also include details of ice avoidance or ice deflection, including forecasting oil-in-ice drift.

The Plan should include alert criteria and alert procedures to ensure a totally effective mobilization of all relevant emergency preparedness resources, including procedures for moving the installation. Measures for danger limitation should be implemented when a hazardous situation occurs in order to prevent its developing into an accident situation.

Emergency Preparedness Maintenance

All the established technical, operational and organizational measures that make up the emergency preparedness of the individual activity, as well as, the actual equipment should be maintained in order to keep up a state of effective emergency preparedness.

Oil spill response exercises should be carried out on a scheduled basis allowing responders to use actual equipment. In addition, a communication exercise in response to an emergency should be conducted on a scheduled basis. Exercises should be reviewed to ensure compliance with all requirements relating to emergency preparedness. Any deviation should be identified and corrected immediately; the causes of such deviation should be identified. In accordance with the safety and environmental program, emergency preparedness work should be verified and documented.

Measures should be taken to update the established emergency preparedness based on continuous evaluation of experience, technological development and new knowledge.

[Back to Table of Contents](#)

8. Decommissioning and Site Clearance

Decommissioning is an integral part of the life cycle of an offshore project. Plans for decommissioning should be incorporated at the design phase of a development and reviewed again when the facility is no longer needed for its current purpose. These plans should involve both technical considerations and financial provisions required to undertake the activity and any post-abandonment clearance and/or monitoring work.

A decommissioning plan should be site- and condition-specific and should take into account sound science and field experience and balance environmental, safety, health, economic and technological factors as well as any constraints imposed by intergovernmental agreements. It is noted that those Arctic States that are Contracting Parties to the OSPAR Convention have agreed a binding package of measures (via OSPAR Decision 98/3) which generally prohibits disposal of installations at sea, but which allows for derogation from this prohibition in a limited number of instances. These include leaving in place the footings of a large steel jacket platform (with a jacket weight in excess of 10,000 tons) as well as a broad exemption for gravity-based concrete

structures for which leaving in place and/or disposal at a designated site may be considered.

Other Arctic States will need to take into account the provisions of the London Convention (1972) or when it enters into force the 1996 Protocol to that agreement where full or partial disposal at sea (including toppling and leaving in place) is considered. For both the 1972 and 1996 agreements, Contracting Parties to the London Convention (1972) have adopted specific guidelines for disposal of platforms.

In addition to these agreements dealing with the special case of disposal of platforms, the International Maritime Organization has adopted “Guidelines and standards for the removal of offshore installations and structures on the continental shelf and in the Exclusive Economic Zone” (Resolution A.672(16))” which govern safety of navigation. Amongst other things, the guidelines state that for structures placed on the seabed after 1998, complete removal should be feasible.

Decommissioning plans should be developed in consultation with the competent authorities and stakeholders, including indigenous residents, fishing groups and other interested parties. The decommissioning plan should address the both the facilities and the environment. (The London Convention (1972) Waste Assessment guidance is a useful reference in this regard.) Abandoned wells should be plugged and sealed. Pipelines may be removed, or cleaned flushed and left in space either on the seabed, if they will not interfere with other uses of the sea, or trenched. Removal of facilities should consider potential impacts on the site, including noise (as from the use of explosives), physical disturbance of communities established during the life of the facility and demobilization routes.

Site clearance and post decommissioning monitoring programs are important aspects. These will ensure that with the exception of facilities purposely left in place that the site is clear of debris and that no obstacles are left that might interfere with other uses of the site. Post abandonment monitoring can also be used to assess the recovery of the production site. Where an artificial island has been constructed as a platform for drilling or construction, it may be appropriate to allow natural processes to return the site to its former configuration.

[Back to Table of Contents](#)

9. Abbreviations and Definitions

Accident: A sudden, unplanned, unintentional and undesired event or series of events that causes physical harm to a person or damage to property, or which has negative effects on the environment.

ADD: International Arctic Environmental Data Directory <http://www.grida.no/add/>

AEPS: Arctic Environmental Protection Strategy

AMAP: Arctic Mapping and Assessment Program, a working group under the Arctic Council. <http://www.amap.no/>

API: American Petroleum Institute <http://www.api.org>

BAT: Best Available Technology/Techniques

BEP: Best Environmental Practice

BOP: Blowout Preventor--Safety system that quickly closes a well in the course drilling to avoid blowouts.

