Agenda item 4.4 – Arctic Ocean Review Project-version 19th of February 2013
AC-SAO-MAR13-4.4
SAO meeting March 2013

The Arctic Ocean Review Project
PHASE II REPORT
2011-2013

Consolidated version of the AOR Report as of 19th February 2013

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PAME

Protection of the Arctic Marine Environment Working Group

Citation

This publication may be cited as:
PAME, The Arctic Ocean Review Project, Phase II Report, 2011-2013 (Ottawa 2013)
Other Press and Author information

Acknowledgement of Lead Countries: Canada, Iceland, Norway, United States and the Russian Federation.

Acknowledgement of Funding and Support

We gratefully acknowledge the financial support provided to this project from the _____ and _____. Furthermore, both financial and in-kind support was provided by the lead countries. We would also extend our thanks to all PAME countries, other Arctic Council Working Groups and Permanent Participants to the Arctic Council for their support and contributions in this work.

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Guide to Acronyms and Abbreviations

ABA Arctic Biodiversity Assessment

ACAP Arctic Contaminants Action Program

ACAP Agreement on the Conservation of Albatrosses and Petrels

ACIA Arctic Climate Impact Assessment

AEPS Arctic Environmental Protection Strategy

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

ARHC Arctic Regional Hydrographic Commission

BePOMAr Best Practices in Ecosystem-based Oceans Management in the Arctic

BAT Best Available Technology

BEP Best Environmental Practices

BFR Brominated Flame Retardants

BONN Bonn Agreement for Co-operation in Dealing with Pollution of the North Sea by Oil

BWMC International Convention for the Control and Management of Ships' Ballast Water and Sediments

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

EA Ecosystem Approach

EBM Ecosystem-based Management (EBM is also used in this Report as shorthand for both EBM and EA)

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

GOOS Global Ocean Observing System

HBCD Hexabromocyclododecane

HELCOM Helsinki Commission

HNS Protocol - Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances,

IADC International Association of Drilling Contractors

IALA International Association of Marine Aids to Navigation and Lighthouse Authorities

IASC International Arctic Science Committee

IASSA International Arctic Sciences Association

ICES International Council for the Exploration of the Sea

IHO International Hydrographic Organization

IMO International Maritime Organization

InterAct International Network for Terrestrial Research and Monitoring in the Arctic

IOC Intergovernmental Oceanographic Commission

IPY International Polar Year

IRF International Regulators Forum

ISAC International Study of Arctic Change

ISO International Organization for Standardization

IUCN International Union for Conservation of Nature

IWC Convention for the Regulation of Whaling

JAMP Joint Assessment and Monitoring Programme (OSPAR)

LOS Law of the Sea (UN Convention on the Law of the Sea)

LRTAP Convention on Long-range Transboundary Air Pollution

LME Large Marine Ecosystem

MARPOL International Convention for the Prevention of Pollution from Ships

MEA Multilateral Environmental Agreement

MEPC Marine Environmental Protection Committee of the IMO

MODU Mobile Offshore Drilling Unit

MOPPR Arctic Marine Oil Spill Preparedness and Response Agreement

MOU Memorandum of Understanding

MSR Marine Scientific Research

NAFO Northwest Atlantic Fisheries Organization

NASCO North Atlantic Salmon Conservation Organization

NEAFC Northeast Atlantic Fisheries Commission

NAMMCO Agreement on Cooperation in Research, Conservation and Management of Marine Mammals in the North Atlantic

NAO North Atlantic Oscillation

NPAFC North Pacific Anadromous Fish Commission

OECD Organisation for Economic Co-operation and Development

OGP Oil and Gas Producers Association

OIC Offshore Industry Committee (OSPAR)

OIS Offshore Industry Strategy (OSPAR)

OPRC International Convention on Oil Preparedness, Response and Cooperation

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

PAG Pacific Arctic Group

PAME Protection of the Arctic Marine Environment

PBDE Polybrominated Diphenyl Ethers

PBSG Polar Bear Specialist Group

PCN Polychlorinated Naphthalenes

PDA Pacific Decadal Oscilliation

PFO Perfluorocarboxylate

PFCA Perfluorooctane Sulfonate

PICES North Pacific Marine Science Organization

POLREP Pollution Reporting System

POP Persistent Organic Contaminants/Pollutants

RAMSAR Convention on Wetlands of International Importance

RFMOs/As Regional Fisheries Management Organizations or Arrangements

ROOS Arctic Regional Ocean Observing System

SAO Senior Arctic Officials

SAON Sustained Arctic Observing Network

SAR Search and Rescue

SEA Strategic Environmental Assessments

SCPAR Standing Committee of Parliamentarians of the Arctic Region

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

UNCED United Nations Conference on Environment and Development

UNCLOS United Nations Convention on the Law of the Sea

UNDRIP United Nations Declaration on the Rights of Indigenous Peoples

UN ECE United Nations Economic Commission for Europe

UNEP United Nations Environment Programme

UNESCO United Nations Educational, Scientific and Cultural Organization

UNFCCC United Nations Framework Convention on Climate Change

UNFSA United Nations Fish Stocks Agreement

WSSD World Summit on Sustainable Development

Executive Summary

[The Executive Summary will be completed after negotiations.]

Chapter 1: Introduction

Revisions here within as of 7th of Dec 2013-Trends as a separate chapter/Section?

1.1 The Context for the Arctic Ocean Review Phase II Report

The Arctic Ocean and its neighboring seas are central to life in the circumpolar north, both geographically and in terms of their importance to human and natural ecosystems. This marine area is the smallest and arguably the most remote of the world's ocean systems but is a vital component in the regulation of global climate and an important source of nutrition, income and cultural identity for Arctic peoples and communities.

The *Arctic Ocean Review* (AOR) is a two phase project initiated by the Arctic Council Ministers in 2009 under the leadership of the PAME working group and anchored in the Arctic Marine Strategic Plan (AMSP), which they adopted in 2004. The AMSP calls for the Arctic Council through its member states and subsidiary bodies to periodically review the status and adequacy of legal and regulatory instruments and standards relevant to the Arctic Ocean (AMSP Strategic Action 7.3.4)(CONFIRM THIS STATEMENT).

The AOR Phase I Report, submitted to Arctic Council Ministers at their meeting in Nuuk, Greenland, in May, 2011, provides the context for the more analytical consideration of instruments contained in this Phase II Report. The Phase I Report contains a compendium of existing Arctic-relevant global and regional measures relating to the Arctic marine environment. Its introductory chapter reviews the AOR background and detailed objectives, the scope and approach of the work, and the dimensions and scope of the AOR project.

The Phase I Report, Chapter 2, discussed some methods of defining Arctic marine areas and provides information on the geography, ocean circulation, sea ice, ecological features, large marine ecosystems (LMEs) and status and trends of the Arctic marine ecosystems. It provided information on the conservation status of Arctic marine mammals and arctic birds. Climate change and variability were examined in the context of climate impacts on the ecosystems as a result of Arctic warming, including ocean acidification and issues relating to the ozone layer and ultraviolet radiation.

In addition, the Phase I Report, Chapter 2, summarized our understanding of Arctic pollution resulting from persistent organic pollutants (POPs), heavy metals and radioactivity and discussed the issue of contaminants and human health. Finally, it reviewed industrial activities and developments, including Arctic marine shipping, Arctic oil and gas development, Arctic fisheries, hunting of Arctic marine mammals and birds, Arctic tourism, important land-based activities affecting the Arctic marine environment, as well as other marine activities.

This current Phase II Report is based upon the broad background and context provided in the Phase I Report. It only updates this information where necessary to better focus the analytical discussions that are the central concern of this concluding phase of the *Arctic Ocean Review* and its treatment of regional and global instruments relevant to the Arctic Ocean. Many such instruments exist, largely uncoordinated with each other. Only a few are designed specifically for the Arctic Ocean. All are implemented in the Arctic by the Arctic States themselves and

by states outside the region whose actions affect the Arctic Ocean. Their effective implementation requires the availability of relevant science and traditional knowledge.

In some cases the relevant instruments are implemented through clusters of regional cooperation that are not centralized in any one entity or program. In other cases, such as shipping, the International Maritime Organization (IMO) regulates this activity globally, including in the Arctic. The Arctic Council, the primary forum for cooperation in the Arctic, addresses many issues relevant to the Arctic Ocean and plays an important role in encouraging implementation of existing global and regional instruments. In neither phase of the AOR Report, however, did PAME's mandate include reviewing national implementation of the instruments, and the topic is not covered here.

1.2 The Structure of the Report

This Phase II Report provides an analysis of some of the key existing instruments identifies a variety of opportunities for further cooperative activities and provides recommendations for consideration by the Arctic Council Ministers.

In light of current and emerging trends and issues, the Phase II Report has been organized by themes and sectors, rather than on the basis of the instruments as presented and compiled in the Phase I Report.

Two organizing principles run through the Phase II Report: the centrality of Arctic Peoples and Cultures, and the importance of ecosystem based approaches, to successfully understand and address change in the Arctic marine environment. Accordingly, Chapter 2 on Peoples and Cultures is the first analytic chapter and Chapter 7 on Ecosystem Based Management is placed near the end, to summarize how EBM can be used to address the sectoral concerns analyzed in the intervening chapters.

Chapter 2 on *Peoples and Cultures* leads off the analytic chapters to emphasize that this Report is premised on promoting the well-being and interests of the approximately four million people, including indigenous peoples, for whom the Arctic is home, and whose interests should be a critical consideration in governance processes relating to the Arctic marine environment. This stage-setting chapter focuses only marginally on international instruments, concentrating instead on small-scale uses of the marine environment, especially related to social and cultural well-being rather than commercial production. The increase in international action on Arctic matters suggests that Arctic communities are more and more likely to be affected one way or another by those actions. The involvement of local communities is paramount in effective responses to environmental change and to the pressures to develop Arctic resources.

Chapter 3 discusses instruments relevant to *Arctic Marine Operations and Shipping*, the primary transportation enablers of many, if not most, activities that occur in Arctic marine areas. Ships and marine craft are vital ingredients for private, scientific and commercial transport, including fishing, oil and gas exploration and development, mining development, tourism and many other marine activities.

Chapters 4 through 6 examine instruments relating to specific sectors that appear most likely to experience growing levels of interest and activity in the immediate future, namely, *Living Marine Resources*, *Arctic Offshore Oil and Gas*, and *Pollution*. Chapter 4 is the longest sectoral chapter, with three separate sections on Fisheries, Cetaceans and, lastly, other marine mammals (e.g. seal, walrus, polar bear) and seabirds.

Chapter 7 explores *Ecosystem-Based Management* (EBM), also known as the ecosystem approach to management (the Report uses EBM as shorthand for both terms). EBM provides a conceptual framework for "cooperative, coordinated, and integrated approaches" to the Arctic marine environment, as called for by Arctic Council Ministers(REQUIRES FOOTNOTE). As Chapter 7 details, EBM is grounded in international instruments and is currently the subject of an Arctic Council Task Force which will report in more detail on the utility of this approach in Arctic marine areas.

Finally, Chapter 8 examines *Arctic Marine Science* and its integral role in supporting EBM and in many of the sectors covered by the other chapters in this Report. Science, including appreciation and use of local and traditional knowledge, is a recurring theme throughout much of the Report. Science and the development of knowledge are critical and essential foundations for understanding dynamic Arctic systems and their relationship to Earth systems, as well as for implementing EBM approaches and supporting the instruments discussed throughout this Phase II Report.

The concluding Chapter 9 identifies opportunities for cooperation and summarizes recommendations for the Arctic Council's consideration. It organizes by type the opportunities identified in the preceding chapters to strengthen governance and achieve desired environmental, economic and socio-cultural outcomes in the Arctic through a cooperative, coordinated and integrated approach to the management of the Arctic marine environment. For example, some opportunities exist for cooperation in knowledge development and dissemination; these are qualitatively different than actions to amend or create new legal instruments. Similarly, institutional coordination, investments in infrastructure, and better instrument implementation and compliance efforts also constitute qualitatively different categories.

1.3 Trends

Overarching Trends

The Arctic, including the marine Arctic, continues to experience significant bio-geophysical changes and accompanying increases in human activity since the first phase of the AOR Report was published in 2011. The changes to the natural world first brought to broad public attention through the 2004 Arctic Climate Impact Assessment, have since been accompanied by the increases in shipping and related activity documented in the 2009 Arctic Marine Shipping Assessment and other reports. In 2012 alone a new minimum for the extent of Arctic sea ice was set in September, eclipsing the dramatic new low set only five years before in 2007; the sea surface temperature on the ice margins continued to exceed the long-term average; the Greenland ice sheet experienced melting over some 97 percent of its expanse in a single day; and massive phytoplankton blooms were measured below the Arctic summer sea ice, an indication that biological production may be lower than originally estimated. (NOAA Arctic Report Card 2012).

The effects of these rapid changes point to sustained alterations to the arctic Marine environment. A growing body of scientific research indicates that there are additional multiple threats to, and changes occurring in, global marine systems (e.g. pollution, over-exploitation of marine resources, acidification, hypoxia, and sea level rise) and some of these are now reaching into the Arctic. Nonetheless, the scientific literature indicates that the effects and interactions among these factors are not yet comprehensively understood.

Similarly, the impacts of these threats and changes on Arctic communities and economies are not yet well understood. As change allows greater access to the waters of the Arctic Ocean, vessel-based human activity there is also increasing. Economic opportunity and advantage drive the search for new transportation options through Arctic marine areas. This increased activity signals a growing perception of the value of Arctic marine resources and ecosystem services. Yet, financial and institutional resources are not available to meet all the demands associated with developing a comprehensive understanding of the dynamic Arctic marine systems and the human dimensions within these systems.

Sectoral Trends

Certain activities have understandably increased in the Arctic marine environment since the period covered by AOR Phase I (2009-Spring 2011). Changes relevant to the chapters on *Peoples and Cultures*, *Ecosystem Based Management* and *Arctic Marine Science* are measured less by individual activity levels and more by the gradually developing issues and trends described in those chapters. Activities relevant to the sectoral chapters covered by this report (*Arctic Marine Operations and Shipping*; *Living Marine Resources*; *Arctic Offshore Oil and Gas;* and *Pollution*) are too extensive to cover in detail in a Report of this scope. However, some major trends can be summarized here.

Arctic shipping activity appears to be increasing as ice loss in the Arctic Basin increases. Transit passages through the Northern Sea Route have received much international publicity. While specific numbers are hard to come by (an observation of the AMSA), destinational traffic relating to offshore resource activity has also been steadily increasing and voyages of cruise ships to the Arctic are on the rise, although these latter numbers remain relatively small. By contrast, resupply deliveries to remote communities have remained fairly constant.

Chapter 3 *Arctic Marine Operations and Shipping* provides a more detailed description of this shipping activity.

