The Arctic Ocean Review

PHASE I REPORT (2009-2011)

SECOND EDITION

PAME
Protection of the Arctic Marine Environment

ARCTIC COUNCIL

The Arctic Ocean Review Project

PHASE I REPORT 2009-2011

Second Edition[1]

Acknowledgements:

Lead countries
Canada, Iceland, Norway, United States and the Russian Federation

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CLIMATE AND POLLUTION AGENCY

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Nordic Council of Ministers

[1] Additional text included within Section 2.3 based on AOR Phase II negotiations, Spring 2013.

Table of Contents

List of Figures:

List of Tables:

Table of acronyms

ABA	Arctic Biodiversity Assessment
ACAP	Arctic Contaminants Action Program
ACAP	Agreement on the Conservation of Albatrosses and Petrels
ACIA	Arctic Climate Impact Assessment
AFS	International Convention on the Control of Harmful Anti-fouling Systems on Ships
AMAP	Arctic Monitoring and Assessment Programme
AMSA	Arctic Marine Shipping Assessment
AMSP	Arctic Marine Strategic Plan
AO	Arctic Oscillation
AOR	Arctic Ocean Review
BFR	Brominated Flame Retardants
BWM	International Convention for the Control and Management of Ships` Ballast Water and Sediments
BePOMAr	Best Practices in Ecosystem-based Oceans Management in the Arctic
CAFF	Conservation of Arctic Flora and Fauna Working Group
CBD	Convention on Biological Diversity
CBMP	Circumpolar Biodiversity Monitoring Program
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLC	International Convention on Civil Liability for Oil Pollution Damage
CLCS	Commission on the Limits of the Continental Shelf
COLREG	Convention on the International Regulations for Preventing Collisions at Sea
COP	Conference of the Parties
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
EBM	Ecosystem Based Management
ECE	Economic Commission for Europe
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EPPR	Emergency Prevention, Preparedness and Response Working Group
FAO	Food and Agriculture Organization
FUND	International Convention on the Establishment of an International Fund for Compensation of Oil Pollution Damage
GPA	Global Programme of Action for the Protection of the Marine Environment from Land-based Activities
GAIRS	Generally Accepted International Rules and Standards
HBCD	Hexabromocyclododecane
HELCOM	Helsinki Commission
HNS	Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances,
ICES	International Council for the Exploration of the Sea
IMO	International Maritime Organization
IUCN	International Union for Conservation of Nature
IASC	International Arctic Science Committee
IASSA	International Arctic Sciences Association
IOC	Intergovernmental Oceanographic Commission
IWC	International Whaling Commission
LME	Large Marine Ecosystem

LRTAP	Convention on Long-range Transboundary Air Pollution
MARPOL	International Convention for the Prevention of Pollution from Ships
NAFO	Northwest Atlantic Fisheries Organization
NASCO	North Atlantic Salmon Conservation Organization
NEAFC	North East Atlantic Fisheries Commission
NAMMCO	North Atlantic Marine Mammal Commission
NAO	North Atlantic Oscillation
NPAFC	North Pacific Anadromous Fish Commission
OPRC	International Convention on Oil Preparedness, Response and Cooperation
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
PAME	Protection of the Arctic Marine Environment Working Group
PBDE	Polybrominated Diphenyl Ethers
PBSG	Polar Bear Specialist Group
PCN	Polychlorinated Naphthalenes
PDA	Pacific Decadal Oscilliation
PFCA	Perfluoro carboxylate
PFO	Perfluorooctane
PICES	North Pacific Marine Science Organization
POP	Persistent Organic Contaminants
RAMSAR	Convention on Wetlands of International Importance
RFMOs/As	Regional Fisheries Management Organizations or Arrangements
SAO	Senior Arctic Official
SAR	Search and Rescue
SEA	Strategic Environmental Assessments
SDWG	Sustainable Development Working Group
SOLAS	International Convention for the Safety of Life at Sea
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers
SWIPA	Snow, Water, Ice and Permafrost in the Arctic
TBBPA	Tetrabromobisphenol-A
UNCLOS	United Nations Conference on the Law of the Sea
UNESCO	United Nations Educational Scientific and Cultural Organization
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNFSA	United Nations Fish Stocks Agreement
WSSD	World Summit on Sustainable Development

Foreword

The Arctic Ocean Review has been organized as a project under the Protection of the Arctic Marine Environment (PAME) working group of the Arctic Council, reporting to the Senior Arctic Officials (SAOs) of the Arctic Council through PAME.

Subject to the discretion of SAOs, the final reports of the two phases of the Arctic Ocean Review will be submitted to the 2011 and 2013 Arctic Council Ministerial meetings.

The AOR project has been led by Canada, USA, the Russian Federation, Norway and Iceland.

The work has been subject to review and comments at the biannual meetings of PAME Working Group and two expert workshops in Copenhagen in March 2010 and in Washington DC in September 2010. Written comments have been received from many individuals and organizations. The survey of the status and trends in the Arctic marine environment has been carried out in cooperation with other working groups of the Arctic Council, which have also provided comments to this report. The SAOs have provided comments and guidance at their meetings as well.[2]

Descriptions in this Report of international law, including as reflected in the 1982 Law of the Sea Convention, as well as other instruments, measures and arrangement are included for the benefit of the reader only and are not intended to constitute interpretations by the Arctic Council, its working groups, or Member States

[2] Alf Håkon Hoel of the Institute of Marine Research in Norway was the project manager and lead author. Gunnar Sander of the Norwegian Polar Institute, Hein Rune Skjoldal and Harald Loeng of the Institute of Marine Research were the co-authors for Chapter 2. Ingvild Jakobsen and Irene Dahl of the University of Tromsø contributed to Chapters 3 and 4. The content of this report provides the necessary information to initiate the AOR Phase II (2011-2013) and may be adjusted and updated as work progresses.

Chapter 1: Introduction

1.1 Background

In a global perspective, the Arctic marine environment is generally clean, with low levels of pollution.[3] A number of the marine ecosystems of the north are highly productive, sustaining major fisheries and providing livelihoods for the people living in the Arctic. The Arctic marine environment is however also subject to a number of stressors, including climate change, pollution and increasing economic activities.[4]

People live and work in the Arctic. About 4 million people live in the Arctic, half of which are in the Russian Federation and about 1,3 million in the Nordic Countries, 130,000 in Canada and 650,000 in the US.[5] The eight Arctic countries are Canada, Denmark with the Faroe Islands and Greenland, Iceland, Norway, Finland, Sweden, the Russian Federation and the United States. Arctic communities and Indigenous people in particular rely on marine ecosystems for an important part of their livelihood and wellbeing. In the Arctic Council, six indigenous organizations are recognized as parties to the Arctic Council.

The stewardship of the Arctic marine environment is a particular responsibility of the Arctic states. The Arctic Council is at the forefront of emerging issues through the development of a number of in-depth reports and assessments, such as the State of the Arctic Environment Reports (1997-2009), the Arctic Climate Impact Assessment (2004/2005), the Arctic Marine Shipping Assessment (2009), and the assessment of Oil and Gas Activities in the Arctic—Effects and Potential Effects (2008). The Arctic Council has also developed the Arctic Offshore Oil and Gas Guidelines (2009) and Observed Best Practices in ecosystem-based oceans management (2009). Work relevant to new or enhanced instruments concerning the management of the marine environment (e.g. search and rescue, polar shipping operations) has been initiated by the Arctic Council to inform the Arctic Council member states in their pursuit of such instruments in other relevant fora.

In 1996 the Protection of the Arctic Marine Environment Working Group (PAME) produced the first report on the Arctic marine environment.[6] This was followed up with the adoption of the Arctic Marine Strategic Plan in 2004.[7] The Plan promotes the implementation of applicable international and regional commitments as a strategic action, and asks for periodic review of the status and adequacy of international/regional agreements and standards that have application in the Arctic marine environment.

The Arctic Council has a number of on-going projects and activities relevant to the management of the Arctic marine environment, including the CAFF Arctic Biodiversity

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[3] AMAP 1997. Arctic Pollution Issues: A State of the Arctic Environment Report. Arctic monitoring and Assessment Programme (AMAP), Oslo, Norway. AMAP, 2002. Arctic Pollution 2002: Persistent Organic Pollutants, Heavy Metals, Radioactivity, Human Health, Changing Pathways. Arctic monitoring and Assessment Programme (AMAP), Oslo, Norway. AMAP, 2009. Arctic Pollution 2009. Arctic Monitoring and Assessment Programme, Oslo. Available at: http://www.amap.no

[4] ACIA 2004 and 2005, AMAP 2009

[5] Arctic Human Development Report, 2004, p. 19.

[6] Working Group on the Protection of the Arctic Marine Environment 1996: Report to the Third Ministerial Conference on the Protection of the Arctic Environment, 20-21 March 1996, Inuvik, Canada.

[7] Arctic Marine Strategic Plan, available at: http://web.arcticportal.org/pame/amsp

Assessment (ABA),[8] the AMAP Snow, Water, Ice and Permafrost in the Arctic (SWIPA)[9] project, joint CAFF/AMAP/SDWG project for identification of areas of heightened ecological and cultural significance for vessel activity, the PAME Ecosystem Approach project,[10] guidelines on fuel transfer,[11] the EPPR guidelines for oily waste management,[12] and the EPPR field guide for oil spill response in Arctic waters.[13]

The Arctic marine environment is subject to increasing pressures from climate change and pollution and from economic activities. Because of the work of the Arctic Council, the pressures on the Arctic marine environment can be better understood and are higher on the international agenda than they were prior to the establishment of the Council in 1996. Given the increased prominence of the Arctic on the international agenda, It is timely to undertake a review of global and regional measures (non-legally binding and legally binding) that are relevant to the conservation and sustainable use of the Arctic marine environment, as well as the relevant activities of the Arctic Council in order to demonstrate to the global community Arctic states' stewardship efforts and analyze options to secure the health and productivity of the Arctic marine environment given environmental and socioeconomic needs.

In April 2009, the Arctic Council Ministers initiated the Arctic Ocean Review project under the leadership of the PAME Working Group. The Arctic Ocean Review is supported by:

> The Arctic Marine Strategic Plan, adopted by the Arctic Council in 2004, which provides the foundation for both the Arctic Council and PAME's mission and objectives. It sets out a range of actions that can be undertaken by the Arctic Council through its member states and subsidiary bodies, among them to "*Periodically review the status and adequacy of international/regional agreements and standards that have application in the Arctic marine environment, new scientific knowledge of emerging substances of concern…*" (Strategic Action 7.3.4).
>
> The common objectives and priorities for the Norwegian, Danish and Swedish chairmanships of the Arctic Council (2006-2013) have given high priority to the theme of integrated management, as well as ensuring a sustainable and ecosystem- based approach to resource development in the Arctic.
>
> Objective II of the PAME Work Plan 2009-2011: *"Determine the adequacy of applicable international/regional commitments and promote their implementation and compliance*".
>
> Commitments by the global community towards sustainable development and protection of marine biodiversity and the marine environment as demonstrated through the application of the ecosystem approach and integrated coastal and ocean management.

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[8] http://caff.arcticportal.org/index.php?option=com_content&view=frontpage&Itemid=156

[9] http://amap.no/swipa/press2009/SWIPA%20Phamflet%20Final%20Version.pdf

[10] http://www.pame.is/ecosystem-approach

[11] TROOP Guidelines for Transfer of Refined Oil and Oil Products in Arctic Waters 2004, http://www.pame.is/offshore-oil-and-gas

[12] Guidelines and Strategies for Oily Waste Management in the Arctic Regions 2009, http://eppr.arctic-council.org/pdf/EPPRWasteManagement_FINALReport_April2009.pdf

[13] Field Guide for Oil Spill Response in Arctic Waters (1998) http://eppr.arctic-council.org/

1.2 Objectives

The overall objective of the AOR is to provide guidance to the Arctic Council Ministers as a means to strengthen governance in the Arctic through a cooperative, coordinated, and integrated approach to the management of the Arctic marine environment.

Phase I Objectives (2009-2011):

- ü Compile information on global and regional measures that are relevant to the conservation and sustainable use of the Arctic marine environment;
- ü Survey the status and trends in the Arctic marine environment in cooperation with other working groups of the Arctic Council;
- ü Disseminate compiled information through communication products/tools, and conduct outreach to both communicate efforts and obtain input;
- ü Prepare a compilation document that will review global and regional measures that are relevant to the conservation and sustainable use of the Arctic marine environment and identify and highlight potential weaknesses; and,
- ü Develop a status report for Arctic Council Ministers.

On the basis of the work in Phase I, a Phase II of the project (2011-2013) will

- ü Take into account major new developments;
- ü Analyze potential weaknesses and/or impediments in global and regional instruments and measures to achieving environmental, economic and socio-cultural outcomes;
- ü Outline options to address potential weaknesses and/or impediments; and,
- ü Produce a final AOR Report to Arctic Council Ministers that will: summarize potential weaknesses and/or impediments in the global and regional instruments and measures for management of the Arctic marine environment; outline options to address these weaknesses and/or impediments; and, make agreed recommendations to help ensure a healthy and productive Arctic marine environment in light of current and emerging trends.

1.3 Scope and approach

The Arctic Ocean Review will not initiate a new assessment, but produce a report, based on existing products, on the global and regional instruments (both binding and nonbinding) and arrangements relevant to the conservation and sustainable use of the Arctic marine environment. The project includes the eight Arctic states: the Russian Federation, the United States, Canada, Denmark for the Faroe Islands and Greenland, Iceland, Norway, Finland, and Sweden.

There is no agreed definition of the geographical extent of the Arctic. In the PAME working group and for the purposes of this Report, the Arctic countries define their Arctic as a component of their territory (e.g. the United States bases theirs on the Arctic Research and Policy Act of 1984). [14]

There are other approaches to defining the Arctic as well such as: . by using the 10º C in July isotherm (see *map x*), or by using latitude (the region north of which one experiences at least

[14] The Offshore Oil and Gas Guidelines, annex A, p. 77.

one day 24 hour sunlight or at least one day with the sun below the horizon ("the Arctic Circle"), at 66° 33′ 39″ (or 66.56083°) north).

The geographic area being applied in this report is wider than the isotherm or latitude definitions given above. This approach reflects that the Arctic is affected by natural and human-driven processes in the south, while processes in the Arctic affect nature and societies to the south.

For the purpose of this project the latter understanding of the Arctic is used as the basis for our work. In the marine area the project covers the central Arctic Ocean, and in addition, the surrounding seas: the Bering Sea, the East Siberian Sea, the Chukchi Sea, the Beaufort Sea, the Davis Strait, Baffin Bay and Labrador Sea, the Greenland Sea, the waters around Iceland and the Faroe Islands, and northern parts of the Norwegian Sea, the Barents Sea, the Kara Sea, and the Laptev Sea. The oceans and seas included in this definition comprise an area of r 20 million km^2 and are referred to as the "Arctic marine environment". The Baltic Sea is not included here.

The map in Figure 1 shows the broad outline of the Arctic Ocean as well as surrounding seas.

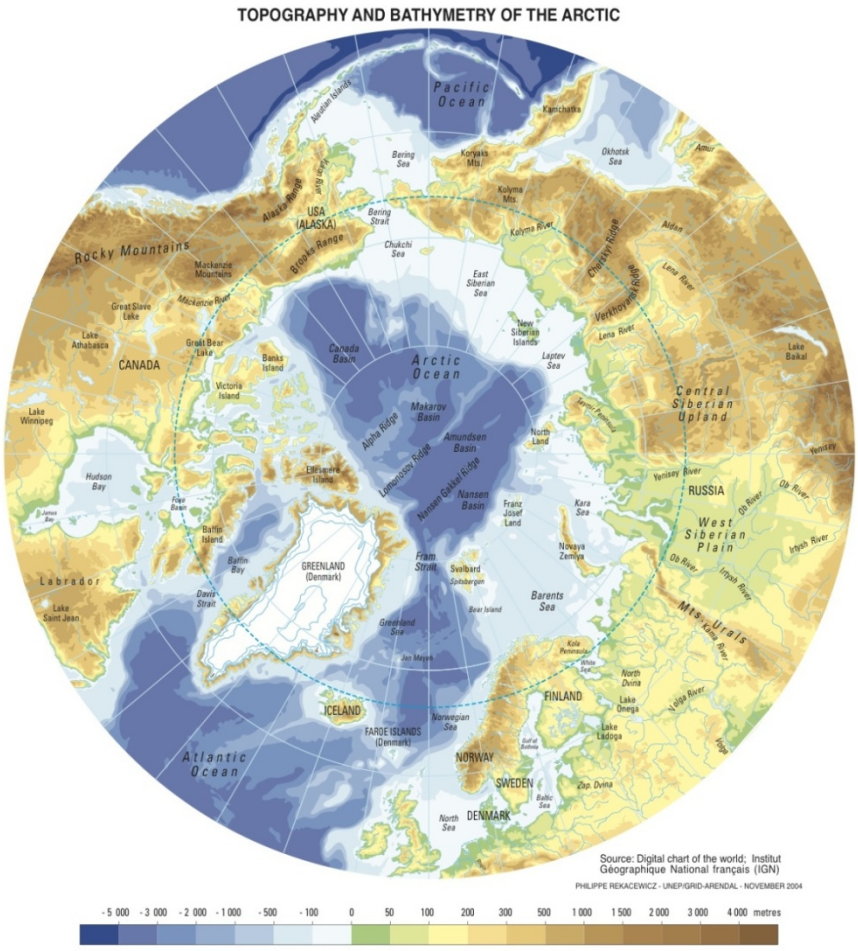

Figure 1 - The Arctic marine environment (source: Arctic Marine Strategic Plan 2004)

The Arctic marine environment consists of many ecosystems. In the PAME working group in the Arctic Council, reference is made to Large Marine Ecosystems (LMEs) as large ocean areas sharing fundamental oceanographic characteristics. The Arctic LME map identifies some 17 LMEs in the Arctic Ocean and the surrounding seas.

Some of the international instruments covered in this report refer to specific areas and therefore have specific definitions of the Arctic.

In this report the term “instrument” is used in a general sense, including legally binding agreements as well as non-binding arrangements. Often, instruments have associated processes. Where relevant, such processes are referred to in this report, for example in relation to work in the UN on oceans and the law of the sea. In addition, the report identifies science arrangements of relevance to the scope of the Arctic Ocean Review Project.

1.4 Dimensions and limitations of the Arctic Ocean Review

One of the major global developments over the last century is the increasing role of international institutions in relations between countries. Nowhere is this more evident than in the subject area of the environment, where the last decades have witnessed a vast expansion in the number and scope of Multilateral Environmental Agreements (MEAs)[15] many of which are of relevance to the Arctic.

International instruments are the product of negotiations between countries (and sometimes other entities) that frequently have diverse interests. The question of how to strengthen them can be addressed in different ways.

An objective of the Arctic Ocean Review is to highlight whether existing instruments need to be strengthened in relation to the protection and sustainable use of the Arctic marine environment. In Phase 1, this will be evaluated along the following four dimensions of key relevant instruments.

(i) geographical scope,

(ii) parties,

(iii) objectives or goals, and

(iv) functional scope

The *geographical scope* of an instrument refers to its area of application. Some multilateral instruments that apply in the Arctic are of global nature. (e.g. the UN Law of the Sea Convention). Others have a more limited, regional scope and cover all or parts of the Arctic as well as areas outside the Arctic. An example of the latter is the 1992 OSPAR Convention on the marine environment in the Northeast Atlantic). A large number of bilateral instruments apply in the Arctic. These are only briefly referred to in this report.

Parties refer to which states are party to or participants in an instrument. As a general rule, treaties are only binding upon their parties.[16] International agreements are implemented at the domestic level through national legislation and other measures.

Objectives or goals of instruments indicate their thematic scope, e.g. which aspects of a given phenomenon or activity is covered. Objectives as defined in international instruments may often be general and need further definition to be (a) operational and (b) more easily subject to monitoring and evaluation. An important question is therefore the extent to which an instrument´s operational provisions achieves its objectives in its provisions.

The *functional scope* of an instrument refers to the measures (in the sense of "tools" – standards, regulations, enforcement provisions, etc.) that the instrument provides for states to use in addressing a given issue. In relation to e.g. pollution issues, functional scope could include mechanisms to monitor and assess the problem; provisions for regulations or standard setting; provisions for data exchange, technical cooperation and capacity-building; and means to ensure compliance, review and enforcement. These issues are addressed where relevant in this report.

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15 http://www.unep.org/dec/docs/MEAs%20Final.pdf (Bibliography: Negotiating And Implementing Multilateral Environmental Agreements (MEAs): A Manual for NGOs, May 2007, UNEP.

16 There are however cases where non-parties choose to act consistently with an agreement without being a party.

Assessed this way, a strong instrument (or suite of instruments) is one that covers the issue in question geographically, has all relevant states as parties, has clearly articulated objectives that address the relevant issues in the Arctic marine environment, and has a functional scope that provides the necessary tools to manage the issue at hand.

Some limitations to this approach should be noted:

- ü International instruments are to a large extent implemented at the domestic level. A full understanding of the effectiveness of a given instrument therefore requires analysis of its domestic implementation. A comprehensive review of how the Arctic marine environment is governed would therefore require an in-depth study also of domestic arrangements: legislation, policies, and institutions.[17] Such a comprehensive review is beyond the scope of this project, which focuses on the global and regional instruments and international cooperation that is relevant to the conservation and sustainable use of the Arctic marine environment. (A brief overview of bilateral instruments is included in chapter 4, to illustrate their importance.)
- ü In many cases a given issue area is addressed by a number of international instruments, including those which are legally binding as well as non-legally binding. Often, a number of instruments will have to be considered together in order to arrive at an understanding of how they collectively address a given issue area.

The Arctic Ocean Review does *not* address the implementation of international instruments at the national level, nor does it study domestic arrangements for the protection and sustainable use of the Arctic marine environment. Bilateral arrangements are briefly discussed because they are essential to the understanding of how international cooperation with regard to the Arctic marine environment works.

1.5 Report Outline

Chapter 2 provides an overview of the status and trends of the Arctic marine environment and activities there, primarily on the basis of work carried out by the six Arctic Council working groups. The chapter starts out with a section on Arctic marine ecosystems, before discussing the conservation status of Arctic marine species, climate change, pollution, contaminants and human health, and industrial activities and developments.

Chapter 3 provides an overview of global instruments relevant to the Arctic marine environment. It first gives an overview of the Law of the Sea Convention in general and related processes. It then goes on to address multilateral instruments in five areas: the marine environment (including general provisions, biological diversity, chemicals, and climate and atmosphere), fisheries, shipping, science, and oil and gas activities, including oil spill preparedness and response. Summary descriptions of international law, including as reflected in the 1982 Law of the Sea Convention, are included for the benefit of the reader and are not intended to constitute interpretations.

Chapter 4 gives an overview of regional instruments that apply to all or parts of the Arctic. It starts out with a general account of the Arctic Council and its programs. In describing the relevant regional instruments and measures, it distinguishes between instruments pertaining to the marine environment, fisheries, science, oil spill prevention and response, general and other cooperation. The chapter concludes with a section on bilateral cooperation in these fields.

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[17] In addition, some instruments provide for reservations, which affects their implementation.

Chapter 5 addresses integrated oceans management, the international practices that have been developed over the last decades. Numerous international agreements commit states to the introduction of ecosystems-based oceans management. The chapter discusses global standards and processes, regional applications and Arctic-specific best practices in this regard.

Chapter 6 identifies the next steps for the Arctic Ocean Review project, including a description of the main objectives and activities to be undertaken during Phase II of this project.

Chapter 2 - Arctic Marine Ecosystems[18]

2.1 Introduction

The objective of this chapter is to summarize existing information on status of and pressures on the Arctic marine environment. The first part of the chapter is a general description of characteristics of Arctic marine ecosystems (2.2), followed by a description of what is known about the status and trends of different species groups (2.3). The next sections describe current and future pressures on the marine environment with general descriptions of their most important impacts (2.4 – 2.7).

The main source for the information is assessments undertaken by the Arctic Council[19]:

- Arctic Pollution Issues in 1998 (AMAP)
- Arctic Pollution 2002 (AMAP) Arctic Pollution 2006 (AMAP), including
    - Acidifying Pollutants, Arctic Haze, and Acidification in the Arctic
- Arctic Pollution 2009 (AMAP), including separate reports on:
    - Persistent Organic Pollutants in the Arctic
    - Radioactivity in the Arctic
    - Human Health in the Arctic
- Arctic Climate Impact Assessment in 2005 by AMAP, CAFF and IASC
- The Greenland Ice Sheet in a Changing Climate (a component of Snow, Water, Ice and Permafrost in the Arctic - SWIPA) 2009
- Arctic Report Card: Update for 2010 (AMAP, CAFF, NOAA)
- Arctic Fauna and Flora in 2001 (CAFF)
- Arctic Biodiversity Trends 2010 (CAFF)
- Arctic Oil and Gas 2007 (Overview report), and
- Assessment of Oil and Gas Activities in the Arctic in 2010/2011 (AMAP)
- Arctic Marine Shipping Assessment in 2009 (PAME)
- Arctic Human Development Report in 2004 (SDWG)

Provided here within is a brief synopsis of some of the main findings revealed in these assessments about the current status and trends in Arctic marine ecosystems in relation to various pressures affecting them now and in the future. Climate change and pollution are two

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[18] Hein Rune Skjoldal and Harald Loeng of the Institute of Marine Research in Norway are the co-authors for this Chapter. Its content does not represent agreed views of the Arctic Council member states as it has not gone through their respective national reviews.

[19] See overview also of other assessments and knowledge-generating activities in ”Arctic Ocean” in Annex IV of ”Assessment of assessments” http://www.unga-regular-process.org/index.php?option=com_content&task=view&id=18&Itemid=20 .

main pressures that have been extensively examined in the assessments. In addition, there are potential pressures associated with industrial activities such as oil and gas development, marine shipping and commercial fisheries. Local activities and development also create pressures such as overharvest of resources and disturbances of sensitive wildlife.

2.2 Key features of Arctic marine ecosystems

2.2.1 Geography

There is not a straightforward and generally accepted definition of the Arctic from a natural scientific point of view. The Arctic is very much connected to the rest of the globe and there are no sharp boundaries where one could put up a sign telling "You are now entering the Arctic" for people travelling north. There are some discontinuities, however, that help us in delineating the Arctic from the warmer parts of the oceans. The ridge that runs between Scotland and Greenland on which the Faroe Islands and Iceland are situated is one feature which separates the deep basins of the Nordic seas (Norwegian, Greenland and Iceland seas) from the rest of the North Atlantic (Skjoldal et al. 2004). These basins are filled below sill-depth with cold Arctic water that forms a continuum with the cold deep water of the Arctic Ocean basin (the Nordic Seas and the Arctic Ocean together are called the 'Arctic Mediterranean Sea' because of its enclosed nature). The Aleutian Island chain forms a similar southern boundary separating the deep basin of the Bering Sea from the rest of the North Pacific, although in this case the connection is more open through the deep and fairly wide Kamchatka Strait between the Komandorsky Islands and the mainland. In the northwestern Atlantic there is no similar geological barrier separating the Arctic from the rest. The Davis Strait between Baffin Island and Greenland lies well within the Arctic zone with Arctic conditions extending further south to Labrador.

The Arctic Ocean in a strict sense is the deep basins (Canadian and Eurasian basins separated by the Lomonosov Ridge) surrounded by the land masses of the Eurasian and North American Continents. On the Eurasian side the shelves are very wide and, particularly in the eastern part, very shallow. On the American side the shelves are generally narrow. The main connection between the Arctic Ocean basins and the North Atlantic is via the deep Fram Strait between Northeast Greenland and Svalbard.

The connection with the North Pacific is radically different, via a stretch of shallow water (mostly <50 m) of about 1000 km through the northern Bering Sea, the Bering Strait (80 km wide) and the Chukchi Sea.

Ecologically the Arctic area with the Arctic Ocean and the surrounding Bering and Nordic seas span a very wide range of conditions. Broadly the Arctic area can be subdivided into high, low and sub-arctic zones, corresponding roughly to areas with permanent ice cover, seasonal ice cover, and no ice cover but with cold water stemming from ice formation in adjacent areas. In terms of productivity, the high Arctic has a short growing season and low production overall, while the sub-arctic seas are generally rich with relatively high production.

2.2.2 Ocean circulation

Relatively warm water from the Atlantic flows through the Nordic Seas into the Arctic Ocean through the Fram Strait and via the Barents Sea. Pacific water enters the Arctic through the Bering Strait driven by a higher sea level in the North Pacific than in the North Atlantic. Approximately five times more Atlantic water than Pacific water by volume enters the Arctic Ocean. The Atlantic water, which still retains some heat, forms a thick layer between about 200-1000 m depth over the whole Arctic Ocean basin, with the less dense Pacific water

overlying it in the Canadian Basin. Below the Atlantic water the basins are filled with cold Arctic deep-water (about -1^{o}C). Above the Atlantic and Pacific waters there is a surface layer of less dense Arctic water influenced by ice formation, ice melt and river input in coastal zones.

Dominant features of the surface circulation are the clockwise Beaufort Gyre, extending over the Canadian Basin, and the Transpolar Drift that flows from the Siberian coast out through Fram Strait. Both features are strongly influenced by wind forcing. The surface currents along the coasts are principally counterclockwise, as is also the subsurface circulation along the rim of the Arctic Ocean basins. Waters exit the Arctic Ocean primarily through Fram Strait and the Canadian Archipelago. The arctic waters leaving through Fram Strait are transported southward along East Greenland, and around the Labrador Sea and Baffin Bay where they merge with the arctic waters flowing out through the Canadian Archipelago before continuing southward.

2.2.3 Sea ice

Sea ice plays a crucial role in the arctic climate, particularly through its albedo effect. Reduction of ice extent in summer leads to warming of the water due to increased absorption of solar radiation at the surface. The two primary forms of sea ice are seasonal (or first-year) ice and perennial (or multi-year) ice. Seasonal ice forms during winter and melts during the next summer. Its thickness in level floes ranges from a few tenths of a meter near the southern margin of winter ice to 2.5 m in the high Arctic at the end of winter. Some first-year ice survives the summer and becomes multi-year ice. This ice develops its distinctive hummocky appearance through thermal weathering, becoming harder and almost salt-free over several years. In the present climate, old multi-year ice floes without ridges are about 3 m thick at the end of winter (ACIA 2005).

Sea-ice extent in the Arctic has a clear seasonal cycle and is at its maximum (14–15 million km^2) in March and minimum (5–6 million km^2) in September. There is considerable interannual variability both in the maximum and minimum coverage. In addition, there are decadal and inter-decadal fluctuations in the sea-ice extent due to changes in atmospheric pressure patterns and their associated winds, continental discharge, and influx of Atlantic and Pacific waters.

Sea ice freezes as a solid sheet of land-fast ice along the Arctic coasts in bays and skerries, extending out to approximately 20 m water depth. Beyond the fast-ice is the drifting polar pack ice. At the transition between the fast-ice and drift ice there are often open flaw leads. These form a more or less continuous system of leads around the periphery of the Arctic Ocean. ‘Polynyas’ are areas of open water in the ice and include the flaw leads between land-fast and drifting ice. Some of the polynyas remain open throughout winter while others open or expand in extent in late winter and spring. Polynyas are of two main types (Smith et al. 1990). Mechanical or ’latent heat’ polynyas are driven by persistent winds that carry ice away and thus keep the water open. Such polynyas occur on the lee side of islands, peninsulas, ice-bridges or land-fast ice. ‘Sensible heat’ polynyas are kept open by transport of warm water (warm means not at freezing temperature). The energy flux from open water in polynyas under arctic winter conditions can be very high and goes to generate ice (down-stream in sensible polynyas). The cumulative ice formation per unit area in polynyas may be up to 30 m or more (ref.). They are therefore very important centers for ice formation, contributing up to 70% of the total volume of sea ice developing in the Arctic seas in winter. Polynyas play an opposite role in spring and early summer when their open waters are accumulating heat and become centers of seasonal sea ice decay.

2.2.4 Ecological features

There is a wide range of organisms that live in close association with sea ice, either within channels in the ice itself, on the underside of the ice, or at the interface with the water immediately below the ice. The organisms that inhabit the sea ice environment are highly specialized, and range from bacteria and unicellular algae to ice-associated vertebrates such as ringed seal and polar bear. There are several small crustaceans, notably amphipods , that live associated with sea ice and constitute a food source for consumers such as polar (or Arctic) cod, ringed seal, thick-billed murre, little auk and ivory gull. Multiyear sea ice has the most complex communities and often serves as a platform for colonizers to young ice (ACIA 2005). In addition, the abundance and biomass of the multiyear sea ice organisms can be relatively high. The spatial distribution of sea ice fauna is generally patchy, even within single ice fields, because the origin, history, size, snow cover, and thickness of the ice can vary.

The level of primary production by plants is generally low and strictly seasonal, limited to a short period of a few months in ice-covered waters of the high Arctic (Rysgaard et al. 1999, Sakshaug 2004). As in most other marine ecosystems, tiny phytoplankton cells make up the most important plants in terms of primary production. In addition, ice algae growing on the under-surface and in crevices of the ice contribute to the plant production in the marine Arctic. Little light penetrates thick sea-ice and most production of phytoplankton takes place when the ice melts. Large areas of the Arctic are affected by seasonal ice that forms in autumn and winter and disappears in summer. As the ice retreats northwards from its maximum distribution in late winter, a sweeping band of phytoplankton production follows, often in the form of ice edge blooms. This production triggers and nourishes the reproduction and growth of new generations of Arctic zooplankton, which again are the basis for higher trophic levels of the food web.

The primary production by phytoplankton and ice algae spans two orders of magnitude variation over the Arctic area. The highest production is found in the northern Bering Sea and southern Chukchi Sea where the annual production may exceed 500 g carbon (C) m^{-2} (Springer et al. 1996). On the other end of the extreme, the production in the central Arctic Ocean with dense pack ice may be <5 g C m^{-2} per year (Sakshaug 2004). The very high productivity in the northern Bering and southern Chukchi seas is driven by transport of nutrient-rich slope water through the Anadyr Gulf and the Bering Strait. As this water is being uplifted into the lighted zone by the shallow topography, very high rates of primary production result (exceeding 10 g C m^{-2} per day, which may be similar to the total annual production per m^2 in the central Arctic Ocean). This has been described as a horizontal upwelling system, with the magnitude of production being comparable to that of the Peruvian upwelling system (McRoy et al. 1987). The high primary production is the basis for the very rich animal life in this area with large populations of plankton-feeding seabirds such as least and crested auklets and of benthic feeding mammals such as Pacific walrus and grey whale.