CAFF: Conservation of Arctic Flora and Fauna-- a working group under the Arctic Council. <http://www.caff.is/>

Chemicals: A generic term for both chemical substance and/or mixture of substances (see definition for 'mixture of substances').

Chemical Substance: A chemical element and chemical compound of several elements, naturally or industrially produced.

Chemical waste: Oil/fuel residues, empty chemical and paint packaging, all kinds of chemical waste (solid and liquid) and all kinds of paint and solvents.

Contamination: concentrations of naturally occurring substances enhanced by man's activities or the occurrence of synthetic substances in the environment at concentrations that do not give rise to adverse effects;

DNV: Det Norske Veritas, Classification, Consulting and Certification Society.
<http://www.dnv.com/>

EIA: Environmental Impact Assessment

EMS: Environmental Management System

Emergency: An unplanned event which has caused injury, loss or damage or which is an actual or potential threat to human life, the environment or the installation and has made it necessary to deviate from the planned operation or suspend the use of standard operating procedures.

EPPR: Emergency Preparedness, Prevention and Response a working group and program of the Arctic Council. <http://eppr.arctic-council.org/>

Hazard: A physical situation with a potential for causing human injury, damage to property, negative effects on the environment or a combination of these. British Standards BS 8800 definition--A source or a situation with a potential for harm in terms

of human injury or ill-health, damage to property, damage to the environment, or a combination of these.

Hazard Analysis: The identification of undesired events that lead to the materialisation of a hazard, the analysis of the mechanisms by which these undesired events could occur and usually the estimation of the extent, magnitude and likelihood of any harmful effects.

Hazard Identification: (British Standards BS 8800) The process of recognising that a hazard exists and defining its characteristics.

HSEMS: Health, Safety, and Environmental Management System

HSE: Health, Safety and Environment

ISM: International Safety Management Code in Chapter IX of the Safety of Life at Sea Convention. <http://www.imo.org/>

ISO: International Organization for Standardization. <http://www.iso.ch/>

IMO: International Maritime Organization <http://www.imo.org/>

Impact: an alteration to the natural environment arising from the activity in question

Incident: A sudden, unplanned, unintentional and undesired event or series of events having the potential of causing physical harm to a person or damage to property, or which has negative effects on the environment. British Standards BS 8800 definition—An unplanned event which has the potential to lead to accident.

MARPOL: International Convention for the Prevention of Marine Pollution. 1973, 1978. MARPOL-Annex I, IV, V and Annex VI. International Maritime Organization <http://www.imo.org/>

MMS: United States Department of the Interior Minerals Management Service <http://www.mms.gov/>

MSC: Maritime Safety Committee of the International Maritime Organization. <http://www.imo.org/>

MEPC: Marine Environment Protection Committee of the International Maritime Organization <http://www.imo.org/>

NORM: Naturally Occurring Radioactive Materials

OGP: International Association of Oil and Gas Producers <http://www.ogp.org.uk/>

OPRC: International Convention on Oil Pollution Preparedness, Response and Cooperation (1990) <http://www.imo.org/>

PAME: Protection of the Arctic Marine Environment <http://www.pame.is/>

PEIA: Preliminary Environmental Impact Assessment

Performance Standard: A statement, which can be expressed in qualitative or quantitative terms, of the performance required of a system, item of equipment, person or procedure, and which is used as the basis for managing the hazard e.g. planning, measuring, control or audit - through the life cycle of the installation.

Petroleum activity: is in this context used for all activities being an integrated part of oil and gas activities, including shuttle transportation of petroleum, supply transportation etc.

Pollution: the introduction by man, directly or indirectly of substances or energy into the marine environment which results, or is likely to result in hazards to human health, harm to living resources and marine ecosystems, damage to amenities or interference with other legitimate uses of the sea.

POP: persistent organic pollutants

Risk: The probability that physical harm to persons will be suffered or negative effects on the environment or that damage to property will occur as a consequence of exposure to a hazard.

Risk Analysis: (United Kingdom Health and Safety Executive, Offshore Research Issue 134/DEC01) The estimation of risk from the basic activity “as is”

Risk Assessment: (Lloyds Register Definition) The quantitative evaluation of the likelihood of undesired events and the likelihood of harm or damage being caused together with the value judgments made concerning the significance of the results. (British Standard BS 8800 Definition) The overall process of estimating the magnitude of risk and deciding whether or not the risk is tolerable or acceptable. (United Kingdom Health Safety Executive (HSE), Offshore Research Issue 134/DEC01) A review as to acceptability of risk based on comparison with risk standards or criteria, and the trial of various risk reduction measures.