Offshore oil and gas *production* currently occurs at a small number of locations in the Arctic marine region but interest in such energy resources continues, e.g. Norway's Snøvhit natural gas fields in the Barents Sea, Russia's Sakhalin Island offshore crude oil production, and liquefied natural gas (LNG) infrastructure for the export of natural gas to international markets; and some near-shore oil production in the Alaskan offshore near Prudhoe Bay. Arctic offshore oil and gas *exploration* activities have fluctuated in recent years, but Russia and Norway continue to pursue exploration. June 2012 lease sales offered in the Canadian Arctic encompass approximately 2,239,000 acres (9,061 sq. km.), but no active exploration takes place there. More seismic surveys are expected in the Greenland offshore in 2013. Iceland offered a second round of exclusive exploration and production licenses in 2011 on the Northern Dreki Ridge area of the Jan Mayen Ridge. Off of Alaska, Shell's exploration plans in the U.S. Chukchi and Beaufort seas in summer 2012 were substantially scaled back to pre-exploratory drilling. Finland and Sweden have no oil or gas activity in the Arctic, although their emergency response practices in the Baltic Sea can inform similar efforts in the Arctic.

Energy supply developments, in particular the "shale gas revolution", will critically affect the economics of new Arctic oil and gas development, which will be highly dependent on the cost of extracting and the market price for these resources. Technological, safety and environmental issues continue to be major concerns. For example, at the 2011 Arctic Council Ministerial Meeting in Nuuk, Ministers mandated a Task Force to develop an international instrument on Arctic marine oil pollution preparedness and response, which is expected to be signed at the 2013 Ministerial.

Trends in relation to Living Marine Resources since the AOR Phase I Report vary depending on the resource in question. As detailed in Chapter 4, commercial fishing is still limited in Arctic marine regions. At present, no significant commercial fishing takes place within the central Arctic Ocean either within or beyond 200 nm. Some predominantly temperate or subarctic seabird species have begun to spread northwards, while at least one Arctic species, the Ivory Gull, is in retreat in Nunavut and Greenland. Chapter 4 details more examples, including seal, walrus, whales and polar bear.

Pollution trends are detailed in Chapter 8 for petroleum hydrocarbons, Persistent Organic Pollutants, heavy metals such as mercury, lead and cadmium, radionuclides, climate change and ocean acidification, physical disturbances, and noise.

As Chapter 9 details, Arctic marine areas have been the subject of coordinated scientific research and cooperation among the Arctic states (and others) for decades and these collaborative efforts have been intensifying during the past 20 years. The International Polar Year (2007-2009) is a prime example a global initiative for joint polar research. A key lesson from IPY is that Arctic marine systems cannot be fully understood simply by reference to science conducted exclusively in Arctic marine areas. Non-Arctic, terrestrial and atmospheric factors are important components in building a better understanding of Arctic marine ecosystems. Furthermore, as Chapter 2 *People and Cultures* indicates, Arctic marine science engages not just western or physical science but also social sciences and local and traditional knowledge generally as it relates to the region.

Chapter 2-Indigenous Peoples and Cultures

Revisions here within as of 14th of Jan 2013

2.1 Introduction

The Arctic has approximately four million residents (AHDR 2004), all of whom are potentially affected by how well the instruments analyzed in this AOR II Report function. In addition to the eight nations with Arctic territory, more than two dozen indigenous peoples call the Arctic home (ACIA 2005). Most Arctic residents live near the ocean, but only a few of the Arctic's indigenous people are truly maritime.

Broadly speaking, the vast majority of instruments analyzed in this AOR II Report have some effect on those who use the Arctic marine environment, whether for small scale or commercial activity. Other chapters of this report address commercial-scale activities at sea and the international and regional instruments that regulate that activity. This chapter focuses on small-scale uses of the marine environment, especially related to social and cultural well-being rather than economic production. The Saami, Inuit, Dene, Aleut, Koryak, Nents, Dolgan, Nganasan, Entsi, Yukagir, Even and Chukchi peoples, as well as non-indigenous residents of Arctic coastal areas, are the primary practitioners of such small-scale uses (e.g., AHDR 2004, ACIA 2005). Some peoples, such as the Athabaskans in Alaska, Yukon and Northwest Territories, make extensive use of marine resources such as salmon (e.g., ADF&G, undated), but do not actually use saltwater areas themselves. Such uses are important to the overall well-being of the Arctic marine environment.

The Arctic population increased greatly in the 20th century, especially as mineral and petroleum reserves were discovered and exploited (ACIA 2005). In the final decade of the century, however, the overall population fell, largely due to outmigration from the Russian Arctic as the nation's economy changed radically (e.g., Voinov et al. 2004). Other regions, including Canada's Northwest Territories, Nunavut and northern FennoScandia, experienced lesser population declines for various social and economic reasons. Relatively high birthrates led to population increases in other regions, where economic conditions remained more stable. Today, the overall population of the Arctic appears to be increasing again, particularly in areas of private- or public-sector economic growth.

Arctic coastal peoples have a long history of using fish, marine mammals, and seabirds for food, clothing, building materials, trade, and other purposes (e.g., McGhee 2005). Small settlements and family camps were spread along coastlines well into the 20th century. The arrival of trading posts, missionaries, government offices and services, and other factors led over the course of many decades to the consolidation of populations into fewer, larger communities, a pattern that is present throughout the Arctic today (e.g., Slezkine 1994, Kulchyski and Tester 2007). While the basic activities of hunting, fishing, and gathering have remained intact in many regions, the patterns of these practices have often shifted to reflect greater concentrations of people or changes in diets and dietary preferences (e.g., Hansen et al. 2008).

When considering the interactions of Arctic peoples and the marine environment, three main themes are important: (1) the benefits that people derive from a healthy marine ecosystem, (2) the areas that people use to realize those benefits, and (3) economic development and

decision-making in the context of governance of marine ecosystems, particularly in relation to Arctic peoples' patterns of use. As conditions change, adjustment and adaptation will require not just action by Arctic peoples, but cooperation and collaboration with others who use the Arctic Ocean or affect what happens there.

First, marine mammals, fish, and seabirds can contribute nearly all of some Arctic communities' traditional food production (e.g., ADF&G, no date). For those who live on islands or in areas with few available land animals, the sea is the only real option. For those who do have access to caribou, muskoxen, lake fish, and other terrestrial and freshwater resources, the ocean is nonetheless an important source of food and well-being. These benefits can reach far beyond salt water areas. A study of Alaska's oceans and watersheds, for example, found that only a small handful of places in the state did not make use of anadromous fish (Colt and Huntington 2002). And even these places often engage in trade with coastal communities, exchanging furs for seal oil or whale maktak (skin and blubber).

"When considering the interactions of Arctic peoples and the marine environment, three main themes are important: (1) the benefits that people derive from a healthy marine ecosystem, (2) the areas that people use to realize those benefits, and (3) economic development and decision-making in the context of governance of marine ecosystems, particularly in relation to Arctic peoples' patterns of resource use."

The importance of marine species goes well beyond nutrition. Cultural identity is often inextricably bound to the practices of marine hunting and the uses of marine products, through rituals, the yearly cycle of events, and even the names people give themselves. "Coast Saami" for example are Sami people who live on the coast and in fjords and rely on fisheries for their main income (e.g., Nielssen 1986), distinct from reindeer herders inland (even if some people practice both livelihoods), and have created a rich landscape of place names reflecting settlement and use patterns as well as recent events (Brattland and Nilsen 2011). Every settlement in Greenland is on the coast, in large part because the interior of the island is solid ice, but also because the productivity of the sea is much greater and more reliable than that of the land. Salmon are central to the art and images of Bering Sea peoples, as are seals and whales farther north. The future of Arctic peoples as distinct cultures with continuity of traditional practices is thus closely linked to the well-being of the Arctic marine environment (AMAP 1998).

Second, the way that people use the Arctic marine environment is an important consideration when discussing the implications of additional human activity. The consolidation of settlements has focused harvesting activity to some degree, but many people still travel great distances to hunt and fish (e.g., AMSA 2009). Seasonal fish camps exist along large stretches of coastline, so that human presence covers a far greater area than the location of permanent towns would indicate. But marine use is not limited to forays along coastlines. In many areas, people travel upwards of 150 kilometers from shore in pursuit of marine mammals (e.g., Bering Straits CRSA 1984). When offshore activities such as oil drilling or commercial shipping are underway, there is a potential for conflict, along with a risk of accidents (AMSA 2009, AMAP 2010). The Arctic is sometimes portrayed as largely uninhabited, with vast stretches of land and sea that have no human presence. While the population is indeed sparse by global standards, the human presence covers a vast extent of Arctic waters (AMSA 2009). The use of marine resources and the significance of that use cannot be separated from the spatial extent of the areas that people use to obtain what the Arctic marine environment

provides. The loss of summer sea ice is leading to rapid changes in the Arctic Ocean and human uses thereof, and further changes in use patterns can be expected.

Third, the economic well-being of Arctic communities, on the other hand, depends more and more on non-traditional activities (e.g., Glomsrød and Aslaksen 2006). Public sector expenditures are a major source of income for most Arctic regions. The development of petroleum and mineral resources drives many Arctic economies, with commercial fisheries also playing a major role in some places. Economic development often brings social and cultural dislocation (e.g., AMAP 2010), but it can also provide funds to support cultural programs and allow people to preserve their traditional ways. In Canada, the implementation of the Inuvialuit Final Agreement has provided opportunities for territorial park development and tourism activities that feature the culture and heritage of the coastal and marine environments.

Oil production in northern Alaska has provided the means for the local government, the North Slope Borough, to provide a high level of services for its residents. Such resources continue to help the Borough support the local bowhead whale hunt as traditional means of subsistence . At the same time, local residents are often ambivalent about the proposed expansion of oil development into the marine environment, where they fear the impacts and risks to marine mammals may outweigh the benefits that local communities will receive.

Economic development is thus a factor in the relationship between Arctic peoples and the Arctic Ocean (and other users thereof), but not a one-sided or necessarily decisive factor. Climate change, too, poses threats to marine ecosystems and those who use them, but may also provide new hunting and fishing opportunities. Arctic peoples have lived through major environmental, social, and economic upheavals in past centuries and the present (e.g., Nuttall and Callaghan 2000). Flexibility and adaptation are crucial characteristics that have allowed them to thrive despite high variability and uncertainty. To what extent they still have the ability to adapt and change is a crucial question. Modern governance and the allocation of resource uses often create a highly structured system with little room for adjustment when conditions change, as discussed below. The allocation of salmon catches, for example, can leave little opportunity for increased harvests when other resources fail. The delineation of shipping lanes can separate hunters from hunting areas. An integrated approach to management of Arctic Ocean resources can be used to help overcome user conflicts.

2.2 Challenges

The Arctic Ocean is changing rapidly. Sea ice loss is driving a host of environmental shifts. Resource development alters social and economic conditions, leads to changes in governance, and may also affect the environment and the way people use it. For Indigenous peoples seeking to continue their practices of using the resources of Arctic marine ecosystems, these changes pose a major challenge. For people seeking to mitigate the impacts of such changes, a secondary challenge is the lack of knowledge about many aspects of life today in the Arctic. The challenges facing local society, culture, and people in the Arctic thus fall into two major categories: (1) responding effectively, and (2) gathering the knowledge required to do so.

Responding effectively to change means retaining what is important to you. Bowhead whalers in Savoonga, Alaska, have been challenged by greater variability in spring weather during the usual bowhead whale hunt, and by changes in sea ice conditions around the island (Noongwook et al. 2007). The loss of ice, however, allowed them to create a new fall whaling

season, sustaining the overall harvest level. Seal hunters in Clyde River, Nunavut, have adjusted in similar ways to changes in sea ice, noting that the effects of sea ice loss are not a simple matter of losing hunting opportunity, but rather a shift from hunting on the ice to hunting by boat at certain times of the year (Gearheard et al. 2006).

In both cases, the regulatory regime left such shifts entirely in the hands of the hunters, so that they were able to adapt by themselves, when and as the new opportunities arose. In other cases, communities have not had the ability to change, due to environmental or governance limitations. In such cases, an effective response requires action beyond the affected community. Many, if not most, major changes we can anticipate in the Arctic Ocean will fall into this category.

The challenge to Arctic communities is thus not simply to learn to adjust. They are already doing so, and have done so for as long as they have been in the Arctic. Instead, the challenge is to figure out how to work with institutions of governance, private companies, and even other communities to develop responses that can minimize the negative impacts of environmental and social change, while allowing them to maximize any benefits or opportunities that arise. People and communities that have the connections and resources that enable them to work in this way may be able to take on this new challenge. Others may lack the time, funding, or political standing to engage substantively in discussions about what will take place in their regions. For someone who simply wants to continue to hunt and fish, reading documents and traveling to take part in meetings may not be an attractive step towards effective response to change (e.g., Huntington et al. 2012a).

The second aspect of responding to change is to develop the base of knowledge upon which to design and advocate for effective response. Within communities, the base of traditional knowledge of their environment, the species they use, and the ways to remain safe while on the land and sea are an essential foundation for response (e.g., ACIA 2005, Gearheard et al. 2006, Noongwook et al. 2007). Although rapid environmental change may make some aspects of traditional knowledge out of date or lead to shifting baselines (in which people lose track of how things used to be and thus underestimate how much change has occurred; e.g., Papworth et al. 2009), a basic understanding of how to deal with uncertainty and variability remains relevant. Modern technology such as GPS has improved navigational ability and reduced some forms of risk, but technology cannot substitute for sound judgment (e.g., George et al. 2004). The perpetuation of hard-won understanding will remain important for Arctic peoples as they respond to new challenges.

> *"A challenge of preparing this chapter has been the lack of documentation of local marine use for many areas of the Arctic (cf. AMSA 2009). Without such information, a sound appraisal of the current status is not possible. Instead, we are limited to extrapolation from existing data and reliance on anecdotal or other incomplete bits of information about large areas of the Arctic."*

Advocating effectively outside of one's community requires making knowledge and information available to the wider world. Studies of the use areas or harvest levels are often decades out of date, calling into question the reliability of the data that may nonetheless be the only ones available for making new decisions. Having Arctic community members participate

in meetings is useful, but does not replace having documented information that can be shared and applied in many settings. Indeed, a challenge of preparing this chapter has been the lack of documentation of local marine use for many areas of the Arctic (cf. AMSA 2009). Without such information, a sound appraisal of the current status is not possible. Instead, we are limited to extrapolation from existing data and reliance on anecdotal or other incomplete bits of information about large areas of the Arctic. For example, the Bering Strait is a key bottleneck for all marine traffic from the Pacific to the Arctic Ocean, and yet the details of local marine practices especially in Russia are not readily available.