The dominant herbivores among the zooplankton are relatively large copepods (*Calanus* and *Neocalanus* species). Large in this context is 4-8 mm in length. This may not seem that impressive but gives the copepods sufficient mass to survive a long winter period without feeding. They manage this by “fuelling up their tanks” with a high amount of lipids in the form of marine oils towards the end of the growing season in late summer. The lipid content may exceed 50% of their body weight and is used as an energy store during passive wintering. The high lipid content of zooplankton is conveyed to their consumers, contributing to the overall high importance of lipids in Arctic marine food webs.

Seals and whales use lipids in the form of an insulating layer of blubber to reduce heat loss. Being warm-blooded, they need to metabolize (“burn”) organic substrates to generate heat to

survive. They draw upon the stored lipids as an energy store for this purpose during winter, while their large body size at the same time allows them to survive long periods without food. As the apex predator in the Arctic marine ecosystem, polar bears specialize in living off stored lipids obtained from their primary prey the ringed seal and bearded seal. For seabirds the situation is different. For seabirds the situation is different. Their insulation against heat loss is mainly the layer of feathers. Being small, they have a higher metabolic rate per unit mass and can therefore survive only for shorter periods without food under Arctic winter conditions.

The Arctic marine ecosystems are highly dynamic driven by the extreme seasonality in ice and production. The total area of the marine Arctic (including Bering and the Nordic seas) is about 20 million km^2, and about half this area is covered by seasonal ice in winter and turns into open water when the ice melts in summer. The dynamic is manifested by large migrations both within and into and out of the Arctic region. We can broadly distinguish the animals of the Arctic into visitors and residents. Each spring and summer very high numbers of animals arrive as visitors to feed and grow during the short and hectic Arctic summer. This includes shorebirds and waterfowls, such as geese and ducks that use the Arctic as their breeding area. It also includes large whales that come to feed on zooplankton and small fish in the Arctic ecosystems, before they return to warmer waters at lower latitudes where they spend the winter and reproduce. Arctic resident species may move between high Arctic summer areas and low or sub-arctic winter areas. Thus, bowhead and beluga generally move south to winter in the southern extent of winter ice, such as in the northern Bering Sea and Davis and Hudson straits. This is also the case for walrus and glaucous and ivory gulls among Arctic seabirds.

2.2.5 Large Marine Ecosystems (LMEs)

The Arctic area has been subdivided into 17 Large Marine Ecosystems (LMEs) (Fig. 2). LMEs are identified on the basis of 4 general criteria (bathymetry, hydrography, productivity, and trophically linked populations). The Arctic LMEs have been used as geographical units to facilitate assessment of vulnerability and to identify vulnerable areas in the assessment of oil and gas activities (AMAP 2008). They are also used in the current follow-up work on AMSA Recommendation IIC to identify areas of heightened ecological significance.

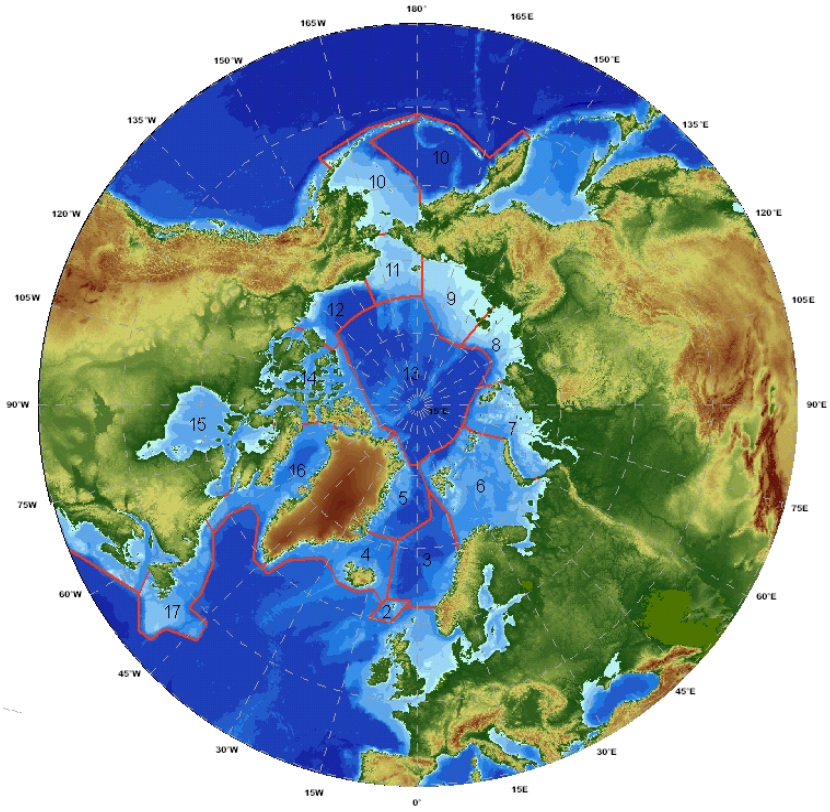

Figure 2 - Map of the 17 Arctic LMEs used for ecosystem descriptions and vulnerability assessment in the Arctic Oil and Gas report (AMAP 2007, 2011).

2.2.6 Status and trends of the Arctic marine ecosystems

The dynamic nature of arctic marine ecosystems is associated with fluctuations and changes, often abrupt and marked and characterized as 'regime shifts'. The changes can be substantial and we know in general terms that they are related to climate variability and oscillations expressed by atmospheric patterns such as the North Atlantic Oscillation (NAO) or the Pacific Decadal Oscillation (PDO) (see later section). The physical forcing affects the oceanographic conditions including sea ice, and has direct and indirect effects on all parts of the marine ecosystems. We also know in general terms that biological interactions play a prominent role for the dynamics and variability of the ecosystems.

This can be illustrated for the Barents Sea ecosystem (see Stiansen et al. 2009 for a comprehensive overview of this ecosystem). Recruitment of the main commercial fish stocks is strongly related to the climatic and oceanographic conditions, with strong year-classes of Barents Sea cod, haddock and herring (Norwegian spring spawning stock) occurring at warm transitions typically associated with positive NAO conditions (Ottersen et al. 2004, Loeng and Drinkwater 2007). Capelin is a key component in the ecosystem, linking lower and higher trophic levels. The stock of capelin has oscillated with stock collapses associated with strong year-classes of juvenile herring which presumably predate heavily on capelin larvae (Gjøsæter et al. 2009). The capelin stock was low in 2003-2006 when juvenile herring was high, but has recovered to high level again in the most recent years (2007-2010) when juvenile herring has been largely absent from the Barents Sea (Fig. 3). Polar cod has shown an increasing but oscillating trend since the 1980s to an estimated stock level of about 2 million tons in 2005.

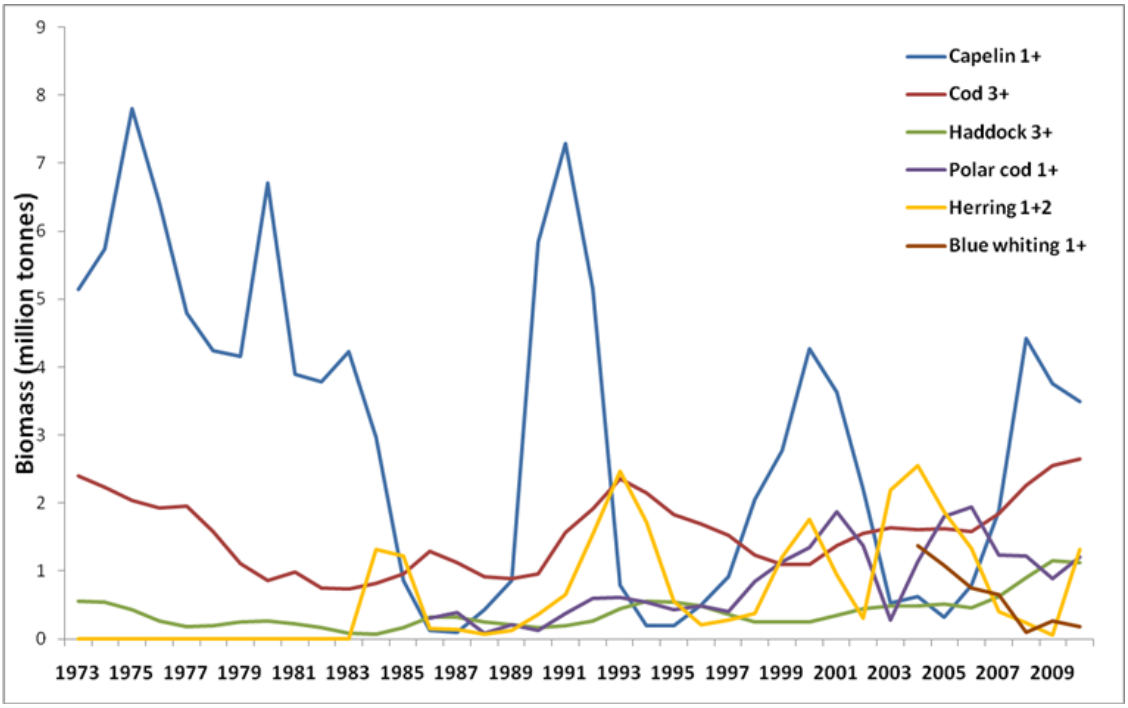

Figure 3 - Time series of stock size (biomass) of the main fish species in the Barents Sea ecosystem. From Gjøsæter et al. (2009) with updates.

The large fluctuations of the capelin stock have had large ramifications on other parts of the ecosystem, both downwards and upwards in the food web. Large zooplankton prey like krill and amphipods have shown variation by about an order of magnitude with an inverse pattern to that of capelin, reflecting predation impact from the latter species (Dalpadado and Skjoldal 1996, Dalpadado et al. 2002). The collapse of capelin in the 1980s had large impacts on seabirds and seals, with massive invasions and high mortality of harp seals in northern Norway and high mortality of common guillemots particularly at the large colonies at Bear Island (up to 90 %) (Skjoldal et al. 1992). Capelin also affected the status of the Barents Sea cod stock, with poor growth and condition of cod when the capelin stock was low (Yaragina and Marshall 2000). The Barents Sea has experienced a warming although oscillating trend since the 1980s, and the ecosystem effects of the most recent capelin collapses have been more moderate compared to the one in the 1980s (Gjøsæter et al. 2009).

Similar pronounced changes related to climate shifts have been observed in other subarctic ecosystems like the Bering Sea (Hunt et al. 2002, 2008), Labrador and Newfoundland area (Rice 2002), and Icelandic waters (Astthorsson and Vilhjalmsson 2002). A recent study originating within the CAFF CBird group, demonstrated synchronous fluctuations of thick-billed and common murres (or guillemots) across their circumpolar distribution ranges in response to major climate shifts in the late 1970s and late 1980s (Irons et al. 2008, CAFF 2010). It was considered likely that the changes in murre colonies were related to changes in major prey species in the ecosystems, including different species of fish such as polar cod, capelin, herring and sandeels that responded synchronously to the large scale climatic forcing.

All these documented cases demonstrate a basic feature of subarctic marine ecosystems which is that they are highly dynamic and variable. This means that components of the ecosystems are constantly changing, driven by physical forcing combined with strong ecological interactions such as predator-prey relationships embedded in more or less complex food webs. It also means that assessing status and trends of ecosystems requires careful analysis to distinguish between the large natural dynamic fluctuations and changes due to impacts from human activities such as harvesting, pollution, and global climate change. Such analyses

largely remain to be done for most parts of the Arctic area. The proposed assessment of 'Arctic change' is an opportunity to examine status and trends of the Arctic marine ecosystems in more depth and detail. Such assessments are required as basic elements for the implementation of the ecosystem approach to management of the Arctic marine ecosystems where the status of the ecosystems is in focus in order to regulate the human activities and pressures to maintain or achieve a desired or acceptable 'good status'.

Ecosystems consist of two main parts: habitats and species. The habitats are the living space for the various species of plants and animals that are the inhabitants of the habitats. The species interact as part of foodwebs, and they have many interdependencies with their habitats through a range of ecological processes. The species depend on specific habitats during their life cycles, such as spawning areas for fish, staging and molting areas for eiders and other marine birds, and feeding areas for marine mammals. The species may in turn influence the habitats through their feeding and other activities, e.g. sediment disturbance and local depletion of mollusk prey by feeding walruses.

Thorough assessments of status of ecosystems need to take into account functional aspects such as energy flow, trophic interactions in the food webs, interdependencies between species and habitats, and the overall regulation of the ecosystem (bottom-up and top-down). The status of ecosystems are reflected in the status of the inhabitant species and their habitats. Assessments of the conservation status of species are therefore relevant elements towards ecosystem assessments, while they in themselves require special management attention.

2.3 Conservation status of Arctic species

2.3.1 Subspecies and populations

Many Arctic species of fish, birds and mammals have wide and often circumpolar distributions. While the number of species in various groups of Arctic animals may be low compared to warmer latitudes, there is a pattern that many of them occur with high 'within-species' variability, often in the form of distinct subspecies in various parts of the Arctic area. This is related to different migratory populations and site fidelity to migratory routes which over a long time leads to differentiation within species. Many species have different subspecies in the Atlantic and Pacific sectors, e.g. northern fulmar, black-legged kittiwake, thick-billed murre and common murre among seabirds, and walrus, minke whale and harbor porpoise among mammals. Blue whales, fin whales and sei whales have different subspecies in the northern and southern hemispheres and different subpopulations within the North Atlantic and North Pacific.

Some species occur with a high number of recognized subspecies. Common eider occurs with 6 or so subspecies (there is some taxonomic uncertainty), 5 in the Atlantic sector and one (Pacific eider) in the Pacific sector. Red knot (a shorebird) occurs also with 6 subspecies, 3 breeding in the Old World and 3 in the New. Canada goose was recognized with 11 subspecies until it was taxonomically split in 2004 into two species: cackling goose as the smaller tundra form (4 subspecies), and the larger and mainly boreal Canada goose (7 subspecies). Harbor seal among the marine mammals occurs with 4 subspecies, two in the North Atlantic and two in the North Pacific (eastern and western).

A population or stock is a reproductive unit of animals within a species with little interbreeding with animals from other populations of the same species. Subspecies can be envisioned as populations that have been reproductively isolated for such a long time (generally a hundred thousand years or longer) that distinct morphological, behavioral and genetic differentiation has occurred. Populations need not be so old or distinct but may be

functional units that represent more recent ecological adaptation. In many cases these are denoted as subpopulations in the literature. Among the Arctic marine mammals, bowhead whale is recognized with 4 populations (Okhotsk, Bering-Chukchi-Beaufort, Eastern Canada-West Greenland, Spitsbergen), beluga whale with around 20-25 stocks, Atlantic walrus with 8 stocks, and polar bear with 19 subpopulations.

2.3.2 Status evaluation of species

Conservation statuses and classifications for marine mammals and seabirds as defined by international agreements and other processes, such as the International Union for the Conservation of Nature (IUCN) Red List and the Convention on Trade in Endangered Species (CITES) appendices, vary across the Arctic seabird and marine mammal species.

IUCN (International Union for Conservation of Nature) assesses the status of species in the global Red List of Threatened Species. There are nine categories in the IUCN Red List system: Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Near Threatened, Least Concern, Data Deficient, and Not Evaluated. Classification into the categories for species threatened with extinction (Vulnerable, Endangered, and Critically Endangered) is through a set of five criteria that form the heart of the system. These criteria are based on biological factors related to extinction risk and include: rate of decline, population size, area of geographic distribution, and degree of population and distribution fragmentation. (See http://www.iucn.org/about/work/programmes/species/red_list/about_the_red_list/ for a complete description of each of the above categories and their application).

The IUCN Red List applies primarily to species worldwide rather than to biological subspecies or populations (e.g. NAMMCO 2006, 2011, IWC 2009[20]). IUCN notes in the guidelines for the criteria that when applied at national or regional levels, 'it must be recognized that a global category may not be the same as a national or regional categories for a particular taxon', thus regional populations may be either more or less threatened than the global assessment. This use of the term populations can lead to confusion for species that have a near global distribution but are subdivided into isolated subspecies or populations of varying conservation status. This is particularly relevant for cetaceans. In the case of fin and sei whales both are classified as "endangered" by IUCN despite the fact that the North Atlantic subpopulation have a healthy conservations status and are in fact close to pre-exploitation levels. The IUCN classification of the species as "endangered" reflects the (1) highly depleted Southern Hemisphere subpopulation that is completely independent from its northern counterpart and (2) a lack of survey effort in many parts of the world's oceans, including the North Atlantic. The harbor porpoise is globally listed as Least Concern while the Baltic Sea subpopulation is listed as Critically Endangered.

With respect to marine mammals, the International Whaling commission (IWC) and the North Atlantic Marine Mammal Commission (NAMMCO) have criteria for defining species stock status. The IWC, as an international Commission, has competence over large whales globally, including the Arctic regions, and NAMMCO, as a regional body, has competence over various North Atlantic cetaceans (large and small) and pinniped species (including walruses), many of which exclusively inhabit the Arctic. Both the IWC and NAMMCO are concerned with species status from the regional stock/population perspective and regularly and periodically undertake stock assessments through their scientific committees. Regional assessments (e.g., IWC and NAMMCO) and global assessments (e.g., IUCN and CITES) may

[20] See statement on IWC's webpage: http://iwcoffice.org/conservation/iceland.htm

use different criteria and may therefore indicate different conservation statuses for some populations (e.g. North Atlantic fin whales).

An overview of the conservation status of Arctic marine mammals and birds are given in the following sections. The red-listing process for fish is generally more difficult due to the reproductive mode with high numbers of eggs that generate high natural variability for many marine fish species. This is a typical feature of many of the commercially important species that are regularly assessed for the sustainability of the harvest as part of the fisheries management systems. IUCN has assessed many groups of fishes, notably elasmobranchs (sharks and rays) and tropical reef fishes. Among Arctic fishes, Greenland shark is assessed as being 'Near threatened' (Kyne et al. 2006). Another shark species, porbeagle, which extends the range into the subarctic, is assessed as being 'Vulnerable' at the species level, with the subpopulations in the Northwest and Northeast Atlantic being assessed as 'Endangered' and 'Critically endangered' respectively (Stevens et al. 2006).

2.3.3 Status of Arctic marine mammals and seabirds

Out of the 35 marine mammal species that occur within the Arctic area (many as seasonal visitors), 11 are assessed by IUCN as being Threatened (7 Endangered and 4 Vulnerable), 2 as being Near Threatened, and 15 as not being threatened (Least concern); the remaining 7 species are considered Data deficient (Table 1). Five of the 'Endangered' species are whales that were depleted by historic whaling (blue, fin, sei, and North Atlantic and North Pacific right whales). As mentioned above (2.3.2) the IUCN global classification of fin and sei whales is over-generalized with respect to the North Atlantic subpopulations of these species. According to recent sightings surveys fin whales in the North Atlantic number over 35,000 animals. Of these, the East Greenland-Iceland stock size is estimated as 21,000 fin whales which is close to the estimated pre-exploitation size. From Fig. 4 it may be seen that North Atlantic fin whales may qualify as "Least Concern" if the IUCN criteria were applied to that subpopulation alone, an analysis that has not been conducted by the IUCN.

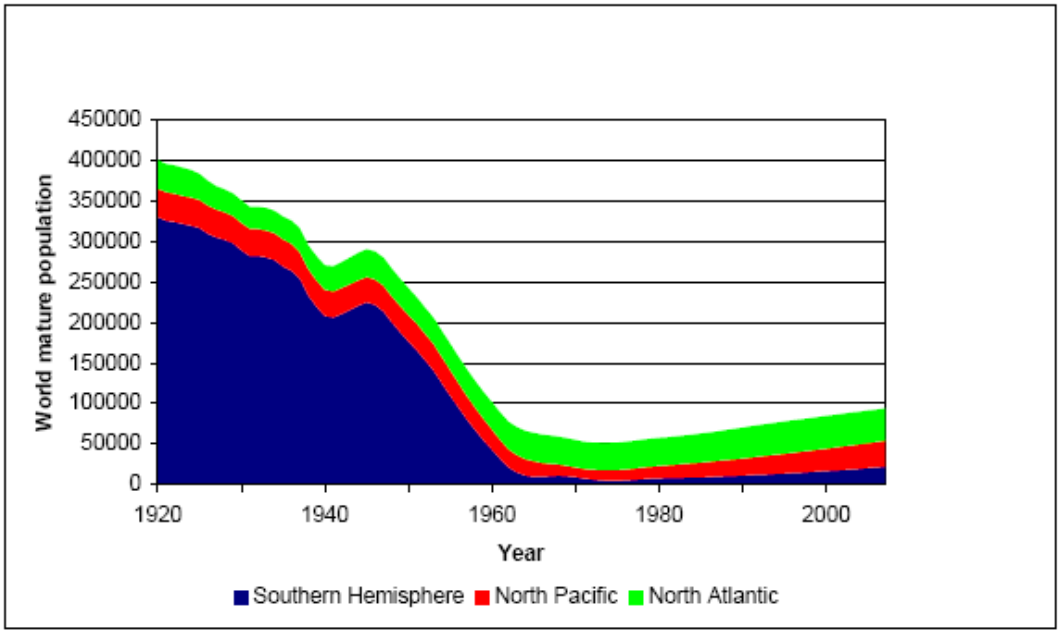

Figure 1: Estimated population trajectory 1920-2007.

Figure 4 - Estimated population trajectory 1920-2007 (Source: From the 2008 assessment of the IUCN Cetacean Specialist Group).

The situation may be similar for the sei whales, which have a highly depleted subpopulation in the Southern Hemisphere and likely a more favorable conservation status for the North Atlantic subpopulation. Unfortunately, survey coverage for the sei whale in the North Atlantic is incomplete, and conclusions regarding sub-regions where surveys have not been completed cannot be drawn.

The common minke whale, which has a complex stock structure in the North Pacific and North Atlantic (and one or more "dwarf" forms in the Southern Hemisphere, is globally listed as Least Concern.

The humpback whale, which also is occurring in both Northern and Southern Hemispheres, has been globally down-listed from Endangered in the 1980s to Vulnerable in the 1990s and Least Concern in 2008. (However, the population structure of humpbacks is very complex and an isolated, distinct subpopulation in the Arabian Sea and the subpopulation in Oceania are listed as Endangered).

The bowhead whale is no longer considered a threatened species by IUCN. It is assessed to be in the 'Least Concern' category, having been successively down-listed from 'Endangered' in the 1980s and 'Vulnerable' in the 1990s (Reilly et al. 2008, IUCN 2010). Bowhead consists of or 5 stocks (Okhotsk, Bering-Chukchi-Beaufort, Eastern Canada-West Greenland, and Spitsbergen) which were all severely depleted by historical whaling. The Bering-Chukchi-Beaufort stock winters in polynyas and drift ice in the northern Bering Sea and migrates in the spring to summer feeding areas in the Bathurst Polynya and adjacent waters in the eastern Beaufort Sea. This stock has been steadily increasing by about 3.5% annually since the 1970s to a population level thought to exceed 13,000 whales in 2001 (Zeh and Punt 2005). The Eastern Canada-West Greenland stock winters in Hudson Strait and western Greenland and migrates north to summer feeding areas in the North Water Polynya and the Lancaster Sound region. This population was considered to be low (hundreds) but recent aerial surveys resulted in much higher estimates of 6,400 individuals or more (Heide-Jørgensen et al. 2007, IWC 2009, COSEWIC 2009).

The Spitsbergen stock of bowhead or Greenland whale, which exists in the Greenland Sea between Greenland and Svalbard, and eastwards in the Barents Sea and the Kara Seas in the Russian Arctic, is considered to have been the largest of the bowhead stocks historically. It is assessed at the stock level by IUCN to be 'Critically Endangered'. There has been debate as to whether the few individuals sighted in the former range were a remnant small stock or stray individuals from other stocks. It now appears that there is a remnant stock that has been slowly increasing and now possibly numbers around 100 individuals. There have been several sightings of bowheads in the range for this stock since 1940, most of them near Svalbard and Franz Josef Land (Moore and Reeves 1993, Belikov and Boltunov 2002, Gilg and Born 2005, Wiig et al. 2007). Late winter observations of bowheads in flaw polynyas near Franz Josef Land in April suggest that this may be a wintering area (Belikov et al. 2002). A total of twenty bowheads were observed in polynyas west of Franz Josef Land in April 2010 (Gavrilo and Ershov 2010). The summer of 2010 there was also observation of a mother with calf in the Greenland Sea providing the first direct evidence that the bowheads are reproducing in this area (Anders Mosbech personal communication).

There are approximately 500 North Pacific right whales, but the eastern population is about 30 individuals. In the western North Atlantic, the right whale population is about 450 whales. The severe declines in their numbers took place in previous centuries, but illegal whaling over the last 75 years contributed to their demise (Ivashchenko et al 2011). They are assessed as being 'Endangered' on the criterion of low population size (and not 'Critically Endangered' as they would if the decline had been more recent). However, the eastern North Pacific right

whale subpopulation is listed as Critically Endangered with less than 50 mature individuals (Reilly et al 2008), but the most recent estimate is about 30 whales (Wade et al. 2011).

Traditionally, two populations of North Pacific gray whales have been recognized, although recent information on movement patterns based on photo-identification, satellite tagging, and genetics has lead to a re-evaluation of stock structure for this species. The eastern population is considered least concern by IUCN and contains approximately 20,000 animals. This population has one of the longest migrations of any mammalian species, spending northern winters in waters of Mexico, and summering in feeding grounds in the Bering, Chukchi and Beaufort Seas. The western population is very small (fewer than 150 animals), is considered critically endangered by the IUCN, and is known to feed in the summer off Sakhalin Island (Russia) and the Sea of Okhotsk. The migratory behavior for this population is not well understood (i.e., the area of calving and over-wintering has not been identified). Gray whales are benthic feeders that feed primarily on continental shelves. The impact of climate change and loss of sea ice on their population size and distribution is difficult to predict at this time.

Another species that is 'Endangered' are the Steller sea lion,[21] which has undergone a marked decline in the Bering Sea region, and the southwest population of the northern sea otter, which was brought to the brink of extinction by historical hunting for pelts, along with the other populations of sea otter in the North Pacific. The southwest population of the northern sea otter recovered for a period of time, but has subsequently declined by over 80% since the late 1980s. The northern fur seal in the eastern North Pacific and hooded seal in the North Atlantic are assessed as 'Vulnerable' due to recent declines in population numbers. The northern fur seal population has been in decline since the late 1970s, but still numbers in the 100,000's of animals. The hooded seal is regarded as a single panmictic population with three breeding stocks in the North Atlantic. The status Vulnerable is due to recent (40-60 years) declines in the Northeast Atlantic stock. The two Northwest Atlantic stocks are stable or modestly increasing.

There are several other species of ice-inhabiting seal species in the Arctic, including ringed, bearded, spotted, ribbon, and harp seals.

Polar bear is currently listed as 'Vulnerable'. The justification for this assessment is in an anticipation of population reductions of >30% within the next three generations (45 years) due to an expected decrease in the sea ice habitat from global warming (Derocher et al. 2004, Stirling and Parkinson 2006). In the most recent assessment by the IUCN Polar Bear Specialist Group (PBSG), 8 of the 19 subpopulations were considered to be in decline (Chukchi, Southern Beaufort, Lancaster Sound, Baffin Bay, Davis Strait, Western Hudson Bay, Norwegian Bay, Kane Basin), 3 were stable (Northern Beaufort, Gulf of Boothia, Southern Hudson Bay), while one subpopulation was considered to be increasing (M'Clintock Channel); for the remaining 7 subpopulations the data were lacking to allow an assessment of trend (PBSG 2009). The declines of subpopulations of polar bears have been attributed to overharvesting and climate change in the Arctic (Aars et al. 2006, PBSG 2009). Persistent pollutants also pose a threat to the health of polar bears (AMAP 2009). Polar bear was recently (May 2008) listed as threatened under the Endangered Species Act in the USA.

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[21] The western Steller sea lion population has been increasing since 2000 (although declining in some areas of its range), while the eastern population has been increasing for over 30 years and is being considered for delisting under the US ESA.

Two Arctic whale species, beluga and narwhal, are assessed by IUCN to be 'Near Threatened'. This is due to a potential negative effect of future climate change combined with overharvesting and disturbances by human activities in some areas. There are about 20-25 geographical stocks of beluga, most of them small (usually less than a few thousand individuals), with four larger stocks numbering 20-50 thousand whales (Bering-Chukchi-Beaufort seas, Baffin Bay-Lancaster Sound, Western Hudson Bay, Barents-Kara seas). In eastern Canada, several beluga stocks are depleted due to overharvesting and considered to be threatened or endangered; this is the case for the Eastern Hudson Bay, Cumberland Sound and Ungava Bay stocks (COSEWIC 2004). Harvest of beluga is also high and possibly unsustainable in West Greenland where there has been a decline in wintering belugas from the Baffin Bay stock (Heide-Jørgensen and Rosing-Asvid 2002, Jefferson et al. 2008). Belugas have disappeared from South Greenland where they are listed as 'Endangered'. Narwhal consists of 4 or 5 stocks. The largest stock (about 90 % of the total population of about 86,000) winters in Baffin Bay and moves north in summer into Lancaster Sound and Prince Regent and adjacent inlets. Narwhals belonging to this stock spend the winter in dense pack ice where they dive down to 1500 m depth to feed on Greenland halibut and the squid *Gonatus fabricii*. Because feeding in the winter accounts for a much larger portion of narwhal energy intake than in the summer, winter feeding is considered more important than summer feeding.

Walrus is considered 'Data Deficient' by IUCN. Walrus occurs with two (or three) subspecies: Pacific walrus and Atlantic walrus (Laptev walrus is considered either a separate subspecies or, more likely a separate population of Pacific walrus). Pacific walrus is about 10 times as numerous as Atlantic walrus (of the order 200,000 individuals versus 20,000, respectively), perhaps reflecting the high productivity of the extensive shallow waters in the northern Bering and the Chukchi seas. Walruses are difficult to census due to their behavior and clumped and scattered distribution patterns. There is little information available regarding current population sizes and trends throughout much of the walrus's range, which is why it is considered 'Data deficient'.

Climate change is expected to have negative consequences for walruses, particularly for the Pacific subspecies. Recent observations of motherless calves on ice floes over deep water off northwest Alaska could indicate the difficulties that walrus are having under the warming climate in the Chukchi Sea (Cooper et al. 2006). With less summer ice and a more northerly distribution, the walruses have become more dependent on coastal haul-outs. This limits their feeding opportunities as they are restricted to feeding in the vicinity of the haul-outs, and the coastal concentration could lead to local depletion of their benthic food sources. The increasing phenomenon of late summer and fall aggregations of large numbers of walruses at coastal haul-outs on both the Russian and U.S. sides of the Chukchi Sea may increase the risk of stampedes of animals disturbed by predators or human activities and lead to increased mortality particularly among young animals. In addition to disturbance by human hunters, other predators such as polar bears, brown bears, and wolverines may cause disturbances and mortalities at the walruses' haul-out sites. The food limitation imposed by receding ice may lead to poorer condition of walruses which could then lead to more susceptibility to stress and diseases. All these factors have probably contributed to lower pup survival in recent years and increased concern about the status of the Pacific walrus population (Kelly et al. 1999, Kochnev 2004, MMS 2007).

No strictly Arctic species of seabird has become extinct during historic times, but three subarctic species, Spectacled Cormorant *Phalacrocorax perspicillatus* (Commander Islands), Labrador Duck *Camptorhynchus labradorius* (Labrador) and Great Auk *Pinguinus impennis*

(Newfoundland and Iceland) were hunted to extinction by Europeans in the 19th century (Fuller 2000).

Two seabird species are listed by IUCN/Birdlife International as near-threatened, at a world scale, Yellow-billed Loon *Gavia adamsii* and Ivory Gull (www.iucnredlist.org/apps/redlist). The cause of the rapid decline in Ivory Gulls in the Canadian High Arctic and possibly elsewhere, since the 1970s (Gilchrist & Mallory, 2005) is unknown. However, the core range of the remaining birds in the Canadian population has retreated northward, suggesting that, irrespective of the cause of the population trend, the remaining birds are concentrating in areas of prolonged summer ice cover (Gilchrist & Mallory, 2005).

Trends in colonial seabirds are generally well known. Some predominantly temperate or subarctic seabird species have begun to spread northwards, such as Glaucous-winged Gull (Winker et al. 2002) in the Bering Sea, Horned Puffin in the Beaufort Sea (Moline *et al*. 2008), Great Skua in Spitzbergen (Krasnov & Lorentsen 2000), Great Black-backed Gull and Lesser Black-backed Gull in Greenland, the latter breeding as far as 66°N (Boertmann 1994, 2008). At the same time there is evidence of a retreat for at least one Arctic species, with the range of the Ivory Gull contracting in Nunavut, with most colonies on N Baffin Island and E Devon Island deserted, while numbers have remained stable farther north on central Ellesmere Island (Environment Canada 2010). Southern colonies also have decreased in Greenland (Gilg *et al*. 2009b). The population of Kittlitz's Murrelet, a species associated with tidewater glaciers in Alaska, as well being distributed in low and sub-Arctic of the North Pacific, is declining in its core breeding range in central S Alaska and perhaps elsewhere (Stenhouse *et al*. 2008).

Black-legged Kittiwake, an abundant species throughout circumpolar Arctic and Boreal waters, has shown significant population declines almost throughout the Atlantic sector of the Arctic, especially around the Barents Sea (Barrett et al. 2006), in Iceland (Garðarsson 2006) and in W Greenland (Labansen et al. 2010). Thick-billed Murre populations in central W Greenland numbers are much depressed compared to the early 19th century, as a result of heavy harvesting of adults at colonies (Evans & Kampp 1991, Kampp *et al.* 1994). Despite better regulations, this population shows no sign of recovery (ABA). Similarly, current numbers in Novaya Zemlya (about 1,000,000) are approximately 50% of numbers in the early 20th century (Bakken & Pokrovskaya 2000). In Svalbard, numbers of Thick-billed Murres were considered stable up to the 1990s, but have since decreased, especially in the southern part of the archipelago (Lorentsen & Christensen-Dalsgaard 2010, CAFF Circumpolar Seabird Working Group, unpublished). In Iceland, numbers of Thick-billed Murres decreased at 7% per year between 1983-1985 and 2005-2008, while numbers of Common Murres decreased abruptly between 1999-2005 after modest increases earlier (Garðarsson 2006). Northern Fulmar, Black-legged Kittiwake and Razorbill also decreased, although some small colonies increased (Garðarsson *et al.* 2009).