Risk Management: (United Kingdom Health Safety Executive (HSE), Offshore Research Issue 134/DEC01) The process of selecting appropriate risk reduction measures and implementing them in the on-going management of the activity.

Safety: freedom from unacceptable risks to, personal harm, damage to property, or environmental pollution.

Safe Job Analysis: A review of the work situation, in which the job is broken down into sub-activities. Possible elements of danger associated with each sub-activity are considered as well as how/which risk reducing measuring should be established.

SEA: Strategic Environmental Assessment--a systematic process for evaluating the environmental consequences of a proposed policy, plan or program initiative in order to ensure they are fully included and appropriately addressed at the earliest appropriate stage of decision-making on par with economic and social considerations.

SEMP: Safety and Environmental Management Program

UNEP: United Nations Environmental Program

[Back to Table of Contents](#)

10 References/Bibliography

The following references are meant to provide the reader with the basis for each chapter and further reading. They are not meant to be a comprehensive bibliography and we encourage the reader to visit the World Wide Web address included at the end of most citations, so that they may check for updated or new information.

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[Back to Table of Contents](#)

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[Back to Table of Contents](#)

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[Back to Table of Contents](#)

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[Back to Table of Contents](#)

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[Back to Table of Contents](#)

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[**Back to Table of Contents**](#)

ANNEX A

Definition of the Arctic

Canada

Canada has defined its Arctic area to include the drainage area of the Yukon Territory, all lands north of 60 degrees North latitude and the coastal zone area of Hudson Bay and James Bay.

Denmark

The Arctic area within the Kingdom of Denmark is the Faroe Islands and Greenland, which is the world's largest island on which stands 9% of the World's ice cap.

Finland

In Finland the Arctic Area is defined as the territory north from the Polar Circle.

Iceland

Iceland has defined the whole of Iceland to be within the Arctic area.

Norway

Norway has no legal/formal definition of its Arctic areas, but for the purposes of these Guidelines, Norwegian Sea areas north of 65 degrees North form the Arctic.

Sweden

Sweden does not have any formal delimitation of the Arctic but has, for the purpose of AEPS, accepted the Arctic Circle as the southern delimitation of the Arctic area.

Russian Federation

In accordance with the draft Law of the Russian Federation "On Zoning of North Russia", the Arctic areas of North Russia include:

All lands and islands of the Arctic Ocean and its seas;

Within the Murmansk region: Pechenga district (coastal areas of the Barents Sea including populated centers located on Sredniy and Rybachiyy Peninsulas, as well as Liynakhamareye populated center, and the town-type settlement of Pechenga) Kolsk district (territories administered by the Tyuman and Ura-Guba rural government bodies), Lovozersk district (territory under the Sosnovsk rural government body), territory administered by the Severomorsk municipal

government, and closed administrative-territorial entities of Zaozersk, Skalistiy, Snezhnogorsk, Ostrovnoy, and the city of Polyarniy with populated centers administratively Attached to it;

Nenets autonomous national area – all territory;

Within the Komi Republic – city of Vorkuta, within areas managed by it;

Within the Yamal-Nenets autonomous national area; Priural, Tazov, and Yamal District, and territories and administered by the Salekhard and Labytnang Municipal governments;

Taimyr (Dolgan-Nenets autonomous area) – all territory;

Within the Krasnoyarsk territory – areas administered by the Norilsk municipal government;

Within Sakha Republic (former Yakutia): Allaikhov, Anabar, Bulun, Nizhnekolym, Olenek and Ust-Yan district:

Chuckchi autonomous national area – all territory;

Within the Koryak autonomous area -- Olutor district.

United States of America

All United States territory north of the Arctic Circle and all United States territory north and west of the boundary of formed by the Porcupine, Yukon and Kuskokwim Rivers; all contiguous seas, including the Arctic Ocean and the Beaufort, Bering and Chukchi Seas; and the Aleutian chain.