The rapid increase in interest in marine shipping, mining, petroleum development, tourism, and other activities in Arctic waters makes it likely that many important decisions will be made before all the important information is available. As a consequence, shipping lanes or development zones may be delineated without sufficient reference to local use areas, leading at best to losses of hunting and fishing opportunities, and at worst to accidents such as collisions. There is thus considerable urgency in conducting appropriate studies of local practices to provide information while there is still time to use it. One example of a precautionary approach that recognizes the lack of scientific information is the 2009 decision by the United States to set a commercial fisheries catch limit of zero for its Arctic Waters north of the Bering Strait until adequate science and management is in place (NOAA 2009).

> ***"The rapid increase in interest in marine shipping, mining, petroleum development, tourism, and other activities in Arctic waters makes it likely that many important decisions will be made before all the important information is available."***

A final challenge for those who use Arctic marine waters is the difficulty of predicting what the future holds. Climate change has already produced a sudden decline in sea ice in 2007 and another in 2012, far faster than models predicted, and these are unlikely to be the last surprises we see. Changes will produce opportunities as well as impacts, but who will be poised to take advantage of those opportunities, and how will the instruments discussed in this Report help or hinder their position? The climate driven switch from cod to shrimp fishing in West Greenland in the 1990s allowed the town of Sisimiut to thrive, whereas Paamiut missed the window of opportunity and saw an economic decline that led to a population decline (Hamilton et al. 2003). Increased coastal erosion in Alaska, however, poses challenges that may be difficult to overcome (Huntington et al. 2012b). Careful planning is important in harnessing economic development opportunities for the benefit of local communities, but uncertainty can make it difficult to create sound plans.

2.3 Adaptation to Change: Opportunities and Challenges

Changes in the Arctic marine environment and changes in human uses thereof, offer opportunities as well as challenges. The main opportunities are economic ones, promising employment and income for individuals, clients and contracts for businesses, and tax revenues and associated monies for local and regional governments. In addition, as noted above, loss of sea ice and the northward movement of some marine species may provide additional possibilities for local hunting and fishing, perhaps counteracting to some extent the losses of opportunity that are also associated with changing conditions (cf. Hamilton et al. 2003, ACIA 2005).

Economic development and traditional activities are far from incompatible (e.g., AMAP 2010). There may, of course, be risks and conflicts over use areas or environmental impacts, but increases in revenue for individuals and regions can help support traditional activities. For example, the equipment needed to go hunting and fishing is expensive. Snowmobiles and outboard engines typically cost far more in remote northern communities than they do in more densely populated regions, and gasoline may be twice as expensive. Jobs provide the means to purchase the gear needed to make hunting trips from today's consolidated settlements. And local and regional governments are able to invest in cultural programs and research needed to advocate effectively for local interests. The trouble is that the connections between industrial-scale resource development and local well-being are not simple and straightforward. The opportunities must be nurtured and pursued.

Realizing the potential local benefits of economic activity in the Arctic requires attention on several fronts, including local involvement in (1) determining local needs and interests to set appropriate goals, (2) establishing appropriate governance mechanisms to ensure local needs and interests are considered, (3) participating effectively in those governance mechanisms and related instruments, and (4) identifying other relevant opportunities for such involvement.

Determining local needs and interests is not necessarily an easy step. Few communities are unified in their views, and there may be differences of opinion among communities in a region. Nonetheless, the views of local residents are unlikely to be represented well, if at all, in the absence of effective local advocacy. Once again, the simplistic view of a zero-sum outcome between economic development and traditional practices is misguided and harmful. In today's Arctic, jobs and income are necessary to support a decent standard of living. And the absence of traditional practices leaves little incentive or justification for living in remote locations. The decline in rural population in Scandinavia, Iceland, and Greenland is a sign of the decreasing attractiveness of the lifestyles characteristic of such regions. Indeed, urbanization is a worldwide trend.

"The simplistic view of a zero-sum outcome between economic development and traditional practices is misguided and potentially harmful. In today's Arctic, jobs and income are necessary to support a decent standard of living. And the absence of traditional practices leaves little incentive or justification for living in remote locations."

The Arctic offers several examples of far-reaching local visions that have been transformed into reality. The North Slope Borough in northern Alaska began with the desire to harness oil production for local benefits, primarily through revenues from taxation of oilfield infrastructure. Today's Self-Government in Greenland began with the push towards self-governance in the 1970s, in part from concerns about European Union fishing fleets operating in Greenland's waters. The territory of Nunavut was created as a result of land claims by Inuit seeking recognition for their occupancy of northern Canada, and followed the earlier Inuvialuit Final Agreement that set in place several co-management bodies to govern use of land and sea. The Saami Parliaments in Fennoscandia are similarly an outcome of a strong desire to sustain Saami identity and culture.

What these examples have in common is that they have set up governance mechanisms to pursue local needs and interests. None has full control over the affairs of its region, though the Greenland Self-Government has come closest, with only a few aspects of governance remaining under the Danish Parliament. Nonetheless, each has in its way established a

position in shaping what takes place in its region, and each is responsive to local interests via elections and other forms of participatory governance.

Because none has full control over all matters in its territory, each of these bodies also has to work with other levels of government as well as the private sector and non-government organizations. At this level, local voices may have larger or smaller roles, depending on the systems in place. Greenland, for example, elects representatives to the Danish Parliament. The North Slope Borough has a local permitting process, but often has to rely on advocating its position with state and federal agencies. In the Inuvialuit Settlement Region in Canada, and in Nunavut, land-claim agreements have established co-management bodies that are responsible setting local regulations and recommending policies to be enacted by federal agencies (e.g., CAFF 2001). The participation by local residents in such co-management arrangements offers a powerful mechanism for entraining local views as well as traditional knowledge relevant to the topics under discussion. Similarly, a report from the Norwegian Coastal Fishing Committee resulted in an agreement between the responsible Norwegian Ministry and the Sami Parliament that establishes a right to fish – on certain terms – for residents of Finnmark and other Sami areas allocating an additional cod quota there; and increases participation in decision-making by establishing a local fjord fishing advisory board. The Norwegian Parliament approved the necessary measures in2012 and the Norwegian Government is establishing that advisory board, a process in which the Sami Parliament will be involved.

An agreement between the responsible Norwegian Ministry of Fisheries and Coastal Affairs and the Sami Parliament establishes a right to fish – on certain terms - for residents of Finnmark and of Sami areas in Troms and Nordland, allocating an additional cod quota there; and increases participation in decision-making by establishing a local fjord fishing advisory board.

Subnational instruments, while not strictly international, are especially important reflections of traditional ecological knowledge and sustainable management practices at the local level. The 1988 Inuvialuit–Inupiat Polar Bear Management Agreement in the Southern Beaufort Sea, a non-legally binding arrangement between indigenous organizations in the United States and Canada, sets the hunting season and other management parameters on both sides of the U.S.-Canada boundary, including the annual sustainable harvest (Brower et al. 2002). The agreement seeks to assuage concerns that the agreement could conflict with federal or international regimes by specifying that the Inupiat signatories act "solely as representatives of the local traditional user group of the polar bear resource in furthering the consultation, management, and information exchange goals of the International Agreement on the Conservation of Polar Bears," Article V(c). Other types of interactions between national governments and local users are not easily categorized as sub- or international as with the "cooperative agreement between U.S. and Russian governments with all Chukotkan Native coastal communities in the harvest, conservation and sound management of the Pacific walrus" (Alaska Eskimo Walrus Commission, undated).

Arctic affairs are now also a matter of international attention and action. The regulation of shipping in the Bering Strait, for example, requires action by the International Maritime Organization (IMO), because neither Russia nor the U.S. can impose regulations unilaterally on an international strait (AMSA 2009). The rights of indigenous peoples are recognized by ILO Convention 169 and by the United Nations Declaration on the Rights of Indigenous

Peoples (e.g., Kleist 2010). The Convention on Biological Diversity, in article 8(j), recognizes the deep connection between indigenous peoples and biodiversity. The Arctic Council itself confers "Permanent Participant" status on six indigenous peoples' organizations, an unprecedented level of recognition at an intergovernmental forum. The extent to which such agreements affect domestic actions in the Arctic countries is a matter of national law, but the increase in international action on Arctic matters suggests that Arctic communities are more and more likely to be affected one way or another by those actions.

This is not to say that everything works smoothly. Having effective governance mechanisms in place is necessary, but effective participation is also required. Many aspects of economic development, for example regulations for shipping or for oil and gas, are highly technical and complex. Thousands of pages of documents are generated to address various aspects of decisions to be made. Conflicting information is offered by different interest groups. Sifting through all the material requires a great deal of time as well as considerable expertise. The burden of reading countless reports and attending a never-ending stream of meetings (often far from home) is a heavy one (Huntington et al. 2012a). A recent effort to relieve such burden - SDWG A Circumpolar-Wide Inuit Response to AMSA - has not yet been evaluated but is a joint effort of the Inuit Circumpolar Council. The project involves community-based workshops in which the findings included in complex reports (here, the AMSA) are communicated to Inuit communities in order to seek their guidance on follow-up work.

Once again, the local revenue streams provide one option for addressing this challenge, harnessing economic development to protect traditional activities. The North Slope Borough, for example, is able to hire highly qualified scientists and lawyers to conduct research, review documents, and advocate for the Borough's positions. While many local indigenous residents also play a major role in these activities, the ability to hire expertise can be a big help both in obtaining needed talent and in allowing local residents some time and freedom to continue to pursue their traditional practices.

The opportunity for local residents and local and regional organizations, with increasing economic development in many sectors and areas, is to take the lead in shaping the relationship of that development to traditional culture and activities. The Inuit Circumpolar Council, for example, held an Inuit Leaders Summit on resource development in 2011, setting out basic principles for how such development should be conducted in Inuit regions (ICC 2011). The Yukon River Inter-Tribal Watershed Council spans the length of the Yukon River, through Alaska and the Yukon Territory, addressing water quality issues as well as international aspects of salmon migration and harvest. To date, however, most attention to Arctic development has focused on individual projects or regions, and has not considered the long-term, cumulative effects of development on the Arctic marine environment and Arctic peoples (e.g., USGS 2011). This piecemeal approach has resulted, among other things, in pitting neighboring groups against one another over fishing rights, or in little attention being paid to the total number of vessels likely to transit key areas.

2.5 Opportunities for Cooperative Action

Based on the preceding discussion, the opportunities and recommendations fall into three categories: (1) documentation of local marine use, (2) governance mechanisms in relation to local marine use, and (3) evaluation of effective responses to change.

- ✓ **Document current and historical 1) timing and geographical extent of local uses of the marine environment, and 2) levels of traditional marine resources harvests, accounting for differing documentation needs and capacities between Arctic States.**

Relatively little current information is available about spatial and temporal patterns of marine uses today in the Arctic. While many results of former studies may remain broadly applicable, they do not reflect intervening changes in technology and behavior. A clearer understanding of current local use patterns allows better identification of how further Arctic development will most likely affect local activities. Documenting current use should consider not just areas local hunters and fishers use, but also areas where the fish, mammals, and seabirds migrate, to determine which communities may be affected by activities in which areas. Documentation should also assess intensity of use across the overall use area.

Understanding the significance of traditional marine subsistence – as opposed to commercial - harvests is also essential to understanding how new activities may affect Arctic communities. For example, shifts in harvest target species may indicate ecosystem changes. For many communities, harvesting marine resources produces a large amount of food, in addition to sustaining cultures. Because much of the harvest takes place outside the market economy, it can be difficult to assess its contribution to local well-being. Documenting harvest levels and related indicators of social and cultural significance will help fill this gap.

Where possible, documentation of use areas and harvest levels should be compared with past records in order to assess trends, and should account for differing documentation needs and capacities between Arctic States.

- ✓ **Assess the role of Arctic residents in governance mechanisms concerning the Arctic marine environment.**

Both the mechanisms and the role of local residents in those mechanisms vary greatly by country in the Arctic, and even within country or by economic sector. While many countries have systems to gather local information and provide opportunities for local comments and other involvement, the effectiveness of these mechanisms is not well understood. Given the amount of time and effort required to participate in most governance mechanisms, it is worthwhile to determine how effective that participation has been. Such an assessment could examine both the time and effort that people invest, as well as the degree to which local input and local interests influence the decisions that are made. A comparison of experiences across the Arctic will help identify and share practices that are effective.

- ✓ **Ensure that traditional uses of the marine environment are considered in decision-making concerning industrial activities and resource management in the Arctic marine environment.**

"To date … most attention to Arctic development has focused on individual projects or regions, and has not considered the long-term, cumulative effects of development on the Arctic marine environment and Arctic peoples."

It can be difficult to compare economic benefits expressed in indicators such as money and jobs with non-market activities such as traditional hunting and fishing. Nonetheless, decisions concerning the Arctic Ocean implicitly or explicitly make such comparisons. Determining how these comparisons are done and identifying ways to better capture the importance of non-

market values could help ensure that local interests are adequately weighed in decision-making.

- ✓ **Reduce and mitigate the various threats to traditional activities, separately and cumulatively.**

Climate change and many forms of industrial activity appear to pose substantial threats to the well-being of Arctic peoples and their communities. At the same time, few analyses have attempted to compare the significance of the different threats or to determine how the cumulative threats can be addressed collectively. An evaluation of these threats should also consider the relative benefits from different activities, allowing a more comprehensive assessment of what the future is likely to hold for Arctic communities, and identifying actions to best manage existing and further development.

- ✓ **Identify and promote successful strategies that Arctic communities have developed for perpetuating traditional activities while engaging in new opportunities.**

Arctic communities have been responding to variability and change for as long as there have been Arctic communities. A great deal of experience exists for finding appropriate responses or avoiding inappropriate ones. The specific environmental, economic, and political settings of different communities will obviously play a major role in determining what works in each case, but there are also likely to be many common elements, or simply a common inspiration to seek the best ways of managing the challenges and opportunities ahead. Allowing Arctic community leaders and others to share ideas and learn from one another offers the chance both to benefit from experiences elsewhere and to identify opportunities for collective action for common goals.

Chapter 3 Arctic Marine Operations and Shipping

Version here within as of 13th of Feb 2013

3.1 Introduction

3.1.1. The character and scope of marine operations in the Arctic

Arctic marine operations have been increasing as natural resource development and economic ties between the Arctic and the global economy expand. These in turn are associated with potential effects of global warming and with development in technology and science, two trends that are expected to continue in the near term. With the retreat of Arctic sea ice, greater marine access and potentially longer seasons of navigation and operation are also expected to occur.

This emerging maritime Arctic is characterized by:

- ✓ new marine systems supporting offshore hydrocarbon exploration and resource development;
- ✓ expanding marine tourism;
- ✓ summer marine transportation routes supporting hard minerals and mining operations and modest but growing levels of trans-Arctic cargo movement;
- ✓ more scientific voyages in the central Arctic Ocean;
- ✓ potential increases in fishing in coastal waters such as Baffin Bay/Davis Strait;
- ✓ a general increase in the summer presence of a wide variety and sizes of vessels around the Arctic basin;

and other related developments.