2.3.4 Status of Arctic birds

There are about 200 species of Arctic birds in total (including about 70 seabird species, about 60 waterfowl species, about 70 shorebird species) that occur within the Arctic area.Most of them are boreal or temperate species with breeding ranges extending into the sub-arctic zone. Many shorebirds and waterfowl such as ducks are mainly inland species associated with freshwater wetlands. Many seabirds (e.g. skuas or jaegers) and most waterfowl and shorebirds breed inland on tundra and wetlands but most of them move to coastal and marine habitats after breeding. The majority of species are migratory to lower northern latitudes or the southern hemisphere. Some species are more true Arctic residents and move to winter mainly

in the sub-arctic zone. These include thick-billed murre, dovekie, and black-legged kittiwake among seabirds, and king eider among the sea ducks.

Fourteen of the 200 species of birds are listed as threatened by IUCN: 3 being 'Critically Endangered', 3 'Endangered' and 8 'Vulnerable'. In addition there are 7 species assessed to be 'Near threatened' (Table 2). The majority of the threatened species occur in the Pacific sector (11), with only two of the species found in the Atlantic (Steller's eider and lesser white-fronted goose). The Pacific species include the 3 North Pacific albatrosses that are 'Endangered' (black-footed) or 'Vulnerable' (Laysan and short-tailed), red-legged kittiwake that breeds with the majority of the total population on the Pribilof Islands, and bristle-thighed curlew that breeds in Alaska adjacent to the northern Bering Sea.

Eskimo curlew is assessed as being 'Critically Endangered/Possibly Extinct'. It used to breed in northern Canada and was one of the most numerous Arctic shorebirds. It was photographed in Texas in the 1950s and the last reliable record is from the 1970s along the coast of James Bay; now it is probably gone forever.

The two other 'Critically Endangered' species both occur in the Bering Strait region. Kittlitz's murrelet is a small, mountain-breeding auk that feeds in coastal waters along western Alaska, the Chukchi Peninsula and around Wrangel Island. It was listed as 'Critically Endangered' in 2004 due to extremely rapid population decline in Alaska owing to a variety of threats. However, recent surveys suggest that the population may not be undergoing such a steep downward trend, and upon clarification the species may warrant down-listing in the near future.

'Spoon-billed sandpiper' is now the most threatened Arctic species (assuming that Eskimo curlew is extinct). It breeds in special coastal habitats along the Chukchi Peninsula, using lagoon spits with crowberry-lichen vegetation or dwarf birch and willow sedges, together with adjacent estuary or mudflat habitats that are used as feeding sites by adults during nesting (BirdLife International 2009). The population is now estimated to be <1,000 individuals and declining (BirdLife International 2009, IUCN 2010).

Steller's eider is listed as 'Vulnerable' due to rapid population decline, particularly in Alaska. It consists of two main populations: a western (Atlantic) and an eastern (Pacific). The status of Steller's eider is not so clear and further studies are needed to determine the causes of the declines, and whether some populations may have shifted to unsurveyed areas within the range (IUCN 2010). All four species of eiders (common (Pacific), king, spectacled and Steller's) have shown declines in recent decades that have raised some concern for their conservation status. Pacific, spectacled and Steller's eiders declined by 90% or more at the breeding areas on the Yukon-Kuskokwim Delta in the Bering Sea in the last decades up to the 1990s (Suydam et al. 2000, Fredrickson 2001). Eider populations have also declined in Canada, Greenland and Russia. While the causes of the declines are often unknown, there are cases where human disturbance, excessive harvests, and severe climatic events have been identified as contributing factors. Some populations of common eider are now recovering after better harvest management has been implemented (CAFF 2010).

The high Arctic ivory gull is assessed to be 'Near Threatened'. It has declined rapidly in parts of its range, notably in Canada, but its status in other areas is poorly known. In Russia, which is the main breeding area for the species, some populations are apparently stable. Climate change, pollution and increasing human intrusion or hunting within breeding areas are likely to be contributing to the observed declines.

2.4 Climate change

2.4.1 The Arctic is warming

Key finding No. 1 in ACIA (2005) was that:

> "*Arctic climate is now warming rapidly and much larger changes are projected*".

ACIA cited increases in Arctic air temperature of more than twice the global average and widespread melting of glaciers and sea ice as evidence for climate change taking place in the Arctic. Increasing emissions and concentrations of CO_2 and other greenhouse gases were projected to contribute additional warming of 4-7 ^{o}C in the Arctic over the next 100 years.

After ACIA was published in 2005 we have seen 4 years with the lowest minimum ice cover in September since satellite recordings started in the 1970s. The linear rate of decline of September ice extent over the period 1979 to 2010 is 11.6% per decade relative to the 1979 to 2000 average. In 2007 there was a substantial drop in the summer ice minimum, which has remained low also in 2008, 2009 and 2010 (Fig. 5; Perovich et al. 2010). Maximum extent of ice in winter (March) has also decreased over the time period but much less marked with -2.7% per decade. The "missing" ice in March 2010 (compared to the average) occurred mainly in the southern Canadian waters (Grand Banks and Gulf of St. Lawrence, and outside the 'Arctic area' of the Arctic Council) and partly in the northern Labrador Sea and the central Barents Sea (Fig. 6). The reduction in summer ice in September 2010 occurred mainly in the Pacific sector (Beaufort, Chukchi, East Siberian seas) and also in the northern Laptev and Kara seas and the Canadian Arctic Archipelago.

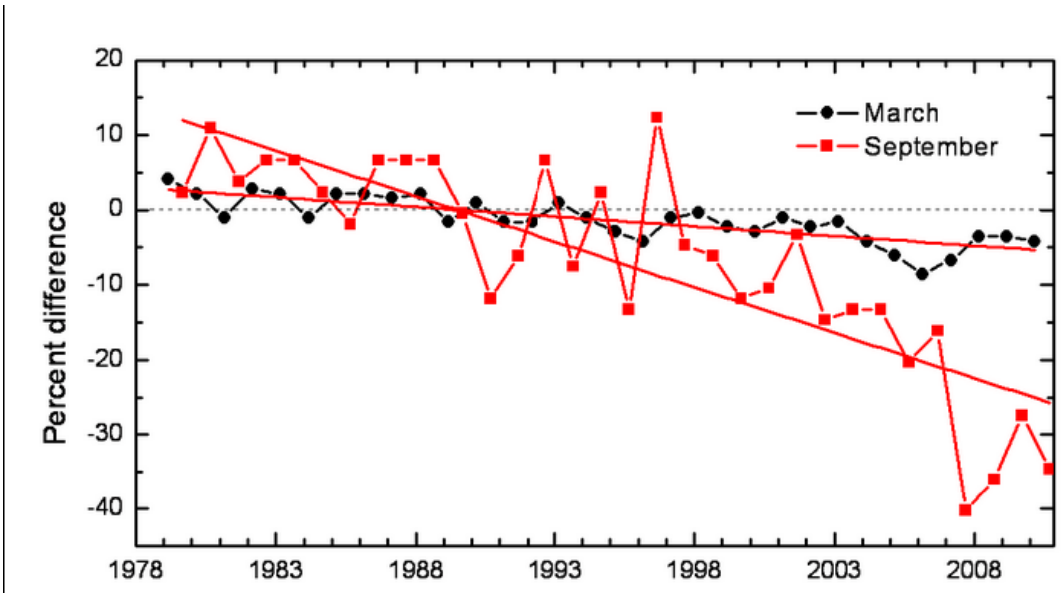

Figure 5 - Time series of the percent difference in ice extent in March (the month of ice extent maximum) and September (the month of ice extent minimum) relative to the mean values for the period 1979–2000. Based on a least squares linear regression for the period 1979-2009, the rate of decrease for the March and September ice extents is –2.7% and –11.6% per decade, respectively. From Perovich et al. 2010.

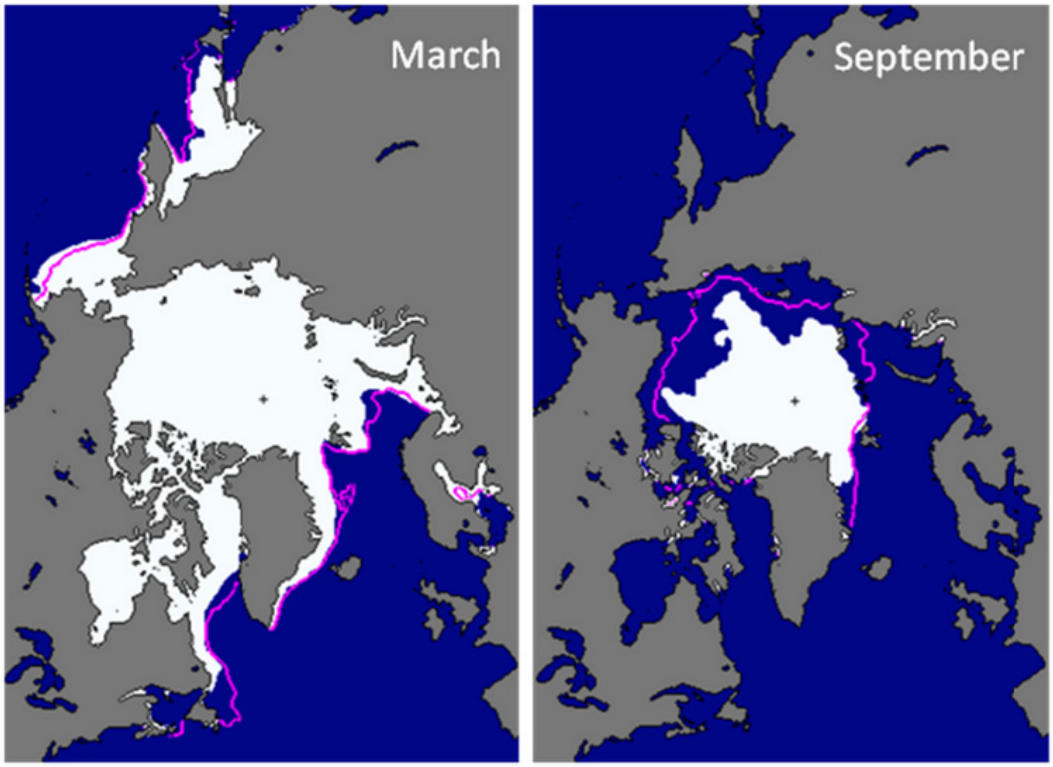

Figure 6 - Sea ice extent in March 2010 (left) and September 2010 (right), illustrating the respective monthly winter maximum and summer minimum extents. The magenta line indicates the median maximum and minimum extent of the ice cover in the given month for the period 1979–2000. (Source: the National Snow and Ice Data Center Sea Ice Index: nsidc.org/data/seaice_index; from Perovich et al. 2010).

The atmospheric conditions in summer 2007 were extraordinary and helped lead to the record low ice extent in September of that year. A new climatic wind pattern, the Arctic Dipole Anomaly (DA), with southerly wind blowing from the Bering Strait across the North Pole persisted throughout the summer of 2007 (Overland et al. 2010). The DA contributed to low summer ice also in 2009 and 2010. The open ocean absorbs more heat than if it was ice-covered. Consequently the temperature of the surface layer was higher than usual, particularly in 2007 (Proshutinsky et al. 2010). The heat accumulated in the ocean is released back to the atmosphere the following autumn, creating consequences for regional and far field wind patterns through large scale atmospheric teleconnection patterns (Overland and Wang 2010). In the winter 2009-2010 there was a change in the typical wind directions in the Arctic in what is called the 'Warm Arctic-Cold continents' climate pattern (Overland et al. 2010). This allowed cold air from the Arctic to penetrate all the way into Europe, eastern China, and the eastern USA. Arctic regions, on the other hand, had anomalies of +4°C to +12°C. This pattern of change in wind directions is rare and has happened only three times before in the last 160 years. It demonstrates the connectivity whereby Arctic climate is influencing the weather at mid latitudes. It also points to a potential climate change paradox whereby the loss of sea ice and a warmer Arctic can increase the impact of the Arctic on lower latitudes and bring colder weather to southern locations (Overland et al. 2010).

The ice thickness has decreased more than 40% since the mid 1970s to the beginning of the 2000s (ACIA 2005). The age of the ice is a way to estimate its thickness. Older ice tends to be thicker than first or second year ice. During the last few years, wind patterns have transported a great deal of multiyear ice from off the northern coast of the Canadian Arctic into the Beaufort and Chukchi seas. Scientists speculated that much of this ice, some five

years or older, would survive the summer melt period. However, at the end of summer this year (2010), less than 15% of the ice remaining in the Arctic Ocean was more than two years old, compared to 50 to 60% during the 1980s. There is virtually none of the oldest ice (five years or more) remaining in the Arctic. Whether younger multiyear ice (two or three years old) in the Arctic Ocean will continue to age and thicken depends on two things: first, how much of that ice stays in the Arctic instead of exiting into the North Atlantic through the Fram Strait; and second, whether the ice survives its transit in the Beaufort Gyre across the Beaufort and Chukchi Seas or instead melts away.

2.4.2 Climate variability and climate change

There is large natural *climate variability* at many different time scales. It is both useful and necessary to distinguish this natural climate variability from the *climate change* caused by human induced emissions of carbon dioxide (CO_2) and other greenhouse gases. Natural climate variability will continue to be there as a pronounced feature in the future but the pattern of variability is likely to be influenced by climate change since they both are features of one and the same global climate system.

It is "only" about 10,000 years since the last ice age. While this may seem long from the perspective of a human life time, it is a very small fraction of the evolutionary time scale for Arctic biota. All the species of fish, birds and mammals we have today have been around for much longer than this; they have lived through many ice ages and interglacial periods. One of the most recent species is polar bear that diverged from grizzly bear some 150-200 thousand years ago (about the same time when our species *Homo sapiens* started to diverge from our ancestors). About 1000 years ago we had the 'Medieval' warm climate period followed by the cold 'Little ice age' in the 1500-1700s. We are now coming out of this cold period on a general warming trend. These 'recent' events have had consequences for Arctic biodiversity patterns. Thus bowheads from the Atlantic and Pacific populations were likely to be in contact with genetic exchange during the Medieval warm period followed by isolation during the Little ice age.

On top of these long-term shifts and trends over millennia and centuries, there is variability at many shorter time scales. Natural atmospheric patterns of variability on annual and decadal time scales play an important role in the Arctic climate. Such patterns include oscillations in the atmospheric circulation patterns, described by for example the North Atlantic Oscillation (NAO), the Arctic Oscillation (AO) and the Pacific Decadal Oscillation (PDO), which are associated with prominent arctic regional precipitation and temperature anomalies. For instance, the positive NAO phase is associated with warmer and wetter winters in Siberia and colder and drier winters in western Greenland and north-eastern Canada. The NAO showed a trend towards its positive phase over the last three to four decades, although it returned to near its long-term mean state in the last five years.

At interannual to decadal time scales, much of the ocean variability is linked to the NAO or PDO. In the Barents Sea, a positive NAO index tends to produce warm conditions. However, the strength of this temperature-NAO correlation varies temporally. For example, correlations increased after the early 1970s, which was attributed to an eastward shift in the Icelandic Low (Ottersen et al., 2003). Blindheim et al. (2000) suggested a positive correlation between the Atlantic inflow into the Barents Sea and the NAO index, a result supported by current measurements (Ingvaldsen, 2005) and consistent with the NAO-temperature relationship in the Barents Sea.

In addition to the above variability there is evidence from measurements of the Atlantic Multidecadal Oscillation (AMO) with a period of between 60-80 years (Kerr, 2000; Sutton and Hodson, 2005; Keenlyside et al., 2008). This period is also supported by paleo-data from

the North Atlantic (Mann et al., 1998). Through much of the Northeast Atlantic, including the Barents Sea (Skagseth et al., 2008), the waters show a general pattern of relatively cold in the late 19th century and early part of the 20th, warm from the 1930s to the 1950s, cool through the 1970s to the 1980s, and warm during the last decade of the 20th century and into this century (Drinkwater, 2006).

The average air temperature of the Arctic (Fig. 7) shows a pattern consistent with the pattern for the ocean climate. The warm period from the 1920s to the 1950s and the cold period in the 1960s and 70s were followed by a pronounced warming from the 1980s to present. It is likely that this represents an upswing in the natural climate oscillation augmented by anthropogenic climate change with the last decade being the warmest on record (Overland et al. 2010). It is possible that the underlying natural oscillation will bring about cooling (or a slow-down of the warming) before the warming again accelerates later in this century.

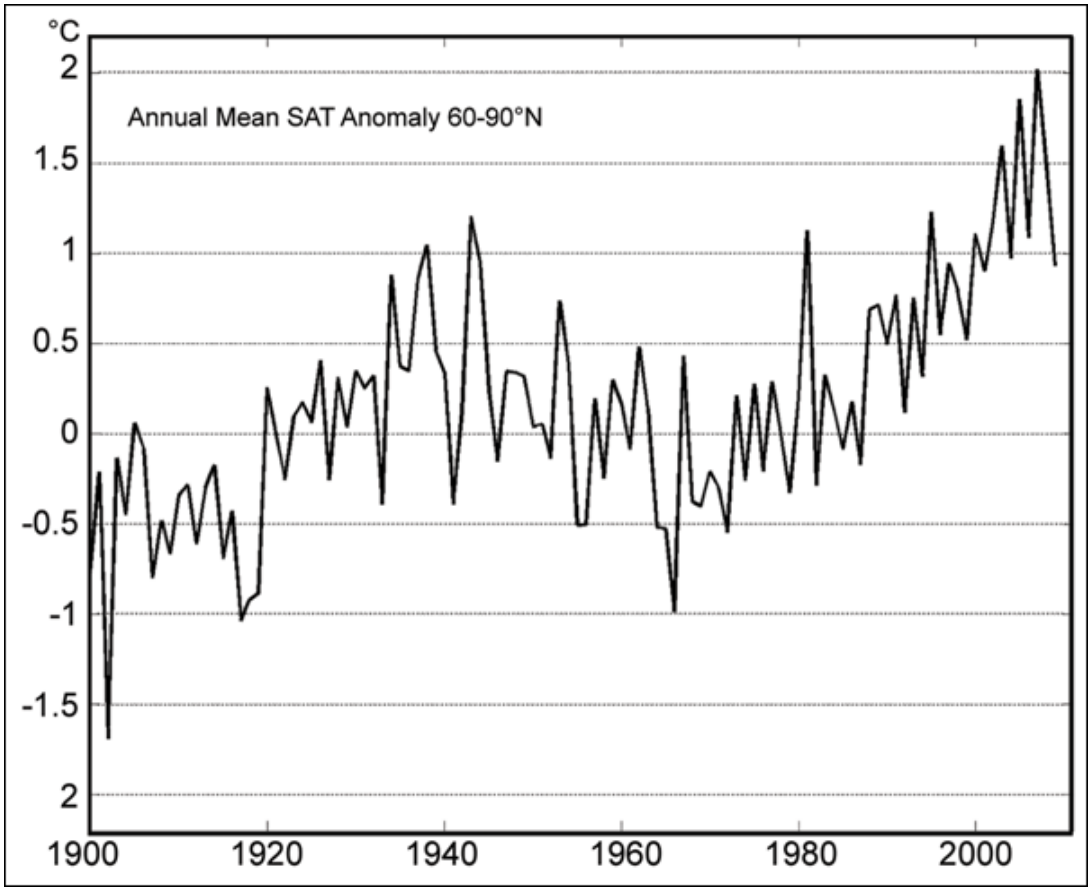

Figure 7 - Arctic-wide annual average surface air temperature anomalies relative to the 1961–90 mean, based on land stations north of 60°N from the CRUTEM 3v dataset, available online at www.cru.uea.ac.uk/cru/ data/temperature/. Note this curve does not include marine observations. (From Overland et al. 2010).

2.4.3 Climate impact on the ecosystem

Thinning and reduced extent of sea ice will have dramatic impacts on the entire sea ice ecosystem. Changes in this highly specialized environment are likely to have repercussions for other parts of the arctic marine community (ACIA 2005). Changes in sea ice, water temperature, freshwater input, and wind stress will affect the rate of nutrient supply through their effect on vertical mixing and upwelling. This will again affect the timing, location, and species composition of phytoplankton blooms, the growth of the zooplankton community and the productivity of fish. Changes in the timing of the primary production will determine

whether this production is utilized by the pelagic community or is exported and utilized by the benthos (ACIA 2005).

Climate change can affect fish production through a variety of means. Direct effects of temperature could occur on the metabolism, growth, and distribution of fish. Food web effects could also occur through changes in lower trophic level production or in the abundance of top-level predators, but such effects are difficult to predict. However, it is expected that generalist predators are more adaptable to change than specialists. Fish recruitment patterns are strongly influenced by oceanographic processes such as local wind patterns and mixing and by prey availability during early life stages, which are also difficult to predict. Recruitment success could be affected by changes in the time of spawning, fecundity rates, survival rate of larvae, and food availability. Migration patterns are very likely to shift, causing changes in arrival times along the migration route. The timing of the spring migration of some species appears to be related to the timing of ice melt (ACIA 2005).

The impacts of climate change scenarios on marine mammals and seabirds in the Arctic are likely to be profound. Patterns of change are expected to be non-uniform and complex, and oscillations occurring at a variety of scales complicate regional predictions of long-term trends. The impacts of reduced sea ice vary depending on the ecological relationship between each species and sea ice. This has been examined in a recent special publication of the journal 'Ecological Applications' which provides a comprehensive review of the likely impacts of climate change on Arctic marine mammals (Huntington and Moore 2008). Impacts of climate change on marine mammals have also been addressed in some detail for the Atlantic part of the Arctic (Kovacs and Lydersen 2008).

Although many climate change scenarios focus on negative consequences for ecosystems, climate change will provide opportunities for some species. The ability to adapt to new climate regimes is often vast, and this potential should not be underestimated; many higher marine vertebrates in the Arctic are adapted to dealing with patchy food resources and high variability in the abundance of food resources (ACIA 2005).

2.4.4 Ocean acidification

Increased levels of CO_2 in the atmosphere not only lead to global warming, but also have a chemical impact on the oceans. Almost 30% of the global CO_2 emitted in industrial times has been dissolved in the ocean, where it reacts with water to form carbonate and hydrogen (H+) ions which lower the pH of the seawater. Surface ocean pH is already 0.1 units lower than pre-industrial values. By the end of this century, it is projected under one climate scenario to become another 0.3–0.4 units lower, which translates to a 100–150% increase in H+ concentration (Orr et al. 2005, CBD 2009). Organisms forming shells and skeletons by calcium (corals, shells, some species of phytoplankton and fish) can potentially be severely affected (Comeau et al. 2009). Changes in species composition can be expected according to tolerance for an environment with lower pH. It is predicted that changes in ocean pH will be largest in cold waters and that conditions detrimental to high-latitude ecosystems could develop within decades (CBD 2009). [22]

AMAP has initiated an assessment of ocean acidification in the Arctic.

[22] See a "summary for policy makers"-report at http://www.ocean-acidification.net/ and a CBD report at http://www.cbd.int/doc/publications/cbd-ts-46-en.pdf

2.4.5 The ozone layer and ultraviolet radiation

Ozone in the stratosphere absorbs some of the sun's biologically harmful ultraviolet (UV) radiation. A number of chemical compounds emitted by human activities are transported up in the stratosphere where they deplete the ozone-layer. The largest depletion of the ozone-layer can be found in the polar regions, first of all in Antarctica. In the Arctic, the accumulated loss in annual ozone levels was 7% between 1979 and 2000. Due to the atmospheric processes around polar sunrise, the most pronounced loss is in spring when potential biological effects are the largest (10 – 15 % loss on average). High atmospheric variability leads to episodes with "ozone holes" that may last for several weeks and result in substantial increases in UV radiation. One of the most pronounced monthly anomalies in the Arctic occurred in March-April 1997, when daily ozone levels were 40-45% below normal (ACIA 2005). The ozone loss during Arctic winter and spring has varied between 2007 and 2010, but remained in a range comparable to the values that have prevailed since the early 1990's (WMO/UNEP 2010).

Increased UV radiation can have harmful effects on plants, animals, humans and materials. In the marine ecosystem, primary production may possibly be reduced by as much as 20-30%. Current UV levels may also have negative effects on zooplankton and fish with reduced survival and reproduction failures. Indirect ecosystem effects may also arise from reduced content of vital fatty acids in algae (ACIA 2005).

The Montreal protocol has successfully controlled the global production and consumption of ozone depleting substances. The ozone layer outside the Polar regions is projected to recover to its pre-1980 levels some time before the middle of this century. A major uncertainty, particularly in the Arctic, is the effects on the ozone layer of greenhouse gasses and the changes they lead to in atmospheric conditions (WMO/UNEP 2010). Ozone levels in the Arctic thus are projected to remain depleted for several decades. The problem therefore still needs attention, including monitoring, alert systems to protect the population, and research on the particular circumstances with ozone depletion in the Arctic.[23]

2.5 Arctic pollution

2.5.1 Introduction

The main sources of pollution in the Arctic marine environment are located outside the Arctic. From the different source regions, each type of contaminant follows distinct pathways (Fig 8). Atmospheric transport by winds are an important pathway for volatile contaminants and for substances that adhere to small particles. Rivers carry contaminants and process them through sedimentation and resuspension of particles. Ocean currents are slow but important pathways for contaminants that partly dissolve in water. Migratory animals also play a role for contaminant transport in the Arctic (AMAP 2009). In addition, there are local sources of pollution within the Arctic associated with mostly land-based industrial developments.

[23] ACIA key finding # 9,

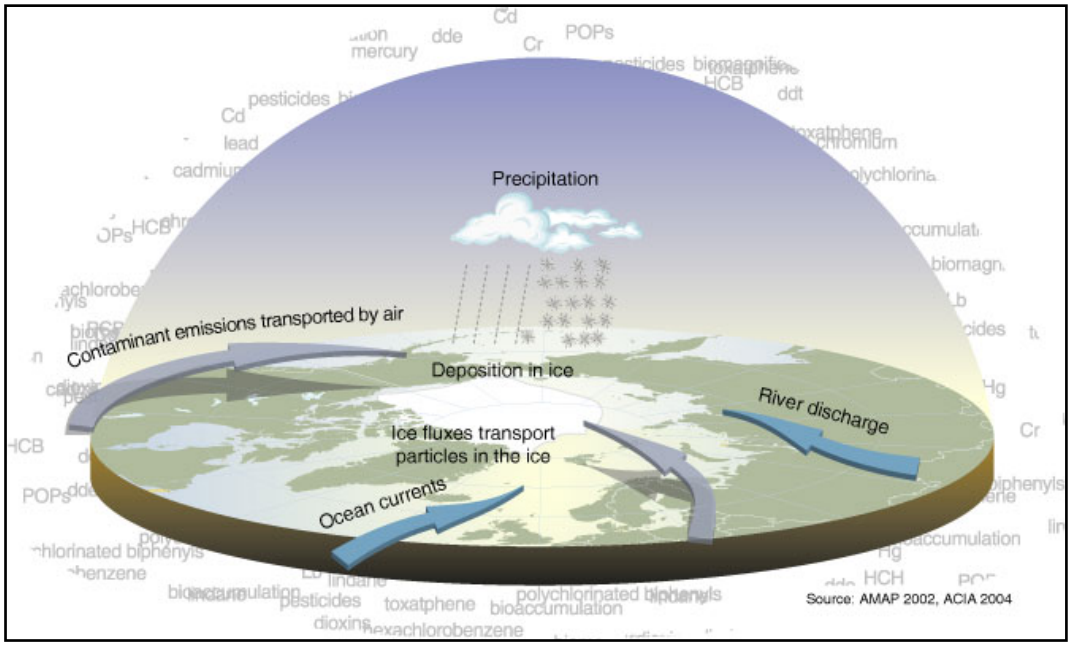

Figure 8 - Pathways for hazardous substances into the Arctic.

2.5.2 Persistent organic pollutants (POPs)

The AMAP assessments have revealed high levels of POPs in some populations of mammals and birds that are high up in the food chain. The species include polar bear, Arctic fox, killer whale, harbor porpoise, beluga, narwhal, harp seal, northern fur seal, glaucous gull, great black-backed gull, and peregrine falcon (AMAP 2002, 2009). A major reason for this pattern is that most POPs are dissolved in fat and thus are being transferred from prey to predator (Fig. 9).

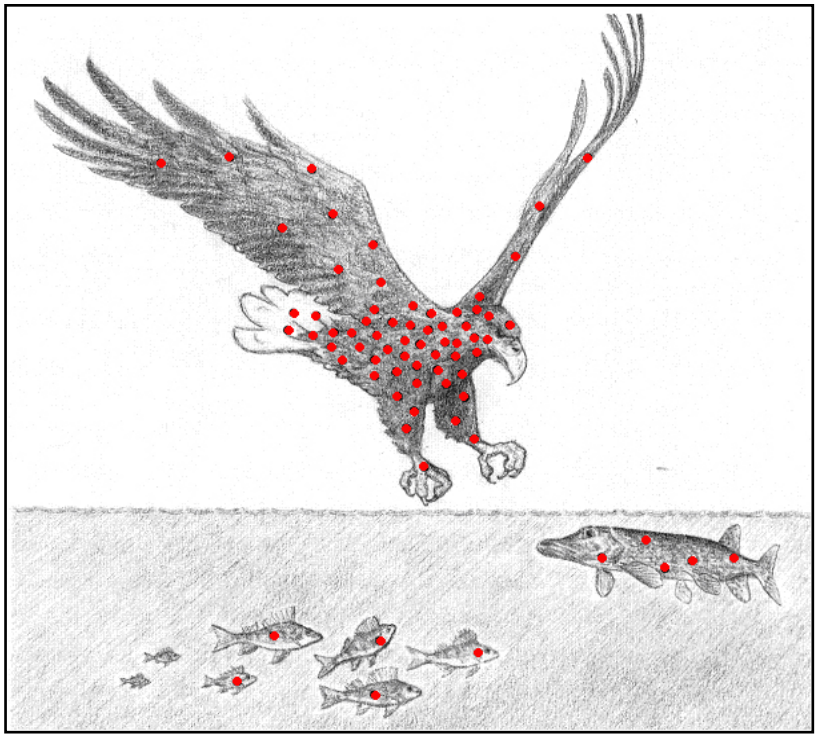

Figure 9 - Biomagnification is the process leading to higher concentrations of contaminants in species at the top of the food chain.

Adverse effects associated with these contaminant burdens have been observed in some of the most exposed or sensitive species in some areas of the Arctic. These effects include a reduced immunological response in polar bears and northern fur seals and an increased susceptibility to infection. Immunological, behavioral, and reproductive effects as well as reduced adult survival have been found in glaucous gulls. Peregrine falcons have suffered from eggshell thinning and reproductive effects (AMAP 2002).

Regions of special concern with regard to effects on polar bears are East Greenland, Svalbard and the Kara Sea area (AMAP 2009).

Recent studies of the biological effects of POPs have been able to confirm the causal link between POPs and observations of adverse health effects in Arctic top predators. Controlled experiments on sled-dogs and captive Arctic foxes have shown effects on hormone, immune and reproductive systems. The observed effects are mainly due to the breakdown products, indicating that these may be more important than the original POP compounds. New evidence shows that the effect of POPs on the health of Arctic seabirds, such as ivory and glaucous gulls, can be enhanced by other environmental stressors (AMAP 2009).

Levels of many POPs have declined in the Arctic environment. This is a consequence of past bans and restrictions on uses and emissions in Arctic and other countries. 'Legacy' POPs that contaminate the Arctic mainly as a result of past use and emissions include PCBs, DDTs, HCB, chlordane, dieldrin, toxaphene, and dioxins. Despite the reductions, concentrations of some legacy POPs, such as PCBs in some top predators in the marine food web, are still high enough to affect the health of wildlife and humans (AMAP 2009).

Most chemicals in commercial use today are not yet regulated by international agreements, though there may be regional or national restrictions. Knowledge about them in the Arctic remains much more limited than for legacy POPs.Many substances have the potential to transport over long distances and accumulate in Arctic food chains. One assessment pointed out 65 such substances produced in more than 1000 tons/year and 4300 with low or unknown production volumes (AMAP 2009). New monitoring efforts assessed by AMAP have extended the information concerning especially brominated flame retardants, fluorinated compounds, polychlorinated naphthalenes, endosulfan and several current-use pesticides . This information is relevant to ongoing consideration of new chemicals for inclusion under existing national, regional and global agreements to regulate use and emissions of POPs (AMAP 2009).

2.5.3 Heavy metals

One of the findings in prior AMAP assessments is that *mercury* is deposited from air to surfaces in polar spring, and lead to the assumption that the Arctic was assumed to be a global sink-region. Historically the in-fluxes and levels have increased strongly since the mid 1800s with burning of coal as an important source. Trends in recent years are however more contradictory both geographically and over time. Levels of mercury in humans in the Arctic are generally decreasing, though they are still above recommended health guidelines in Canada and Greenland (AMAP 2005). A new AMAP assessment on mercury is due to be published in spring 2011.

Levels of *lead* are decreasing, following the phasing out of leaded petrol. Like *cadmium,* it is a minor problem in the marine environment apart from some areas contaminated by local sources.[24]

[24] Arctic council 2009: Regional Programme of Action, page 7-8.

2.5.4 Radioactivity

Radioactivity in the Arctic is a concern because contamination can persist for long periods and because pathways in the terrestrial environment can lead to high exposure of people (AMAP 2009).

AMAP assessments have documented fallout from past nuclear weapons tests, the 1986 Chernobyl accident, and releases from reprocessing plants close to the Arctic as the three major sources of anthropogenic radioactive contamination in the Arctic. Current discharges from spent fuel reprocessing plants (Sellafield, Le Hague) have declined due to new technology. In areas from which there are monitoring data, the levels of radioactivity in the Arctic environment are declining (AMAP 2009). . Monitoring of Cesium-137 in fish in the Barents Sea, where many sources aggregate, show that activity levels are at the same order of magnitude as other marine areas in Europe and lower than in source regions like the Irish Sea and the Baltic. Levels are well below critical levels for human exposure through diet.[25]

Previous AMAP assessments have highlighted risks associated with potential sources in north-west Russia and recommended actions to improve safety surrounding nuclear installations and waste handling. Significant progress has been made with respect to actions to reduce risks of radioactive contamination from several of these potential sources. New potential risks include Russian plans for building floating nuclear power plants and the possibility of increased marine transport of radioactive material in the Arctic.