[**Back to Table of Contents**](#)

ANNEX B

Criteria for the Definition of Practices and Techniques mentioned in Paragraph 3(b)(i) of Article 2 of the OSPAR Convention

BEST AVAILABLE TECHNIQUES (BAT)

1. The use of the best available techniques shall emphasise the use of non-waste technology, if available.
2. The term "best available techniques" means the latest stage of development (state of the art) of processes, of facilities or of methods of operation which indicate the practical suitability of a particular measure for limiting discharges, emissions and waste. In determining whether a set of processes, facilities and methods of operation constitute the best available techniques in general or individual cases, special consideration shall be given to:
 - (a) comparable processes, facilities or methods of operation which have recently been successfully tried out;
 - (b) technological advances and changes in scientific knowledge and understanding;
 - (c) the economic feasibility of such techniques;
 - (d) time limits for installation in both new and existing plants;
 - (e) the nature and volume of the discharges and emissions concerned.
3. It therefore follows that what is "best available techniques" for a particular process will change with time in the light of technological advances, economic and social factors, as well as changes in scientific knowledge and understanding.
4. If the reduction of discharges and emissions resulting from the use of best available techniques does not lead to environmentally acceptable results, additional measures have to be applied.
5. "Techniques" include both the technology used and the way in which the installation is designed, built, maintained, operated and dismantled.

BEST ENVIRONMENTAL PRACTICE (BEP)

6. The term "best environmental practice" means the application of the most appropriate combination of environmental control measures and strategies. In making a selection for individual cases, at least the following graduated range of measures should be considered:
 - (a) the provision of information and education to the public and to users about the environmental consequences of choice of particular activities and choice of products, their use and ultimate disposal;
 - (b) the development and application of codes of good environmental practice which covers all aspect of the activity in the product's life;
 - (c) the mandatory application of labels informing users of environmental risks related to a product, its use and ultimate disposal;
 - (d) saving resources, including energy;
 - (e) making collection and disposal systems available to the public;
 - (f) avoiding the use of hazardous substances or products and the generation of hazardous waste;

- (g) recycling, recovery and re-use;
 - (h) the application of economic instruments to activities, products or groups of products;
 - (i) establishing a system of licensing, involving a range of restrictions or a ban.
7. In determining what combination of measures constitute best environmental practice, in general or individual cases, particular consideration should be given to:
- (a) the environmental hazard of the product and its production, use and ultimate disposal;
 - (b) the substitution by less polluting activities or substances;
 - (c) the scale of use;
 - (d) the potential environmental benefit or penalty of substitute materials or activities;
 - (e) advances and changes in scientific knowledge and understanding;
 - (f) time limits for implementation;
 - (g) social and economic implications.
8. It therefore follows that best environmental practice for a particular source will change with time in the light of technological advances, economic and social factors, as well as changes in scientific knowledge and understanding.
9. If the reduction of inputs resulting from the use of best environmental practice does not lead to environmentally acceptable results, additional measures have to be applied and best environmental practice redefined.

[**Back to Table of Contents**](#)

ANNEX C

Environmental Assessment Flowchart

Phase	Procedure	Activity	Responsible
<i>Opening of new area for petroleum activities</i>	<p><i>PEIA</i> ↓ hearing ↓ <i>EIA</i> ↓ hearing ↓ opening</p>	<p>Environmental survey</p> <p>Impact assessment</p> <p>Regulations</p>	Authorities
<i>Exploration</i>	<p><i>EIA</i> in Particularly Sensitive Areas</p> <p>Risk assessment</p> <p>Contingency planning and emergency response</p>	<p>Seismic</p> <p>Drilling</p>	Operator/Authorities
<i>Development</i>	<p><i>EIA</i> ↓ Permission for discharge ↓ <i>Baseline survey</i></p> <p>Risk assessment</p> <p>Contingency planning and emergency response</p>	<p>Construction activities</p> <p>Transportation</p> <p>Drilling</p>	Operator/Authorities
<i>Production</i>	<p><i>Monitoring</i></p> <p>Risk assessment</p> <p>Contingency planning and emergency response</p>	<p>Drilling</p> <p>Discharges to water</p> <p>Air emissions</p> <p>Transportation</p>	Operator/Authorities/ Third Party
<i>Decommissioning</i>	<p><i>PEIA/EIA</i> <i>Monitoring</i></p>		Operator/Authorities

[Back to Table of Contents](#)

ANNEX D

Overview of offshore activities and potential environmental effects

Activity	Possible Causes	Potential environmental effects
Evaluation Seismic activity	Noise	Effects on fish ¹ , sea birds and marine mammals such as avoidance behavior.
Exploration Rig emplacement	Dredging, filling, anchoring, and/or rig set-down.	Seabed disturbance.
Drilling	Discharges of drill cuttings, drill fluids, excess cement, platform drainage, household discharges and emissions of exhaust gases. Discharges from supply vessels, helicopter transportation etc. Risk of blowouts.	Predominantly local effects on living resources. Potential effects on living resources such as birds and marine mammals, as well as susceptible areas of the coastal zone.
Development and production Facility and pipeline installation	Potentially more dredging, filling and anchoring. Extended risk of blowouts and oil spills.	Long and short-term seabed disturbances. As under exploration, but more extensive in both the water column and air.