Recognizing two key aspects of marine operations in the Arctic is critical for framing this chapter. First, the 'Arctic marine environment,' as understood for the purposes of this report, encompasses an area broader than the Arctic Ocean, and includes numerous regional marine areas such as the Bering Sea. A complete list of those regions appears in Chapter 1, section 1.2. Some of these areas are seasonally ice-covered and others are ice-free. Second, Arctic shipping is understood to include a wide range of vessels from icebreakers, tankers, offshore support vessels, container ships, fishing vessels, bulk carriers, ferries, tug-barges and cruise ships, to government ships, research vessels, and more. This range is consistent with the Arctic Council's Arctic Marine Shipping Assessment (AMSA 2009, 71-72).

3.1.2. Documenting the scope of Arctic marine operations, and building on AMSA

Properly addressing the issues of maritime safety and marine environmental protection requires a comprehensive and holistic perspective on all vessel traffic within each large marine ecosystem (LME) of the Arctic marine environment. Such an approach calls for regional databases of Arctic indigenous marine use and a spatial understanding of ecologically and culturally significant or sensitive areas. An additional complex challenge is accounting for the numerous fishing vessels in Arctic waters and their impacts on the Arctic

marine environment. The fishing activities of many of these vessels are under the jurisdiction of the Arctic coastal states where they operate.

The Arctic Council's Arctic Marine Shipping Assessment (AMSA), conducted during 2004-2009 under the working group for the Protection of the Arctic Marine Environment (PAME) in cooperation with other Arctic Council working groups [NORWAY], provides a framework for action with 17 recommendations arranged under three key themes: Enhancing Arctic Marine Safety, Protecting Arctic People and the Environment, and Building the Arctic Marine Infrastructure (AMSA 2009, 6-7). The AMSA Recommendations were negotiated and consensus was reached by the eight Arctic states, resulting in an effective document for further policy development. AMSA can be viewed as a strategic guide for a host of stakeholders and actors, as a baseline of information that can be updated as traffic and regional marine use change, and as an overall Arctic Council policy document.

AMSA recommended that the Arctic states identify common interests and work within relevant international maritime organizations to enhance the Arctic as a region, by requiring new attention and action to advance the safety, and address the environmental impacts of Arctic marine shipping. As will be seen, several of the Arctic states have taken the lead at the International Maritime Organization (IMO) to develop a mandatory code for ships operating in polar waters (Polar Code). This is a complex process involving the global maritime community, including key sectors of the maritime industry operating today in the Arctic marine environment, for example, bulk carriers, tankers and passenger vessels.

3.2 New Arctic Marine Operations and Challenges

3.2.1. Emerging developments in Arctic operations

AMSA provides a baseline view of Arctic marine traffic patterns in summer and winter, based on data provided by Arctic states for 2004 and 2005. Since AMSA's release in 2009, a number of notable increases in marine vessels operating in Arctic areas have occurred but they have not been reported systematically . Identifying the appropriate reporting bodies and drawing on increasingly available satellite data could help better track these increases.

Chapter 1, the Introduction to this report, provides additional detail on this increased vessel traffic summarized here: With respect to offshore exploration, one of the many challenges is the number of local transits and marine operations within the relatively small drilling site or lease area and to a coastal support area. During the 2010 and 2011 summer seasons drill ships and a fleet of offshore support vessels operated in lease areas off the west coast of Greenland. Offshore hydrocarbon exploration continued in the Norwegian Arctic in several areas of the Barents Sea. In the U.S. maritime Arctic during late summer 2012 Shell conducted preliminary operations in leased areas in the Chukchi and Beaufort Seas. Two new shuttle systems are operating year-round in the eastern Barents Sea of the Russian Arctic, both without icebreaker escort (Brigham 2011).

During recent summer navigation seasons, the Central Arctic Ocean – the remote, high seas beyond the Exclusive Economic Zones (EEZs) of the Arctic Ocean coastal states – has witnessed the presence of advanced icebreakers conducting seabed data gathering on the continental shelf. The potential impacts of these marine operations are not clear, but the access implication is that very capable icebreaking ships from Arctic and non-Arctic states can operate today in summer in *all* regions of the central Arctic Ocean. Continued decreases

in sea ice extent and thickness will increase the access for surface ships in a longer navigation season of potentially lighter ice conditions.

3.2.2 Vessels operating in the Arctic

Since AMSA, the cruise ship industry has continued to operate large and medium ships, some ice-capable, along Greenland's west coast during a two to three month summer season, and along its east coast and around Svalbard in fewer numbers. Both marine areas have limited or nonexistent marine infrastructure. However, as of July 2012, the Norwegian Pilotage Act and implementing regulations were made applicable to Svalbard, thus introducing state pilotage service, compulsory pilotage and pilot exemption certificates on Svalbard.

In summer 2010, two cruise ships sailed the length of the Northwest Passage (NWP), as did one each in 2011 and 2012. During summer 2012, *The World*, a 196.3 meter condominium ship, became the largest tourist ship to transit the NWP. The NWP has also experienced a notable increase in adventurers and small yacht voyages in 2010 (Arctic SAR 2011), 2011 (IMO 2010) and 2012 (IMO status 2012). These small vessel voyages along the NWP present a new set of challenges for the maritime authorities in the remote Canadian Arctic. To put these numbers in perspective, as of the 2012 navigation season, there have been only 183 full voyages of the NWP since Roald Amundsen's voyages aboard *Gjøa* from 1903-1906 (Headland 2012). However, development of a trans-Arctic route through the NWP does not appear likely in the near future.

In the near term, destinational voyages related to natural resource development in the Canadian Arctic are likely to increase. For example, the Mary River Mine is being developed based on the use of a shuttle system of icebreaking iron ore carriers from Baffin Island to European ports. Recognizing that global supply and demand patterns are the dominant driver, other major mineral development prospects in Canada, Greenland and other Arctic locations may be more likely to proceed if comparable shipping services are feasible.

Russia is interested in further developing its Northern Sea Route (NSR), which has experienced renewed activity, so as to carry a greater volume of natural resources to global markets. Linking the Russian Arctic during a summer navigation season of three to four months (roughly July to October) to markets in China and Southeast Asia has been the focus of recent experimental voyages. In late August 2011, a super tanker, the *Vladimir Tikhonov*, crossed the NSR with icebreaker support to deliver 120,000 tons of gas concentrate from Murmansk to Bangkok, Thailand. A bulk carrier under Liberian flag with 66,000 tons of iron ore, *Sanco Odyssey*, sailed from Murmansk to Beilun, China on the NSR during 3-10 September 2011 (Barents Observer 2011). These two voyages represent the largest tanker and bulk carrier to sail the NSR and indicate an increase in the size of ships that can sail on more northerly routes along the Russian Arctic as well as a marked change in the NSR shipping season.

Sidebar 3.1 ~ Selected Major Cruise Ship Accidents of Relevance to the Arctic ~

Two recent cruise ship accidents have direct relevance to marine safety in polar waters. In November 2007 the M/V *Explorer* was holed by ice and sank off the Antarctic Peninsula; 100 passengers and 54 crew members were rescued by a Norwegian cruise ship operating in the region.

In August 2010 the M/V *Clipper Adventurer* grounded in the Canadian Arctic resulting in damage to its hull and a lengthy salvage operation; more than 200 passengers were safely removed from the stranded ship by a Canadian Coast Guard icebreaker.

[Add image of the two incidents]

During summer 2012, 46 ships sailed the NSR carrying more than one million tons of cargo, a 53 per cent increase in cargo volume over 2011 (Barents Observer 2012). More traffic on trans-Arctic voyages will also mean increased traffic in the Bering Strait Region and along the northern Norwegian coast. Thus far, the shippers along the NSR are focusing on the transport of natural resources from west to east in a summer navigation season of three to four months. However, In *November* 2012 the *River Ob* sailed the NSR, delivering liquefied natural gas (LNG) from Norway to Japan. Although escorted by icebreaker, the vessel encountered only 30-cm thick young sea ice (Barents Observer 2012).

While Russia and several Asian nations pay significant attention to the NSR for all cargoes, regular container ship operations during such a short navigation season have not yet proven viable. The higher risks for delayed cargoes, the uncertainly of marine insurance for this remote region, and the variability of the regional sea ice cover all present unique challenges to international container shippers along the NSR.

3.2.3 Cruise ship operations

Two recent cruise ship accidents relevant to marine safety in polar waters are highlighted in Sidebar 3.1. The ramifications of such incidents were anticipated in the discussions at the AMSA Arctic Marine Incidents Workshop in March 2008 (AMSA, 176-177). Including cruise ships within a mandatory IMO Polar Code is an essential step for enhancing marine safety and environmental protection. Developing best practice guidelines, such as possible coordinated ship-to-ship and ship-to-shore operations in the same Arctic area, could also provide an important contribution to improving the marine safety of Arctic marine tourism. Industry best practices applied to Antarctic cruise ship operations could be considered relevant to cruise ship operations in the Arctic, for example along the west coast of Greenland. This may be an arena where the Arctic Council, through one or more of its Working Groups, can consider developing recommendatory best practice guidelines.

3.3 Technical, Policy and Governance Developments

3.3.1 Monitoring of shipping operations – AIS - LRIT

During the past five years significant strides have been made in monitoring and surveillance of ship traffic in the Arctic marine environment. These complement provisions in IMO agreements that require automatic identification systems (AIS) for collision avoidance on all vessels over 300 tons when engaged in international voyages, all cargo ships over 500 tons when not engaged in international voyages, and passenger vessels of any size. These are useful size limits and allow such vessels to provide information about themselves to other ships and to coastal authorities.

Shore-based systems in Norway and the United States that use ground-based radars and AIS transponders/receivers have the capability to gather detailed spatial and timely information about Arctic ship traffic. Satellite tracking of ships in the central Arctic Ocean, which has begun to show patterns of shipping traffic and high density flows of vessels in select areas, might also be useful for future analyses. As well, Canada uses long range identification and tracking (LRIT) to monitor vessels transiting its waters and has recently established two terrestrial AIS sites in the Arctic. These systems can be used to develop vessel tracking in international straits such as the Bering Strait and can assist in the design of voluntary IMO

marine traffic routes through complex and evolving patterns of commercial and indigenous marine use.

3.3.2 Arctic Search and Rescue (SAR) Agreement, 2011

[The Agreement on Cooperation and Aeronautical and Maritime Search and Rescue in the Arctic (SAR), signed by the eight Arctic Council states in 2011 and entered into force in January 2013, is [a seminal] [an important] policy and governance development (Arctic SAR 2011). The Arctic states, under the cooperative framework of the Arctic Council, created a legally binding agreement on maritime and aeronautical SAR covering more than 13 million square miles of the Arctic marine environment. The Arctic states defined the southern limit for the agreement so that all high latitude regions would be included. For example, all of the Bering Sea, the southern half of Greenland below the Arctic Circle, and the southern EEZ extending from Iceland into the north Atlantic are covered by the agreement. Areas of SAR responsibility were agreed to for the central Arctic Ocean and SAR boundaries were taken to the North Pole.]

The remoteness of the Arctic, limited SAR resources, and severe weather and ice conditions required the Arctic states to be proactive in designing a cooperative agreement. Under the Arctic SAR Agreement, all Arctic states are committed to coordinate assistance to those in distress and cooperate with each other in SAR operations. The Arctic states agree to promote the establishment, operation and maintenance of an adequate and effective SAR capability within their areas of responsibility. The agreement also includes an article on requests to enter the territory of a Party for SAR operations.

3.3.3 Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic

At the October 2012 meeting of the Arctic Council Task Force on Marine Oil Pollution Preparedness and Response, the eight Arctic States concluded negotiations on new legally-binding Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic. The Agreement, when signed, will strengthen cooperation among States in the event of an oil pollution incident in the region. The Agreement will be presented for signature at the Arctic Council Ministerial Meeting scheduled for May 2013.

The new Agreement provides for mutual assistance in responding to oil pollution incidents in the Arctic region that are beyond the capacity of one State, acting alone, to respond to effectively. Such assistance could include, among others, provision of human resources, know-how, equipment and technology. The Agreement also outlines other actions that are essential to spill response such as maintaining national spill response systems, notifying other States of spills that may affect their marine areas, conducting monitoring activities to identify spills, and undertaking joint exercises and training. Provisions governing assistance, reimbursement for such assistance, and moving resources across borders are also provided for in the Agreement (and will be further elaborated in a set of non-legally binding operational guidelines that will be attached to the Agreement).

EPPR has prepared a set of operational guidelines for oil spill response in Arctic waters that is an Annex to the Agreement. Included in the guidelines will be sections on Notification, Assistance, Movement and Removal of Resources across Borders, Response Operations in Areas Beyond National Jurisdiction, Command and Control, Facilitation of Situational Awareness and a Common Operating Picture, Joint Review of Oil Pollution Incident

Response Operations, Joint Exercises and Training, and Administrative Provisions. In the future, the Arctic Council could address preparedness and response with respect to other hazardous chemicals that are being transported by bulk carriers in Arctic waters.

3.3.4 Hydrography, communications and monitoring

The recent creation of an Arctic Regional Hydrographic Commission (ARHC) within the International Hydrographic Organization (IHO) is recognition that the maritime states have been proactive in dealing with hydrography and charting issues in a region of increasing access and longer seasons of navigation (IHO 2010). One of the ARHC's important tasks is to develop standards for Arctic spatial data so as to enhance quality assurance of bathymetric information for the whole of the Arctic Ocean.

The World Meteorological Organization (WMO), in concert with the IMO, has established five new WMO METAREAs/IMO NAVAREAs covering the Arctic with responsibility for provision of services accepted by Canada, Norway and the Russian Federation. The new Arctic METAREAs became operational in June 2011 (IMO 2011 Briefing Paper). This extends the Global Maritime Distress Safety System (GMDSS) to ensure that Arctic mariners would be provided, as much as possible, with the same standard of weather, wave and ice warning and forecasts and navigation alerts as in the other world oceans. However helpful this information is, its general nature renders it critical that individual vessels possess additional detailed and location-specific information when operating in the area.

Together with the WMO, the International Ice Charting Working Group (IICWG), a forum of the national ice services, is working to implement policies and procedures for coordinated sea ice mapping and distribution of products (IICWG 2007). Full operational capability commenced in 2011 with standardized marine forecasts and warnings, ice edge information, and the deployment of additional monitoring equipment. Services are being expanded incrementally as marine activity increases. Recognizing that floating ice in Arctic areas presents a major hazard to navigation, the WMO and IICWG are working on standards for the creation, distribution and display of ice information in shipboard Electronic Chart Display and Information Systems (ECDIS). A new product specification (under the IHO S-100 family of standards) is under development so that mariners will be able to display ice information from any of the national ice services as overlays on their electronic (ECDIS) displays.