2.6 Contaminants and human health

Many indigenous populations in the Arctic region have poorer health than national averages. While socioeconomic conditions and lifestyle choices are major determinants of health, contaminants may also have a contributing effect. Epidemiological studies, looking at Arctic residents directly, provide evidence for subtle immunological, cardiovascular, and reproductive effects due to contaminants in some Arctic populations. These results indicate that POPs, mercury, and lead can affect health of people and especially children at lower levels of exposure than previously thought (AMAP 2009).

Most human exposure to contaminants is through food. A major dietary shift from traditional to store-bought food is underway in most of the Arctic, with important health implications. Despite this shift, traditional foods remain important to Arctic indigenous peoples for social, cultural, nutritional, economic, and spiritual reasons. Some traditional foods like blubber from marine mammals carry potential risks from contaminants. The combination of high prices for store-bought foods and the work, risks, and costs associated with obtaining traditional foods has made food security a large concern for many Arctic residents. Recent studies have found a number of mechanisms by which contaminants can affect metabolism. Obesity is associated with an increased risk of cardiovascular disease and of developing diabetes; as in other parts of the world, obesity is increasing in Arctic communities. POPs, even at low concentrations, also increase the risk of diabetes. These new findings emphasize the need to consider the interactions between contaminants and other health conditions (AMAP 2009).

Human exposure to most legacy POPs and mercury is decreasing in many Arctic populations. This reflects changes in diet, changing levels of environmental contamination, and health advice to critical groups in some areas concerning consumption of certain foods; however, exposure remains high in some populations. The proportion of women of childbearing age

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[25] NRPA 2010, http://mosj.npolar.no/no/influence/pollution/indicators/radiation_fish.html

who exceed blood level guidelines for PCBs, mercury, and lead is decreasing. For PCBs and lead, in particular, there is evidence that this reflects the declines in environmental levels of these contaminants (AMAP 2009).

Emerging compounds such as brominated flame retardants and fluorinated compounds are a concern for three reasons: they are present in Arctic people and biota, levels globally have increased over the last 15 years, and their toxic effects have not been studied in detail. There is little information on the routes of exposure or trends of these contaminants in Arctic human populations (AMAP 2009).

2.7 Industrial activities and developments

2.7.1 Arctic marine shipping

In 2004, around 6000 vessels had one or more voyages in the Arctic marine area. Half of these were operating on the Great Circle Route between Asia and North America that crosses the Aleutian Islands chain. If we exclude this traffic, almost 50% of the vessels were fishing boats and 20% bulk carriers. Nearly all shipping in the Arctic today is destinational, conducted for re-supply of Arctic communities, marine tourism and moving natural resources like petroleum products and various types of ore out of the Arctic. Nearly all voyages took place in the periphery of the Arctic Ocean with the Barents Sea as the most heavily trafficked area (Fig 9). In the central Arctic Ocean, shipping activity is low (AMSA 2009).

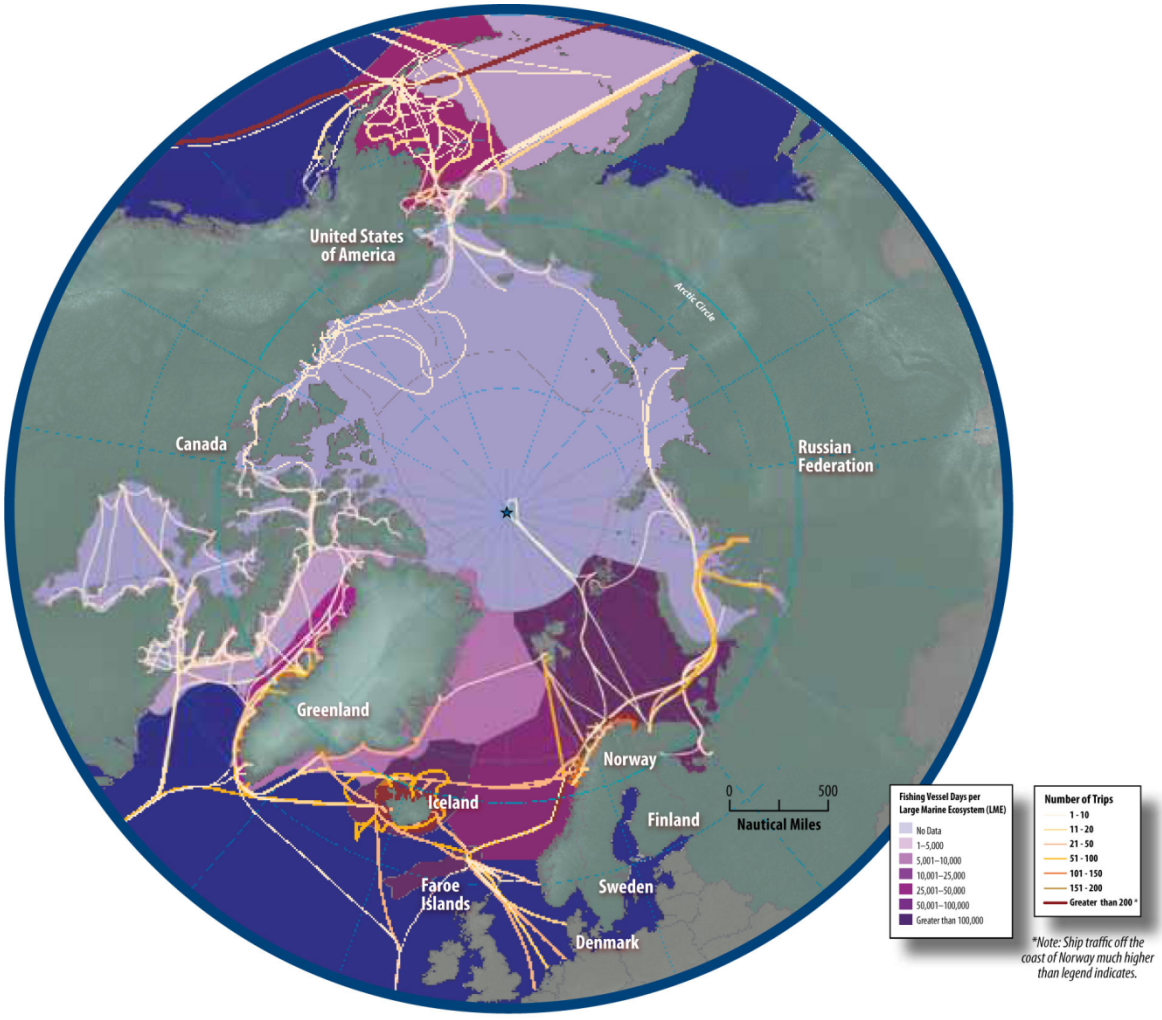

Figure 10 - Overview of all vessel activity for 2004. Activity of fishing vessels is marked with coloured areas, whereas other vessels' traffic is marked with dominant sailing routes. AMSA 2009.

There is an expectation of increased marine shipping in the Arctic with global warming and less sea ice. For the near future up to at least 2020, dominating pattern of traffic is expected to be destinational, with marine shipping going to and from Arctic harbours, not trans-Arctic between continents. The major drivers for this will be Arctic natural resource development (fish, hydrocarbons, minerals, timber etc), regional trade and tourism (AMSA 2009). It will take time for trans-Arctic shipping between the continents to eventually develop into considerable volumes on regular commercial terms. Such a relocation of international shipping routes will be inhibited by several factors like a lack of major ports and critical infrastructures along the Arctic sea routes, inadequate search and rescue capabilities and problems keeping fixed timetables necessary for the "just-in-time" delivery dominating container transport.[26] In the mean-time, traffic to and from Arctic destinations may increase to considerable volumes on parts of the routes, for example shipment of oil from the Pechora region. Such traffic will pose many of the same risks and challenges as trans-continental shipping.

The most significant threat from ships to the Arctic marine environment is the release of oil through accidental or illegal discharges. Other potential impacts include ship strikes on marine mammals such as bowhead whales, disruption of migratory patterns of marine mammals and the introduction of anthropogenic noise from marine shipping activity. There is a broad geographical correspondence between the routes used by marine mammals (bowhead, beluga, narwhal, walrus) on their spring migration to summer feeding grounds in the Arctic and Arctic shipping routes, notably through the Bering Strait, Lancaster Sound and the Kara Gate. At present, most shipping movements take place after the mammals have migrated through these choke-points. Other, more local shipping movements may take place in the summer and fall feeding areas of marine mammal species such as bowhead and walruses. With less sea ice there may be a longer season of both directional and local navigation and the potential for more conflicts between migratory species and ships.

The introduction of invasive species into the Arctic marine environment from shipping can occur and the risk may be enhanced due to changing climate, possibly making conditions more favorable to some species. Of particular future concern is the transfer of boreal or sub-Arctic organisms across the Arctic Ocean from the North Pacific to the North Atlantic and vice versa. Emission of black carbon (soot) from shipping in the Arctic is another another environmental effect that could have significant regional impacts by accelerating ice melt. Other ship emissions, such as SOx and NOx, may also have consequences for the Arctic environment (AMSA 2009).

2.7.2 Oil and gas development

Extensive oil and gas activity has occurred in the Arctic, mainly on land and mostly in Russia, which has produced about 80% of the oil and 99% of the gas extracted in the Arctic so far. The Arctic is known to contain large petroleum hydrocarbon reserves, much of which (75% of known Arctic oil and 90% of known gas) are in Russia, which is expected to continue to be the dominant Arctic petroleum producer (AMAP 2008).

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[26] AMSA page 5. See also discussion of drivers and uncertainties in ch 2 of Brunstad 2007 and in AMSA, particularly the chapter on scenarios.

Oil and gas activities in the marine part of the Arctic have been more restricted compared to activities on land (AMAP 2008). Canada had exploration activities in the Mackenzie Delta in the 1970s and 80s. In Alaska, exploration extended offshore resulting in production from some nearshore fields starting in 2001. Norway started exploration activities in the Norwegian and Barents seas in the 1980s, with production of oil and gas starting in the 1990s from fields in the Norwegian Sea and in 2007 from the 'Snøhvit' gas field in the Barents Sea. Production on land in western Siberia started in the 1970s, with tanker transport from northern Russia to Europe beginning in 2002. Exploration activities in the Russian offshore have identified large potential resources that so far have not been developed. Petroleum exploration has been carried out offshore in West Greenland in recent years with prospects of finding reserves that can be developed.

Uncertainty about offshore development is large. Stable and relatively high petroleum prices, reduced ice cover and stable political conditions regionally compared to other areas are factors that will stimulate developments in the Arctic. High costs for offshore developments and transport particularly of gas are obstacles pointing in the opposite direction. The recent blow-out in the Mexican Gulf and stronger environmental regulations may also slow down offshore developments in the Arctic.

Oil spills are considered to be the largest environmental threat from oil and gas activities in the Arctic marine environment. While a large spill could have very large consequences, even small spills could have substantial impacts. Birds and mammals such as polar bear and seal pups that rely on feathers and fur to keep warm under cold Arctic conditions are particularly sensitive to the effects of oiling. Guillemots, eiders and other seabirds can occur very concentrated in leads and polynyas during spring migration and prior to breeding, when they are very vulnerable to oil spills. Also bowhead and beluga whales that migrate north in spring through lead systems may be vulnerable to oil spills, as well as to disturbances from oil and gas activities (AMAP 2008, OGA Scientific report 2011).

There have fortunately not been any substantial oil spills reported for the Arctic marine area where spills in ice-covered waters might be very difficult to clean-up. The potential for damage was demonstrated by the Exxon Valdez spill under sub-arctic conditions in the Gulf of Alaska where on the order of 0.25 million seabirds were killed (the majority of them being common murres; Piatt and Ford 1996). A relatively small spill of bunker oil in the Gulf of St. Lawrence in the 1970s killed many harp seals that were aggregated in a whelping area on the ice (St. Aubin 1990). The difficulty of stopping, containing and cleaning up a spill, even in temperate ice-free waters was demonstrated by the Deepwater Horizon spill in the Gulf of Mexico in spring and summer 2010. The inherent difficulties of oil spill response in accessible temperate locations are magnified by the extremes of Arctic weather, the problems posed by cold and ice covered conditions, and the remoteness of exploration and development activities from ports from which to launch containment and clean-up response.

2.7.3 Fisheries

The sub-arctic parts of the Arctic area support some of the largest fish stocks and fisheries in the world, notably in the Barents, Norwegian, Iceland and Bering seas. Prominent species in these fisheries are Atlantic and Pacific cod, halibut and herring, walleye pollock, blue whiting, redfishes (*Sebastes* species), and Greenland halibut. Capelin feeds in the low Arctic zone but is fished mainly when it comes south into sub-arctic waters to winter and spawn. The most important Arctic fish species is polar cod (named Arctic cod in North America) which is found mainly in the low Arctic zone around the periphery of the central Arctic Ocean. Polar cod is a dominant food item for a wide range of seabirds, seals and whales including ringed seal, beluga and narwhal. Apart from some Russian catches in the eastern Barents Sea, there

is no commercial fishery for polar cod which is left to support the many other consumers in the Arctic marine ecosystems. The most Arctic of the commercial fish species is Greenland halibut which extends its distribution north in Baffin Bay, where it is one of the food items for 60,000 or more narwhals, and north of Svalbard along the slope to the Arctic Ocean basin.

It is noteworthy that the main gateways to the Arctic Ocean, the Greenland Sea and the Chukchi Sea, today do not support any large fish stocks (except perhaps for polar cod) and no industrial commercial fisheries.

The effects of climate change on marine fish stocks and the socio-economic consequences of those effects for arctic fisheries depend on many factors and cannot be accurately predicted. There is likely to be a northern shift in the distribution of some species, but the pattern will differ dependent on the biology of the species and the ecological conditions. The Arctic Ocean is expected to be ice covered in winter even under scenarios with pronounced warming. It is therefore likely that the surrounding shelves will have seawater cooled to freezing in winter, limiting the occurrence of fish to true Arctic species physiologically adapted to low temperature. While the plankton productivity is expected to increase with less summer ice, strong vertical stratification from ice melt will continue to limit the supply of nutrients and keep the increase at a moderate level. There should therefore not be an expectation of a marked increase in harvestable fisheries resources in a warmer Arctic Ocean in the future.

The total effect of climate change on fish stocks is probably going to be of less importance than the effects of fisheries policies and their enforcement (ACIA 2005).

Ocean acidification, introduced alien species and conflicts with other activities like petroleum and shipping may also affect fish stocks and fisheries.

Environmental impacts of fisheries includes thedirect effects on the stocks of targeted commercial species as well as on other species of fish, birds and marine mammals caught as by-catch. This includes the impacts of “ghost-fishing” from lost fishing gear. Fisheries can also have indirect effects through the food-web by reducing the availability of prey for dependant species in the ecosystem. There is also the potential for changing the genetic composition of fish stocks due to selective catch of the larger and older individuals of the populations. Fisheries with gears such as bottom-trawls may adversely impact vulnerable benthic habitats such as deep-water coral reefs as has been documented in Norway (Fosså and Skjoldal 2010).

The impacts of fisheries on the ecosystems are largest in the sub-arctic parts of the area where the large-scale commercial fisheries are concentrated. The status of the exploited stocks are regularly monitored and assessed as part of the fisheries management systems. In the Northeast Atlantic, the International Council for Exploration of the Sea (ICES) is an international advisory organization to national and international fisheries management bodies.

2.7.4 Hunting of marine mammals and birds

Hunting of mammals and birds is part of the harvest of natural resources which constitute a key feature of traditional lifestyles and economies throughout the Arctic (ACIA 2005, CAFF 2010). Hunting is a pressure that has led to decline in some populations and contributed to unfavorable conservation status (Merkel and Barry 2008, Huntington 2009). The impact of hunting is not always well understood due to lack of information on status and trends and influence of other pressures, such as climate change and hunting and habitat changes along migratory routes and on wintering grounds for migratory species of birds.

Hunting of marine mammals is generally well documented and regulated by management institutions, often involving co-management where hunters work closely with wildlife managers (Caulfield 2004, ACIA 2005, Hovelsrud et al. 2008). A concern for the future is the combined effects of dynamic and complex environmental and economic changes on subsistence harvests which may represent a challenge to management systems (CAFF 2010). Better information on levels and trends of harvested populations will be required to help management institutions adjust hunting pressures in a timely and wise manner (Hovelsrud et al. 2008, Huntington 2009).

2.7.5 Tourism

Arctic tourism has long historical roots and is now a mature industry offering very different products for different client groups. Ship-based tourism with cruise activities takes place in the areas around Greenland, Iceland, Norway including Svalbard, and Alaska. The number of passengers probably doubled from 2004 to 2007 and is expected to continue to grow (UNEP 2007). Most of the cruise ships are not purpose-built for Arctic operations, which may increase the likelihood for accidents with risks for loss of human lives and environmental effects (AMSA 2009).

Environmental impacts of Arctic tourism are generally the same as the impacts of shipping, with accidental oil spills as a main threat, discharges of sewage and graywater (which can be significant for the largest cruise ships that may carry several thousand passengers and crew) as secondary threats followed by the potential for introduction of alien species.. An additional effect is that tourists seek out attractive localities with wildlife (bird colonies, walrus haul-out sites etc) or cultural heritage objects that can be negatively affected from their behaviour unless the industry is carefully regulated.

2.7.5 Land-based activities

Activities on land in the Arctic affecting the Arctic marine area include oil- and gas activities, mines, industrial complexes, harbours and human settlements. The marine pollution effects are with a few exceptions mostly local. In Russia, more than 100 “hot spots” near the coast and rivers have been registered, most of them in NW Russia. 30 of them have been prioritized for future action plans. Physical destruction and fragmenting of coastal and marine habitats is a highly prioritized problem.[27] With increased economic activities in the Arctic, land-based activities may have a larger influence on the marine area in the future.

2.7.6 Other marine activities

- *Bioprospecting* looks for useful applications, processes or products in nature, such as, from species living in cold waters. The extent and environmental impacts of the activity in the Arctic have not been investigated and assessed. Potential impacts include large-scale resources collection and/or physical destruction resulting from collection.
- *Seabed mining* for minerals in the deep seabed in the area beyond national jurisdiction received much attention in the UNCLOS negotiations when expectations were high about a new industry. Exploration and exploitation can also take place on the more shallow continental shelves within national jurisdiction. However, the development of a new sub-sea industry has been much slower than anticipated and is probably almost non-existent in the Arctic marine area. Dredging, sand and gravel extraction also are very small activities, at least in the OSPAR part of the Arctic (OSPAR 2009b).

[27] PAME 2009.

- *Research*. Marine research is mostly ship-based with the same impacts on the marine environment as any shipping activity. Specific research activities include deployment of scientific equipment, seismic activities, possible physical disturbance of important habitat, and handling, disturbance and destruction of animals under sampling and experiments, and disturbance associated with noise created by the vessels engines, as well as noise associated with a vessel moving through sea ice. The impacts from research are expected to be low, and must be seen in connection with the benefits of better knowledge that can support management to achieve sustainability. However, the impacts of anthropogenic noise associated with shipping and other human activities does have the potential to adversely impact subsistence hunting, and could cause changes in the phenology or spatial distribution of animals on feeding grounds or during their migrations.
- *Military activities* include operations with warships and submarines, construction of harbors, under-water installations and storages, laying cables and usage of ammunition. The extent and environmental impacts of these activities have not been reported on in a comprehensive manner. On the other hand, there is an extensive literature on the impacts particularly on marine mammals, but also on fish, from the use of sonars, underwater explosions and other sources of noise and pressure waves (OSPAR 2009 a, b).[28] Military accidents and dumping of military equipment, munitions and waste has also received much attention, particularly the nuclear heritage from the Soviet northern fleet (AMAP 2002).
- *Marine energy production (wind farms, facilities for usage of tidal waves and currents, floating nuclear facilities etc)* are future activities in the Arctic apart from small installations.

[28] Military sources are included in these reports: OSPAR Commission (2009a): "Overview of the impacts of anthropogenic underwater sound in the marine environment". OSPAR Commission (2009b): "Assessment of the environmental impact of underwater noise".

Table 1 - Red-listed species (IUCN 2010) of marine mammals that occur within the Arctic area.

Category of Threatened	Species	Latin name
Critically Endangered	Gray whale (western subpopulation)	*Eschrichtius robustus*
	Harbour porpoise (Baltic Sea subpopulation)	*Phocoena phocoena*
Endangered	North Atlantic right whale	*Eubalaena glacialis*
	North Pacific right whale	*Eubalaena japonica*
	Blue whale	*Balaenoptera musculus*
	Fin whale[29]	*Balaenoptera physalus*
	Sei whale[30]	*Balaenoptera borealis*
	Steller sea lion	*Eumetopias jubatus*
	Sea otter	*Enhydra lutris*
Vulnerable	Sperm whale	*Physeter macrocephalus*
	Hooded seal	*Cystophora cristata*
	Northern fur seal	*Callorhinus ursinus*
	Polar bear	*Ursus maritimus*
Near Threatened	Beluga	*Delphinapterus leucas*
	Narwhal	*Monodon monoceros*
Least Concern	Gray Whale (eastern subpopulation)	*Eschrichtius robustus*
	Ringed seal	*Pusa hispida*
	Harp seal	*Pagophilus groenlandicus*
	Bearded seal	*Erignathus barbatus*
Data Deficient	Walrus	*Odobenus rosmarus*
	Spotted seal	*Phoca largha*
	Ribbon seal	*Histriophoca fasciata*

[29] Global assessment largely based on the depleted Southern Hemisphere subpopulation (Balaenoptera physalus quoyi). The North Atlantic subpopulation is likely not endangered.

[30] Global assessment largely based on the depleted Southern Hemisphere subspecies (Balaenoptera *borealis schlegellii*). The North Atlantic subspopulation is likely not endangered

Table 2 - Red-listed species (IUCN 2010) of Arctic or Arctic breeding seabirds, waterfowl and shorebirds.

Category of Threatened	Species	Latin name
Critically Endangered	Eskimo curlew [1]	*Numenius borealis*
	Kittlitz's murrelet	*Brachyramphus brevirostris*
	Spoon-billed sandpiper	*Eurynorhynchus pygmeus*
Endangered	Black-footed albatross	*Phoebastria nigripes*
	Marbled murrelet	*Brachyramphus marmoratus*
	Red-breasted goose	*Branta ruficollis*
Vulnerable	Laysan albatross	*Phoebastria immutabilis*
	Short-tailed albatross	*Phoebastria albatrus*
	Pink-footed shearwater	*Puffinus creatopus*
	Red-legged kittiwake	*Rissa brevirostris*
	Lesser white-fronted goose	*Anser erythropus*
	Baikal teal	*Anas formosa*
	Steller's eider	*Polysticta stelleri*
	Bristle-thighed curlew	*Numenius tahitiensis*
Near Threatened	Sooty shearwater	*Puffinus griseus*
	Ivory gull	*Pagophila eburnea*
	Long-billed murrelet	*Brachyramphus perdix*
	Emperor goose	*Anser canagicus*
	Yellow-billed diver	*Gavia adamsii*
	Great snipe	*Gallinago media*
	Black-tailed godwit	*Limosa limosa*
	Buff-breasted sandpiper	*Tryngites subruficollis*

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Chapter 3: Global instruments and processes relevant to the Arctic marine environment

3.1 Introduction

This chapter reviews global instruments and measures relevant to the conservation and sustainable use of the Arctic marine environment. This review does not constitute or purport to offer interpretations of these instruments and measures, but rather is intended to aid the reader by providing an overview of some of their potentially relevant aspects.

The starting point is a brief overview of the law of the sea and the 1982 Law of the Sea Convention in particular, with a view to how this provides for jurisdiction over ocean space. The Law of the Sea Convention provides the framework within which all other oceans-related treaties and arrangements have to be understood and implemented. It also contains provisions for specific issue areas, such as fisheries, marine scientific research, and protection and preservation of the marine environment. Then global instruments relevant for the Arctic marine environment are described, followed by fisheries, shipping, marine scientific research, and oil and gas activities, including oil spill prevention and response measures. For each of these issue areas relevant provisions of the Law of the Sea Convention are referred to as well.

3.2 The Law of the Sea

3.2.1 Evolution

The law of the sea has evolved over centuries. As the uses of the oceans and their resources have grown, ever more detailed international rules have been developed. Until the end of the Second World War, the generally accepted view was that the ocean was mainly subject to the freedom of the seas apart from a narrow belt of sea along the coasts over which sovereignty of the coastal states extended. In 1958, the first United Nations Conference on the Law of the Sea (UNCLOS I) was convened, resulting in four conventions: the Convention on the Territorial Sea and the Contiguous Zone; the Convention on the High Seas; the Convention on Fishing and Conservation of the Living Resources of the High Seas; and the Convention on the Continental Shelf, formalizing the core of the law of the sea.[31]

UNCLOS III was a major negotiation process between 1973 and 1982. It sought to codify and further develop the law of the sea across a wide range of traditional and emerging issues. It resulted in the 1982 United Nations Convention on the Law of the Sea (the Law of the Sea Convention), a comprehensive instrument that defined a global order of the oceans, including the formal recognition of the exclusive economic zone (EEZ) and a more precise definition of the seaward extent of coastal state rights and jurisdiction over the continental shelf.

The Law of the Sea Convention has an important position in international law. It is widely considered to be the fundamental instrument on the law of the sea, and thus other agreements must be compatible with it,[32] It establishes general principles and mandates that states, directly and through international organizations and diplomatic conferences to develop further rules, measures, and regulations. Many of its provisions are also widely considered to reflect

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[31] The UN held the second Conference on the Law of the Sea ("UNCLOS II") in 1960. The conference did not result in any new agreements

[32] The Law of the Sea Convention, art. 311.

customary international law. Elaborating upon the Law of the Sea Convention, a number of other international instruments have been developed at various levels.

3.2.2 The United Nations Convention on the Law of the Sea[33] and related processes

The Law of the Sea Convention was adopted in 1982 and entered into force in 1994.

Parties: The Law of the Sea Convention has 161 State parties, among them the Arctic States Canada**,** Denmark, Finland, Iceland, Norway, the Russian Federation and Sweden.

Objective: In establishing the Convention, the parties recognized the desirability for establishing, with due regard for the sovereignty of all States, a legal order for the seas and oceans that would facilitate international communication, and will promote the peaceful uses of the seas and oceans, the equitable and efficient utilization of their resources, the conservation of their living resources, and the study, protection and preservation of the marine environment.

Geographical scope: The area of application of the Law of the Sea Convention is global. It defines different regimes for the management of resources and activities in the different maritime zones defined by it – covering all ocean space.

Functional scope: Internal waters are the sea areas inside the baselines drawn in conformity with the Convention's rules. In the *territorial sea*, the seaward limit of which may extend a maximum of 12 nautical miles (nm) from the baselines, the coastal State has sovereignty over the water column, sea bed and air space. Other States have limited rights when in the territorial sea of coastal States, most notably the right of innocent passage.

The Law of the Sea Convention also defined the *exclusive economic zone (EEZ),* the seaward limit of which may extend to a maximum of 200 nautical miles from the baselines. Here the coastal State has sovereign rights relating to natural resources and jurisdiction relating to matters such as marine scientific research and environmental protection. Other States have to comply with the coastal state's regulations regarding exploring and exploiting the resources and are furthermore subject to other certain duties in the coastal state's EEZ, but they also enjoy several rights, most notably the high seas freedom of navigation compatible with the provisions of the Convention.

The continental shelf of a coastal State comprises the sea-bed and subsoil of the submarine areas that are a natural prolongation of its land territory. The coastal state exercises sovereign rights to exploring and exploiting the natural resources of the continental shelf, and these rights do not depend on any express proclamation. The continental shelf extends either to 200 nautical miles or further out, depending on certain legal and geological criteria, as described in Law of the Sea Convention article 76 and Annex II regarding the Commission on the limits of the continental shelf. The Convention provides that the coastal State is to delineate the outer limits of its continental shelf, as provided in the Convention, where that shelf extends beyond 200 nautical miles and submit information on the limits to the Commission on the Limits of the Continental Shelf (CLCS). The CLCS then makes recommendations to coastal States on the outer limits of their continental shelves. The Convention provides that the limits of the shelf established by a coastal State on the basis of these recommendations shall be final and binding. These sovereign rights are exclusive and do not depend on occupation, effective or notional, or on any express proclamation.

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http://treaties.un.org/Pages/ViewDetailsIII.aspx?&src=TREATY&mtdsg_no=XXI~6&chapter=21&Temp=mtdsg3&lang=en (6. december 2009)

Furthermore, the Law of the Sea Convention provides that the seabed and ocean floor and subsoil thereof beyond the limits of national jurisdiction (the "Area") and its mineral resources (defined as all solid, liquid or gaseous mineral resources at or beneath the seabed) are the common heritage of mankind. Pursuant to the Convention, the International Seabed Authority (ISA) was established in 1994 in Kingston, Jamaica. In accordance with the regime for the Area established in Part XI of the Law of the Sea Convention and the 1994 Agreement, the ISA is the organization through which States Parties to the Convention organize and control activities in the Area, particularly with a view to administering the resources of the Area.

The Law of the Sea Convention reaffirms the right of all States to exercise the freedom of the *high seas* under conditions laid down in the Convention. These include fishing, scientific research, navigation and overflight, and the freedom to lay submarine cables and pipelines.

With regard to the *marine environment*, the Law of the Sea Convention contains a number of general provisions concerning its protection and preservation.[34]

The Convention establishes the legal regime governing the conduct of *marine scientific research*, including the requirement that such activities be conducted in compliance with all environmental regulations adopted in conformity with the Convention.[35] (See Section 3.3.1).

Relevant for *ice-covered areas* is the coastal State's right to adopt and enforce non-discriminatory laws and regulations for the prevention, reduction and control of marine pollution from vessels within the limits of the exclusive economic zone, where particularly severe climatic conditions and the presence of ice covering such areas for most of the year create obstructions or exceptional hazards to navigation, and pollution of the marine environment could cause major harm to or irreversible disturbance of the ecological balance. Such laws and regulations shall have due regard to navigation and the protection and preservation of the marine environment based on the best available scientific evidence.[36]

For the Law of the Sea Convention provisions on *marine living resources,* see Section 3.4.1 below.

In 1999, the General Assembly decided to establish the *United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea* (the Consultative Process)(resolution 54/33).[37] The consultation process has had its mandate renewed several times. It is intended to facilitate the annual review by the General Assembly of developments in ocean affairs and the law of the sea by considering the Secretary-General's report on oceans and the law of the sea and by suggesting issues and possible elements for addressing them to be considered by the General Assembly. The emphasis has been on identifying areas where coordination and cooperation at the intergovernmental and inter-agency levels needs to be enhanced. The consultation process has reviewed the status of for example marine science, vulnerable marine environments and ecosystem-based oceans management.

In addition, States Parties to the Law of the Sea Convention meet annually. The role of the Meetings of States Parties is prescribed in the Convention: to conduct elections for the International Tribunal for the Law of the Sea and the Commission on the Limits of the

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[34] The Law of the Sea Convention articles 192 – 206.

[35] The Law of the Sea Convention, article 240(d).

[36] The Law of the Sea Convention, article 234.

[37] http://www.un.org/Depts/los/consultative_process/consultative_process_background.htm

Continental Shelf, and to determine the Tribunal's budget. In addition, the Meeting receives the report of the Secretary-General on oceans and the law of the sea.

The UN General Assembly has also initiated processes for specific issues. An Ad Hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction was established in 2004.[38] The working group has had its mandate renewed several times.

Also, following the recommendations of the 2002 World Summit of Sustainable Development, the General Assembly in 2005 initiated the start-up phase of a *Regular process for global reporting and assessment of the state of the marine environment*.[39] A framework was endorsed by the General Assembly in 2009, and the formal establishment of the Regular Process and its institutional mechanisms were agreed in 2010, together with the next steps necessary to produce the first global marine assessment by 2014.

The Law of the Sea Convention also specifically mentions "competent international organizations", which include the International Maritime Organization (IMO), the International Hydrographic Organization, regional organizations for the protection of the marine environment, regional marine science organizations, and regional fisheries management organizations and arrangements (RFMOs/As).

3.2.3 Associated agreements and processes

The General Assembly has developed the practice of adopting annual resolutions on oceans and the law of the sea and sustainable fisheries. The General Assembly has also initiated several processes and meetings that consider specific ocean issues in more detail and may make recommendations for consideration by the General Assembly. Also, states have adopted two implementing agreements related to the Law of the Sea Convention.

The 1994 *Agreement relating to the implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982* forms an integral part of the Law of the Sea Convention and is to be applied and interpreted together with it. The Agreement addresses difficulties with the seabed mining regime of the Convention that prevented many industrialised countries from becoming a party to it. It consists of 10 articles dealing mainly with procedural aspects and an extensive annex modifying the effect of the deep seabed mining provisions (Part XI) of the Law of the Sea Convention.[40]

The United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UNFSA) was adopted in 1995 and entered into force in 2001.[41] It sets out provisions for the conservation and management of such fish stocks notably the precautionary approach and an ecosystem approach. Since such stocks migrate across maritime zones, the Agreement requires that their management in coastal states' zones and in the adjacent high seas are compatible. The Agreement establishes a framework and benchmarks for the development of regional and sub-regional fisheries agreements and enforcement arrangements. (See Section 3.4.2.)

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[38] http://www.un.org/Depts/los/biodiversityworkinggroup/biodiversityworkinggroup.htm. See A/RES/59/244, para 73.

[39] http://www.un.org/Depts/los/global_reporting/global_reporting.htm

[40] http://www.un.org/Depts/los/convention_agreements/convention_overview_part_xi.htm

[41] http://www.un.org/Depts/los/convention_agreements/convention_overview_fish_stocks.htm

For the UNFSA, Informal Consultations and the Review Conference are called for on an ad hoc basis by the UNGA Resolution on Sustainable Fisheries.