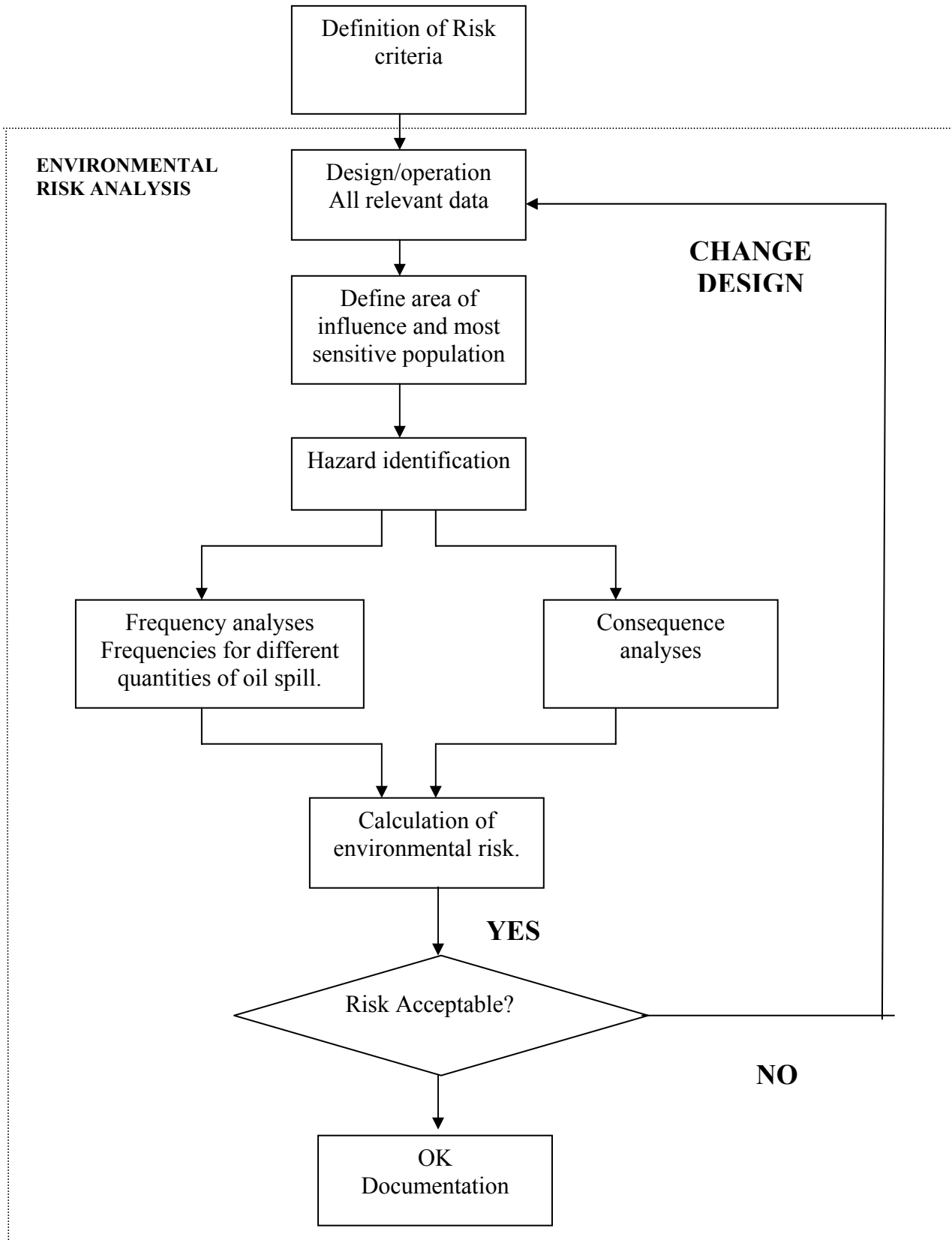
¹ Recent, large scale laboratory experiments on cod ([Meier, et. al, 2002](#)) have shown that alkylphenols of a similar type to those found in produced water have hormone disrupting effects. The alkylphenols affected the size of the gonads, made male fish more feminine and delayed the spawning time with several weeks, even at low concentrations. If these results may be transferred to natural conditions, produced water discharges may have considerable effects on stocks of cod and other fish.