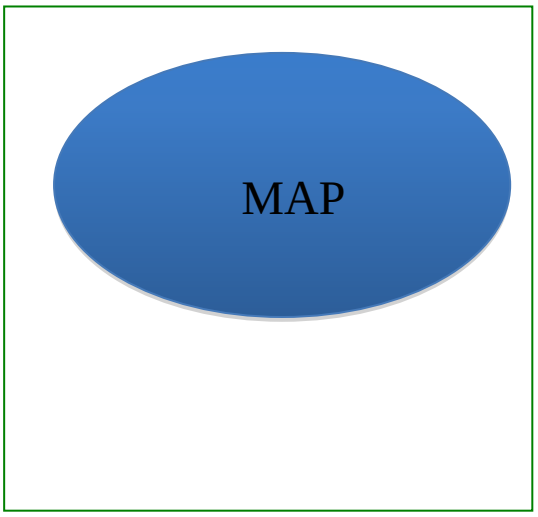
The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) is a non-profit, non-governmental, international and technical association that gathers marine aids to navigation authorities, manufacturers and consultants from all parts of the world. Moving forward, IALA is well placed to support the sustainable design, implementation and operation of aids to navigation, as well as related infrastructure, such as communications and vessel monitoring systems for the Arctic. IALA's diverse membership can expedite the identification of overall information needs to enable safe Arctic navigation; the technical complexities of virtual aids to navigation and other electronic means (complementary to conventional aids to navigation in Arctic waters); and, the feasibility and benefits of harmonizing approaches and sharing best practices.

3.3.5 IMO - MARPOL

Recent work at IMO for the global oceans is timely and relevant for the Arctic marine environment. New amendments to annexes of the International Convention for the Prevention of Pollution from Ships (MARPOL) include: Annex IV on sewage; Annex V on garbage; and, Annex VI on air pollutant emissions and ship energy efficiency, particularly the control of sulfur and now CO_2 emissions (IMO 2001 [check year]). All of these advances at IMO point to continuing policy work at the Arctic Council and for the Arctic state IMO delegations. Among the issues that could be explored are: the identification and protection of ecologically or culturally important marine areas in the Arctic Ocean including special areas, particularly sensitive sea areas (PSSAs) and other sensitive ecological-biological and cultural areas, and possibly emission control areas. Thirteen PSSAs have been established by the IMO around the globe; however, none are in the Arctic (IMO 2005).

Sidebar 2 ~ Mapping Arctic Marine Areas of Ecological Significance

The Arctic Council, through several of its Working Groups, is completing a report on *Identification of Arctic Marine Areas of Heightened Ecological and Cultural Significance*, and starting a project on 'Specially-Designated Arctic Marine Areas' that may recommend International Maritime Organization protection designation (from the effects of international vessel activities) for one or more Arctic marine areas outside of national jurisdiction. Both of these projects follow the recommendations of the Arctic Marine Shipping Assessment (AMSA) that stated the Arctic states should identify such areas and encourage development of special areas or particularly sensitive sea areas (PSSAs) as appropriate tools for environmental protection. These key, ongoing projects will be completed in 2013 and 2014 respectively.



Current research and policy initiatives on black carbon impacts in the Arctic may also merit special controls – presumably in MARPOL Annex VI -- regarding ships sailing in and even outside Arctic waters. The Bering Strait Region as an international strait and chokepoint for entering and departing the Arctic Ocean is a prime example of a region requiring policy initiatives and cooperation between the Russian Federation and the United States.

The Arctic Council's PAME working group is conducting a study on the environmental risks associated with the use and carriage of heavy fuel oil (HFO) by vessels in the Arctic and will identify options and make recommendations – including possibly for the adoption of new international regulations – to mitigate those risks. In Norway, a ban on the use of HFO has been adopted on the east coast of Svalbard.

[Editors suggest moving some background discussion of Polar Code from Opportunity K to this location]

3.3.6 Marine mammals and Biodiversity

The IMO and International Whaling Commission (IWC) both have technical working groups or scientific committees addressing marine mammal issues in a global context. More emphasis and focus are required related to impacts of new Arctic uses on marine mammals, a key theme for the attention of the Arctic state delegations to IMO and IWC.

3.4 Opportunities

3.4.1 International cooperation

Most of the policy and regulatory work for Arctic marine safety and environmental protection in the future will be undertaken through international bodies such as IMO, IALA, IHO, WMO, IWC, FAO and IMSO, as well as by the individual Arctic Ocean [CANADA] coastal states. However, there are significant opportunities for the Arctic Council and its working groups to help guide, inform, and influence this work through actions of the eight Arctic Council states, together and individually, within these international bodies. Some measures can be facilitated by the Arctic Council and attained by regional agreements among the Arctic states, for example the Arctic Search and Rescue (SAR) Agreement, entered into force January 2013, and the Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic to be presented for signature at the 2013 Arctic Council Ministerial.

3.4.2 Regional actions

Other regional actions can be taken to develop and apply Arctic ship traffic monitoring and surveillance; to define potential Arctic marine protected or special areas; to build and strengthen Arctic marine infrastructure; and to implement ecosystem-based management concepts in the Arctic Ocean. Much progress has been made in the Arctic Council dealing with response to marine accidents and oil spills, but greater attention needs to be given to fostering international prevention measures.

The three-theme approach from AMSA – Enhancing Arctic Marine Safety, Protecting Arctic People and the Environment, and Building the Arctic Marine Infrastructure – remains a sound strategy for implementation of AMSA's 17 recommendations. Continued reporting by PAME to the Senior Arctic Officials on the status of the AMSA recommendations provides a consistent progress report and can help identify new gaps and opportunities for action by the Arctic Council's working groups.

3.4.3 Specific opportunities

[Editors' note: To parallel the format in other chapters, the paragraphs below have been split into "Background" and "Opportunity"- adhering as closely as possible to the original text that the shipping expert reviewers agreed upon. Upon instruction from Country Co-leads, "Background" sections can be moved to earlier placements in the chapter.]

(A) Timely Completion and implementation of a Mandatory IMO International Polar Code

Background. Harmonized and enhanced Arctic marine safety and environmental protection will be greatly improved with adoption and full implementation by IMO member states of a mandatory IMO Polar Code. Defining the risks for various class ships within ice-covered and ice-free polar waters has been challenging, and there has been a focus on hazard identification and consequences. Appropriate inclusion of various environmental protection measures in addition to those already provided under IMO instruments has also proven to be challenging. When finalized, these measures are expected to take legal effect through amendments to existing IMO instruments, primarily SOLAS and MARPOL. A new target completion date for a Polar Code is set for 2014.

Opportunity. Arctic states should continue their close cooperation in the IMO on this matter to underline the necessity and urgency of protecting Arctic people and the environment in an era of expanding Arctic marine operations.

(B) Ballast Water Management and Anti-Fouling System Conventions

Background. The International Convention for the Control and Management of Ship's Ballast Water and Sediments was adopted by the IMO in 2004. To become effective, the Ballast Water Management Convention requires ratification by 30 States representing at least 35 percent of the world's merchant shipping tonnage. As of January 31, 2013, 36 nations had ratified representing, 29.07% of world tonnage (IMO Status 2013). Five of the eight Arctic states (Canada, Denmark, Norway, Sweden and the Russian Federation) have ratified, and one (Finland) has signed subject to acceptance (IMO Status 2013). The BWM Convention is a maritime convention applicable to the global oceans and is critical to controlling the introduction and spread of alien and invasive species to the Arctic marine environment. Recent growth in Arctic regional marine operations and trans-Arctic voyages as well as evidence of alien and invasive species in the Arctic highlight the need for ratification and entry into force of the BWM Convention and/or adoption of other domestic prevention measures as more regular summer voyages are conducted in Arctic waters. However, there are looming challenges to the entry into force and effective implementation of the BWM Convention. The phase-in of ballast water management systems (BWMS) in a timely manner on various ship types may be especially problematic; also, questions have been raised regarding the operational efficacy of BWMSs when they are used in the colder settings of polar regions.

The International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS Convention) entered into force in September 2008, and will lead to the elimination of organotins in anti-fouling paints that are harmful to the marine environment. All Arctic States are parties (IMO Status 2013), however, anti-fouling systems seem to be less durable on ships operating in ice-covered waters.

Hull fouling on ships sailing into Arctic waters from southern latitudes may pose an equal risk as ballast water for introducing alien and invasive species to the Arctic marine environment. IMO has therefore developed guidelines for the control and management of ships´ biofouling to minimize the transfer of invasive aquatic species.

Opportunity [proposed by editors, not from shipping group]. Country co-leads will negotiate to distill an opportunity from the background materials above.

(C)-Beyond Oil to Include Bulk Chemicals

Background**.** The [Arctic agreement on oil spill response and preparedness, under the Arctic Council Task Force on Oil Spills,] [proposed Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic] focuses solely on oil. Although the Arctic States discussed the possibility of including other harmful substances within its scope, they ultimately decided not to do so at this time.

Opportunity. However, Arctic states may wish to consider further work on substances other than oil, in separate (nonbinding or binding) instruments or potentially through amending the oil spill agreement to add to its scope noxious liquid substances (banned in the Antarctic under MARPOL ANNEX II). The Arctic states may also wish to consider whether and how they might include other important vessel types in this agreement.

(D)-Monitoring and Surveillance Agreement on Arctic Marine Traffic

Background. Establishing and operating a coordinated and effective vessel monitoring and surveillance system by the Arctic states – an Arctic marine traffic awareness system called for in AMSA Recommendation III B - will be key to enhancing Arctic navigation safety and contributing to environmental protection. Enhanced data sharing in near real-time among all the Arctic states is central to such an integrated system. An effective system would need improved cooperation among Arctic States and others (e.g., EMSA) to share satellite as well as shore-based automatic identification system (AIS) information. The use of AIS transponders as required under SOLAS of certain vessels is essential to an effective Arctic traffic awareness system. Any Arctic system should also explore making use of vessel information available through the Long Range Identification and Tracking of Ships (LRIT) requirement for ships under SOLAS, IMO-approved vessel traffic systems and IMO-approved ship reporting systems. Such a coordinated system will .

Opportunity [proposed by editors, not from shipping group]. Arctic States should consider requiring fishing vessels, smaller ships and pleasure craft operating in the Arctic to carry AIS transponders. They should also explore options for enhanced cooperation and possibly one or more new agreements or arrangements among themselves – and possibly with others – to collect and share Arctic marine traffic data through such means as LRIT, AIS, and IMO approved systems.

(E) Updated Surveys of Indigenous Marine Use

Background. Critical to developing mitigation measures for risks from Arctic marine traffic is having a spatial and temporal understanding of the patterns of indigenous marine use. AMSA Recommendation IIA calls for the Arctic states to consider conducting surveys where gaps of knowledge of this use is missing. An Arctic Council project team under PAME responding to AMSA Recommendation IIC [and working with SDWG, AMAP and CAFF] has attempted to identify areas of heightened ecological and cultural significance including subsistence use

areas. This team has also highlighted the paucity of this information in the Arctic. Changing patterns of sea ice and marine mammal habitats may necessitate new surveys throughout the Arctic, especially in straits and coastal areas. The information from these surveys is also important to ecosystems-based management concepts. As the concept of food security for Arctic communities is advanced, in an era of increased commercial use of Arctic marine waters, a much greater understanding of indigenous marine use is needed for all stakeholders and actors.

Opportunity. The Arctic Council, working closely with its Permanent Participants, should develop a strategy for the conduct of comprehensive surveys as recommended in AMSA IIA.

(F) Enhanced Roles of IWC and IMO in the Protection of Arctic Marine Mammals

Background. The Arctic States have opportunities to be more proactive in bringing marine mammal issues to Committees and Sub-committees of the IMO and the scientific committees of the International Whaling Commission (IWC). Many issues need to be explored in an Arctic context including: ship strikes; noise impacts; appropriate management and mitigation measures; sanctuaries; and marine protected areas. Addressing noise from commercial ships and its impacts on marine life is a work in progress within the IMO. The IMO's Design and Equipment Sub-committee has been tasked with developing voluntary technical guidelines considering ship-quieting technologies, and navigation/operational practices to minimize impacts.

Opportunity. The Arctic Council working groups, PAME and CAFF, could link more with IMO and IWC experts and the national delegations to these bodies and seek to identify areas where the Working Groups could support projects and initiatives at IMO and IWC.

(G) Protection of Arctic Marine Areas

Background. Identifying areas of heightened ecological and cultural significance in the Arctic is important, given increases in Arctic marine operations and shipping. Moreover, because a number of these areas are closely linked to Arctic sea ice, they are also increasingly susceptible to change given the diminishing sea ice. Recognizing the uniqueness and vulnerability of these areas, the Arctic Council and its working groups (AMAP, CAFF and SDWG) have followed up on the AMSA

***Table 3.1 ~ IMO MARPOL Special Areas** **

***Annex 1 -- Oil**: Mediterranean Sea, Baltic Sea, Red Sea, 'Gulfs' Area, Gulf of Aden, Antarctic Area (South of Latitude 60 Degrees South), North West European Waters, Oman Area of the Arabian Sea, and Southern South African Waters.*

***Annex II -- Noxious Liquid Substances**: Antarctic Area*

***Annex IV -- Sewage**: Baltic Sea (1 Jan 2013 Entry into Force).*

***Annex V -- Garbage**: Mediterranean Sea, Baltic Sea, Black Sea, Red Sea, 'Gulfs' Area, North Sea, Antarctic Area*, and the Wider Caribbean Region (including the Gulf of Mexico and the Caribbean Sea).*

***Annex VI – Prevention of Air Pollution by Ships (Emission Control Areas)**: Baltic Sea (SOx), North Sea (SOx), North American (SOx, NOx, and PM), and the United States Caribbean Sea ECA (SOx, NOx, and PM….1 Jan 2013 Entry into Force).*

**Adapted from an IMO table of Special Areas under MARPOL Annexes (for pollution prevention) including dates when adopted, entry into force, and when in effect.*

II (C) recommendation and identified areas of heightened ecological and cultural significance in light of changing climate conditions and increases in marine activity. Similarly, taking into account the special characteristics of the Arctic marine environment, the PAME working group is currently exploring the need for internationally designated areas for the purpose of environmental protection from shipping in high seas regions of the Arctic Ocean (AMSA II(D) recommendation). This protection can be achieved through various IMO "tools", including Particularly Sensitive Sea Areas (PSSAs), Special Areas, or various other Associated Protective Measures (APMs). As indicated in Table 1, there are currently no MARPOL Special Areas in the Arctic Ocean, which establish more stringent controls on discharges of oil, noxious liquid substances, sewage, or garbage. Moreover, there are currently no MARPOL Emission Control Areas in the Arctic Ocean which establish more stringent controls on air pollution.

Opportunity. Based on recommendations of the future AMSA II(D) Report, Arctic States might consider proposing to the IMO, as the responsible body, the designation of one or more areas within the high seas portion of the Arctic Ocean for enhanced environmental protection.