3.3 Environment and nature conservation

3.3.1 General

The *Law of the Sea Convention* provides an international framework for protection and preservation of the marine environment. Part XII of the Convention contains general obligations to protect and preserve the marine environment, as noted above, including obligations to address imminent pollution damage and contingency planning and to carry out environmental monitoring and environmental impact assessment. There is a general obligation for all States to protect and preserve the marine environment and to take all measures necessary to prevent, reduce and control pollution from any source. The following sources are addressed more specifically: land-based activities, offshore seabed activities, activities in the Area, dumping, and vessels, as well as pollution from or through the atmosphere, and pollution resulting from the use of technologies under national jurisdiction or control States are obligated to address the intentional or accidental introduction of alien species which may cause significant or harmful changes to a particular part of the marine environment. There is also an obligation for States to cooperate in formulating and elaborating further rules and standards at global and regional levels, and there are also provisions regarding enforcement rights and obligations on the part of flag States, coastal States and port States.

Furthermore, a coastal State's sovereign right to exploit its natural resources is to be done in accordance with the duty to protect and preserve the marine environment.[42] States' measures to prevent, reduce and control pollution must include those necessary to protect and preserve rare or fragile ecosystems and habitats of depleted, threatened or endangered species.[43]

Numerous global and regional agreements build on the environmental provisions of the Convention, notably conventions on vessels negotiated under the auspices of IMO and the regional seas agreements developed under the auspices of UNEP. Moreover, the Convention requires by reference that national measures adopted by States either be "no less effective than" (seabed activities, dumping), "at least have the same effect as" (vessels), or "take into account (land-based sources, atmosphere) internationally-agreed rules and standards and, in some cases, *recommended* practices and procedures.

In addition a number of non-legally binding arrangements are important for the global conservation and use of the marine environment.

The 1995 Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA)[44] seeks to prevent the degradation of the marine environment from land-based activities. It is designed to assist States in taking actions individually or jointly according to their respective policies, priorities, and resources. It constitutes a practical source of guidance for action that must take place at the national and regional level; identifies steps for making available knowledge and experience about effective measures to combat land-based sources of marine pollution; and offers instruction on how to involve the relevant United Nations institutions in the implementation effort.

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[42] Article 193

[43] Article 194

[44] http://www.gpa.unep.org

The 1992 United Nations Conference on the Environment and Development (UNCED) produced a global action plan for the environment, *Agenda 21*. Chapter 17 sets forth an ambitious program for the international community in pursuing the objective of sustainable development of the oceans and coasts. To this end, it promotes new approaches to managing human uses of ocean resources, including environmental impact assessment and natural resource accounting techniques; economic incentives to encourage industrial and agricultural practices that avoid degradation of the marine environment; and protection of the ecosystems and habitats of marine species. A number of program areas are listed, including integrated management of coastal areas, development and implementation of strategies to prevent degradation of the marine environment from land-based activities, (which led to the 1995 Global Programme of Action), strengthening implementation of international measures to prevent marine pollution from vessels and from dumping at sea, improved management of coastal fisheries, and implementation of obligations for international cooperation to conserve marine living resources found on the high seas[45] (which led to negotiation and adoption of the UNFSA)[46]

The 2002 World Summit of Sustainable Development produced the *Johannesburg Plan of Implementation*, which also deals with oceans issues and calls for a number of institutional improvements. Specifically, to ensure sustainable development of the oceans, the plan of implementation among other things also calls for the application of the ecosystem approach, the promotion of integrated oceans management at national level, and the establishment of marine protected areas consistent with international law and based on scientific information, including representative networks by 2012, [47] the establishment of the Regular Process by 2004[48] (see Section 3.2.3), and certain targets to achieve sustainable fisheries.[49]

3.3.2 Biological diversity

Convention on Biological Diversity

The Convention on Biological Diversity (CBD) is a global treaty.[50] The Convention was adopted 22 May 1992, and entered into force 29 December 1993.

Parties: CBD is a global convention with 193 Parties.[51] Among the Arctic states, Canada, Denmark, Finland, Iceland, Norway, the Russian Federation and Sweden are parties to the Convention.

Objectives: The objectives of CBD are i) the conservation of biological diversity; ii) the sustainable use of its components; and iii) the fair and equitable sharing of the benefits arising from the utilization of genetic resources.[52]

Geographical scope: The geographical scope of CBD is global. The provisions of CBD only apply for areas under the Parties´ national jurisdiction. The provisions of the CBD also apply to "processes and activities" regardless of where their effects occur, carried out under a

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[45] http://www.un.org/Depts/los/consultative_process/documents/A21-Ch17.htm

[46] http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/WSSD_PlanImpl.pdf

[47] http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/WSSD_PlanImpl.pdf, para. 29-31.

[48] http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/WSSD_PlanImpl.pdf ; para. 36

[49] http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/WSSD_PlanImpl.pdf, para. 29-31.

[50] Convention on Biological Diversity (United Nations, *Treaty Series,* vol. 1760, p. 79).The text of the convention is available at www.cbd.int

[51] www.cbd.int

[52] Convention on Biological Diversity Article 1.

party's national jurisdiction or control, within the area of its national jurisdiction or beyond the limits of national jurisdiction. This means that CBD also applies to processes and activities that take place beyond the limits of national jurisdiction, but that are under the state party's jurisdiction or control of a Contracting Party.

Functional scope: The Convention includes obligations to achieve its three objectives: conservation of biological diversity, sustainable use of its components and fair and equitable sharing of the benefits arising out of the utilization of genetic resources. Biological diversity covers the diversity within species, between species and of ecosystems.[53] The concept of biological diversity therefore covers the variability of life. The Convention calls for general measures for conservation and sustainable use, and requires the parties to identify and monitor components of biological diversity and the effects of categories of activities that have or are likely to have significant adverse impacts on biodiversity.[54] Moreover, Parties are to take steps, as far and as possible and as appropriate, to assess environmental impacts of proposed projects likely to have significant adverse effects on biodiversity, and to cooperate with other States to notify and address such effects as relevant, in situations of grave or imminent danger.[55] (See also Section 4.8). Additionally, CBD includes more specific obligations on in situ conservation measures and ex situ conservation measures.[56] Other provisions address research and training, public education and awareness, access to genetic resources and transfer of technology.

The Convention directs the Conference of the Parties (COP) to keep the implementation of the Convention under review, and requires Parties to present reports of measures they have taken for the implementation of the provisions and their effectiveness in meeting the objectives of the Convention.[57] The COP has adopted various non-legally binding Decisions, as well as two legally binding Protocols. Of particular importance in relation to the marine environment is the work carried out under the COP through the adoption of its Programme of Work on Marine and Coastal Biodiversity.[58] The Programme of Work includes programme elements such as Integrated Marine and Coastal Management, Marine and Coastal Living Resources, Marine and Coastal Protected Areas, Mariculture and Invasive Alien Species. Of particular significance for the work carried out under the COP is the development of criteria for identifying ecologically and biologically significant areas, and for the selection, establishment and management of Marine Protected Areas.[59] This work also includes cooperation in providing information relevant to the establishment of marine protected areas beyond the limits of the national jurisdiction.[60]

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[53] Convention on Biological Diversity Article 2.

[54] Convention on Biological Diversity, Articles 6,7 and 10.

[55] Convention on Biological Diversity, Article 14.

[56] Convention on Biological Diversity, Articles 8 and 9.

[57] Convention on Biological Diversity, Article 26.

[58] Information about the Programme of work and the COP Decisions are available at http://www.cbd.int/marine/

59 An elaborated Programme of work was adopted in Decision VII/5, available at http://www.cbd.int/decision/cop/?id=7742

[60] Decision IX/20 available at http://www.cbd.int/decision/cop/?id=11663

Convention on Wetlands of International Importance especially as Waterfowl Habitat

The Convention on Wetlands of International Importance (the Ramsar Convention) was signed on 2 February 1971 and entered into force 21 December 1975.[61] It has 160 Contracting Parties.[62]

Parties: All the Arctic states are parties to the Convention.

Geographical scope: The Ramsar Convention is a global convention, generally applicable to wetlands. The convention defines "wetlands" as areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres.

Objectives: The objective of the Ramsar Convention is to protect and conserve wetlands of international significance, and to promote the wise use of wetlands within the territories of the Contracting Parties.

Functional scope: The convention requires the parties to designate suitable wetlands within their territory for inclusion in a List of Wetlands of international importance, and promote their conservation.[63] The convention also requires wise use of wetlands and waterfowl in the parties´ territories.[64] The parties shall coordinate and consult, in particular with respect to wetlands that extend over the territory of more than one Contracting Party.[65]

The Convention does not include any regular reporting or enforcement measures. The Conference of the Parties shall however, review and promote the implementation of the Convention. [66] The IUCN as Secretariat, is to be informed by the Contracting Parties of any changes in the ecological character of wetlands included in the List.[67]

Convention Concerning the Protection of the World Cultural and Natural Heritage

Convention Concerning the Protection of the World Cultural and Natural Heritage (The World Heritage Convention)[68] was done 23 November 1972 and entered into force 17 December 1975.

Parties: There are 187 States Parties to the Convention.[69] All Arctic states are parties to the Convention.

Objectives: The objective of the Convention is to protect and conserve the world cultural and natural heritage.

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[61] The Convention on Wetlands of International Importance (United Nations, *Treaty Series,* vol. 996, p. 245). The official website of the convention is http://www.ramsar.org/cda/ramsar/display/main/main.jsp?zn=ramsar&cp=1_4000_0__

[62] Information from the official website http://www.ramsar.org/cda/ramsar/display/main/main.jsp?zn=ramsar&cp=1-36-123^23808_4000_0__

[63] The Ramsar Convention Articles 2 and 3.

[64] The Ramsar Convention Article 4.

[65] The Ramsar Convention Article 5.

[66] The Ramsar Convention Article 6.

[67] The Ramsar Convention Article 8.

[68] Convention Concerning the Protection of the World Cultural And Natural Heritage.

[69] April 2009, see http://whc.unesco.org/en/statesparties.

Geographical scope: The World Heritage convention is a global convention.

Functional scope: The Convention unites nature conservation and cultural heritage. The World Heritage Convention defines sites, monuments, groups of buildings, natural features and geological and physiographic formations that are considered as cultural or natural heritage.[70] The Convention highlights that the duty to ensure the identification, protection, conservation, presentation, and transmission to future generations of the cultural and natural heritage situated within its territory belongs primarily to that State.[71] Each State Party shall also endeavour to take measures to ensure that through certain actions, as appropriate, effective and active measures are taken for the protection, conservation and presentation of the cultural and natural heritage.[72] The Convention also notes the duty of the international community as a whole to cooperate to protect cultural and natural heritage.[73] Parties are to submit to the World Heritage Committee an inventory of property forming part of the cultural and natural heritage, situated in its territory and suitable for inclusion in the World Heritage List.[74]

There are a number of designated world heritage areas in the Arctic. As a follow-up of AMSA, working groups in the Arctic Council are conducting a project on identification of Arctic Marine Areas of heightened ecological and cultural significance.[75]

The States Parties shall report to the Secretariat in the United Nations Educational, Scientific and Cultural Organization (UNESCO)[76] on the legislative and administrative provisions that they have adopted and other action which they have taken.[77]

Convention on International Trade in Endangered Species of Wild Fauna and Flora

Convention on International Trade in Endangered Species of Wild Fauna and Flora (The CITES Convention) was adopted in Washington DC 3 March 1973.[78] It entered into force 1 July 1975.

Parties: There are 175 Parties to the Convention.[79] All Arctic states are Parties to CITES, although the Convention does not apply to the Faroe Islands.]

Objectives: The Convention regulates international trade in plant and animal species that are or may become threatened with extinction.

Geographical scope: The geographical scope of the Convention is global.

Functional scope: The Convention includes three Appendices with listed species, categorised according to the degree of protection they need.[80]. Trade in species that are threatened with extinction (Appendix I) is banned, except for non-commercial purposes.[81] Trade in species

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[70] The World Heritage Convention Articles 1 and 2.

[71] The World Heritage Convention Article 4.

[72] The World Heritage Convention Article 5.

[73] The World Heritage Convention Article 6.

[74] The World Heritage Convention Article 11.

[75] These areas will not necessarily be candidates for future inclusion in the World Heritage List.

[76] www.unesco.org

[77] The World Heritage Convention Article 29.

[78] Convention on International Trade in Endangered Species of Wild Fauna and Flora.

[79] See http://www.cites.org/eng/disc/parties/alphabet.shtml

[80] www. http://www.cites.org/eng/disc/how.shtml

[81] The CITES Convention Article III.

that may be threatened with extinction unless trade is subject to strict regulation (Appendix II), require export permits, re-export certificates or Introduction from the sea certificates, the issuance of which is subject to specific criteria.[82] Decisions on listing of species in these appendices are made by the parties with a 2/3 majority and there is a right to opt out with respect to listings.[83] Appendix III includes species which are subject to regulation in certain states, needing international cooperation to control trade. States can list species here unilaterally.[84] For certain marine species subject to earlier conventions, in certain circumstances a party complying with such an earlier agreement can be relieved of certain CITES obligations. A number of the listed species are relevant to the Arctic region.

States are required to report on all trade in species of flora and fauna that are listed in the Appendices.[85]

Convention on the Conservation of Migratory Species of Wild Animals

Convention on the Conservation of Migratory Species of Wild Animals (The Convention on Migratory Species)[86] was signed in Bonn 23 June 1979, and entered into force 1 November 1983.

Parties: There are 114 parties to the Convention on Migratory Species.[87] Four Arctic States are parties to the Convention: Denmark (excluding Greenland and the Faroe Islands with respect to The ASCOBANS Agreement), Finland, Norway and Sweden.[88]

Objectives: The objective of the Convention is to conserve species of wild animals that migrate across national boundaries.

Geographical Scope: The Convention is a global convention, with no particular emphasis on Arctic issues. The ranges of many species covered by the Convention include Arctic areas.[89]

Functional scope: The major mechanism of the convention is to list species in one of two appendices and establish obligations for their protection. Endangered migratory species are listed in Appendix I. Parties that are Range States shall endeavour to conserve and, where feasible and appropriate, restore the habitats of such species and prevent, remove and minimise as appropriate, the adverse effects of activities or obstacles that seriously impede or prevent the migration and also where feasible and appropriate, to prevent, reduce or control factors that are endangering or likely to endanger such species.[90] Parties that are range States generally also are obligated prohibit the taking of endangered species listed in Appendix I. Appendix II deals with migratory species that would benefit from international co-operation and which require international agreements for their conservation and management.[91] Range States of such species shall conclude agreements for their conservation and management. A

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[82] The CITES Convention Article IV.

[83] The CITES Convention Article XV.

[84] The CITES Convention Article XVI.

[85] The Cites Convention Article VIII.

[86] Convention on the Conservation of Migratory Species of Wild Animals.

[87] January 2010, see http://www.cms.int/about/Partylist_eng.pdf

[88] See http://www.cms.int/about/Partylist_eng.pdf

[89]Overview report: Multilateral Environmental Agreements and their relevance to the Arctic, September 2006, p. 10.

[90] The Convention on Migratory Species Article III.

[91] The Convention on Migratory Species Article IV.

number of regional Agreements or a Memoranda of Understanding (MOU) have been concluded for marine species like small cetaceans and seabirds.

Reporting/enforcement mechanisms: The Conference of the Parties shall review the implementation of the Convention. The Convention requires each Party to inform the Conference of the Parties of measures it is taking to implement the Convention, and to inform the Secretariat of any exception made to the prohibition on taking of species listed in Appendix I.[92]

3.3.3 Chemicals

The Stockholm Convention on Persistent Organic Pollutants (Stockholm Convention on POPs)

Parties: There are 172 Parties to the Convention. Denmark, with the territorial exclusion of the Faroe Islands[93] and Greenland, Finland, Iceland, Norway, Sweden and Canada are Parties to the Convention.[94]

Geographical scope: The Stockholm Convention[95] is a global convention dealing with persistent organic pollutants (POPs).

Objectives: The objective of the Convention is to protect human health and the environment from POPs.

Functional scope: The Stockholm Convention requires parties to prohibit production and use, and restrict trade, of certain listed POPs, including PCBs and various pesticides.[96] It also requires restrictions on production and use of DDT and measures to reduce emissions from unintentional production of certain other POPs including dioxins and furans. Substances that meet the criteria to be defined as POPs (persistence, bio-accumulation, long-range transport, and adverse effects) can be added to the lists in the Convention according to processes established in the Convention. In 2009, the Parties to the Convention agreed to add nine new substances to the lists, bringing the total number of substances regulated to 21, and others are under evaluation under the convention.[97]

The convention requires the Conference of the Parties to keep the implementation of the Convention under continuous review and evaluation.[98] Each Party shall develop and endeavour to implement a plan for the implementation of its obligations under the Convention.[99] Each Party shall also report to the Conference of the Parties on the measures it has taken to implement the provisions of this Convention and on the effectiveness of such measures in meeting the objectives of the Convention.[100] The Convention obliges the Parties as soon as practicable to develop and approve procedures and institutional mechanisms for determining non-compliance with the provisions of the Convention (Art. 17). Such procedures and mechanisms are, however, not yet developed by the Parties."

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[92] The Convention on Migratory Species Article …

[93] A proposal for approval by the Faroese Parliament has been tabled in the present parliamentary session.

[94] See http://chm.pops.int/Countries/StatusofRatification/tabid/252/language/en-US/Default.aspx

[95] The Stockholm Convention on Persistent Organic Pollutants (Stockholm Convention on POPs). Official website http://chm.pops.int/

[96] The Stockhom Convention on POPS Article 3.

[97] See http://chm.pops.int/Programmes/NewPOPs/Overview/tabid/667/language/en-US/Default.aspx

[98] Stockholm Convention on POPs Article 19.

[99] Stockholm Convention on POPs Article 7.

[100] Stockholm Convention on POPS Article 15.

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (the Basel Convention) was adopted in 1989 and came into force in 1992.

Parties: The Basel Convention has 175 parties.[101] Canada, Denmark with a territorial exclusion for the Faroe Islands and Greenland, Finland, Iceland, Norway and the Russian Federation are parties.

Geographical scope: The scope of the convention is global.[102]

Objectives: Although the Basel Convention does not specify its objectives, its main objectives have been described as follows: to reduce transboundary movements of hazardous wastes and other wastes to a minimum consistent with their environmentally sound management; to treat and dispose of hazardous wastes and other wastes as close as possible to their source of generation in an environmentally sound manner; and to minimize the generation of hazardous wastes and other wastes.[103]

Functional scope: The general obligations of the Convention address the transboundary movement of hazardous wastes primarily though the establishment of a prior informed consent procedure in respect of the import of such wastes. This obligates Parties to prohibit or not permit export to the Parties which have prohibited the import of such wastes.[104] When a State has not prohibited the import of such wastes, parties shall still prohibit or not permit the export of hazardous wastes or other wastes to that State if it does not consent in writing to the specific import.[105] The State of export shall notify proposed transboundary movement of hazardous wastes to the State of import which shall respond to the notification. The State of import may consent to the movement with or without conditions, deny permission or request additional information.

The Conference of the Parties shall keep under continuous review and evaluation the effective implementation of the Convention.[106] The Convention includes national reporting as a mechanism for monitoring the implementation of the Convention. Parties are required to transmit information i.e. of the regarding transboundary movements.[107] A Compliance Mechanism, adopted by decision of the Conference of the Parties, promotes the identification, as early as possible, of implementation and compliance difficulties encountered by Parties. Such difficulties may relate to, for example, dealing with illegal traffic, or meeting reporting obligations. The mechanism is non-confrontational and preventive in nature, and seeks to assist Parties in implementing appropriate and effective solutions to difficulties. A Compliance Committee consisting of 15 members drawn in equal numbers from the five regional groups of the UN was established to administer the mechanism. Submissions can be made to the Committee by a Party about its own compliance or implementation difficulties, or about another Party's difficulties, or by the Secretariat when it becomes aware, through national reporting, that a Party may be experiencing difficulties.

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[101] Information about the Basel Convention is available at http://www.basel.int/

[102] Overview report: Multilateral Environmental Agreements and their relevance to the Arctic, September 2006, p. 15.

[103] See guide to the implementation of the Convention http://www.basel.int/meetings/sbc/workdoc/manual.doc.

[104] Basel Convention Article 4.

[105] Basel Convention Article 6.

[106] Basel Convention Article 15.

[107] Basel Convention Article 13.

The Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter

The Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, London, 1972.[108] In force 1975. (The London Convention), and Protocol (the London Protocol), 1996.[109] In force 2006.

Parties: There are currently 86 parties to the London Convention and 39 parties to the Protocol. All the Arctic States are party to the London Convention, and Canada, Denmark, Iceland, and Norway are party to the Protocol.

Geographical scope: The London Convention is global.

Objective: The objective of the London Convention is to promote the effective control of all sources of marine pollution and specifically to promote all practicable steps to prevent pollution of the sea by dumping of wastes and other matter.

Functional scope: The London Convention is the primary international agreement controlling the deliberate dumping of non-ship generated wastes at sea. It also governs the deliberate at-sea disposal of abandoned or disused offshore installations and structures (e.g., oil and gas platforms) and of vessels.

The Convention has become more restrictive over the years. In 1993, bans on the ocean disposal of low-level radioactive wastes and industrial wastes were adopted.

The Protocol is a free-standing agreement to which both contracting and non-contracting parties to the London Convention may become party and is intended ultimately to replace the London Convention. The Protocol embodies a major structural revision of the Convention whereby Parties are obligated to prohibit the dumping of any waste or other matter that is not listed in its Annex 1 (the so-called “reverse list"). Dumping of wastes or other matter on the reverse list requires a permit. Parties to the Protocol are further obliged to adopt measures to ensure that the issuance of permits and permit conditions for the dumping of reverse list substances comply with Annex 2 (the Waste Assessment Annex) of the Protocol. There are eight categories of substances on the reverse list: dredged material; sewage sludge; fish waste; vessels and offshore platforms; inert, inorganic geological material; organic material of natural origin; and bulky items of unharmful materials for which the concern is physical impact and is limited to those circumstances where such wastes are generated at locations with no practicable access to options other than dumping, and carbon dioxide streams from carbon dioxide capture processes for sequestration.

3.3.4 Climate and Atmosphere

United Nations Convention Framework Convention on Climate Change (UNFCCC)

The United Nations Framework Convention on Climate Change[110] (UNFCCC) was adopted 9 May 1992 in New York and entered into force 21 March 1994.[111]

Parties: There are currently 194 Parties to the Convention.[112] All the Arctic states are parties to the UNFCCC.

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[108] http://www.imo.org/Conventions/contents.asp?topic_id=258&doc_id=681

[109] http://www.imo.org/OurWork/Environment/SpecialProgrammesAndInitiatives/Pages/London-Convention-and-Protocol.aspx

[110] United Nations, *Treaty Series*, vol. 1771, p. 107.

[111] Information about the Convention is available at http://unfccc.int/2860.php

Objectives: The Objective of the Convention is to achieve stabilization of the greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.[113]

Geographical Scope: The geographical scope of the Convention is global. Global conventions on atmosphere are of significance for the Arctic environment as the Arctic is particularly vulnerable to climate changes.

Functional Scope: The Convention requires the adoption of policies and measures to achieve the objectives of the Convention, and to implement its provisions. Among other things, Parties must develop national inventories of their greenhouse gas emissions and removals, formulate and implement programmes to mitigate climate change and promote and cooperate in the development, diffusion and application of technologies, practices and processes that control, reduce or prevent emissions of greenhouse gasses.[114] The Convention also states that Parties should accordingly, inter alia, take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects.[115]

All Parties must report on their national inventories and submit national communications. Annex I Parties follow a robust system of reporting and expert panel review of their inventories and national communications. In December 2010, the Parties also agreed to a reporting, analysis, and consultations process for non-Annex I Parties. In addition, the COP keeps under regular review the implementation of the Convention.[116]

Kyoto Protocol

The UNFCCC is complemented by the Kyoto Protocol[117], adopted in 1997, in force 2005.

Parties: There are currently 193 Parties to the Protocol.[118] Canada, Denmark (which has entered a territorial exclusion for the Faroe Islands)[119], Finland, Iceland, Norway, the Russian Federation and Sweden are parties to the Kyoto Protocol.

Objectives: The objective of the Kyoto Protocol is to achieve the objective of the UNFCCC to stabilize greenhouse-gas concentrations in particular through the taking of binding targets by developed States (Annex I Parties) for reducing greenhouse-gas emissions.

Geographical Scope: The geographical scope of the Kyoto Protocol is technically global, but only Annex I Parties have reduction obligations.

Functional Scope: Under the Kyoto Protocol, Annex I Parties are required to meet specific targets for the reduction of greenhouse gasses.[120] Annex I Parties are required to, individually or jointly, ensure that their aggregate emissions of the greenhouse gases listed in Annex A do not exceed their assigned amounts, calculated pursuant to their quantified emission limitation

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[112] See http://unfccc.int/essential_background/convention/status_of_ratification/items/2631.php

[113] UNFCC Article 2.

[114] UNFCC Article 4.

[115] UNFCCC Article 3.

[116] UNFCCC Article 7.

[117] United Nations, *Treaty Series* , vol. 2303, p. 148;

[118] http://treaties.un.org/pages/ViewDetails.aspx?src=UNTSONLINE&tabid=2&mtdsg_no=XXVII-7-a&chapter=27&lang=en#1

[119] The Faroe Government has set its own target to reduce greenhouse gas emissions in existing domestic sectors by at least 20% below 2005 levels in the period from 2010 to 2020.

[120] About the Kyoto Protocol see http://unfccc.int/kyoto_protocol/items/2830.php

and reduction commitments inscribed in Annex B and in accordance with the provisions of Article 3, with a view to reducing their overall emissions of such gases by at least 5 per cent below 1990 levels in the commitment period 2008 – 2012.[121] Parties to the Protocol can meet their targets through national measures and use of three market-based mechanisms called flexibility mechanisms.[122] The Kyoto flexibility mechanisms are emissions trading (Article 17), the clean development mechanism (Article 12) and joint implementation (Article 6).

The Kyoto Protocol Parties have adopted a decision establishing a compliance mechanism, which includes an enforcement branch and a facilitative branch. Failure by a Party to meet its targets will result in penalties, including the suspension of that Party's eligibility to trade emissions and the addition of 1.3 times that Party's excess emissions to its target for the next commitment period. In addition, the Conference of the Parties serving as the meeting of the Parties to the Protocol, is required to meet regularly and keep under regular review the implementation of the Protocol and shall make decisions necessary to promote its effective implementation.[123]

Vienna Convention on the Protection of the Ozone Layer and the Montreal Protocol on substances that deplete the Ozone Layer.

The Vienna Convention on the Protection of the Ozone Layer[124] was adopted in 1985 and entered into force in 1988. The Montreal Protocol on Substances that Deplete the Ozone Layer[125] was adopted in 1987 and entered into force in 1989.[126]

Parties: There are 196 Parties to the Convention and to the Protocol.[127] All Arctic countries are parties to both.

Objectives: The Convention aims to protect human health and the environment against adverse effects resulting or likely to result from human activities which modify or are likely to modify the ozone layer. The ultimate objective of the Montreal Protocol is the elimination of listed ozone-depleting substances.

Geographical scope: The geographical scope of the Convention and the Protocol is global.

Functional scope: The Convention contains a general obligation to take appropriate measures to achieve the objective of the Convention.[128] Hereby the Parties are required to adopt appropriate legislative or administrative measures to and co-operate in harmonizing appropriate policies to control, limit, reduce or prevent human activities that have or are likely to have adverse effects resulting from modification or likely modification of the ozone layer.[129] Additionally Parties are required to co-operate in the legal, scientific and technical fields.[130] The Montreal Protocol sets targets for reducing and eliminating consumption and production of a range of ozone-depleting substances.[131]

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[121] Kyoto Protocol Article 3 (1).

[122] http://unfccc.int/kyoto_protocol/items/2830.php

[123] Kyoto Protocol Article 13.

[124] United Nations, *Treaty Series* , vol. 1513, p. 293.

[125] United Nations, *Treaty Series* , vol. 1522, p. 3.

[126] Information about the Convention and the Protocol is available at http://ozone.unep.org/ .

[127] http://ozone.unep.org/Ratification_status/

[128] Article 2 (a).

[129] Article 2 (2) a).

[130] Articles 4 and 5.

[131] The text and iinformation about the Protocol is available at at http://ozone.unep.org/.

The Conference of the Parties shall keep under continuous review the implementation of the Convention.[132] The Protocol provides for a formal and active non-compliance procedure, which assesses compliance and recommends measures to be taken with regard to Parties out of compliance. Parties are required to transmit information about the measures adopted in implementing the Convention and Protocols.[133]

3.4 Fisheries

3.4.1 Introduction

At the global level, the Law of the Sea Convention and the UN Fish Stocks Agreement (UNFSA) are the key treaties setting out the legal framework for the conservation and management of fish stocks. Also treaties and other arrangements negotiated, including under the auspices of the FAO, are important here.

Law of the Sea Convention

In marine areas within its territory, a coastal state has sovereignty over the marine resources. The Law of the Sea Convention also codifies the coastal State´s sovereign rights for the purpose of exploring and exploiting, conserving and managing the fish stocks in the EEZ. These rights are subject to a number of restrictions/duties, among them: to have due regard to the rights and duties of other States and act in a manner compatible with the provisions of the convention,[134] and, taking into account the best scientific evidence available to it, to ensure through proper conservation and management measures that the maintenance of the living resources in the exclusive economic zone is not endangered by over-exploitation.[135] As appropriate, the coastal State and competent international organizations, whether sub-regional, regional or global, shall co-operate to this end. In taking conservation measures the coastal State shall take into consideration the interdependence of stocks and the effects on species associated with or dependent upon harvested species with a view to maintaining or restoring populations of such associated or dependent species above levels at which their reproduction may become seriously threatened.[136] It shall also take into account any *generally recommended* international minimum standards, whether sub-regional, regional or global [137]

Furthermore, the Law of the Sea Convention contains provisions about utilization, inter alia that the coastal State is required to promote the objective of optimum utilization of the living resources.[138]

The coastal State is given a broad discretion in deciding which other States´ fishermen are to be given access to its fisheries resources. The Convention also contains provisions regarding enforcement of laws and regulations of the coastal State.[139]

On the high seas, the flag states of the fishing vessels are to respect certain conditions, primarily the duty to take such measures for their respective nationals as may be necessary for the conservation of the living resources and the duty to cooperate with other states in the

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[132] Article 6.

[133] Articles 4 and 5.

[134] The Law of the Sea Convention article 56 (2).

[135] The Law of the Sea Convention article 61 (2).

[136] The Law of the Sea Convention article 61 (4).

[137] The Law of the Sea Convention article 61 (4).

[138] The Law of the Sea Convention article 62 (1).

[139] The Law of the Sea Convention article 73.

conservation and management of living resources.[140] In determining conservation measures, States are to take into account the same criteria noted above for coastal State fisheries (interdependence of stocks, associated or dependent species, generally recommended international minimum standards). These provisions establish a foundation for further developments in the UNFSA.[141]

3.4.2 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UNFSA)[142]

The UNFSA was adopted in 1995 and entered into force in 2001.

Parties: There are 78 parties to the Agreement, among them the 8 Arctic States.

Objective: The UNFSA is an implementing agreement of the provisions in the Law of the Sea Convention regarding the conservation and management of straddling and highly migratory fish stocks. The ".. objective of this Agreement is to ensure the long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks through effective implementation of the relevant provisions of the Convention."[143]

Geographical scope: The agreement applies to the conservation and management of straddling fish stocks and highly migratory fish species beyond areas under national jurisdiction and to some extent to the conservation and management of such stocks within areas under national jurisdiction.

Functional scope: The principles in the agreement include the precautionary approach[144] as well as ecosystem-based management.[145] UNFSA affirms the duty to cooperate concerning straddling and highly migratory fish stocks. Where an organisation or arrangement (RFMO/RFMA) already exists (such as NEAFC and NAFO), it is to be used. Where a fishery occurs and no organisation or arrangement exists, States fishing on the high seas shall establish one.

The UNFSA requires the flag State (a State whose vessels fish on the high seas) to ensure compliance by its vessels with subregional and regional conservation and management measures for straddling and highly migratory fish stocks. States cooperating through RFMOs and arrangements are to establish appropriate cooperative mechanisms for effective monitoring, control, surveillance and enforcement.

3.4.3 Agreement to promote compliance with international conservation and management measures by fishing vessels on the high seas (FAO Compliance Agreement)[146]

The Agreement was adopted in 1993, and entered into force in 2003.

Parties: There are 39 parties to the Agreement. Of the Arctic states, Canada, Norway and the USA are party.[147]

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[140] The Law of the Sea Convention article 117 and 118.

[141] The Law of the Sea Convention article 117 - 119and 118.

[142] http://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXI-7&chapter=21&lang=en (9 December 2009)

[143] UNFSA, Article 2

[144] UNFSA article 6 and 7.

[145] UNFSA article 5 (e).

[146] ftp://ftp.fao.org/docrep/fao/Meeting/006/x3130m/X3130m00.pdf (15

Geographical scope: The scope is global, as the Agreement applies to all fishing vessels that are used or intended for fishing on the high seas.

Objective: The objective is to promote compliance with international conservation measures on the high seas.

Functional scope: The Agreement applies to fisheries on all types of stocks on the high seas. It primarily stresses that flag states take necessary measures to ensure that fishing vessels entitled to fly its flag do not engage in any activity that undermines the effectiveness of international conservation and management measures. Central to the fulfilment of this obligation is the Agreement's requirement that no Party allow fishing vessels entitled to fly its flag be used for fishing on the high seas unless it has been authorized to do so by the Party.

Regarding enforcement, the flag state shall take measures in respect of fishing vessels which act in contravention of the provisions of the agreement. Sanctions applicable shall be of sufficient gravity as to be effective in securing compliance. Art. III (2)-(3) obligates Staets Parties not to allow vessels entitled to fly their flag to fish on the high seas without authorization, and not to authorize vessels entitled to fly their flag to fish on high seas unless they can exercise effective control over these vessels.

The Agreement also requires the State Parties to cooperate on enforcement. The States shall exchange information relating to activities of fishing vessels in order to assist the flag State in identifying fishing vessels flying its flag reported to have engaged in activities undermining international conservation and management measures. When a fishing vessel is voluntarily in the port of a Party other than its flag State, that Party, where it has reasonable grounds for believing that the fishing vessel has been used for an activity that undermines the effectiveness of international conservation and management measures, shall promptly notify the flag State accordingly.

Each Party shall report promptly to FAO all relevant information regarding any activities of fishing vessels flying its flag that undermine the effectiveness of international conservation and management measures.

3.4.4 Agreement on port state measures to prevent, deter and eliminate illegal, unreported and unregulated fishing (FAO Port State Agreement), 2009. (Not yet in force.)