Drilling	Discharges of produced water. Emissions of gases.	Potential effects on the reproduction of fish and possible contribution to climate effects, acidifying effects, etc.
Production	Spills, discharges and emissions connected to transportation (tankers, supply vessels, pipelines etc.).	Additional risks of effects on the marine environment and atmosphere.
Decommissioning and reclamation Removal of installations	Cutting piles containing oil and chemicals, dredging, air emissions, noise, etc.	Seabed disturbance, possible effects on fish, sea birds and marine mammals.
Leaving artificial islands or partial installations in-place	Exposed Biophilic substrate or surfaces.	Development of habitat for fish, mammals and/or birds.

[Back to Table of Contents](#)

ANNEX E

Environmental Risk Analysis Flow Diagram



ANNEX F

Detailed elements that may be incorporated in to company safety and environmental policies and objectives

- ❑ Competent personnel are used during planning and implementation of the separate phases, including design, fabrication and installation and operation
- ❑ The operator's personnel and those of any Contractors are provided with necessary training
- ❑ Lines of responsibility, authority and communication are clearly defined and understood;
- ❑ Risk evaluation should be a part of the project management strategy in order to establish and maintain an acceptable level of health Safety and Environmental protection for the personnel and the environment;
- ❑ No activity should be performed unless an acceptable level of HSE protection can be maintained;
- ❑ Management of discharges should be achieved through the application of Best Available [Techniques/Technology]
- ❑ Experiences from arctic operations should be integrated into specifications, functional requirements, standards and procedures;
- ❑ Safety evaluations should be undertaken both prior to start-up and in subsequent phases of the operation;
- ❑ Administrative systems are established for the control of all documentation in all phases of the operation;
- ❑ Purchase documents and specifications should contain Quality Assurance requirements;
- ❑ Contractor's Quality Assurance systems should be evaluated and assessed and be the subject of regular audits;
- ❑ The quality of supplied materials should be documented;
- ❑ Quality Assurance and Quality Control during operations should function effectively and corrective action should be taken when quality control indicates deviation from specification;
- ❑ Operational programmes should be prepared and compiled with relevant regulations and their functional capability should be subject to verification;
- ❑ Specifications for repairs should be established and specifications provide sufficient basis and requirements for their execution;
- ❑ Temporary equipment may be installed and operated in a secure way and in accordance with established specifications;
- ❑ Modifications should not reduce the degree of safety originally specified;
- ❑ An emergency preparedness system should be established and maintained so that necessary measures can be activated effectively and authorities involved notified;
- ❑ Administrative decisions made by the supervisory personnel are communicated effectively to the personnel and contractors;
- ❑ There should be continuous control and monitoring of all aspects of the working environment with regard to health safety and environmental risks and that necessary actions are implemented

- ❑ There should be continuous control and monitoring of the danger of pollution of the external environment and that personnel at all times will perform their tasks in such a way that pollution is avoided ;
- ❑ Both operator and contractor personnel should be made aware of the potential danger of accidents and inherent health and pollution aspects and they are given necessary information, training and exercises.

[**Back to Table of Contents**](#)

ANNEX G

Example of a Generalized Monitoring Plan

Region	Installation	Phase	Type of investigation	Part of environment	Elements to be included	Frequency
Region I	Installation 1	planning for development	baseline	Seabottom /water column /shoreline etc	inventory of biota/eco-systems, levels of all relevant contaminants, identification of particularly sensitive resources	once, before activities are started
		development	monitoring	Seabottom and other as relevant	physical disturbance, biota, contaminants	every year and as frequent as necessary, depending on the type of activity
		production	monitoring	Seabottom	relevant contaminants in environment and biota, effects on biota	every year first 3 years, thereafter every 3 years
				Water column		every 3 years and /or periodically as necessary
	Seashore and other as relevant	as relevant				
decommissioning	monitoring	Seabottom and water column, as relevant	levels of contaminants and effects on biota, as relevant	during operations and once at reclamation phase		
	Installation 2					
	Installation 3					
Region II	Inst. 1					
	Inst. 2					
	Etc					
Region III	Inst. 1					
	Etc					
Etc	National shelves should be divided into regions where monitoring of the individual installations is coordinated. Regional monitoring of the water column is coordinated for the entire shelf of each country.					

[Back to Table of Contents](#)