(H) Infrastructure Investments in Hydrographic Surveys and an Observing Network

Background. Improved Arctic charting and greatly enhanced Arctic marine observations are vitally required for current and future Arctic marine operations. An estimated 6-7% of the Arctic marine environment is charted to international navigation standards, meaning that most of the coastal Arctic needs extensive hydrographic surveying. There is an ongoing effort to develop Sustaining Arctic Observing Networks (SAON) by the International Arctic Science Committee and the Arctic Council. [Operational agencies (define/rephrase)] may also be used to enhance marine safety and environmental protection.

Opportunity. Arctic Council States should explore partnerships among themselves and with other public and private entities to share the burden of conducting critical hydrographic surveys in the Arctic and to share in the establishment of a robust Arctic Observing Network.

(I) Strategies for Enhancing Passenger Ship Safety in Arctic Waters

Background. Passenger ships will fall within the scope of a mandatory IMO Polar Code. The Arctic states and flag states of passenger ships that visit Arctic waters should encourage and support a range of best practices by the cruise ship industry when operating in remote and cold Arctic waters.

Opportunity. The Arctic Council Working Groups (PAME and EPPR) and the cruise ship industry should explore forming closer links and maintaining a continuing dialogue related to issues of safety, environmental protection and response.

(J) Mandatory training requirements for seafarers

Background. New guidelines for mariners operating in polar waters were promulgated in the Manila amendments (25 June 2010) to the International Convention on Training, Certification and Watchkeeping for Seafarers (STCW). It is important to ensure that all seafarers on board ships operating in polar waters have additional training. Such training requirements should be mandatory and prescribed in relevant IMO instruments.

Opportunity The Arctic States should support efforts in the IMO to develop mandatory training requirements for officers and crew onboard ships operating in polar waters.

Version here within as of 13th of Feb 2013

(K) Potential IMO Measures for the Arctic

Background (see note re discussion of Polar Code at end of 3.3.5, above).

Opportunities.

- ✓ Within an appropriate time after the mandatory Polar Code has been adopted and made effective through amendments to relevant IMO instruments, the Arctic States together should initiate a process to assess the success of the Code in meeting its objectives in Arctic waters. Based on that assessment, the Arctic states may wish to explore taking appropriate action.
- ✓ At the same time, Arctic states should explore collaborative approaches for monitoring compliance with the Polar Code. Such approaches may include the development at IMO of port state control guidelines for the Polar Code and/or initiatives within existing regional port state control arrangements.
- ✓ Current work underway at IMO to address the impact of black carbon emissions from international shipping in the Arctic or relevant sub-Arctic waters may warrant amendments to MARPOL or other IMO instrument.
- ✓ Arctic states may also wish to consider exploring approaches, including at IMO, to address safety and environmental concerns with respect to other types of vessels that, due to their size, routes, and nature of activity, may not be subject to the Polar Code.

(L) Integration Efforts of Arctic Information to Support Mitigation Measures

Background. The Arctic community has an increasing amount of information about Arctic ship traffic and the location of ecologically and culturally significant areas (that can be used to develop marine protected areas). With advanced spatial and temporal information on indigenous marine use and migratory patterns of marine mammals, an integration process can begin to examine the interactions of these components in the Arctic marine environment. Integration of these unique data sets can aid in the development of mitigation and adaptation measures for other environmental protection and marine safety efforts, e.g., to promote the mitigation of air pollution from shipping in and near the Arctic. Such information will also assist in defining the spatial range and size of future special marine areas.

Opportunity [proposed by editors, not from shipping group]. Arctic states should promote collection and integration of advanced spatial and temporal information on indigenous marine use and migratory patterns of marine mammals and integrating resulting data sets to address environmental and other challenges.

REFERENCES for each chapter appear at the end of this Report.

Revisions here within as follows: Introduction as of 23rd of Jan - Part A: Fishery Resources –version 14th of Jan and Norway has tabled comments/suggested changes to Part A as a separate document - Part B: Marine Mammals and Seabirds as of 29th of Jan

Chapter 4: Marine Living Resources

Version here within as follows:

- ✓ **Introduction – revised by Allison version 23rd of Jan**
- ✓ **Part A: Fishery Resources – Revised by BF version 14th of Jan – comments and suggested changes tabled by Norway as a separate document, version 7th of Feb**
- ✓ **Part B: Marine Mammals and Seabirds – revised by Allison version 29th of Jan**

GENERAL COMMENT AS PER 4TH DEC - This chapter should (like the preceding chapters) have a section on opportunities for cooperative activities with other organizations, e.g., scientific data collection and research with ICES (which has just agreed to place more emphasis on the Arctic).

For many of the Arctic nations, marine living resources are an important food source, are economically important and contribute to cultural identity. The focus of this chapter is on marine living resources and their management and conservation, a discussion which implicates not only the interests of the peoples and cultures who use the resources, but the ecosystems of which they are part. This chapter thus intersects significantly with others in this Report, including Peoples and Cultures, Arctic Pollution, Ecosystem Based Management, Arctic Oil and Gas, Climate Change, Arctic Marine Shipping and Operations, and Arctic Marine Science. The first section of this chapter addresses Arctic fisheries, and the second addresses Arctic seabirds and marine mammals (seals, polar bears, walruses and cetaceans). As reflected in the Arctic Ocean Review Phase 1, there is a wide range of international and regional instruments, as well as domestic and bilateral agreements, that address the management and conservation of all of these resources.

With respect to fisheries, commercial fishing is still limited in Arctic marine regions, and most harvesting is confined to near-shore or small-scale activities. A perceived "gap" in management in the region is often identified regarding potential fishing activity in the area of the central Arctic Ocean national exclusive economic zones where, it is argued, freedom of fishing is not as circumscribed as it is in other high seas areas. Opportunities are identified in this chapter to address this, and other, identified gaps in Arctic fisheries management and conservation. With respect to Arctic seabirds and marine mammals, a majority of the regulatory and policy work for management and conservation is currently being addressed through existing international and regional instruments or organizations and by Arctic Council states' domestic instruments and bilateral agreements. Opportunities exist, however, for the Council to be more proactive in addressing the most pressing conservation issues that face Arctic seabirds and marine mammals, which are identified towards the end of this chapter.

Revisions here within as follows: Introduction as of 23rd of Jan - Part A: Fishery Resources –version 14th of Jan and Norway has tabled comments/suggested changes to Part A as a separate document - Part B: Marine Mammals and Seabirds as of 29th of Jan

4.1 Part A: FISHERY RESOURCES

4.1 Introduction

A. Scoping

For the purposes of Arctic fisheries, it is important to recognize certain spatial characterizations. The 2004 Arctic Climate Impact Assessment (ACIA) focused its attention on four areas: the Northeast Atlantic (Barents and Norwegian Seas); the central North Atlantic (waters adjacent to Iceland and eastern Greenland); northeast Canada (adjacent to Newfoundland and Labrador) and the North Pacific (Bering Sea). The ACIA did *not* focus on the central Arctic Ocean defined for the purposes here as the ocean area north of Canada, Denmark (Greenland), Russia, Norway (Svalbard) and the United States. It is not the case that any of the above areas are independent or self-contained ecosystems. It is the case that within the four areas of focus in the ACIA there is significant commercial fishing activity driven by presence of fish stocks in turn a function of water temperature and food sources. In the area the ACIA did not focus on, the central Arctic Ocean, there is, as yet, minimal commercial fishing activity.

The legal/political spatial characterization is also important. As a result of the international law of the sea (the 1982 U.N. Convention on the Law of the Sea), States have an entitlement to exercise jurisdiction over all fisheries resources located within 200 nm of their coasts and sedentary species on their continental shelf beyond 200 nm. All of the Arctic Council States have, in different ways, enacted detailed legislation and implemented complex fisheries management apparatuses respecting marine living resources in national waters. The national fisheries management frameworks are structured differently in the various States as a result of constitutional and legal tradition differences, yet each of the relevant States attempts to manage the fishery resources in their waters in a manner consistent with local conditions, sustainable development, the ecosystem approach and other fisheries management goals including their obligations under international law.

In international law a freedom to fish exists beyond 200 nm (the high seas).This means that , fishers from any State can harvest fisheries resources on the high seas subject to international obligations and agreements to be noted below,. While the four regions studied in the ACIA contain areas beyond 200 nm and fishing activity exists there, for the most part the freedom to fish in these high seas areas has been circumscribed. A perceived "gap" often identified is regarding potential fishing activity in the area of the central Arctic Ocean beyond 200 nm where, it is argued, freedom of fishing is not as circumscribed as it is respecting other areas beyond 200 nm.

Revisions here within as follows: Introduction as of 23rd of Jan - Part A: Fishery Resources –version 14th of Jan and Norway has tabled comments/suggested changes to Part A as a separate document - Part B: Marine Mammals and Seabirds as of 29th of Jan

B. *The Resource*

Little is known about the existence of fish stocks or the potential for the existence of fisheries resources in large parts of the central Arctic Ocean both within and beyond 200 nm. In an effort to review and assess the existing scientific data respecting marine fishery resources in the Arctic, the United States hosted the Arctic Coastal States Arctic Fisheries Workshop in June 2011. There are commercial fish stocks in the Barents Sea, the Bering Sea and other areas that border the central Arctic Ocean, which has given rise to the possibility of an expansion of such stocks northward. If fisheries extend to the central Arctic Ocean it will be first principally in coastal areas (within 200 nm) and only at a later stage, if at all, to the central Arctic Ocean area beyond 200 nm. It has been explained that: "because of the complex processes and interactions [involved] …, there is currently no simple way to predict whether fish productivity will increase or decrease in a warming Arctic and whether new potential habitats will be successfully occupied." (Hollowed et al., undated). Nevertheless, it has been concluded that six stocks (polar cod, snow crab, Bering flounder, Greenland shark, Arctic skate, and beaked redfish) are "highly likely" to expand in such a manner as to be of sufficient quantity to support commercial fishing in the central Arctic Ocean (defined as both within and beyond 200 nm) (ibid.). At present, no significant commercial fishing takes place with either within or beyond the central Arctic Ocean.

"If fisheries extend to the central Arctic Ocean it will be first principally in coastal areas (within 200 nm) and only at a later stage, if at all, to the central Arctic Ocean area beyond 200 nm."

A sometime overlooked aspect of fishing resources in the central Arctic Ocean is what is required to physically access any potential stocks. While it remains uncertain whether fishing vessels will be included in the scope of the Polar Code applicable to vessels navigating in the Arctic Ocean being prepared within the International Maritime Organization (IMO), it is clear that commercial vessels will be subject to significant challenges regarding vessel construction, design, equipment, and training in waters where sea ice may be encountered. Even with the predicted reduction in ice-presence in the central Arctic Ocean, the variability of ice conditions, especially on the high seas, may require uniquely outfitted fishing vessels to be able to engage in sustained commercial fishing and this may act as a deterrent to such activity.

4.2 Reviewing the Major Relevant International Treaties and Instruments

The UN Convention on the Law of the Sea, which is often referred to as the "constitution of the oceans," applies to the Arctic Ocean in the same manner as it applies to other oceans, thus ensuring that the Arctic Ocean is an area of global engagement. The Convention recognizes or allows for the creation of: areas of national jurisdiction (200 nm zones) for the purposes, inter alia, of fisheries management; high seas beyond 200 nm, where all States have certain freedoms related to the water column; exclusive national authority over the resources of the seafloor both inside and beyond 200 nm, where the physical features of the seafloor and the relevant provisions of the Convention allow; and certain navigational rights for all vessels in

national waters. The Convention prohibits fishing on the high seas for anadromous species (e.g., salmon), subject to a limited exception.

The principal approach to circumscribing high seas fishing rights for non-anadromous species has been through the creation of regional fisheries management organizations (RFMOs) and, in some cases, bilateral fisheries agreements where an area in question is small, supported by the 1995 UN Straddling and Highly Migratory Fish Stocks Agreement (1995 Fish Stocks Agreement). RFMOs generally seek to manage fishing activity beyond 200 nm for stocks that "straddle" the 200 nm limit (stocks that exist within and beyond 200 nm) or for the entire range of stocks both inside and outside 200 nm that are "highly migratory" (e.g., tuna). It is worth noting that the RFMOs that deal with straddling stocks and those that deal with highly migratory species are structured and operate differently and have within them different political tensions. In the case of RFMOs focused upon straddling stocks, the tension is inevitably between the coastal State(s) across whose 200 nm zone the stocks straddling and the non-coastal States (referred to as distant water fishing States) who harvest the straddling stocks on the high seas adjacent to the 200 nm. RFMOs only apply to their member States, although States that are party to the 1995 Fish Stocks Agreement are also to respect the regulatory authority of RFMOs within their area of competence even if those States are not members of the RFMO.

The North-East Atlantic Fisheries Commission (NEAFC), to which Denmark (Faroe Islands and Greenland), the European Union, Iceland, Norway and Russia are members, has regulatory authority, subject to certain exceptions, for its members fishery activities respecting straddling stocks in areas of the northeast Atlantic beyond the 200 nm zones of the coastal States of the region. According to its treaty, the NEAFC regulatory area includes an area of water in the central Arctic Ocean, although no management measures have been adopted that specifically deals with this area.

Fishing activity on the high seas respecting:

- ✓ stocks not covered by an RFMO (or an equivalent arrangement); or
- ✓ stocks covered by an RFMO to which the flag State of the vessel engaged in the fishing activity is not internationally obligated to adhere; or
- ✓ "discrete" stocks (stocks primarily located in a high seas area that are not straddling or highly migratory stocks)

are subject to minimal obligations under Articles 63-64 and 118-119 of the Law of the Sea Convention respecting conservation of stocks. States that are party to the 1993 FAO Compliance Agreement are to require all their fishing vessels to have licences/permits for fishing on the high seas and to ensure that their vessels "do not engage in any activity that undermines the effectiveness of international conservation and management measures."

Of particular note respecting the high seas of the central Arctic Ocean is Article 6(6) of the 1995 Fish Stocks Agreement, which directs that:

For new or exploratory fisheries, States shall adopt as soon as possible cautious conservation and management measures, including, inter alia, catch limits and effort limits. Such measures shall remain in force until there are sufficient data to allow assessment of the impact of the

fisheries on the long-term sustainability of the stocks, whereupon conservation and management measures based on that assessment shall be implemented. The latter measures shall, if appropriate, allow for the gradual development of the fisheries.

While the application of the Fish Stocks Agreement is beyond 200 nm, it is argued that Article 6, which deals generally with precaution, may have application within 200 nm.

While not an international treaty, an important international instrument is the 2001 FAO International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA – IUU). "Unregulated fishing," as defined in the 2001 IPOA-IUU, does not mean all fishing activity on the high seas where no RFMO or other management arrangement exists. "Unregulated fishing," which States undertake to deter, is defined as that done in areas or for fish stocks for which there are no applicable conservation or management measures "and where the activities are conducted in a manner inconsistent with State responsibilities for the conservation of living marine resources under international law" (FAO 2001, para. 3.3.2 and see para. 3.3.3.).