The Agreement enters into force thirty days after the date of deposit of the twenty-fifth instrument of ratification, acceptance, approval or accession.

Parties: 23 states have signed the Agreement.[148] Of the Arctic States, Canada, Iceland, Norway, the Russian Federation and USA have signed, thereby indicating their intent to ratify, accept, approve or accede to the Agreement. The Faroe Islands and Greenland are currently in the process of approving, respectively, their joint participation in the agreement.

Objective: The objective is to prevent, deter and eliminate illegal, unreported and unregulated fishing (IUU-fishing) through the implementation of effective port State measures, and thereby to ensure the long-term conservation and sustainable use of living marine resources and marine ecosystems.

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[147] In the case of matters relating to fisheries management, the EU has the competence to enter into international agreements. The Faroe Islands and Greenland are not joined in Denmark´s membership in the EU. The Faroe Islands is an associate member of the FAO.

[148] As of 4 January 2010.

Geographical scope: FAO Port State Agreement is global in scope.

Functional scope: By recognising that port State measures are widely viewed as a cost effective means to fight IUU-fishing, the Agreement includes among other measures: Foreign fishing vessels seeking entry into port will be required to request permission from designated ports ahead of arrival, transmitting information on their activities and the fish they have on board. Port States shall conduct inspections of ships according to common standards, set out in the Agreement in order to reveal if it has engaged in IUU-fishing. When a vessel is denied access to port in accordance with requirements of the Agreement, port states must communicate that information to the flag State of the vessel and, as appropriate and the extent possible, relevant coastal states, regional fisheries management organizations and other international organizations. The flag State is responsible for follow-up action.

Four years after the entry into force of the Agreement, FAO shall convene a meeting of the Parties to review and assess the effectiveness of it in achieving its objective. The Parties shall decide on further such meetings as necessary.

3.4.5 The FAO Code of Conduct for Responsible Fisheries[149] – 1995

The Code of Conduct is a voluntary instrument *(soft law)*. Parts of it are based on relevant rules of international law, including those reflected in the Law of the Sea Convention. The code also contains provisions that may be or have already been given binding effect by means of other legally binding instruments, such as the UNFSA, agreements creating RFMOs, and the FAO Compliance Agreement (1993), which forms an integral part of the Code.

Geographical scope: The Code of Conduct has a global scope of application. FAO request all states to implement certain measures in order to achieve a responsible fisheries management.

Functional scope: The code contains several concepts and principles States should make use of, including ecosystem-based management, international cooperation and the precautionary principle. FAO has developed a series of technical guidelines for the implementation of the Code.[150] The code has given rise to and is implemented through a number of international plans of action, including:

- ü International plan of action to prevent, deter and eliminate illegal, unreported and unregulated fishing (IPOA-IUU)[151] (2001).
- ü International plan of action for reducing incidental catch of seabirds in longline fisheries (IPOA-SEABIRDS)[152] (1999)
- ü International plan of action for the conservation and management of sharks (IPOA-SHARKS) – FAO[153] 1999
- ü International plan of action for the management of fishing capacity (IPOA-CAPACITY)[154] (1999)

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[149] http://www.fao.org/DOCREP/005/v9878e/v9878e00.htm

[150] http://www.fao.org/fishery/ccrf/publications/guidelines/en

[151] http://www.fao.org/DOCREP/003/y1224e/y1224e00.htm

[152] http://www.fao.org/fishery/ipoa-seabirds/legal-text/en

[153] http://www.fao.org/fishery/ipoa-seabirds/legal-text/en

[154] http://www.fao.org/fishery/ipoa-seabirds/legal-text/en

The FAO has also developed International Guidelines for the Management of Deep-sea Fisheries in the High Seas, adopted in 2008,[155] , and International Guidelines on Bycatch Management and Reduction of Discards, adopted in 2011

3.4.6 International Convention for the Regulation of Whaling

The Convention was adopted in 1946, and entered into force in 1948.

Parties: The convention establishes an International Whaling Commission (IWC), which has 88 member governments, among them the Arctic States, Denmark, Finland Iceland, Norway, the Russian Federation, Sweden, and USA.

Objective: The convention was concluded to provide for the proper conservation and management of whale stocks and thus make possible the orderly development of the whaling industry.

Geographical scope: Global

Functional scope: The Convention establishes an International Whaling Commission with responsibility to adopt regulations with respect to the conservation and utilization of whale resources. The Commission's scientific committee provides scientific advice and recommendations to the Commission. The IWC establish catch limits for the large whale species.

3.5 Shipping

3.5.1 Introduction

In relation to shipping, the main rights and obligations for the protection and preservation of the environment of both coastal and flag States are established by the Law of the Sea Convention.

The global regulatory regime on maritime traffic, safety at sea, and on vessel source pollution is contained in other instruments. In some cases, regulations are referred to in the Convention, as "generally accepted international rules and standards adopted through the competent international organization or general diplomatic conference" (GAIRS).[156]

The competent international organization for issues related to shipping is the International Maritime Organisation (IMO). Thus regulations of navigation, safety at sea, and vessel source pollution are primarily developed through the IMO,[157] which was established as a specialized agency under the UN in 1948 for the purpose of i.a. improving maritime safety and security and for preventing marine pollution.[158] The most relevant and important IMO instruments in relation to the Arctic marine environment are reviewed below.

Most of the provisions of the Law of the Sea Convention on vessel source pollution are contained in Part XII of the Convention, which contains both provisions of general application and provisions specific to the Arctic. Flag States shall adopt laws and regulations for the prevention, reduction and control of pollution of the marine environment from vessels

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[155] http://www.fao.org/docrep/011/i0816t/i0816t00.htm

[156] Such as the Law of the Sea Convention Articles 21 (2), 22 (3) and 211 (5) and (6).

[157] For information about IMO see www.imo.org.

[158] The 1948 IMO Convention.

flying their flag or of their registry.[159] These regulations shall "at least have the same effect" as that of GAIRS.[160]

Coastal States have a wide jurisdiction to adopt regulations on shipping within their territorial sea for the purpose of protecting the marine environment.[161] The Coastal State's laws and regulations concerning the design, construction, manning or equipment of foreign ships in the territorial sea must give effect to "generally accepted international rules and standards".[162] In the Exclusive Economic Zone the jurisdiction of the coastal State to adopt regulations on vessels is more limited. Among other things, Coastal States have jurisdiction over the protection and preservation of the marine environment, but in exercising these rights, Coastal states must have due regard for the rights and duties of other States.[163] Coastal States may adopt laws and regulations for the prevention of pollution from vessels that are "conforming to and giving effect" to GAIRS.[164] Furthermore coastal States may be authorized to adopt stricter regulations within special areas in some circumstances upon a determination of the competent international organization.[165]

Distinct from the general rules that apply within the various maritime zones, special rules apply in ice-covered areas. Article 234 provides the coastal States in such areas with the right to adopt and enforce stricter pollution measures for vessels in ice-covered areas within the limits of the EEZ, provided that they meet the various requirements set forth in this article relating to, inter alia, non-discrimination, ice coverage, and due regard to navigation.

Whereas the prescriptive jurisdiction of the coastal States is limited, the prescriptive jurisdiction of the port state is in principle unlimited. However, states which adopt particular pollution-related requirements as a condition for the entry of foreign vessels into their ports, "shall give due publicity to such requirements and shall communicate them to the competent international organization".[166]

3.5.2 The IMO conventions[167]

A number of legally binding and non-legally binding instruments on maritime safety and vessel source pollution have been adopted by the IMO.[168]

Legally binding IMO instruments of relevance for shipping in the Arctic include:

- *Convention on the International Regulations for Preventing Collisions at Sea (COLREG), 1972.*
- *International Convention for the Prevention of Pollution from Ships (MARPOL 73/78), 1973 and 1978 and 1997 Protocols Relating Thereto.*
- *International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended.*

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[159] Article 211 (2)

[160] The Law of the Sea Convention Article 211 (2).

[161] Article 21(1)(f) and 211(4)

[162] The Law of the Sea Convention Article 21(2).

[163] The Law of the Sea Convention Article 56

[164] Article 211 (5)

[165] The Law of the Sea Convention Article 211 (6).

[166] The Law of the Sea Convention Article 211 (3).

[167] The Faroe Islands is an associate member of IMO.

[168] Information about these instruments is available at www.imo.org.

- *International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), 1978.*
- *International Convention for the Control and Management of Ships` Ballast Water and Sediments (BWMC), 2004.*
- *International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS), 2001.*
- *International Convention on Oil Pollution, Preparedness, Response and Co-operation (OPRC), 1990 and the Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances (HNS Protocol), 2000.*
- *International Convention on Civil Liability for Oil Pollution Damage (CLC), 1969, as amended.*
- *International Convention on the Establishment of an International Fund for Compensation of Oil Pollution Damage (FUND), 1971, as amended.*
- *International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances at Sea, 1996 and the 2010 HNS Protocol.*
- *International Convention on Civil Liability for Bunker Oil Pollution Damage, 2001*
  - Nairobi International Convention on the Removal of Wrecks, 2007

Recognising that polar environments impose additional demands on ships, their systems and operation beyond the existing requirements of SOLAS' MARPOL and other existing instruments of the IMO, the IMO is currently working to develop a legally-binding Code for Navigation in Polar Waters to address the risks that are specific to operations in polar waters.

Several non legally binding IMO instruments are relevant for shipping in the Arctic. As discussed below, many of these measures may be made binding under specific IMO Conventions or in conjunction with them:

- *General Provisions on Ships Routeing*
- *PSSA Guidelines*
- *Guidelines for Ships operating in Polar Waters*
- *Guidance document for minimizing the risk of ship strikes with cetaceans.*

International Convention for the Safety of Life at Sea (SOLAS)

General: The SOLAS Convention[169] was signed 1 November 1974 and entered into force 25 May 1980.[170]

Parties: The SOLAS Convention has 169 Parties. All Arctic countries are parties.

Objective: The objective of the Convention is to improve the safety of shipping.

Geographical scope: The Convention is global, and all the Arctic states have ratified it.

Functional scope: The SOLAS Convention and its protocols include regulations on construction, equipment and operation of vessels. In addition the Convention includes

[169] The International Convention for the Safety of Life at Sea.

[170] Earlier versions of the Convention were adopted in 1914, 1929, 1948 and in 1960. Abut the history of the Convention see www. imo.org

regulations on stability, fire detection and fire fighting, communication, regulations on the carriage of dangerous goods etc.[171] In relation to protection of the marine environment the regulations for ensuring safety of navigation are of significance. In this regard a chapter V includes regulations on safety of navigation, routeing measures, ship reporting systems and vessel traffic services. [172]

International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 relating thereto (MARPOL73 /78) and 1997 Protocol

General: The International Convention for the Prevention of Pollution from Ships (MARPOL) was adopted in 1973. Several protocols to the Convention have been adopted. The Convention entered into force in 1983.

Parties: The 1973/78 MARPOL Convention has 150 parties (annex I/II). All Arctic states are parties. Canada, Denmark, Finland, Norway, and the US are parties to the 1997 Protocol.

Objectives: The objectives of the Convention are to eliminate pollution of the sea by oil, chemicals and other harmful substances which might be discharged to the sea and air in the course of operation. The 1997 Protocol adds annex VI that limits air pollution from ships.

Geographical scope: The Convention is global. Certain areas are designated as Special Areas in which stricter regimes for prevention of discharges are adopted.

Functional scope: The Convention is aimed at preventing marine pollution. Its technical content is laid out in six Annexes, the first five relating to pollution of the sea, the sixth covers air pollution from ships. The five first Annexes cover pollution by oil, by noxious liquid substances in bulk, by harmful substances carried by sea in packaged form, by sewage from ships and by garbage from ships. Certain areas may be designated for the purposes of an annex as Special Areas in which stricter regimes for prevention of discharges are adopted. Special criteria and procedures are developed for the designation of special areas under MARPOL.[173]

The 1972 Convention on International Regulations for Preventing Collisions at Sea (COLREG)

COLREG was adopted 20 October 1972 and entered into force 15 July 1977.[174]

Geographical Scope: The Convention is global.

Parties: The Convention has 153 Parties. All Arctic states are parties.

Functional Scope: The COLREG Convention is of particular relevance in relation to the regulation of navigation as it includes regulations of traffic separation schemes. This is a frequently applied routeing measure which is a relevant measure for avoiding ship collisions. Traffic separation schemes are dealt with in COLREG rule 1 (d) and 10 and may be made mandatory for its parties.

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[171] See www.imo.org

[172] See in particular regulations 10, 11 and 12 in chapter V. Chapter V was part of the amendments of the Convention which took place during the 1990s. Chapter V was revised in 2000. For an overview of the amendments see www.imo.org

[173] See "Guidelines for the Designation of Special Areas under MARPOL 73/78" Annex I, IMO Assembly Resolution A.927(22).

International Convention for the Control and Management of Ships` Ballast Water and Sediments (BWMC)

The Ballast Water Convention was adopted 13 February 2004 and has not entered into force yet.[175] The Convention will enter into force 12 months after ratification by 30 Parties representing 35% of world merchant shipping tonnage.

Parties: As of [update with month of printing] 2011, the convention has been ratified by 27 states (which amount to 25% of world tonnage?).[176] Arctic states party are Norway, Sweden and Canada.

Geographical scope: The Convention is global.

Functional scope: The BWMC is aimed at preventing the transfer of harmful aquatic organisms and pathogens through ships´ ballast water and sediments. A State or States may seek to apply higher standards through IMO established procedures.

3.5.3 Non legally binding IMO instruments

General Provisions on Ships' Routeing

The General Provisions on Ships' Routeing were adopted by the IMO Assembly in 1985 and has been amended periodically since that time.[177] The General Provisions include both substantive and procedural guidelines and criteria routeing measures. Regulation 10 of SOLAS Chapter V provides the legal basis for making mandatory those routeing measures adopted and implemented in accordance with General Provisions on Ships' Routeing. A routeing measure, such as an "area to be avoided", may thus be made mandatory if adopted pursuant to SOLAS and in accordance with the General Provisions.

PSSA Guidelines

PSSA (Particularly Sensitive Sea Area) is an area of the sea that needs special protection through action of IMO. The concept of PSSA is developed through IMO practice since the 1970s and adopted on the basis of Guidelines.[178] These Guidelines do not have any binding force and the concept of PSSA is in itself not legally binding. A PSSA may only be designated where one or more associated protective measures (APMs) that have a legal basis in the MARPOL Convention, the SOLAS Convention or in any other mandatory IMO instrument have been adopted by IMO. The APMs adopted to ensure the protection of the sensitive area designated as a PSSA may therefore be legally binding**.**

Polar Shipping Guidelines

In 2002, IMO approved Guidelines for Ships operating in Arctic ice-covered waters.[179] In 2009, these Guidelines were modified and made applicable also in the ice-covered areas of the Antarctic. The Guidelines, which are nonbinding, were developed to address additional provisions deemed necessary for ships operating in ice-covered waters, beyond existing requirements of the SOLAS Convention, the MARPOL Convention and other relevant conventions and codes in order to take into account the climatic conditions of these waters

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[175] Information about the Convention is available at www.imo.org.

[176] Information available at http://www.imo.org/ .

[177] General Provisions on Ships Routeing as amended (IMO Resolution A.572(14)).

[178] Revised Guidelines for the Identification and Designation of Particularly Sensitive Sea Areas (IMO Assembly Resolution A.982(24)).

[179] Guidelines for Ships operating in Arctic Ice-Covered Waters", IMODOC. MSC/Circ. 1056- MEPC/Circ. 399, of 23 December 2002.

and to meet appropriate standards of maritime safety and pollution prevention.[180] Using the guidelines as a starting point, the IMO has initiated the development a mandatory polar shipping code with a target date for adoption of 2012-2013.

3.6 Marine Scientific Research

General: The Law of the Sea Convention contains provisions that address the rights and obligations with respect to the conduct of marine scientific research in the different maritime zones. Part XIII of the Convention covers the right of all states to conduct marine scientific research and the competence of the coastal State to regulate, authorize and conduct this activity within its jurisdiction. Marine scientific research is a freedom of the high seas. States likewise have a duty to promote and facilitate the development and conduct of marine scientific research.[181] The Convention also sets forth general principles that shall apply in the conduct of marine scientific research,[182] including that it shall be conducted in compliance with all relevant regulations adopted in conformity with the Convention, including those for the preservation and protection of the marine environment.[183]

Territorial Seas and internal waters: Coastal States have sovereignty over their territorial sea and internal waters. Accordingly, coastal States have the exclusive right to regulate, authorize and conduct marine scientific research in their territorial sea. It is explicitly provided for in the Convention that marine scientific research in this zone shall only be conducted with the express consent of and under the conditions set forth by the coastal State.[184]

Exclusive Economic Zone and Continental shelf: Coastal States also have jurisdiction with regard to MSR in their EEZ and on the continental shelf, but their competence is more limited in the EEZ than in the territorial sea.[185] Coastal States have the right to regulate, authorize and conduct MSR, and other states wishing to conduct MSR in the coastal state's EEZ and the continental shelf must obtain the consent of the coastal state. Coastal States shall however "in normal circumstances" grant their consent for marine scientific research carried out exclusively for peaceful purposes and in order to increase scientific knowledge of the marine environment.[186] The conduct of marine scientific research in a foreign state's EEZ or continental shelf is subject to a number of obligations such as a duty to provide information on the marine scientific research project and to comply with certain conditions.[187]

High Seas: Marine scientific research is specifically referred to as a freedom of the high seas in Article 87. The freedom to conduct research is however, subject to the provisions of Part VI and XIII of the Convention. States must also carry out this activity with due regard for the interests of other states in their exercise of the freedom of the high seas.[188]

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[180] See http://www.imo.org/ .

[181] Law of the Sea Convention , Article 239.

[182] Law of the Sea Convention, Article 240 .

[183] Law of the Sea Convention, Article 240 .

[184] Law of the Sea Convention, Article 245.

[185] Law of the Sea Convention ,Article 56.

[186] Law of the Sea Convention Article 246. See also Churchill and Law, The Law of the Sea, 1999, p. 405-406.

[187] Law of the Sea Convention, Articles 248-249.

[188] Law of the Sea Convention, Article 87 (2).

The Area: Marine scientific research in the Area is specifically referred to in Arcticle 143 as shall be carried out ex clusively for peaceful purposes and for the benefit of mankind as a whole, in accordance with Part XIII.[189]

Intergovernmental Oceanographic Commission, 1960

The Intergovernmental Oceanographic Commission (IOC) promotes international cooperation and coordinates programmes in marine research, services, observation systems, hazard mitigation and capacity development in order to learn more and better manage the nature and resources of the ocean and coastal areas While not having a regulatory mandate, the IOC plans, coordinates, and supports global and regional programs, in cooperation with IOC member states and other international organizations. The IOC is recognized as the competent international organization for marine scientific research under the Convention. It also has specific responsibilities relating to the Framework Convention on Climate Change, the Convention on Biodiversity, Agenda 21 of the UN Conference on Environment and Development, and the International Decade for Natural Disaster Reduction.

Through memoranda of understanding, the IOC cooperates with the International Council for the Exploration of the Sea (ICES) in the North Atlantic, and with the North Pacific Marine Science Organization **(**PICES) in the North Pacific region. UN agencies that work closely with the IOC on programs of mutual interest include the World Meteorological Organization, the UNEP, the International Maritime Organization, the FAO, and the International Atomic Energy Agency. Scientific advice is provided to the IOC by the Scientific Committee on Oceanic Research of the International Council of Scientific Unions. Major programs include study of global ocean circulation, ocean mapping, and global ecosystem dynamics. Under each of these program areas and in cooperation with national and international agencies, the IOC sponsors and organizes meetings and workshops to define scientific problems and service requirements, and to develop appropriate international programs. The programs are executed by the participating IOC member states.

3.7 Oil and gas activities, including oil spill prevention, preparedness and response and emergency response

3.7.1 Introduction

A State has sovereignty over hydrocarbon resources within its territory. Moreover coastal States have sovereign rights over their continental shelf, within or outside 200nm, for the purpose of exploring it and exploiting its natural resources, which includes oil and gas.[190] There are a number of instruments that address issues related to the exploration and exploitation of oil and gas resources.

3.7.2 Global instruments

The general obligations of the Law of the Sea Convention to protect and preserve the marine environment are of significance when States engage in oil and gas activities.[191] Additionally, The Law of the Sea Convention contains certain provisions relating to the an obligation to prevent pollution from sea bed activities. For example, coastal States are required to adopt laws and regulation to prevent, reduce and control such pollution of the marine environment

[189] Law of the Sea Convention, Part XI, Article 143

[190] The Law of the Sea Convention Article 77.

[191] The Law of the Sea Convention Article 192 and 194.

arising from or in connection with seabed activities subject to their jurisdiction and to take other measures as may be necessary to prevent, reduce and control such pollution.[192]

The MARPOL Convention and the London Dumping Convention (see above) also include regulations that are relevant for oil and gas activities as they cover certain forms of operational pollution from continental shelf installations.[193] Certain provisions in these agreements do, however, exclude exploration, exploitation, and processing activities.

Furthermore the International Convention on Oil Preparedness, Response and Co-operation (the OPRC Convention) requires states to prepare for and respond to an oil pollution incident nationally or in co-operation with other states.[194] The Convention covers oil pollution incidents involving ships, offshore units, seaport and oil handling facilities.[195]

UNEP has also developed nonbinding guidelines for state practice with regard to offshore mining and drilling.[196]

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[192] The Law of the Sea Convention Article 208.

[193] More about the MARPOL Convention and the London Dumping Convention see 3.5.2 and 3.3.3.

[194] The International Convention on Oil Pollution Preparedness, Response and Co-operation was adopted 30 November 1990 and entered into force 13 May 1995. All the Arctic States are parties to the Convention.

[195] The International Convention on Oil Pollution Preparedness, Response and Co-operation Article 2.

[196] http://www.unep.org/law/PDF/UNEPEnv-LawGuide&PrincN04.pdf, about the Guidelines see Churchill and Lowe, The Law of the sea, 1999, p. 371-372.

Chapter 4: Regional instruments pertaining partly or fully to the Arctic marine environment

4.1 Introduction

This chapter addresses *regional* instruments and arrangements that relate to the Arctic marine environment. "Regional" here means that an instrument applies in the marine environment of more than two of the Arctic countries. This is commonly required in situations where a pollution issue or a natural resource is transboundary. While coastal states have sovereign rights over the natural resources in the areas under their jurisdiction, there is also a need to cooperate with regard to the management of living marine resources on the high seas. This Chapter does not constitute or purport to offer interpretations of the regional instruments and arrangements reviewed, but is rather intended to aid the reader by providing an overview of some of their potentially relevant aspects.

Broadly speaking, there are three marine regions in the Arctic: The *Central Arctic Ocean* to the North of the continents, including the Chukchi, Beaufort, East Siberian, Kara, and Laptev Seas; the *North Pacific* which borders the Central Arctic Ocean in the Bering Sea; and the *North Atlantic* – the Northwest Atlantic between Greenland and Canada and the Northeast Atlantic with the waters around Iceland, the Northern Norwegian Sea, the Barents Sea and the White Sea. The North Pacific and the North Atlantic span vast areas, with a number of regional agreements that apply to their Arctic parts.

The northern areas of the North Pacific and the North Atlantic are different from each other in a number of respects that are important to the Arctic marine environment and its management. First, the Northeast Atlantic is heavily influenced by the Atlantic current, which carries warm water from the southwest to the northeast. This region therefore has a substantially warmer climate than other regions at the same latitude.

Second, and for that reason, most of the four million people in the Arctic live in the Northeast Atlantic region, in particular in the Northwestern part of the Russian Federation and the Nordic countries.[197] Here, urban populations and substantial economic activity is found up to more than 70 degrees north. Also, the Northeast Atlantic is downstream from major populations in Europe, which exposes the region to pollution carried into the Arctic by ocean currents and air. For these reasons this region is also subject to more international cooperation on regulating such activities.

This chapter does ***not*** address requirements in domestic legislation for consultations with respect to international agreements. Neither does it go into the details of bilateral instruments, which are critical in many areas for the actual management of transboundary issues and economic activities, in the Arctic marine environment.

The chapter starts out with an account of the Arctic Council and the activities there, before accounting for instruments pertaining to pollution and nature conservation, fisheries, science and oil and gas. The final sections address a group of regional instruments that does not fall into these categories, relevant EU regulations, and bilateral arrangements, respectively.

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[197] Arctic Human Development Report 2004, p. 19.

4.2 The Arctic Council

The Arctic Council and its working groups produces assessments, guidelines, etc. and influence debate in other international fora. The working groups are important entities for developing international cooperation on a number of issues.

4.2.1 The Rovaniemi Declaration on the Protection of the Arctic Environment (1991)

In 1989, on the initiative of Finland, officials from the eight Arctic countries met to discuss cooperative measures to protect the Arctic environment. The process led to the adoption of the Arctic Environmental Protection Strategy[198] in 1991. On the basis of this, and the desire to also include sustainable development, the idea of an Arctic Council emerged.

The Rovaniemi Declaration identified areas of cooperation and established working groups to address these.

4.2.2 The Ottawa Declaration (The Arctic Council)[199]

The Ottawa Declaration of 1996[200] established the Arctic Council as a high level intergovernmental forum to promote cooperation, coordination and interaction among the Arctic States, with the involvement of the Arctic Indigenous communities and other Arctic inhabitants on common Arctic issues, in particular issues of sustainable development and environmental protection in the Arctic.

The member States of the Arctic Council are Canada, Denmark (including Greenland and the Faroe Islands), Finland, Iceland, Norway, the Russian Federation, Sweden, and the United States of America.

In addition to the Member States, the Arctic Council has Permanent Participants, a special category that includes Arctic organizations of Indigenous peoples with a majority of Arctic Indigenous constituency representing a single Indigenous people resident in more than one Arctic State; or more than one Arctic Indigenous people resident in a single Arctic State. The category of Permanent Participant is created to provide for active participation of the Arctic Indigenous representatives within the Arctic Council. This principle applies to all meetings and activities of the Arctic Council.

Observer status in the Arctic Council is currently under review but has in the past been open to non-Arctic states, inter-governmental and inter-parliamentary organizations, and non-governmental organizations.

The Working Groups of the Arctic Council and their supporting scientific and technical Expert Groups hold meetings at regular intervals throughout the year, ahead of the meetings of Senior Arctic Officials and Arctic Council Ministers. There are six Working Groups of the Arctic Council:

- Arctic Contaminants Action Program (ACAP)
- Arctic Monitoring and Assessment Programme (AMAP)
- Conservation of Arctic Flora and Fauna (CAFF)
- Emergency Prevention, Preparedness and Response (EPPR)

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[198] http://arctic-council.org/filearchive/artic_environment.pdf

[199] The material in this section is mostly from the Web site of the Arctic Council: http://arctic-council.org/

[200] http://arctic-council.org/filearchive/Declaration%20on%20the%20Establishment%20of%20the%20Arctic%20Council-1..pdf

- ü Protection of the Arctic Marine Environment (PAME)
- ü Sustainable Development Working Group (SDWG)

Each Working Group has a specific mandate, and a Chair and Management Board or Steering Committee, and is supported by a Secretariat. The Working Groups execute the programs and projects mandated by the Arctic Council Ministers. These mandates are stated in the Ministerial Declarations that result from Ministerial Meetings. All decisions of the Arctic Council and its subsidiary bodies are by consensus of the eight Member States.

4.2.3 The Arctic Council programs

The Arctic Contaminants Action Program (ACAP)[201]

ACAP is one of the six Working Groups of the Arctic Council. It was given working group status at the Arctic Council Ministerial Meeting in 2006. Prior to that, ACAP had operated as a steering committee called the Arctic Council Action Plan to Eliminate Pollution in the Arctic with a mandate to increase efforts to limit and reduce emissions of pollutants into the environment and promote international cooperation. The goal of ACAP continues to be to reduce emissions of pollutants into the environment in order to reduce the identified pollution risks. ACAP also encourages national actions for Arctic State governments to take remedial and preventive actions relating to contaminants and other releases of pollutants. ACAP acts as a strengthening and supporting mechanism to encourage national actions to reduce emissions and other releases of pollutants.

The Arctic Monitoring and Assessment Program (AMAP)[202]

The current objective of AMAP is "providing reliable and sufficient information on the status of, and threats to, the Arctic environment, and providing scientific advice on actions to be taken in order to support Arctic governments in their efforts to take remedial and preventive actions relating to contaminants". AMAP is responsible for measuring the levels, and assessing the effects of anthropogenic pollutants in all compartments of the Arctic environment, including humans; documenting trends of pollution; documenting sources and pathways of pollutants; examining the impact of pollution on Arctic flora and fauna, especially those used by indigenous people; reporting on the state of the Arctic environment; and giving advice to Ministers on priority actions needed to improve the Arctic condition. AMAP has produced a series of high quality scientifically based assessments of the pollution status of the Arctic. The AMAP assessment reports (both the popular readable versions and detailed scientific background documents) are available on the AMAP website.

Conservation of Arctic Flora and Fauna (CAFF)[203]

CAFF's mandate is to address the conservation of Arctic biodiversity, and communicate the findings to the governments and residents of the Arctic, helping to promote practices that ensure sustainability of the Arctic's living resources. CAFF is responding to the recommendations in the Arctic Climate Impact Assessment calling for long-term data series on status and trends of Arctic biodiversity and the need for further research, observations monitoring and modelling. It is possible to successfully conserve the natural environment and allow for economic development, but this requires solid baseline data on long-term status and trends of Arctic biodiversity, habitats and ecosystem health. CAFF's projects for the

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[201] http://arctic-council.org/working_group/acap

[202] http://arctic-council.org/working_group/amap

[203] http://arctic-council.org/working_group/caff

upcoming inter-ministerial period will provide data for informed decision making in resolving conflicts that are now arising in trying to both conserve the natural environment and permit regional growth. CAFF is now working towards a pan-Arctic biodiversity assessment, to be completed in 2013.

Emergency Preparedness, Prevention and Response (EPPR)[204]

The mandate of the EPPR Working Group is to deal with the prevention, preparedness and response to environmental emergencies in the Arctic. Members of the Working Group exchange information on best practices and conducts projects (e.g. development of guidance and risk assessment methodologies, response exercises, training etc.). EPPR is not a response agency. The work has focused mainly on oil and gas transportation and extraction, and on radiological and other hazards. In 2004, EPPR was directed by the Arctic Ministers to expand its mandate to include natural disasters.

Protection of the Arctic Marine Environment (PAME)[205]

PAME's mandate is to address policy and non-emergency pollution prevention and control measures related to the protection of the Arctic marine environment from both land and sea-based activities. These include coordinated action programmes and guidelines complementing existing legal arrangements. PAME's objectives for 2009-2011 were developed according to its mandate and agreed priorities, and are in line with the goals and objectives as outlined in the Arctic Marine Strategic Plan. PAME´s Working Group activities are directed towards protection of the Arctic marine environment. Increased economic activity and significant changes due to climatic processes are resulting in increased use, opportunities and threats to the Arctic marine and coastal environments. These predicted changes require more integrated approaches to address both existing and emerging challenges of the Arctic marine and coastal environments.

Sustainable Development Working Group (SDWG)[206]

The Sustainable Development Working Group (SDWG) was established at the first Arctic Council Ministerial meeting in 1998. The objective of the SDWG is to protect and enhance the economies, culture and health of the inhabitants of the Arctic, in an environmentally sustainable manner. Currently the Sustainable Development Working Group is involved in projects in the areas of socio-economic issues, Arctic cultures and languages, human health, adaptation to climate change, management of natural resources, and energy.

4.2.4 The products of the Arctic Council

The direction of the work of the Arctic Council is given by the ministerial declarations adopted every second year, at the end of a chairmanship. The declarations contain broad instructions for the development of the work programs of the working groups.

Among the important accomplishments of the Arctic Council to date are the various assessments that have been performed, for the Arctic Environment (1998), the Arctic Climate Impact Assessment (2004), the Arctic Human Development Report (2004), the Oil and Gas Assessment (2008), and the Arctic Marine Shipping Assessment (2009).

In addition to the assessments, which are major undertakings, the working groups run a large number of projects. These may result in strategic initiatives, as for example the Arctic Marine

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[204] http://arctic-council.org/working_group/eppr

[205] http://arctic-council.org/working_group/pame

[206] http://arctic-council.org/working_group/sdwg

Strategic plan (see below), or project reports on issues of concern, as for example ecosystem-based oceans management. The Arctic Council may also act on recommendations from projects and assessment to develop guidelines or best practices. This has happened for example with regard to offshore petroleum development in 2009 (see below).

4.3 Pollution and Nature Conservation

Regional environmental instruments that pertain to the Arctic marine environment are largely confined to the North Atlantic. In the North Pacific a number of bilateral instruments address such issues.

4.3.1 Convention on Long-range Transboundary Air Pollution (LRTAP)

The Convention on Long-range Transboundary Air Pollution was adopted 13 November 1979 and entered into force 16 March 1983. [207]

Parties: The Convention currently has 51 Parties. The eight Arctic countries are Parties to the Convention; Canada, Denmark with a territorial exclusion in respect of the Faroe Islands and Greenland, Finland, Iceland, Norway, Sweden, the Russian Federation and the United States.[208]

Objectives: The objectives of the Convention are to protect human beings and their environment against air pollution and to limit and, as far as possible, gradually reduce and prevent air pollution including long-range transboundary air pollution.

Geographical scope: The Convention is regional. It covers the UNECE – region, which includes Europe and parts of North America and Central and Western Asia.

Functional Scope: The Convention establishes a framework under which parties can cooperate to reduce air pollution, including through the establishment of legally-binding obligations, the exchange of information, research, monitoring, and policy development. Eight protocols to the Convention establish obligations with respect to specific pollutants such as ozone, sulphur, and nitrogen oxides, heavy metals, persistent organic pollutants, and volatile organic compounds. Several protocols specifically mention the Arctic; for example, the 1998 Protocol on Persistent Organic Pollutants includes an acknowledgment of the particular risks to Arctic ecosystems and indigenous people from the biomagnification of persistent organic pollutants and the Protocol on Heavy Metals acknowledges the benefits of emission reductions to the Arctic. Furthermore, the Executive Body of LRTAP has increasingly focused on the impacts of emissions of air pollutants from the UNECE region on the Arctic. Thus, for example, LRTAP Parties convened an Ad-hoc Experts Group on Black Carbon that identified the Arctic as a region that may benefit more than other regions from reducing emissions of black carbon and recommended a number of policies and actions. Other bodies under the Convention have identified how emissions of black carbon emissions from regions close to the Arctic are likely to have a different impact than emissions farther away from the Arctic. At its most recent meeting in December 2010, the Executive Body agreed to consider the inclusion of black carbon in the upcoming revision of the Gothenburg Protocol, including identifying specific measures that reduce black carbon as a component of particulate matter. In addition, the Executive Body also decided to inform the International Maritime Organization (IMO) of its concern about the impact of black carbon emissions and to urge the

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[207] http://www.unece.org/env/lrtap/lrtap_h1.htm

[208] See http://www.unece.org/env/lrtap/status/lrtap_st.htm

IMO to adopt requirements to reduce emissions of black carbon from international shipping, especially in areas that impact the Arctic.