The 2009 FAO Port State Measures Agreement, when it comes into force, will require its Parties to deny the opportunity to a vessel to land or tranship fish in its ports where the fish has been harvested through IUU fishing, which includes the above noted definition of "unregulated fishing" from the 2001 IPOA-IUU. As a matter of international law and subject to trade law and other obligations, States have this authority. The purpose of the FAO Port State Measures Agreement is to increase the number of States who will use this authority.

Of final note is the FAO Code of Conduct for Responsible Fisheries which, while not a legally binding document, creates certain benchmarks for fisheries behaviour both within and beyond 200 nm.

As outlined above, States have obligations and responsibilities respecting fishery activities and resources in the central Arctic Ocean beyond 200 nm, however, the international legal regime applicable is hobbled to a certain extent by not all States being a party to the relevant international treaties.

4.3 Challenges

With respect to fisheries in the central Arctic Ocean and other Arctic areas both within and beyond 200 nm, the challenges are several-fold.

First, the need exists for more scientific information (including ongoing monitoring) on the presence of fish stocks and information respecting the potential for fish stocks to appear in the various areas of the central Arctic Ocean and other Arctic areas both within and beyond 200 nm.

Second, challenges face States within 200 nm where they have fisheries jurisdiction to evaluate scientific information, to monitor the domestic commercial fishing activity that does or may take place, to assess the impact of commercial fishing activity on the indigenous peoples of the region, to consider and adopt as necessary management measures concerning commercial fishing activity that are respectful of the needs and desire of indigenous people in balance with environmental protection and economic development. An additional concern for

coastal States is the safety of fishing vessels and the possibility of marine environmental pollution in uncertain and changing ice conditions.

Third, the challenges that exist respecting fisheries in the central Arctic Ocean beyond 200 nm are ones of balance, timing and nuance.

- ✓ When, if ever, might there be an abundance of fishery resources to allow for a viable commercial fishery beyond 200 nm in the central Arctic Ocean?
- ✓ What is the best approach to ensure that future possible commercial fishing activity is undertaken in manner that is consistent with the international legal regime of the law of the sea, the interests of conservation, environmental protection, economic development and global food needs?
- ✓ Who are or should be the principal States (players) in considering the timing for or the design of an approach for dealing with future possible commercial fishing activity in the central Arctic Ocean area beyond 200 nm?

In respect of this last point, it is noteworthy that not all of the State participants in the Arctic Council have coastal State interests respecting the central Arctic Ocean and some States which may have a fishing interest in the Arctic are not participants in the Arctic Council.

4.4 Opportunities

The Arctic Council is not a body that regulates, manages or directs its participating States to undertake particular actions or to adopt particular policies respecting fisheries. However, Arctic Council States recognize the need to move with great care regarding exploratory and commercial fishing activities in Arctic marine areas.

All of the States with coasts on the central Arctic Ocean have laws and policies that apply to fishery resources and their national fishing vessels. At this time no regular fora exist where States (and others) with clear interests in the Arctic Ocean or, more specifically, fisheries in the central Arctic Ocean, meet to adopt or issue formal declarations or statements. Therefore, attention is given here to potential opportunities for the Arctic Council respecting the conservation and management of fishery resources in Arctic marine areas.

As stated at the beginning of this chapter, certain spatial considerations are important to recognize in relation to Arctic fisheries. Opportunities relevant to fisheries within national jurisdiction can be distinguished from opportunities in relation to potential fishery resources in the central Arctic Ocean beyond national jurisdiction. Currently there are no known fish stocks of significant commercial interest in the central Arctic Ocean in areas beyond national jurisdiction. Scientific research to date indicates that factors such as low primary production, habitat limitations and depth make it unlikely that commercial stocks exist in this area. However, in sub-Arctic seas surrounding the Arctic Ocean there are significant commercial fisheries.

The Council has been the catalyst for the 2011 Arctic Search and Rescue Agreement and the Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic that will be presented for signature at the 2013 Arctic Council Ministerial. Similarly, there are opportunities for the Arctic Council to act as a catalyst to promote sound conservation and

management of Arctic fisheries resources. Through declarations, statements, resolutions, and so on, the Council could communicate shared intentions, desires, goals, political commitments and calls for action respecting Arctic fisheries.

There are many different options for the content and "modes of delivery" of any such declarations, statements and resolutions. The Arctic Council Ministerial Meetings have regularly adopted Declarations and could do so as regards fisheries within and/or beyond areas of national jurisdiction in the central Arctic Ocean. While the nomenclature of an instrument has some significance, what is of more relevance is the State grouping that adopts, approves or issues such an instrument. It is noteworthy that the Arctic Council operates under the consensus rule.

Given the intention, expressed in the Declaration Establishing the Arctic Council, to provide for the active participation and full consultation of the Permanent Participants, development of any such instrument should involve the Permanent Participants and should receive their support.

The possibility of a treaty on Arctic fisheries also exists. Issues of concern for a treaty approach would be which States (or State grouping) would negotiate such a treaty and which States could or would become a party to such a treaty.

Zones within National Jurisdiction

[Note the need to clarify if intent is to include territorial seas]

Numerous opportunities for cooperation in respect of marine living resources exist for the Arctic States with exclusive economic zones in the Arctic.

States collectively or bilaterally could engage in cooperative research and scientific study and exchanges of information. Arctic states already promote scientific cooperation and could encourage that any fishing activities must be based on adequate scientific knowledge. For example, in 2009, the United States closed its fishing zone (beyond 3 nm) in the Chukchi and Beaufort Seas to commercial fishing until sufficient information is available to support the sustainable management of a commercial fishery.

Where the possibility exists of transboundary stocks (stocks which occur within the 200 nm zone of two or more coastal States) the Arctic States could consider, commit to, or work towards achieving coordinated, cooperative or joint management of such stocks as contemplated in Article 63(1) of the LOS Convention. In 2008, for example, the U.S. Congress directed that the United States "should initiate international discussions" to negotiate with other Arctic nations agreements for managing migratory, transboundary, and straddling stocks in the Arctic Ocean and to establish "a new international fisheries management organization … for the region" (United States 2008, sec. 1). Pending the completion of such agreements, "the United States should support international efforts to halt expansion of commercial fishing activities in the high seas of the Arctic Ocean" (*ibid*., sec. 4). The United States "is encouraging other Arctic coastal States to take comparable steps for managing fisheries within Arctic waters under their respective jurisdiction" (United States, undated, para. 7). Of final note, "The United States is also considering whether it would be

desirable for a group of States with interests in present and future Arctic fisheries to adopt some form of general statement or declaration" (*ibid*., para. 8).

It is to be noted that the establishment of institutional structures for the coordination, cooperation and management of transboundary stocks is often difficult because of differing national fisheries management structures.

As indicated above, pre-emptive closure of some fisheries is also an option. While the United States has adopted a closure of commercial fishing in waters adjacent to northern Alaska, Canada, having a differently constituted national fishery regime, has issued no permits or licenses for commercial fishing in its central Arctic Ocean within 200 nm. Several alternatives exist for each State, individually or collectively, to consider or agree to implement or maintain a no access policy to these waters for commercial fishing: for a set period (e.g., five years); until further research on the resource is undertaken and assessed and both the economic benefits of a commercial fishery and/or the impact of such activity on indigenous fishing interests are assessed; or indefinitely. In this context, the relevant Arctic States could consider, agree on, or commit towards achieving conditions or principles under which exploratory fishing could take place and commercial fisheries could be developed.

Central Arctic Ocean High Seas Areas

Considerable international attention has been centered on this geographic area if for no other reason than the water column and the fisheries therein are beyond coastal State jurisdiction and thus open to non-Arctic State engagement. Irrespective of this potential non-Arctic State involvement on the high seas of the central Arctic Ocean, the littoral States of the Arctic Ocean (and the populations of the High Arctic) are the ones with the primary interest in the region as they will be the most affected by actions and activities on the high seas.

Despite the absence of evidence of the existence of straddling or highly migratory fish stocks in the central Arctic Ocean high seas area, there have been calls for a regional fisheries management organization (RFMO) to become involved in this area. The suggestions have been for the creation of a new RFMO dedicated to the central Arctic Ocean or for an existing RFMO, such as the NEAFC, to extend its geographic reach to cover the central Arctic Ocean high seas area. The arguments that favour this development are that having an RFMO in place prior to any possible fishing activity decreases the risk of illicit fishing activity taking place and increases the possibility of the development of a well-managed fishery. The arguments against near-term RFMO establishment or extension is that without a knowledge of the nature of the fishery involved crafting the most effective RFMO is difficult and that in the absence of activities to regulate, it is a waste of resources and could lead to "mission creep" by an RFMO into other subject areas. As noted above, membership in RFMOs can be a contentious issue where those States with the most direct interest may be overwhelmed by States with a differing interest. The design of a RFMO can sometimes take this into account, but this depends upon the States engaged in the negotiation of the RFMO constitutive document.

If the immediate establishment or extension of an RFMO is not deemed timely, this does not preclude the desirability of RFMO engagement at a future point.

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Another institutional option is the establishment of a treaty-based body focusing on the promotion and cooperation of high seas fisheries research (and perhaps also within areas of national jurisdiction) similar to PICES (created by the 1992 Convention for a North Pacific Marine Science Organization) or ICES (created by the 1964 Convention for the International Council for the Exploration of the Sea). An even less formal structure for the same purpose could be the establishment of a scientific committee perhaps modeled on the International Scientific Committee (ISC) for Tuna and Tuna-like Species in the North Pacific (initialized in 1995). A specific purpose of the ISC is to "establish the scientific groundwork" for a possible tuna-based RFMO in the North Pacific Ocean. In contrast to the central Arctic Ocean, at the time PICES and ICES were created, there was and continues to be significant active research in those regions. Thus, as with RFMOs, questions of timeliness and effectiveness exist respecting the establishment of a multilateral scientific body.

As noted earlier in this chapter, it is important to distinguish fishery resources within the national jurisdictions of the Arctic Council States with coasts on the central Arctic Ocean, from the fishery resources in the Central Arctic Ocean High Seas Area that are not under the exclusive jurisdiction of any State. This might affect the nature and content of any Arctic Council declarations, statements, resolutions or other actions.

[BF question: does AOR II want to direct recommendations at subsets of Arctic states such as "Arctic Council States with coasts on the central Arctic Ocean", or is the intention to make recommendations that the Arctic Council as a whole would adopt?]

National Zones within 200nm

[BF comment: recommend deleting headings here depending on answer to above question]

1 The Arctic Council States with coasts on the central Arctic Ocean should move with great care regarding exploratory and commercial fishing activities, in particular, being mindful of the rights and interests of the indigenous peoples of the Arctic. Moreover, decisions on encouraging or permitting commercial fishing activities must be based on an adequate scientific basis.

2 The Arctic Council States with coasts on the central Arctic Ocean should monitor the science and fishing activity respecting transboundary stocks and, as appropriate, cooperation to ensure that adequate management measures are adopted to assure effective joint management of transboundary stocks.

<u>Central Arctic Ocean High Seas Area</u>

[BF comment: recommend deleting headings here depending on answer to above question]

1 The Arctic Council States should commit to preventing all commercial fishing activity under its control from taking place on the high seas of the central Arctic Ocean until such time that there is scientific evidence supporting the sustainability of a commercial fishery.

2 The Arctic Council States should request that all other States with fishers that may have an interest in central Arctic Ocean high seas area to respect the above commitment of the Arctic Council States and prevent commercial fishing activity

under their control until such time that there is scientific evidence supporting the sustainability of a commercial fishery.

3 The Arctic Council States either collectively through a working group or committee or individually should undertake and share studies that examine the current and potential existence of fish stocks in the high seas of the central Arctic Ocean.

4 The Arctic Council States either collectively or individually should, to extent possible, monitor fishing activity that takes place in the high seas of the central Arctic Ocean.

4.2 Part B: Marine Mammals and Seabirds

4.2.1 Introduction

Seabirds and marine mammals (including polar bears, walruses, seals and cetaceans) are a very prominent element in Arctic marine ecosystems. Although the fauna of high latitudes tend not to be high in species diversity, this is not true of either seabirds or seals, both of which reach their greatest diversity in polar regions (Gaston 2004). Many species of air-breathing vertebrates retreat from Arctic waters in winter, migrating back as the ice clears away in early summer. The annual expansion and contraction of polar sea ice places a premium on mobility, and seabirds and marine mammals, being capable of long migrations, are especially well-adapted to make use of the opportunity for feeding presented by the polar summer. While marine mammals principally shift to low Arctic or subarctic waters in winter (except polar bears and six species of seals), seabirds may range anywhere on the planet outside the northern summer, with several species wintering south of the equator.

4.2.2 Status and Trends

Conservation statuses and classifications for marine mammals and seabirds as defined by international agreements, 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. Refer to the Arctic Ocean Review Phase I for detailed information.

Marine Mammals

There are seven species of seals within the circumpolar Arctic, most of which are more or less resident, but harp seals undertake lengthy migrations to whelping areas in the low and subarctic, possibly to escape predation by polar bears (Lavigne & Kovacs 1988). Hooded seals make similar, although shorter, migrations (Riedman 1989). Information on population trends among seals is variable in quality. Those species subject to commercial harvest, for example, are monitored well, whereas other species, especially those without concentrated whelping areas, are poorly known. Harp seals have recovered from low populations in the 1950s and are currently the most numerous seal in the northern Hemisphere (Kovacs 2008b). In contrast, northern fur seals have been declining since the 1970s and are now at less than 50% of their former population size (Towell et al. 2006).

The polar bear is a large, specialized ice-seal predator that is largely dependent on annual sea ice. Although basically resident, polar bears also form seasonal aggregations on land in areas

such as Hudson Bay, where sea ice disappears during the summer (Peacock et al. 2010). There are also specific denning areas where pregnant females lie up during the middle of winter to give birth and where, in early spring, there are above-average concentrations of families comprising a mother with one or more first-year cubs (Peacock et al. 2010). While polar bears may consume a variety of foods (e.g., bird eggs, berries, and other vegetation) while on land (Stirling, 2011), they can be considered specialized predators of seals. Polar bears occur everywhere that seals are found on sea ice and retain the majority of their historic range to date. Such inter-relationships between species underlines a central theme of this Report, namely the need for an ecosystem approach to managing the marine Arctic.

Polar bear populations have remained fairly stable over recent years and decades, although individual subpopulations may be declining and data are not sufficient to evaluate trends for some populations (Obbard et al 2010). Climate change is considered the major threat to polar bears, with warming temperatures leading to reduced time, extent, and depth of the annual sea ice on which polar bears are so dependent (Stirling & Derocher 2012).