The Executive Body of the Convention reviews the implementation of the Convention. The protocols also include reporting requirements. An Implementation Committee was established by the Executive Body in 1997 to review compliance by Parties with their obligations under the protocols to the Convention. The Committee's work focuses on three main areas: it reviews periodically compliance with Parties' reporting obligations; considers any submission or referral of possible non-compliance by an individual Party with any of its obligations under a given protocol; and carries out in-depth reviews of specified obligations in an individual protocol at the request of the Executive Body. The Implementation Committee is not a decision-making body. It meets twice a year and reports annually to the Executive Body which makes decisions upon recommendations by the Committee.

4.3.2 Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)

The OSPAR Convention was adopted in 1992 and came into force in 1998.[209] It established a Commission (OSPAR Commission).

Parties: There are 15 governments in Europe and the European Union that are Parties to the OSPAR Convention. Of the Arctic Countries in Europe, Denmark, Finland, Iceland, Norway and Sweden are parties.

Objectives: The objective of the OSPAR Convention is to prevent and to eliminate marine pollution and to achieve sustainable management of the maritime area and to ensure the management of human activities in such a manner that the marine ecosystems will continue to sustain legitimate uses of the sea and will continue to meet the needs of present and future generations.

Geographical scope: The Convention is regional and concerns the marine environment of the North East Atlantic. The area covers roughly the Northeast Atlantic sector of the Arctic. The geographical scope of the OSPAR is described in Article 1 and extends to the east coast of Greenland in west, south to the Straits of Gibraltar and to the North Pole in the north.[210]

Functional scope: The Convention includes general obligations for the Parties to adopt strategies and elaborate the Convention. The states are under a general obligation to "prevent and eliminate pollution and to take the "necessary measures to protect the maritime area against the adverse effects of human activities".[211] The Convention covers all sources of

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[209] www.ospar.org

[210] Article 1 (a): "Maritime area" means the internal waters and the territorial seas of the Contracting Parties, the sea beyond and adjacent to the territorial sea under the jurisdiction of the coastal state to the extent recognised by international law, and the high seas, including the bed of all those waters and its sub-soil, situated within the following limits:

(i) those parts of the Atlantic and Arctic Oceans and their dependent seas which lie north of 36° north latitude and between 42° west longitude and 51° east longitude, but excluding:
   a. the Baltic Sea and the Belts lying to the south and east of lines drawn from Hasenore Head to Gniben Point, from Korshage to Spodsbjerg and from Gilbjerg Head to Kullen,
   b. the Mediterranean Sea and its dependent seas as far as the point of intersection of the parallel of 36° north latitude and the meridian of 5° 36' west longitude;

(ii) that part of the Atlantic Ocean north of 59° north latitude and between 44° west longitude and 42° west longitude.

[211] The OSPAR Convention Article 2.

marine pollution. It has also a broader scope than pollution and includes all human activities with the exception of fishing.[212] The general obligation is elaborated and specified through the obligations in Articles 3 to 7 and through the Annexes and Appendices.[213] Annexes I-V cover issues such as dumping, pollution from land based sources, pollution from offshore sources, assessment of the quality of the marine environment and protection and conservation of the ecosystems and the biological diversity. With regard to marine scientific research, the Convention does not include specific provisions. The OSPAR Commission cooperates with the International Council for the Exploration of the Sea.[214] Annex V, which was adopted in 1998, aims to implement the Convention on Biological Diversity at the regional level and provides a comprehensive legal framework for the protection and conservation of ecosystems and biological diversity.[215] Appendix 3 provides criteria for identifying human activities that may have adverse impacts on human activities, for the purpose of implementing Annex V. At the 2010 OSPAR ministerial meeting, a recommendation was adopted in the prevention of significant acute oil pollution from offshore drilling activities.[216]

The OSPAR Convention includes mechanisms for reporting on the implementation of the Convention. The Contracting Parties shall report at regular intervals to the OSPAR Commission who shall assess their compliance with the Convention.[217] The OSPAR Commission elaborates and develops the Convention through the adoption of legally binding Decisions (unless a Party has indicated within a given time frame that it cannot accept it) and non-legally binding Recommendations.[218]

The OSPAR Commission and the Northeast Atlantic Fisheries Commission (NEAFC) have entered into a *Memorandum of Understanding (MoU) between NEAFC and OSPAR Commission (2008)*.[219] The objective of the MoU is to promote cooperation towards the conservation and sustainable use of marine biological diversity including protection of marine ecosystems in the North-East Atlantic. Measures in this regard include flow of mutually useful information, discussions of the management of human activities that impact on the marine environment, and development of common understanding of the application of the precautionary approach/principle and to encourage the funding and conduct of marine science.

4.3.3 Agreement on the Conservation of Polar Bears (1973)[220]

The agreement was adopted in 1973 and entered into force in 1976.

Parties: Canada, Denmark, Norway, the Russian Federation and the United States.

Objective: The objective of the Polar Bear Agreement is to provide for the conservation of polar bears.

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[212] The OSPAR Convention, Preamble.

[213] The OSPAR Convention, the Annexes and the Appendices are available at www.ospar.org

[214] It has also adopted the "Code of Conduct for Responsible Marine Research in the Deep Seas and the High Seas of the OSPAR Maritime Area" in 2008.

[215] See Preamble and Article 2 of Annex V.

[216] Annex 46 of the Meeting of the OSPAR Commission, 20-24 September 2010, Bergen. Available at: http://www.ospar.org/content/content.asp?menu=01441000000000_000000_000000

[217] The OSPAR Convention Articles 22 and 23.

[218] The OSPAR Convention, Articles

[219] http://www.ospar.org/html_documents/ospar/html/mou_neafc_ospar.pdf

[220] http://sedac.ciesin.org/entri/texts/polar.bears.1973.html

Geographical scope: The Agreement applies to the five parties to the Agreement, which are the five polar bear range states.

Functional scope: The Agreement regulates the taking of polar bears and provides for a broad prohibition on the taking of polar bears, subject to a number of specific exceptions, including, for example, takings for scientific or conservation purposes and by local people using traditional methods in the exercise of their traditional rights.

4.3.4 The Arctic Marine Strategic Plan

The 3rd Ministerial Meeting of the Arctic Council recognized that *".... existing and emerging activities in the Arctic warrant a more coordinated and integrated strategic approach to address the challenges of the Arctic coastal and marine environment..." and agreed "... to develop a strategic plan for the protection of the Arctic marine environment under leadership by PAME."*

An Arctic Marine Strategic Plan (AMSP) was endorsed by the Arctic Council Ministers in 2004. The Arctic Council's vision for the Arctic marine environment is: a *healthy and productive Arctic Ocean and coasts that support environmental, economic and sociocultural values for current and future generations.* The goals of this Strategic Plan are as follows:

- ü Reduce and prevent pollution in the Arctic marine environment
- ü Conserve Arctic marine biodiversity and ecosystem functions
- ü Promote the health and prosperity of all Arctic inhabitants
- ü Advance sustainable Arctic marine resource use

Twenty-nine strategic actions in the AMSP were selected according to its goals, principles and approaches, taking into consideration the current and emerging situation affecting the Arctic marine environment, its ecological integrity and the social, cultural, economic and physical well-being of its peoples.

4.4 Fisheries

4.4.1 Introduction

While the Arctic Ocean has few or no commercial fisheries, the subarctic seas in the North Atlantic and the North Pacific have globally significant fisheries for a number of species. The fisheries take place mainly in the waters under the jurisdiction of coastal states, and are managed by those states. Large fish stocks are often transboundary, and therefore bilateral and regional fisheries arrangements are very important in these regions. Some fisheries also take place at the high seas areas in the North Atlantic and these are managed by regional fisheries management organizations.

4.4.2 Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea ("Donut Hole Agreement"), 1994[221]

Parties: The People's Republic of China, Japan, the Republic of Korea, Poland, the Russian Federation, and the United States.

Objectives:

[221] Walleye pollock

1. to establish an international regime for conservation, management, and optimum utilization of pollock resources in the Convention Area [the high seas area of the Bering Sea beyond the U.S. and the Russian Federation 200- mile jurisdictions];
2. to restore and maintain pollock resources in the Bering Sea at levels which will permit their maximum sustainable yield;
3. to cooperate in the gathering and examining of factual information concerning pollock and other living marine resources in the Bering Sea; and
4. to provide, if the Parties agree, a forum in which to consider the establishment of necessary conservation and management measures for other living marine resources in the Convention Area as may be required in the future.

Functional scope: The Convention establishes long-term measures for the conservation, management, and optimum utilization of the Aleutian Basin Pollock stock in the Central Bering Sea. The stock experienced a drastic decline prior to the negotiation of this agreement, and remains at a low level of abundance. There is currently a moratorium on fishing for pollock in the "Donut Hole," although fishing may resume under the Convention when stocks reach a sustainable abundance level. The Convention requires that vessels fishing for pollock in the "Donut Hole" use real-time satellite position-fixing transmitters and carry observers on board. It also requires that any vessels fishing in the area consent to boarding and inspection for compliance with the Convention by enforcement officials of the member states. The agreement will aid in ensuring the long-term health of pollock stocks in the Central Bering Sea on which the U.S. pollock industry in the Pacific Northwest in part depends.

4.4.3 Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean (Basic Instrument for the North Pacific Anadromous Fish Commission – NPAFC) (1992)

Parties: Canada, Japan, the Republic of Korea, the Russian Federation, and the United States.

Geographic scope: The area, as defined in the Convention, is "the waters of the North Pacific Ocean and its adjacent seas, north of 33E North Latitude beyond 200 nautical miles from the baselines from which the breadth of the territorial sea is measured."

Objective: The NPAFC serves as a forum for promoting the conservation of anadromous stocks and ecologically-related species, including marine mammals, sea birds, and non-anadromous fish, in the high seas area of the North Pacific Ocean.."

Functional scope: The NPAFC serves as the venue for coordinating the collection, exchange, and analysis of scientific data regarding the above species within Convention waters. It also coordinates high seas fishery enforcement activities by member countries (the Convention prohibits directed fishing for salmonids and includes provisions to minimize the incidental take of salmonids in other fisheries in the Convention area).

4.4.4 Convention on Future Multilateral Co-operation in North-East Atlantic Fisheries[222] (NEAFC Convention)

Entry into force: 17 March, 1982.

Parties: Denmark (in respect of the Faroe Islands and Greenland), EU, Iceland, Norway and the Russian Federation. Cooperating Non-Contracting Parties are Belize, Cook Islands, Canada, Japan and New Zealand.

[222] http://neafc.org/basictexts

Objective: The objective is to ensure the long-term conservation and optimum utilisation of the fishery resources in the Convention Area, providing sustainable economic, environmental and social benefits.

Geographical scope: The Convention Area is defined as those parts of the Atlantic and Arctic oceans and their dependent seas which lie north of 36° north latitude and between 42° west longitude and 51° east longitude. (Certain areas are excluded.) NEAFC's regulations apply to the high seas in its Regulatory Area which includes the high seas areas of a part of the Arctic Ocean (the Atlantic wedge), the Barents Sea Loophole, the Norwegian Sea Banana Hole, and the high seas area in the southern North East Atlantic Ocean.

Functional scope: NEAFC has competence to make recommendations concerning fisheries conducted beyond the areas under jurisdiction of the Contracting Parties. Such recommendations are adopted by a qualified majority. NEAFC has amended its convention in order to bring it up-to-date with developments in international law, and provide a mandate to regulate fisheries with regard to the marine ecosystem and marine biodiversity, by using the precautionary approach and ecosystem-based management. In 2008 NEAFC adopted provisions to prevent significant adverse impacts from bottom fishing on vulnerable marine ecosystems.

NEAFC may, by a qualified majority, make recommendations concerning measures of control relating to fisheries conducted beyond areas under the jurisdiction of the Contracting Parties for the purpose of ensuring the application of the convention and any recommendations adopted there under.

In 2006 NEAFC adopted the Scheme of Control and Enforcement,[223] replacing similar arrangements adopted earlier. Unless otherwise stated, the Scheme shall apply to all vessels used or intended for use for fishing activities conducted on fisheries resources in the Regulatory Area. The scheme is comprehensive. The parties establish a system of "NEAFC inspectors", after which the parties are qualified to inspect each other's (flagged) vessels on the high seas. Further the Scheme set out procedures for port state control of foreign fishing vessels.

4.4.5 Convention on Future Multilateral Cooperation in the Northwest Atlantic Fisheries (NAFO Convention) (1979)[224]

Entry into force: 1 January 1979.

Parties: Canada, Cuba, Denmark (in respect of the Faroe Islands and Greenland), France (on behalf of St. Pierre et Miquelon), Iceland, Japan, the Republic of Korea, Norway, the Russian Federation, Ukraine, and United States of America.

Objective: In the preamble of the convention, the parties state their desire to "promote the conservation and optimum utilization of the fishery resources of the Northwest Atlantic area (….) and accordingly to encourage international cooperation and consultation with respect to these resources.

Geographical scope: The waters of the Northwest Atlantic Ocean north of 35°00' north latitude and west of a line extending due north from 35°00' north latitude and 42°00' west longitude to 59°00' north latitude, thence due west to 44°00' west longitude, and thence due

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[223] http://www.neafc.org/system/files/scheme_2010.pdf

[224] http://www.nafo.int/about/frames/convention.html

north to the coast of Greenland, and the waters of the Gulf of St. Lawrence, Davis Strait and Baffin Bay south of 78°10' north latitude. [225]

Functional scope: The NAFO Fisheries Commission is responsible for management and conservation of the fishery resources of the NAFO Regulatory Area, which is the high seas portion of the Convention Area. In the exercise of this function, the Fisheries Commission shall take into account relevant advice to it by the NAFO Scientific Council. It shall also seek to ensure consistency between any management proposals for the NAFO straddling fish stocks and the management measures and management approach taken by the coastal States. Straddling fish stocks are those stocks that occur both within a high seas area, such as the NAFO Regulatory Area, and in areas under the fisheries jurisdiction of a coastal State.

In 2007, the NAFO Contracting Parties adopted amendments to the 1978 NAFO Convention in order to bring it up to date with recent developments in international law including the United Nations Fish Stocks Agreement and to provide a mandate to regulate fisheries with regard to the marine ecosystem and marine biodiversity by implementing the precautionary approach and ecosystem-based management approaches. To date, Norway, Canada and the European Union have approved the amendments to the NAFO Convention. For the amendments to take effect, three-quarters, or 9 of the 12, NAFO Contracting Parties must approve the amendments to the NAFO Convention.

The Fisheries Commission has adopted the *NAFO Conservation and Enforcement Measures* which is a comprehensive suite of measures to regulate fishing activities in the NAFO Regulatory Area and their impact on vulnerable marine ecosystems. [226] It comprises eight chapters to address the following areas: Conservation and Management Measures, Bottom Fisheries in the NAFO Regulatory Area, Control Measures, Monitoring of Fisheries, Joint Inspection and Surveillance Scheme, Port State Control, Scheme to Promote Compliance by Non-Contracting Party Vessels with Recommendations Established by NAFO, and Electronic Reporting, Satellite Tracking and Observers.

One of the key elements of the *NAFO Conservation and Enforcement Measures* is the Scheme of Joint Inspection and Surveillance. This forms the legal basis for the exercise of third party inspections at sea. It authorizes inspectors from one NAFO Contracting Party to inspect the fishing vessels of another NAFO Contracting Party that are fishing in the NAFO Regulatory Area. It authorizes inspectors to inspect fishing gear; inspect and record estimates of catch; access production logbooks and/or stowage plans; inspect fish holds and stowage areas and remove, tag, seal and photograph any illegal fishing gear. It also establishes time limits and other procedures for the inspections; outlines the duties of the fishing vessel master; outlines procedures for documenting any violations of the NAFO Measures and the obligations of the NAFO Contracting Party or flag State to follow up on violation reports.

The *NAFO Conservation and Enforcement Measures* also have provisions that apply to landings or transhipments of fish caught in the NAFO Regulatory Area, or fish products originating from such fish, in ports of Contracting Parties by fishing vessels flying the flag of another Contracting Party. These provisions are subject to the right of the port State Contracting Party to impose requirements of its own for access to its ports.

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[225] The scope of NAFO appears from a map on NAFO´s website: http://www.nafo.int/fisheries/frames/fishery.html

[226] http://www.nafo.int/publications/frames/fisheries.html

4.4.6 Agreement on Cooperation in Research, Conservation and Management of Marine Mammals in the North Atlantic (NAMMCO Agreement)[227]

The NAMMCO Agreement entered into force 8 July 1992. It established an international organization, the North Atlantic Marine Mammal Commission (NAMMCO)

Parties: The Faroe Islands, Greenland, Iceland, and Norway. The governments of Canada, Denmark, the Russian Federation and Japan participate in NAMMCO as observers.

Objective: The objective is to contribute through regional consultation and cooperation to conservation, management and study of marine mammals in the North Atlantic.

Geographical scope: The geographical scope of NAMMCO is the North Atlantic. The NAMMCO Agreement does not define its geographical scope any further.

Functional scope: NAMMCO consists of the Council, the Secretariat, the Management Committees (for cetaceans and seals and walruses), the Scientific Committee, the Committee on Finance and Administration, the Committee on Hunting Methods and the Committee on Inspection and Observation. NAMMCO provides a mechanism for cooperation on conservation and management for all species of cetaceans (whales and dolphins) and pinnipeds (seals and walruses) in the region, many of which have not before been covered by such an international agreement. Cooperation through NAMMCO focuses on modern approaches to the study of the marine ecosystem as a whole, and to understanding better the role of marine mammals in this system

4.4.7 Convention for the Conservation of Salmon in the North Atlantic Ocean, 1982. (In force 1983).

Parties: Canada, Denmark (in respect of the Faroe Islands and Greenland), the European Union, Norway, the Russian Federation, and the United States.

Objective: The purpose of the North Atlantic Salmon Conservation Organization (NASCO) is to promote the acquisition, analysis, and dissemination of scientific information pertaining to salmon stocks in the North Atlantic Ocean, and to promote the conservation, restoration, enhancement, and rational management of salmon stocks in the North Atlantic Ocean through international cooperation.

Geographical scope: The Convention applies to the salmon stocks which migrate beyond areas of fisheries jurisdiction of coastal states of the Atlantic Ocean north of 36° N latitude throughout their migratory range.

Functional scope[228]: The Convention created a large protected zone, free of targeted fisheries for Atlantic salmon in most areas beyond 12 nautical miles from the coast. One immediate effect was the cessation of the salmon fishery in the Northern Norwegian Sea

In the late 1980s and early 1990s, NASCO acted through diplomatic initiatives to address fishing for salmon in international waters by vessels registered to non-NASCO Parties. While NASCO's initial focus was very much on developing management measures for the distant-water fisheries at West Greenland and the Faroe Islands, it is widely accepted that conservation and restoration of salmon stocks cannot be achieved by these measures alone. NASCO has considerably broadened its base and now addresses a wide range of issues including management of salmon fisheries, habitat protection and aquaculture.

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[227] http://www.nammco.no/Nammco/Mainpage/DocumentsAndInformation/nammco_agreement.html

[228] http://www.nasco.int/background.html

4.4.8 Other regional fisheries arrangements

In addition to those listed above, there are a number of other regional fisheries arrangements of a more limited nature. In the Northeast Atlantic there are a number of coastal state agreements on fisheries management. These agreements are usually renewed on an annual basis, and include major fisheries such as Atlanto-Scandic herring,[229] blue whiting[230] and mackerel. These arrangements also provide a basis for measures adopted through NEAFC for fisheries on the same stocks in international waters.

There are also a North Atlantic Fisheries Ministers´ Conference which held its 15th meeting in 2010,[231] and a Nordic cooperation at ministerial level.[232] Talks regarding a new agreement to establish a North Pacific RFMO concluded on March 4, 2011.[233]

Two of the international tuna commissions are relevant in this context. The Western Central Pacific Fisheries Convention (on Pacific highly migratory fish stocks) has an undefined management area to the north and could be applicable to the Arctic marine environment.[234] The same applies to the International Convention for the Conservation of Atlantic Tuna.[235]

4.5 Oil and gas

4.5.1 Introduction

As pointed out in chapter 3 on global instruments, the Law of the Sea Convention provides a general framework for governing the oceans. It includes obligations for the states to protect the marine environment against pollution. Coastal states have sovereign rights over the continental shelf, for the purpose of exploring it and exploiting its natural resources, including oil and gas resources.[236]

4.5.2 The OSPAR Convention (1992)

Parties: 15 governments in Europe and the European Union are parties to the OSPAR Convention. Of the Arctic Countries in Europe, Denmark, Finland, Iceland, Norway and Sweden are parties.

Objectives: Cfr. Section 4.3 above. In relation to oil and gas the objective to prevent and to eliminate marine pollution is particularly relevant.

Geographical scope: The Convention is regional and concerns the marine environment of the North East Atlantic.

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[229] http://www.regjeringen.no/upload/FKD/Vedlegg/Kvoteavtaler/2011/Sild/agreed_record_NVG2011.pdf

[230] http://www.regjeringen.no/upload/FKD/Vedlegg/Kvoteavtaler/2011/Kolmule/Agreed_record_Blue_whiting_2011.pdf

[231] http://www.dfo-mpo.gc.ca/media/npress-communique/2010/hq-ac39-eng.htm

[232] http://www.norden.org/en/nordic-council-of-ministers/council-of-ministers/council-of-ministers-for-fisheries-and-aquaculture-agriculture-food-and-forestry-mr-fjls

[233] Cfr comments from the Faroe Islands to an earlier version of this report.

[234] http://www.wcpfc.int/convention-area-map

[235] http://www.iccat.int/en/

[236] The Law of the Sea Convention Article 77.

Functional scope: The OSPAR Convention and its Decisions and Recommendations are of significance for the oil and gas activities in the North East Atlantic.[237] These regulations are more extensive/specific than the obligations to prevent pollution from seabed activities provided in LOSC. The Convention covers all sources of marine pollution, including from oil and gas related activities. Annex II prohibits dumping of wastes and other matters from offshore installations, whereas Annex V includes obligations to protect and conserve the ecosystems and the biological diversity of the maritime area.

The OSPAR Commission has adopted a number of non-legally binding strategies. The objective of the Offshore Oil and Gas Industry Strategy is to prevent and eliminate pollution from offshore sources and to protect the OSPAR maritime area against the adverse effects of offshore activities so as to safeguard human health and conserve the marine ecosystems.[238]

Following the Deep Water Horizon accident, the OSPAR 2010 ministerial meeting initiated work to consider regulations on oil and gas activities.[239]

4.5.3 Agreement Between Denmark, Finland, Iceland, Norway and Sweden Concerning Cooperation in Measures to Deal with Pollution of the Sea by Oil or Other Harmful Substances, 1993. (In force 1998)

Parties: Denmark, Finland, Iceland, Norway and Sweden

Geographical Scope: The Agreement is a regional agreement between the Nordic states. It applies within the waters under the jurisdiction of the Parties.

Objectives: The Parties undertake to cooperate in the protection of the marine environment against pollution of the sea by oil or other harmful substances.[240]

Functional Scope: The Agreement includes measures for monitoring the respective waters of the Parties and for responding to incidents such as oil spill and pollution of the sea by other harmful substances. In a situation where pollution of the sea by oil or other harmful substances may seriously threaten the marine environment, the Parties are i.e. required to investigate the situation, provide information, assist in the production of evidence and establish measures for abatement of the pollution. [241]

4.5.4 Arctic Council Arctic Offshore Oil and Gas Guidelines

In addition to the OSPAR Convention and of particular relevance for the Arctic region are the non-legally binding Arctic Offshore Oil and Gas Guidelines, which were adopted by the Arctic Environmental Ministers in 1997[242] and revised in 2002 and in 2009 by PAME.[243]

The Guidelines are intended to be of use to the Arctic nations for offshore oil and gas activities during planning, exploration, development, production and decommissioning. Specifically, they are intended to define a set of recommended practices and outline strategic

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[237] Information about the work area of oil and gas within OSPAR is available at http://www.ospar.org/content/content.asp?menu=00210305000000_000000_000000

[238] http://www.ospar.org/html_documents/ospar/html/Revised_OSPAR_Strategies_2003.pdf#nameddest=offshore_o_and_g

[239] http://www.ospar.org/content/news_detail.asp?menu=00600725000000_000013_000000

[240] The Nordic Agreement Article 2.

[241] The Nordic Agreement Articles 3-7.

[242] http://arctic-council.org/filearchive/Arctic%20Offhsore%20Oil%20and%20Gas%20Guidelines%202009.pdf

[243] http://arctic-council.org/filearchive/Arctic%20Offhsore%20Oil%20and%20Gas%20Guidelines%202009.pdf

actions for consideration by those responsible for regulation of offshore oil and gas activities (including transportation and related onshore activities) in the Arctic.

4.5.5 EPPR-related activities

The EPPR in 2000 performed a gap analysis for relevant international agreements. EPPR is currently considering international regimes related to oil and HNS spills in international waters, review of relevant AMSA recommendations and will propose a way forward.

Other EPPR documents relevant in this context include: Guidelines on fuel transfer,[244] EPPR guidelines for oily waste management,[245] EPPR field guide for oil spill response in Arctic waters,[246] Arctic SCAT Manual--a field guide to the Documentation of Oiled Shorelines,[247] and the Arctic Guide to National emergency response arrangements and contacts[248].

4.6 Shipping

4.6.1 Introduction

The international regulatory framework for shipping is to a large extent global, and developed and operated under the auspices of the International Maritime Organization (IMO) (cfr chapter 3).

4.6.2 SAR

The Arctic states has completed their negotiations on an instrument for search and rescue preparedness and operations. The instrument will be signed during the Arctic Council Ministerial Meeting in May 2011.

4.6.3 AMSA follow-up

The Arctic Marine Shipping Assessment (AMSA) Report was completed and approved by Arctic Council Ministers at their meeting in Tromsø, Norway in April 2009. The AMSA Report examines Arctic shipping from historical, legal, environmental, infrastructure and other perspectives and provides 17 recommendations to promote the safety and environmental awareness of current and future Arctic shipping activity, which is consistent with the Arctic Council's mandates of environmental protection and sustainable development.

The AMSA report recommendations involve multiple stakeholders and apply at national, Arctic Regional, and international levels. The recommendations are aligned under three themes: Enhancing Arctic Marine Safety; Protecting Arctic People and the Environment; and Building the Arctic Marine Infrastructure. Some of the recommendations can be realized quickly while others are complex and long-term in nature, and require considerable resources to implement. Although each of the 17 recommendations deals with a particular issue or

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[244] TROOP Guidelines for Transfer of Refined Oil and Oil Products in Arctic Waters 2004, http://www.pame.is/offshore-oil-and-gas

[245] Guidelines and Strategies for Oily Waste Management in the Arctic Regions 2009, http://eppr.arctic-council.org/pdf/EPPRWasteManagement_FINALReport_April2009.pdf

[246] Field Guide for Oil Spill Response in Arctic Waters (1998) http://eppr.arctic-council.org/

[247] Owens, Edward H., and Gary A. Sergy (2004). The Arctic SCAT Manual: A Field Guide to the Documentation of Oiled Shorelines in Arctic Environments. Environment Canada, Edmonton, AB, Canada, 172 pages.

[248] Arctic Guide http://eppr.arctic-council.org/

hazard, they need to be considered collectively in order to effectively address the potential impacts of increased Arctic shipping activity.

A progress report on the status of the implementation of the AMSA report's 17 recommendations has been prepared (2011) and is intended to acknowledge the successes and significant progress in several areas and, at the same time, draw attention to areas and recommendations where progress is limited and more work may be needed. This progress report highlights safety of Arctic shipping and protection of the Arctic marine environment has drawn increased attention not only in the region but also globally. Arctic Council member governments, through the IMO and other fora, are working to enhance Arctic marine safety and environmental protection. Arctic Council working groups are following up and making progress on many of the AMSA report recommendations. The Arctic Search and Rescue agreement is a clear indication that Arctic States are cooperating to resolve important issues and can work rapidly and effectively together. At the same time, this progress report identifies areas for further cooperation and increased efforts to improve Arctic maritime safety and protection of the Arctic marine environment. Monitoring the implementation of the AMSA recommendations will be an ongoing part of the PAME agenda, including regular reports to the Arctic Council Ministers.

4.7 Marine scientific research

4.7.1 Introduction

Science is a major part of human activity in the Arctic, as well as a critical factor in the sustainable management of the Arctic marine environment. Science is a global endeavour, and has a long tradition in the polar regions. As pointed out in chapter 3, the Law of the Sea Convention contains general provisions regarding marine scientific research that apply in the Arctic marine environment. In addition, there are also regional binding and non-legally binding instruments and institutions that play an important role.

4.7.2 Convention for a North Pacific Marine Science Organization (PICES), 1992

Parties: Canada, Japan, People's Republic of China, Republic of Korea, the Russian Federation, and the United States of America.

Objective: PICES was established to promote and coordinate marine scientific research in the northern North Pacific and adjacent seas. The organization's purpose is to advance scientific knowledge about the ocean environment, global climate change, living resources and their ecosystems, and the impacts of human activities, and to promote the collection and rapid exchange of scientific information on these issues.

Geographical scope: The PICES area is the temperate and sub-Arctic region of the North Pacific Ocean and its adjacent seas, especially northward from 30 degrees North Latitude.

Functional scope: PICES is comprised of a Governing Council, a Science Board, such permanent or ad hoc scientific groups and committees as the Governing Council from time to time may establish and a Secretariat. PICES has carried out several research projects, among others; Marine Ecosystem Model Inter-Comparison Project (in progress), Bering Sea Indicators and North Pacific Ecosystem Status Report.

4.7.3 Convention for the International Council for the Exploration of the Sea (ICES)[249]

Parties: ICES has 20 member countries. All the Arctic countries participate.

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[249] http://www.ices.dk/aboutus/convention.asp

Geographical scope: The environment of the North Atlantic and adjacent seas has been the prime concern of ICES since its inception in 1902.

Objective: Article 1 of the 1964 ICES Convention identifies the Council's principal functions:

a. promote and encourage research and investigations for the study of the sea particularly related to the living resources thereof;
b. draw up programs required for this purpose and to organize, in agreement with the contracting parties, such research and investigations as may appear necessary;
c. publish and otherwise disseminate the results of research and investigations carried out under its auspices.

ICES works in fisheries, oceanography, and environmental sciences, including the study of marine pollution, and maintains extensive databases on the North Atlantic, in cooperation with other international organizations.

More than 40 international organizations have Observer status and cooperative relations with ICES.[250]

Functional scope: As the oldest intergovernmental marine science organization in the world, the main focus of ICES has continued to be on international cooperative scientific studies. Since the 1970s, a major responsibility for ICES has involved the provision of scientific information and advice for fisheries conservation and protection of the marine environment to intergovernmental regulatory commissions,[251] the European Commission, and the governments of ICES member countries.

ICES is a forum for the promotion, coordination, and dissemination of research on the physical, chemical, and biological systems in the North Atlantic and adjacent seas such as the Baltic Sea and North Sea, and advice on human impacts on its environment, in particular fisheries effects in the Northeast Atlantic. In support of these activities, ICES facilitates data and information exchange through publications and meetings, in addition to functioning as a marine data centre for oceanographic, environmental, and fisheries data. ICES is a complex organization involving about 1600 scientists, with an Annual Science Conference, a dozen committees, over 100 working and study groups, several symposia annually, and a wide range of quality science publications.

4.7.4 The International Arctic Science Committee (IASC)[252] and the International Arctic Social Sciences Association (IASSA)

The International Arctic Science Committee (IASC)[253] and the International Arctic Social Sciences Association (IASSA) are technically non-governmental organizations. IASC was established in 1990, began operations in 1991 and today comprises 19 member countries. The IASC member organisations are national science organisations covering all fields of Arctic research. Each national member organisation has a mechanism to provide ongoing contact between its IASC council member and its Arctic science community.

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[250] Of the United Nations agencies, ICES works with the Fisheries Department of the Food and Agriculture Organization (FAO), the Intergovernmental Oceanographic Commission, the International Maritime Organization, the World Meteorological Organization, and the UNEP.

[251] NEAFC, HELCOM, OSPAR, NASCO, Norway-Russia Fisheries Commission, Norway-EU Fisheries Cooperation.

[252] http://web.arcticportal.org/iasc/

[253] http://web.arcticportal.org/iasc/

The mission of IASC is to encourage, facilitate and promote leading-edge multi-disciplinary research to foster a greater scientific understanding of the arctic region and its role in the Earth system. IASC is not a funding agency, but assists with science development by providing scientific advice and also seed money. In general, IASC supported activities are international, circum-arctic and of interest to several IASC member countries. The IASC instruments to support science development include: Assessments and science planning activities, long-term programs, workshops, networks, and Early Career Scientist Support.

IASC draws on this structure to identify scientific priorities, members of working groups, etc. An international science programme planned or recommended by IASC should be of high priority to Arctic or global science.

There are 19 Member countries, including the eight Arctic states.

The overarching purpose of the International Arctic Social Sciences Association (IASSA)[254] is to promote and stimulate international cooperation and to increase the participation of social scientists in national and international Arctic research. Membership is on a personal basis.

4.8 Other instruments

4.8.1 Introduction

Some regional instruments are important in other respects than those addressed above. Environmental impact assessments are addressed both by a UN Economic Commission for Europe (ECE)[255] instrument (and is therefore open to all Arctic countries) as well as by Arctic Council guidelines. Similarly, access to information, public participation in decision-making and access to justice in environmental matters is addressed by another UN ECE instrument.

4.8.2 UNECE Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention).[256] (1991, in force 1997).

Parties: There are 45 Parties to the Convention.[257] Of the Arctic States, Canada, Denmark (including the Faroe Islands and Greenland), Finland, Norway, and Sweden are Parties.

Objectives: It follows from the Preamble that the Parties are determined to enhance international co-operation in assessing environmental impact in particular in a transboundary context. They are also affirming the need to ensure environmentally sound and sustainable development.[258]

Geographical Scope: The geographical scope of the Espoo Convention is the UNECE region, which covers Europe and parts of North America and Central and Western Asia.

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[254] http://www.iassa.org/

[255] The United Nations Economic Commission for Europe (UNECE) is one of the five regional commissions of the United Nations. It is the forum where the countries of western, central and eastern Europe, central Asia and North America – 56 countries in all – come together to forge the tools of their economic cooperation. That cooperation concerns such areas as economic cooperation and integration, energy, environment, human settlements, population, statistics, timber, trade, and transport. See: http://www.unece.org/programs/programs.htm

[256] http://www.unece.org/env/eia/

[257] http://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-4&chapter=27&lang=en

[258] The Espoo Convention, Preamble.

Functional Scope: The Convention sets out an obligation to assess the environmental impacts at an early stage of planning and before decisions are made.[259] Parties are required to take all appropriate and effective measures to prevent, reduce and control significant adverse transboundary environmental impact from proposed activities.[260] Parties to the Convention must have a system for EIAs and have to carry out an EIA before the decision is taken to authorize or undertake proposed activities listed in Appendix 1 that are likely to cause significant adverse transbounday impact. These are mostly land-based, with a few exceptions, such as oil and gas pipelines, "trading ports, offshore hydrocarbon production" and storage facilities for petroleum, petrochemical and chemical products". Affected Parties shall be notified of a proposed activity listed in Appendix I. The duty to notify the affected Parties applies however, only to activities that are likely to cause a significant adverse transboundary impact.[261] The Parties are required to establish an EIA procedure that permits public participation and preparation of EIA documentation as described in Appendix II.

The Parties to the Convention adopted 21 May 2003 a Protocol on Strategic Environmental Assessments (SEA) that entered into force 11 July 2010 and has 20 Parties.[262] Of the Arctic states, Norway, Finland and Sweden have ratified it, whereas Denmark has signed the Protocol.[263] The protocol requires that SEAs should be carried out for plans and programs that set the framework for future development consent of projects listed in Annex 1 and Annex 2 to the Protocol although an SEA shall be carried out for Annex 2 projects only if they require an environmental impact assessment under national legislation. .

Reporting/enforcement measures: The Convention has an implementation Committee[264], which is responsible for the review of compliance by the Parties with their obligations under the Convention, with a view to assisting them to fully meet their commitments. An amendment to the Convention not yet in force provides that the Parties shall review compliance with the provisions of this Convention on the basis of the compliance procedure, as a non-adversarial and assistance-oriented procedure adopted by the Meeting of the Parties. The compliance procedure shall be available for application to any protocol adopted under this Convention[265]

4.8.3. Guidelines for Environmental Impact Assessment (EIA) in the Arctic

The Guidelines for Environmental Impact Assessment in the Arctic were adopted in the ministerial meeting under the Arctic Environmental Protection Strategy in Alta in 1997.[266] The Guidelines are not legally binding, but provide guidance on how EIAs should be carried out in the Arctic while paying attention to the special conditions and environment of the region.

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[259] http://www.unece.org/env/eia/eia.htm

[260] The Espoo Convention Article 2.

[261] The Espoo Convention Article 2.

[262] http://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-4-b&chapter=27&lang=en

[263] http://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-4-b&chapter=27&lang=en

[264] Established by decision of the Meeting of the Parties, revised as decision III/2

[265] Article 14bis of the Convention

[266] http://ceq.hss.doe.gov/nepa/eiaguide.pdf

4.9 Bilateral and trilateral cooperation

Bilateral cooperation falls beyond the scope of the Arctic Ocean Review. It is nevertheless a very important element of international cooperation in the Arctic. A number of the issues related to the Arctic marine environment discussed here are transboundary in the sense that they appear in the marine environment of more that one state. In such cases bilateral cooperation plays an important role in addressing an issue area. Another reason for their importance is that they in many cases are critical elements in implementing multilateral agreements. Several hundred bilateral agreements are relevant to the Arctic marine environment.

The importance of bilateral cooperation – the case of Northeast Atlantic fisheries

Following the developments in the law of the sea and the extension of coastal state jurisdiction in the 1970s, many previously international fishing areas became subject to national jurisdiction. Fisheries that had earlier been managed by regional fisheries commissions now came under the jurisdiction of one coastal state or became shared between two states. This resulted in the establishment of a large number of mostly bilateral arrangements between the states in the region to manage shared fish stocks.

The most important fish resources in the Barents Sea, for instance, are shared between Norway and the Russian Federation. In 1975 the two countries set up the Joint Norway-Russian Federation Fisheries Commission, which as been operative since then. The Commission manages shared stocks of cod, haddock, capelin and Greenland halibut, while quotas of a number of other species are exchanged. In addition to quotas, the commission also decides on technical regulations. The commission also deals with matters relating to enforcement of fisheries regulations. A certain percentage of the total allowable catches are set aside for third countries, who get access to fish quotas in the Barents Sea in exchange for quotas to Norway and the Russian Federation in their waters. Norway has such bilateral quota exchanges with the EU,[1] the Faroe Islands, Iceland, and Greenland.

The Joint Norway-Russian Federation Fisheries Commission has requested ICES to assess fish stocks in the Arctic Ocean and potential changes in migratory patterns.

Similarly, Iceland, the Faroe Islands and Greenland have bilateral agreements for the exchange of fishing opportunities and mutual cooperation on fisheries matters.

The bulk of the fisheries in the sub-Arctic part of the Northeast Atlantic is under management by such bilateral arrangements, because the fish resources span vast areas and therefore are shared between two (and in some instances three) countries. The regional fisheries arrangements between coastal states accounted under Section 4.4 are important for pelagic species (herring, mackerel, blue whiting) that spans even wider areas, while the Northeast Atlantic Fisheries Commission manages the high seas portion of the stocks.

5. Integrated oceans management[267]

5.1 Introduction

Population growth and technological advances drive an increasing demand for the ecosystem services of the oceans. This brings increasing pressure on the marine environment, such as overexploitation of living marine resources and pollution. Also, climate variability and change is an important factor in the marine environment. With increasing pressures on marine ecosystems, different uses of the oceans may be increasingly difficult to reconcile. Managing these increasing numbers of demands is critical to the protection of the marine environment and the long-term sustainability of the oceans.

The changing nature of oceans can be witnessed also in the Arctic. Although Arctic marine ecosystems in general are healthy, the increasing pressures raise concerns. The Arctic countries have in the 2004 Arctic Marine Strategic Plan identified the ecosystem-based approach to oceans management as a critical measure in confronting these challenges and as a means to achieve the following 4 strategic goals:

1. Reduce and prevent pollution in the Arctic marine environment
2. Conserve Arctic marine biodiversity and ecosystem functions
3. Promote the health and prosperity of all Arctic inhabitants; and,
4. Advance sustainable Arctic resource use.

The purpose of this chapter is to survey the international practices that have been developed over the last decades for integrated oceans management. Numerous international agreements commit states to the introduction of ecosystem-based oceans management. This has since been followed up by many countries as well as other entities, in developing and implementing plans for integrated oceans management, including ecosystem-based management. The Arctic countries have undertaken important work in this regard, and several of them have implemented or are in the process of implementing an ecosystem-based approach to oceans management in one form or another.

5.2 Integrated/ecosystem-based/ecosystem approach to oceans management

The concepts of "integrated oceans management", "ecosystem-based oceans management" and "ecosystem approach to oceans management" are all used in the international debate and are used interchangeably in this report.

A common definition of ecosystem-based management is:

> *"Ecosystem-based management is an integrated approach to management that considers the entire ecosystem, including humans. The goal of ecosystem-based management is to maintain an ecosystem in a healthy, productive and resilient condition so that it can provide the services humans want and need. Ecosystem-based management differs from current approaches that usually focus on a single species, sector, activity or concern; it*

[267] For the purpose of this report, the terms "Integrated oceans management" "ecosystem-based oceans management" and "ecosystem approach to oceans management" are used interchangeably.

considers the cumulative impacts of different sectors. Specifically, ecosystem-based management:

- ü *emphasizes the protection of ecosystem structure, functioning, and key processes;*
- ü *is place-based in focusing on a specific ecosystem and the range of activities affecting it;*
- ü *explicitly accounts for the interconnectedness within systems, recognizing the importance of interactions between many target species or key services and other non-target species;*
- ü *acknowledges interconnectedness among systems, such as between air, land and sea; and*
- ü *integrates ecological, social, economic, and institutional perspectives, recognizing their strong interdependences."*[268]

5.3 Global practices

A number of the instruments and measures reviewed here address integrated/ecosystem-based/ecosystem approach to oceans management.

5.3.1 The Law of the Sea

At a fundamental level, the United Nations Convention on the Law of the Sea in its preamble states that "…the problems of ocean space are closely interrelated and need to be considered as a whole." Also, the UN Fish Stocks Agreements addresses an ecosystem-based approach, as well as the precautionary approach, to the management of living marine resources, cfr chapter 3 in this report.[269]

5.3.2 The Convention on Biological Diversity

The ecosystem approach is considered as the overarching framework for the implementation of the objectives of the United Nations Convention on Biological Diversity (CBD). The *Malawi principles, adopted in 1998 identify* 12 principles/characteristics of an ecosystem-approach to biodiversity management.[270]

1. Management objectives are a matter of societal choice.
2. Management should be decentralized to the lowest appropriate level.
3. Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.
4. Recognizing potential gains from management there is a need to understand the ecosystem in an economic context. Any ecosystem management program should (a) reduce those market distortions that adversely affect biological diversity; (b) align incentives to promote sustainable use; (c) internalize costs and benefits in the given ecosystem to the extent feasible.

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[268] Scientific Consensus Statement on Marine Ecosystem-Based Management, 21 March 2005. Available at: http://compassonline.org/pdf_files/EBM_Consensus_Statement_v12.pdf

[269] Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UNFSA), article 5.e.

[270] http://www.cbd.int/doc/meetings/cop/cop-04/information/cop-04-inf-09-en.pdf

5. A key feature of the ecosystem approach includes conservation of ecosystem structure and functioning.
6. Ecosystems must be managed within the limits to their functioning.
7. The ecosystem approach should be undertaken at the appropriate scale.
8. Recognizing the varying temporal scales and lag effects which characterize ecosystem processes, objectives for ecosystem management should be set for the long term.
9. Management must recognize that change is inevitable.
10. The ecosystem approach should seek the appropriate balance between conservation and use of biological diversity.
11. The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.
12. The ecosystem approach should involve all relevant sectors of society and scientific disciplines.

5.3.3 Agenda 21

Chapter 17 of the 1992 *Agenda 21*, states that "the marine environment - including the oceans and all seas and adjacent coastal areas - forms an integrated whole…".[271] It specifically addresses integrated oceans management through a programme area on "Integrated management and sustainable development of coastal and marine areas, including exclusive economic zones", it states that it is necessary to "Provide for an integrated policy and decision-making process, including all involved sectors, to promote compatibility and a balance of uses" in order to meet the objective of integrated management and sustainable development of coastal areas and the marine environment. A number of management related activities are listed, as are issues relating to data and information and international cooperation.

Agenda 21 also addresses "critical uncertainties for the management of the marine environment and climate change", stating the necessity of promoting scientific research, exchange of data, and scientific cooperation to meeting the objective of improving the understanding of the marine environment and its role on global processes..

5.3.4 World Summit on Sustainable Development

The 2002 *World Summit on Sustainable Development* (WSSD) adopted a Johannesburg Joint Plan of Implementation.[272] The plan states that:

"Oceans, seas, islands and coastal areas form an integrated and essential component of the Earth's ecosystem and are critical for global food security and for sustaining economic prosperity and the well-being of many national economies…." In relation to ecosystem-based oceans management , the plan of implementation states that ensuring the sustainable development of the oceans requires effective coordination and cooperation between relevant bodies, and actions at all levels to "*Encourage the application by 2010 of the ecosystem approach...", noting the* Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem and decision V/6 of the Conference of Parties to the Convention on Biological Diversity and to "*Promote* integrated, multidisciplinary and multisectoral coastal and ocean management at the national level..".

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[271] http://www.un.org/esa/dsd/agenda21/res_agenda21_00.shtml

[272] http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/POIToc.htm

5.3.5 UN General Assembly

The UN General Assembly included in its 2006 Resolution on Oceans and the Law of the Sea a paragraph related to ecosystem-based oceans management[273], based on "agreed consensual elements" relating to ecosystem approaches and oceans[274] developed by the Consultative Process earlier that year. These agreed consensual elements include a listing of elements that an ecosystem approach to oceans management should include, as well as requirements to improve the application of an ecosystem approach.[275] This paragraph has been reaffirmed every year since 2006, cf. paragraph 134 of the 2010 resolution.

Noting that "there is no universally agreed definition of an ecosystem approach, which is interpreted differently in different contexts" the agreed consensual elements proposed that an ecosystem approach should, inter alia:

(a). Emphasize conservation of ecosystem structures and their functioning and key processes in order to maintain ecosystem goods and services;

(b). Be applied within geographically specific areas based on ecological criteria;

(c). Emphasize the interactions between human activities and the ecosystem and among the components of the ecosystem and among ecosystems;

(d). Take into account factors originating outside the boundaries of the defined management area that may influence marine ecosystems in the management area;

(e). Strive to balance diverse societal objectives;

(f). Be inclusive, with stakeholder and local communities' participation in planning, implementation and management;

(g). Be based on best available knowledge, including traditional, indigenous and scientific information and be adaptable to new knowledge and experience;

(h). Assess risks and apply the precautionary approach;

(i). Use integrated decision-making processes and management related to multiple activities and sectors;

(j). Seek to restore degraded marine ecosystems where possible;

(k). Assess the cumulative impacts of multiple human activities on marine ecosystems;

(l). Take into account ecological, social, cultural, economic, legal and technical perspectives;

(m). Seek the appropriate balance between, and integration of, conservation and sustainable use of marine biological diversity; and

(n). Seek to minimize adverse impacts of human activities on marine ecosystems and biodiversity, in particular rare and fragile marine ecosystems.

It was also suggested that the implementation of an ecosystem approach could be achieved through, inter alia:

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[273] A/RES/61/222, http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N06/507/69/PDF/N0650769.pdf?OpenElement

[274] [274] A/RES/61/222, para 119.

[275] A/61/156 Report of the work of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea at its seventh meeting. http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N06/432/90/PDF/N0643290.pdf?OpenElement

(a) Its inclusion in the development of national policies and plans;

(b) Encouraging and supporting marine scientific research, in areas within and beyond national jurisdiction, in accordance with international law;

(c) Understanding, through increased research, the impacts of changing climate on the health of marine ecosystems, and developing management strategies to maintain and improve the natural resilience of marine ecosystems to climate variations;

(d) Understanding, through increased research, the impacts of underwater noise on marine ecosystems and taking into account those impacts;

(e) Where appropriate, strengthening regional fisheries management organizations, adapting their mandates and modernizing their operations in accordance with international law;

(f) Strengthened and improved coordination and cooperation within, and, in accordance with international law, between and among States, intergovernmental organizations, regional scientific research and advisory organizations and management bodies;

(g) Effective and full implementation of the mandate of existing multilateral organizations, including those established under the Law of the Sea Convention;

(h) Application of the Rio Principles and the use of a broad range of management tools for the conservation and sustainable use of marine biodiversity, including sector specific and integrated area-based management tools on a case-by- case basis, based on the best available scientific advice and the application of the precautionary approach and consistent with international law;

(i) Identifying and engaging stakeholders to promote cooperation;

(j) Sectoral approaches and integrated management and planning on a variety of levels, including across boundaries, in accordance with international law;

(k) Effective integrated management across sectors;

(l) Advancement of the Plan of Implementation of the World Summit on Sustainable Development, including, inter alia, the elimination of destructive fishing practices, the establishment of marine-protected areas consistent with international law and based on scientific information, including representative networks by 2012 and time/area closures for the protection of nursery grounds and periods, proper coastal land use and watershed planning and the integration of marine and coastal areas management into key sectors; and

(m) Conducting, in accordance with national legislation and international law, assessments in relation to marine activities likely to have a significant impact on the environment.

It was proposed that the improved application of an ecosystem approach will require, inter alia:

(a) Capacity-building through technology, knowledge and skills transfer, particularly to developing countries, including small island developing States and coastal African States, as well as exchange of information, data and lessons learned, and capacity-building in support of science, information management and exchange, monitoring, control and surveillance, assessment and reporting as well as through public outreach and education;

(b) Steps in the development of an ecosystem approach include identification of ecologically based management areas; assessment of ecosystem health; development of indicators; identification of the key environmental limits; monitoring, control, surveillance and reporting and adjustment of management measures, as appropriate;

(c) Monitoring the state of ecosystems supported by the use of data collection systems, analysis, and modelling to inform future management approaches;

(d) Addressing activities and pressures that lead to adverse impacts on marine ecosystems, including land-based pollution, overfishing, illegal, unreported and unregulated fishing, by-catch of threatened species, sea-based pollution, dumping, physical destruction and degradation of habitats, and introduction of invasive species;

(e) An iterative development of an ecosystem approach with an emphasis on integrated management of human uses of the oceans, which could be achieved, inter alia, through the strengthening of cooperation and collaboration among existing instruments, bodies and scientific research and advisory organizations;

(f) Targeted action to address root causes of activities that can undermine the conservation and integrity of marine ecosystems;

(g) Filling critical knowledge gaps and addressing uncertainty;

(h) Developing, raising and sustaining public awareness and institutional and political will;

(i) Improved cooperation and collaboration among international organizations, including better linkages between regional fisheries management and marine-related organizations and by encouraging all States whose vessels participate in a fishery regulated by a regional fisheries management organization or arrangement to cooperate by becoming Parties of such organization or participants in such arrangement, and, to this end, establishing mechanisms to promote non-member participation;

(j) Developing mechanisms to monitor and review ecosystem health and management effectiveness;

(k) Dissemination of information to the public on activities that negatively affect ecosystems and the ocean environment and their associated products;

(l) Improving, as appropriate, legal and policy frameworks to support and facilitate the application of the precautionary approach and ecosystem approaches; and

(m) Compilation of scientific and ecological criteria, inter alia, for the identification of marine-protected areas.

In its annual resolutions on Oceans and the Law of the Sea, the United Nations General Assembly has also, since 2006, repeatedly noted ecosystem-based oceans management and encourages competent organizations and bodies that have not yet done so to incorporate an ecosystem approach into their mandates, as appropriate, in order to address impacts on marine ecosystems.[276]

5.3.6 Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem

The 2001 *Reykjavik Declaration* on Responsible Fisheries in the Marine Ecosystem[277], developed under the auspices of the United Nations Food and Agriculture Organization (FAO), addresses ecosystem considerations in the management of living marine resources. The Reykjavik Declaration has since been followed up by the development of FAO guidelines on the ecosystem approach to fisheries[278] and the 2006 Bergen Conference on Implementing

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[276] See, for example, Resolution 64/71 from 2009 on Oceans and the Law of the Sea, para. 134. http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N09/466/09/PDF/N0946609.pdf?OpenElement

[277] ftp://ftp.fao.org/fi/DOCUMENT/reykjavik/y2198t00_dec.pdf

[278] http://www.fao.org/docrep/009/a0191e/a0191e00.htm

the Ecosystem Approach to Fisheries which resulted in a report summarizing the main trends in the current debate on ecosystem approach to fisheries.

5.4 Regional applications of Integrated Oceans Management

5.4.1 Introduction

Regional applications of integrated oceans management are found in many regions of the world. In the Arctic, the Arctic Council Arctic Marine Strategic Plan[279], adopted in 2004, advocates an ecosystem approach to oceans management. Building on this, the "Best Practices in Ecosystems Based Oceans Management Project" addressed what could be regarded as best practices in that regard, based on the experiences of the Arctic countries. A set of "Observed Best Practices for Ecosystems Based Oceans Management in the Arctic"[280] were endorsed by the Arctic Council at the ministerial meeting in Tromsø in April 2009.[281]

Beyond the Arctic, the cooperation under the OSPAR Convention in the North Atlantic and European Union Marine Strategy Framework Directive (adopted in June 2008) also have an application in parts of the Arctic marine environment.

5.4.2 Arctic Council applications

Many Arctic communities and settlements are based on the sustainable use of natural resources, and see themselves as integrated parts of these ecosystems. The importance of the non-renewable resources is growing, and offshore petroleum developments are expanding to new areas of the Arctic. Likewise, tourism is growing in importance and with it the cruise-ship traffic. Other economic developments include expansion of mining, bioprospecting, aquaculture, and marine transportation. At the same time, climate change, increased pollution and other human-induced pressures brings unprecedented rates of change in marine ecosystems.

The aggregate effects of these multiple pressures on the oceans call for an ecosystem-based and integrated approach to oceans management. This is critical to the protection and sustainable use of marine ecosystems and the natural resources there. To aid in this process, the Arctic Marine Strategic Plan, which describes the ecosystem approach and calls for its application, was adopted by the Arctic Council in November 2004.[282] The plan calls for ecosystem-based oceans management in the Arctic, defined as an activity that is "… coordinated in a way that minimizes their impact on the environment and integrates thinking across environmental, socio-economic, political and sectoral realms".[283]

The Arctic Council has emphasized the importance of an ecosystem-based approach to oceans management in several statements and declarations. Also, a number of other projects under the Arctic Council are relevant to integrated oceans management. Under the Protection of the Arctic Marine Environment (PAME) Working Group an ecosystem project[284] addressing

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[279] http://www.pame.is/arctic-marine-strategic-plan

[280] Available at the Web site of the Sustainable Development Working Group: http://portal.sdwg.org/content.php?doc=75

[281] Tromsø Ministerial Declaration page 5, accessible at: http://arctic-council.org/filearchive/Tromsoe%20Declaration-1..pdf

[282] Available at: http://www.pame.is/arctic-marine-strategic-plan

[283] 2004 Arctic Marine Strategic Plan, p 8.

[284] http://www.pame.is/ecosystem-approach

Large Marine Ecosystems LMEs) was developed in 2006 with the goal of developing and maintaining a working map of the 17 identified Arctic LMEs.

The Best Practices in Ecosystems Based Oceans Management Project

The objective of the Best Practices in Ecosystem-based Oceans Management in the Arctic (BePOMAr) Project is to present the concepts and practices the Arctic countries have developed for the application of an ecosystem-based approach to oceans management. By reviewing how countries actually put such concepts and practices to use, lessons could be drawn on how to effectively do ecosystems-based oceans management.

The project considered how countries defined ecosystems-based oceans management, the types of objectives that are formulated, the choice of policy instruments and organization of the work. An important aspect of the practices considered is that they address use as well as conservation and protection of marine ecosystems.

Important elements include the *process aspects* of interagency cooperation and the organization of that, the organization and use of science, and stake- holder involvement, as well as the actual *content* of ecosystems-based oceans management, such as institutions for ecosystems-based oceans management, legislation and policy tools, geographical approaches, including LMEs, and biodiversity considerations.

The project was built around 7 case studies of how countries develop and implement ecosystems-based oceans management in the Arctic: the Russian Federation, Finland, Norway, Iceland, Greenland, Canada and the USA. An additional case study presents an indigenous perspective on these issues.

These case studies represent a very diverse set of practices for ecosystems-based oceans management. For one thing, they vary in geographical scope. The countries also are very diverse with respect to administrative traditions and cultures. Also, the types of ecosystems included in this study range from boreal in the Atlantic to Arctic. Moreover, the challenges countries face with regard to ecosystems- based oceans management vary considerably, with some primarily being concerned with fisheries, while other consider how to reconcile the concerns of fisheries, petroleum and the protection of the marine environment.

All Arctic countries face the reality of their marine ecosystems being to some extent shared with other countries. The application of ecosystem-based approaches to oceans management may therefore raise transboundary issues. A large number of bilateral and regional agreements address such issues, mostly on a sectoral basis as the case is in relation to for example fisheries.

The Best Practices in Ecosystem-based Oceans Management project, carried out by the Arctic Council working groups on Sustainable Development and Protection of the Arctic Marine Environment, has observed a number of Best Practices in this regard. These practices have proved useful and may be relevant also to other Arctic countries as well as in the world beyond, in order to provide for sustainable development and protection of the marine environment.

The *"Observed Best Principles"* makes a distinction between "core elements" found in most cases of ecosystem-based oceans management, and "conclusions" which are lessons to be learnt.

Core elements: Although definitions may differ, some core elements are essential to ecosystems based oceans management:

ü The geographical scope of ecosystems defined by ecological criteria.

- ü The development of scientific understanding of systems and of the relationship between human actions and changes in other system components.
- ü The application of the best available scientific and other knowledge to understand ecosystem interactions and manage human activities accordingly.
- ü An integrated and multidisciplinary approach to management that takes into account the entire ecosystem, including humans.
- ü Area-based management and use of scientific and other information on ecosystem changes to continually adapt management of human activities.
- ü The assessment of cumulative impacts of different sectors on the eco-system, instead of single species, sectoral approaches.
- ü A comprehensive framework with explicit conservation standards, targets and indicators in order to facilitate responses to changes in the eco-system
- ü Transboundary arrangements for resolution and handling of transboundary ecosystems and issues.

Conclusions: In reviewing the practices countries have established in developing and implementing ecosystem-based oceans management, the following elements were found to be useful: 1) flexible application, 2) integrated and science based decision-making, 3) commitment to ecosystem-based oceans management, 4) area-based approaches and transboundary perspectives 5) stakeholder participation, and 6) adaptive management. This entails, inter alia, the following:

Flexible application of effective ecosystem-based oceans management concerns the need to take differences in circumstances and contexts into consideration. Also, ecosystem-based management is a work in progress and should be considered a process rather than an end state. Management must be based on best available science.

Decision-making must be integrated and science based: Increased communication and exchanges among both states and sectors are also key components of successful ecosystem-based management. A great deal of scientific knowledge already exists. However, much of this information needs to be better synthesized and communicated to a variety of audiences. Cooperation in science and exchange of relevant information within and between countries is important for understanding the cumulative impacts to the marine environment.

National commitment is required for effective management: A "roadmap", management plan or national action plan for addressing priorities in oceans management is developed in many of the Arctic countries. An integrated organizational structure (framework) to support the co- ordination of a holistic approach to the implementation of EBM at the national level through inter-agency cooperation seems to be effective.

Area-based approaches and transboundary perspectives are central to ecosystem-based management. The identification of management units within ecosystems should be based on ecological criteria. Issues of scale can be addressed viewing ecosystems as nested systems. Increased international cooperation in shared ecosystems could be addressed through existing regional management bodies and, as necessary, new collaborative efforts focused on individual ecosystems. Effective area-based approaches include mechanisms for addressing effects of land-based activities and atmospheric deposition on ocean ecosystems.

Stakeholder and Arctic resident participation is important to build understanding and foster development of knowledge.

Adaptive management is critical requiring management strategies that reflect changing circumstances. This is especially important in view of the accelerating effects of climate change on marine ecosystems. Implementation of ecosystem-based management should be approached incrementally.

5.4.3 OSPAR applications

The work under the OSPAR Convention *for the Protection of the Marine Environment of the North-East Atlantic* (cfr chapter 4 above) applies to the Nordic Parties of the Arctic Council. The convention covers all sources of marine pollution, as well as all human activities with the exception of fishing.[285]

In 2003 OSPAR and HELCOM adopted a adopted the Statement towards an Ecosystem Approach to the Management of Human Activities, addressing the application of the ecosystem approach in the Northeast Atlantic and the Baltic. At its meeting in 2010, the OSPAR Commission adopted a North-East Atlantic Environment Strategy, where the Ecosystem Approach was highlighted as an "overarching principle in OSPAR's work in order to achieve sustainable use of ecosystem goods and services and to safeguard ecosystem integrity."[286] The OSPAR Commission will implement the Ecosystem Approach through a continuous cycle of steps of (i) setting and coordinating ecological objectives and associated targets and indicators, (ii) ongoing management, and (iii) regular update of ecosystem knowledge, research and advice.

5.4.4 European Union Marine Strategy Framework Directive

The European Union in 2008 adopted Directive 2008/56/EC establishing a Framework for Community Action in the field of Marine Environmental Policy (Marine Strategy Framework Directive).[287] The Directive aims for achieving "good environmental status in the marine environment within the Community´s jurisdiction. This is to be achieved by applying an ecosystem approach. Marine strategies shall apply an ecosystem-based approach to the management of human activities, ensuring that the collective pressure of such activities is kept within levels compatible with the achievement of good environmental status and that the capacity of marine ecosystems to respond to human-induced changes is not compromised, while enabling the sustainable use of marine goods and services by present and future generations.[288] To this end the directive specifies a number of actions to be taken.

5.5 Environmental impact assessments/strategic environmental assessment

Environmental impact assessments may be undertaken both for concrete projects and for strategic initiatives like policies, plans and programmes. Provisions on these tools for decision-support can be found in a number of legally binding and non-binding instruments.

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[285] The OSPAR Convention, Preamble.

[286] Strategy of the OSPAR Commission for the Protection of the Marine Environment of the North-East Atlantic 2010–2020, at: http://www.ospar.org/welcome.asp?menu=0

[287] Iceland and Norway are not members of the EU, but may be bound by certain EU legislation through the European Economic Area (EEA) Agreement. However, the geographical scope of the EEA Agreement only covers the land territory and the waters within the baselines, and neither Iceland nor Norway have chosen to incorporate the Marine Strategy Framework Directive.

[288] Marine strategy directive, article 1.3.

The Law of the Sea Convention[289] establishes a general duty to assess, as far as practicable, the potential effects of future planned activities that may cause significant and harmful effects to the marine environment. This is a general, unqualified requirement that could apply both to strategic developments and projects. The duty applies both to areas within and beyond national jurisdiction.

Article 14 of the CBD obliges parties as far as possible and as appropriate to introduce appropriate procedures for environmental impact assessment (EIA) of proposed projects and a Strategic Environmental Assessment (SEA) of programmes and policies that are likely to have a significant adverse effect on biodiversity. This has been supplemented by guidelines for how biodiversity can be incorporated into environmental assessments.

The Marine and Coastal Decision (X/20) adopted at the Tenth Meeting of the Conference of Parties to the CBD in October 2010, requests the Executive Secretary of the CBD to facilitate the development of voluntary guidelines for the consideration of biodiversity in environmental impact assessments (EIAs) and strategic environmental assessments (SEAs) in marine and coastal areas using the guidance in annexes II, III and IV to the Manila workshop report (UNEP/CBD/SBSTTA/14/INF/5), provide for technical peer review of those guidelines, and submit them for consideration to a future meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) prior to the eleventh meeting of the Conference of the Parties, *recognizing* that these guidelines would be most useful for activities that are currently unregulated with no process of assessing impacts.

A number of other conventions have provisions obliging states parties to conduct environmental assessments before undertaking certain actions or projects. Certain non-binding instruments also address impact assessments, including the Arctic Council's 2009 Oil and Gas Guidelines, and the FAO Deep Sea Fisheries Guidelines.

The instruments mentioned above are not specific in describing what the obligation implies. There is an international literature on this, including documentation of states' legislation and practices, and the 1987 UNEP "Goals and principles of EIA" and Arctic Council's guidelines on the subject.[290]

The Espoo convention including its protocol on SEA is the only specialized convention on environmental assessments that applies to the Arctic.[291] For the Espoo-Parties, these detailed procedures thus should be followed in situations where LOSC or CBD establish a duty to assess. The Espoo Convention is however of limited use when it comes to the Arctic marine area as several Arctic states are not parties to the Espoo convention and its protocol on SEA.[292]

Furthermore, the Espoo convention only applies to situations where activities in one country may affect areas under the jurisdiction of other countries. That excludes the duty to assess effects on high seas or the deep seabed ("the Area"), and also developments that only affect the origin state's own territory or maritime zones. Finally, the activities that are listed as

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[289] Article 206

[290] These can be found both in the separate 1997 EIA guidelines and in the 2009 Oil- and gas guidelines that also includes SEA.

[291] The 1991 Madrid Protocol on Environmental Protection to the Antarctic Treaty and its Annex I also contain detailed provisions on conducting environmental impact assessments.. It has a number of provisions that are relevant for discussions of procedural obligations in vulnerable (polar) areas and international spaces.

[292] The US is neither a party to LOSC and CBD, meaning that the state neither is under the international obligation according to these instruments to conduct EIA or SEA.

requiring prior assessment include few of the relevant marine developments apart from petroleum.

Chapter 6 Next Steps: Phase II of the Arctic Ocean Review Project

The overall objective of the AOR is to provide guidance to Arctic Council Ministers as a means to strengthen governance in the Arctic through a cooperative, coordinated, and integrated approach to the management of Arctic marine environment. The AOR will also play an important role in demonstrating Arctic States' stewardship efforts for the conservation and sustainable use of the Arctic marine environment.

The Phase II (2011 – 2013) of the Arctic Ocean Review project will analyze the information collected in Phase I with an emphasis on areas where the Arctic Council can effectively add value to the existing mechanisms of governance for the Arctic marine environment. As a first step consultants will be approached to prepare theme-based papers which will contain an analysis of the information contained in phase I. Theme-based workshops will be arranged, as necessary. These theme-based papers, in addition to the Phase I report will form the basis for an international AOR conference with the aim to further discuss options and opportunities to strengthen existing instruments and measures.

The AOR Phase II report will be based on the outcomes of the AOR Phase I report, the theme-based papers and the results of the outcome of the international conference. It will follow-up on the information collected in Phase I by analyzing potential opportunities in global and regional measures in place, including Arctic Council activities, and outline options to address these opportunities and produce recommendations to improve current mechanisms for the conservation and sustainable use of the Arctic marine environment.

The main AOR Phase II Objectives are:

- ü Take into account major new developments;
- ü Analyze potential opportunities in global and regional instruments and measures to achieving environmental, economic and socio-cultural outcomes;
- ü Outline options to address potential opportunities to strengthen the conservation and sustainable use of the Arctic marine environment; and,
- ü Produce a final AOR Report to Arctic Council Ministers that will: summarize opportunities to strengthen global and regional instruments and measures for management of the Arctic marine environment; outline options to address these opportunities; and, make agreed recommendations to help ensure a healthy and productive Arctic marine environment in light of current and emerging trends.