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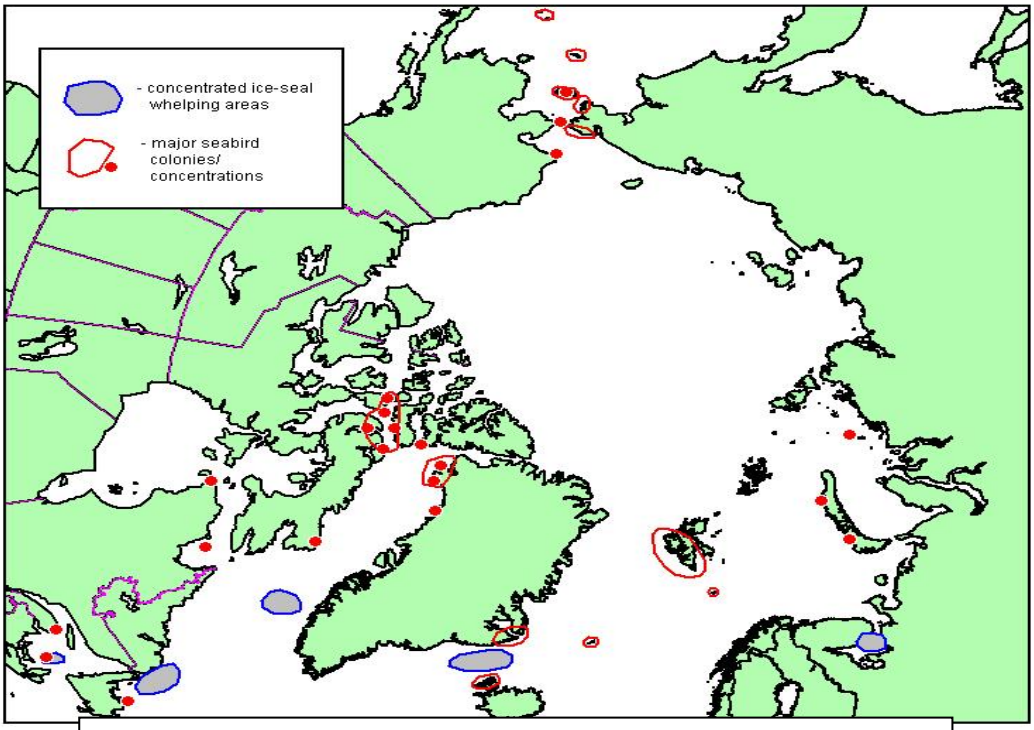

Figure 4.1

Important areas for breeding seabirds and whelping seals

Baffin Bay-Lancaster Sound; Ungava Bay; W Hudson Strait; Spitsbergen, W coast Novaya Zemlya; Bering Strait islands; Pribilof Islands; NW Iceland; Bear Island; W Greenland; Labrador front (Harp seal), S Davis Strait (Hooded seal); Foxe Basin (Atlantic walrus)

The walrus hauls out frequently on sea ice, although it gives birth in the water. It also hauls out regularly on land after annual sea ice has cleared (Riedman 1990).

Seventeen species of cetaceans are found within the Arctic, many with wide and often circumpolar distributions. While the number of species in various groups of Arctic animals may be low compared to warmer latitudes, patterns of high 'within-species' variability exist for many, often in the form of distinct subspecies in various parts of the Arctic area. Many species have different subspecies in the Atlantic and Pacific sectors, *e.g.*, minke whales. 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.

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Seabirds

Among the nearly 300 species of seabirds worldwide, more than 30 breed in the Arctic (Ganter and Gaston, in press, ABA), some of which reach their greatest diversity in the Arctic and subarctic.. Some Arctic-breeding species are among the most numerous seabirds in the world, having populations in excess of 10 million (ABA). All seabirds shift their range between summer and winter, with the exception of a few low Arctic populations. Some species are trans-equatorial migrants, wintering in tropical or temperate waters of the southern hemisphere or sub-Antarctic waters. These species are vulnerable to changes occurring outside the Arctic and beyond the jurisdiction of the Arctic Council Member States.

Many seabirds gather in large, dense aggregations at certain times of the year and are highly vulnerable to point source disturbance and pollution events during that those times (Heubeck et al. 2003). Colony sites tend to be constant from year to year, with some seabird colonies having persisted in the same location for centuries (Gaston & Donaldson 1996). Birdlife International has identified a network of Important Bird Areas, based on specific population criteria (http://www.birdlife.org/action/science/sites/). Those based on marine bird populations provide an excellent summary of sensitive breeding sites across the Arctic.

Most seabirds inhabiting Arctic waters are found in the peripheral seas (Barents Sea, Beaufort Sea, Kara Sea, and waters of the Canadian archipelago) and principally in continental shelf waters. The Central Arctic Ocean supports relatively few seabirds. One exception is Ross's Gull *Xema sabini*, which migrates into the Arctic Ocean for a period in late summer and fall (Hjort et al. 1997). Increased dispersal and colonization of new breeding areas by seabirds is likely as Arctic summer sea ice continues to retreat.

4.2.3 Relevant International and Regional Instruments

CITES: An important international instrument that addresses international trade in endangered flora and fauna, including Arctic marine mammals and seabirds, is the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). All Arctic Council states are party to CITES, which aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Because it concerns international trade, CITES does not apply to limited situations in which products from endangered species are for domestic consumption only. It becomes highly relevant, however, when a CITES-listed species (or its products or derivatives) is intended to cross an international border. Under CITES, species and geographical populations are subject to listing in one of three appendices. The goals of monitoring and regulation are achieved through a system of permits and certificates for export or import, issued by national governmental authorities, and based upon criteria set forth in the articles of CITES. All species of cetaceans are listed in CITES appendices and are therefore subject to CITES requirements. In addition, since 1979 the CITES Conference of the Parties has adopted several resolutions regarding cetaceans and the relationship with the IWC since 1979, the current version of which is Resolution Conf. 11.4 (Rev. CoP12), which among other things calls for CITES member states to honor IWC restrictions on whaling and the trade of whale products. This latest resolution remains in force.

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Seabirds

Within the Arctic Council's Conservation of Arctic Flora and Fauna, a working group on seabirds (C-bird) has been active since 1993 (see http://web.arcticportal.org/en/caff/cbird). This *ad hoc* working group has produced several reports on the status of Arctic seabirds and on specific threats to their populations (http://caff.is/expert-group-documents/view_category/16-circumpolar-seabird-expert-group-cbird). Recently, it has created several online tools to enable timely tracking of seabird populations and reproductive success (http://www.caff.is/seabirds-cbird/seabird-information-network).

Many existing threats to seabirds occur on their wintering areas outside the Arctic (ABA). Therefore, a number of international conventions aim to protect the year-round habitat of migratory species and promote cooperation among range states and countries such as the Convention on Migratory Species (ratified by most Arctic Council countries).

Marine Mammals

NAFO/ICES: The Northwest Atlantic Fisheries Organisation (NAFO) is an intergovernmental fisheries science and management, which together with the International Council for the Exploration of the Sea (ICES), provides advice on the management of Harp and Hooded Seals in the Atlantic through a joint NAFO/ICES working group.

Polar Bears: An important agreement is the 1973 Agreement on the Conservation of Polar Bears, to which five of the eight Arctic Council States are party (Canada, Norway, Denmark/Greenland, Russia and the US). In addition, a Polar Bear Specialist Group operates under the IUCN to provide guidance and recommendations on polar bear conservation in support of this agreement.

IWC: The International Whaling Commission (IWC) was set up under the International Convention for the Regulation of Whaling (ICRW); all Arctic Council states except Canada are among the 89 member governments of the IWC. The Convention's purpose is to provide for the conservation and utilization of whale resources and the management of whaling The Commission reviews and revises as necessary measures contained in the Convention's Schedule with respect to the conservation and utilization of whale resources. Among other things, these measures provide for the complete protection of certain species; designate specified areas as whale sanctuaries; and set limits on the numbers and size of whales, which may be taken.

The IWC is responsible for setting catch limits for commercial whaling, however there is currently a commercial whaling moratorium in place under the IWC. Norway and Iceland have an objection and a reservation to the moratorium decision, respectively. Both countries establish their own catch limits but must provide information on those catches and associated scientific data to the Commission. Canada is not a commercial whaling nation. The Russian Federation has also registered an objection to the moratorium decision but does not exercise it. The IWC also addresses aboriginal subsistence whaling (ASW), and three Arctic countries have historically received ASW catch limits from the IWC: Denmark/Greenland, the Russian Federation and the USA. Since its inception, the IWC has acknowledged that ASW is of a different nature to commercial whaling, and it is therefore not subject to the moratorium.

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NAMMCO: The Agreement on Cooperation in Research, Conservation and Management of Marine Mammals in the North Atlantic (NAMMCO) entered into force in 1992. It established a regional organization, the North Atlantic Marine Mammal Commission (NAMMCO). The Parties to NAMMCO are The Faroe Islands, Greenland, Iceland, and Norway, with Canada, Denmark, the Russian Federation and Japan participating as observers.

NAMMCO's geographical scope is the North Atlantic, and its objective is to contribute through regional consultation and cooperation to the conservation, management and study of marine mammals, including large whales, smaller cetaceans, and pinnipeds, in the NAMMCO region. NAMMCO has been instrumental in management of cetaceans in the NAMMCO countries by providing scientific management advice both on larger species (minke, fin humpback whales) and in particular on medium sized and the small cetaceans which are not covered by the IWC.

LOS Convention: The United Nations Convention on the Law of the Sea (LOS Convention) did not create any specific provisions for the regulation of whaling, yet it contains sections relevant to cetaceans. Article 64 provides for the conservation of highly migratory species (HMS) and Annex I identifies cetaceans as HMS. Specifically, Article 64 calls on coastal State and other States whose nationals harvest HMS to cooperate directly or through appropriate international organizations to ensure conservation and the promotion of optimum utilization of HMS, both within and beyond EEZs. In regions for which no appropriate international organization exists, the coastal State and other States whose nationals harvest HMS in the region shall cooperate to establish such an organization and participate in its work.

Article 65 of the LOS Convention applies specifically to marine mammals. States have an obligation to cooperate with a view to the conservation of marine mammals and in the case of cetaceans to work through the appropriate international organizations for their conservation, management and study. The right of a coastal State or international organization to prohibit, limit or regulate exploitation of marine mammals more strictly is not restricted.

IMO: The International Maritime Organization (IMO) is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships. A number of legally binding and non-legally binding IMO instruments are relevant for shipping in the Arctic. Some potentially relevant measures are set forth in the General Provisions on Ships Routing, the Particularly Sensitive Sea Areas Guidelines, the Guidelines for Ships operating in Polar Waters, and the Guidance document for minimizing the risk of ship strikes with cetaceans. In addition, two IMO processes now underway are relevant to Arctic cetaceans: the development of a binding Polar Code and the development of voluntary technical guidelines considering ship quieting technologies.

4.2.4 Challenges

Most of the regulatory and policy work for the management and conservation of Arctic seabirds and marine mammals is currently being addressed and conducted through existing international and regional instruments or organizations such as the IWC, IMO, IUCN, UNCLOS, CITES, NAFO, and NAMMCO, and by Arctic Council states' domestic instruments and bilateral agreements. Opportunities exist, however, for the Arctic Council to

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be more proactive in addressing the most pressing conservation issues that face Arctic seabirds and marine mammals. These include climate change, changes in sea ice, increased marine operations, and pollution. Some of these issues are covered in depth in other Chapters (*see* Arctic Marine Shipping and Operations Chapter, Pollution Chapter and Arctic Oil and Gas Chapter).

Climate Change and Diminished Sea Ice

Until recently the main threat to Arctic seabirds and marine mammals was over-harvesting (Meltofte et al. date?, ABA, Synthesis). In the past few decades, however, climate change has emerged as a growing threat to seabirds and marine mammals, both directly, through earlier break-up and reductions in total extent of sea ice (Parkinson & Cavalieri 2008. Perovich & Richter-Menge 2009) and indirectly through changes in the food web, prey species and facilitation of developments such as mineral exploitation, increased shipping, tourism and new commercial fisheries in previously untouched areas (ABA, SWIPA). These changesimpact Arctic marine ecosystems, affecting the structure of the ice platform, the timing of biological events like plankton blooms and bird nesting, the amount of primary production (Arrigo et al. 2011, Arrigo et al. 2008, Popova et al. 2012) and the availability of open water at different times of year.

Possible effects on Arctic marine mammals were among the first biological signals of climate change to be identified (e.g., Stirling & Derocher 1993; Tynan & DeMaster 1997) Ice-associated Arctic marine mammals are of particular concern because of the current rapid changes in Arctic summer sea ice extent (e.g., ACIA, 2005, Snow, Water, Ice and Permafrost in the Arctic [SWIPA] 2011). The reduction in total sea ice area diminishes the habitat available for whelping and other hauling out activities and may also affect the timing of food flushes resulting from changes in the balance of under-ice and pelagic primary production along with the associated food webs (Moline et al. 2008). As ice conditions continue to change we can anticipate that vital rates (fertility, mortality rates etc.) will also be affected.

Decadal patterns of sea ice variation suggest that changes in recent years are likely to impact resident marine mammal populations at regional and hemispheric scales (Barber & Iacozza, 2004), and seals that whelp on ice in spring are likely to be the most susceptible to changing ice conditions. Reduced sea-ice can also lead to increased predation of seals, for example increased

In 2011, NOAA convened the CetMap Working Group to produce cetacean density and distribution maps The project aims to produce maps for U.S. waters that are time- and species-specific and that estimate density using predictive environmental factors. CetMap has identified a hierarchy of preferred density and distribution model or information types, conducted a cetacean data availability assessment, modeled or re-modeled density, created standardized GIS files from new and existing modeling results and created a NOAA website interface to organize the datasets and maps, make them searchable by region, species, and month and provide the files for download.

CetMap also identifies Biologically Important Areas (BIAs) where cetacean species or populations are known to concentrate for specific behaviors, or be range-limited to assist resource managers in planning how reduce adverse impacts to cetaceans resulting from human activities.

http://cetsound.noaa.gov/cetacean.html

incursion into Arctic water by killer whale pods (Ferguson, 2009; Higdon & Ferguson, 2009, SWIPA). These feed mainly on whales but also take seals (Ferguson et al. 2010). Although the proportion of local seal populations killed by killer whales is probably small, the effect of their presence may alter the seals' feeding habits and distribution (the "landscape of fear" effect).

Polar bears feed mainly on ice-associated seals and consequently are dependent on sea ice as their primary hunting platform. Early ice-break up and delayed freeze-up has reduced the duration of sea-ice, causing bears to spend more time ashore, which can lead to reductions in reproductive rates, cub and adult survival rates, and population size (Stirling et al. 1999, 2004; Parks et al., 2006; Stirling & Parkinson, 2006), as well an increase in the number of defense kills from human-bear interactions (e.g., Towns et al., 2009) ; Clark et al., 2012). In East Greenland, bears are now smaller than they were some decades ago, perhaps because of a reduction in the availability of prey (Pertoldi et al., 2009). As multi-year ice becomes less extensive, polar bears make less use of this habitat for denning and increasingly den on land (e.g., Fischbach et al., 2007).

Earlier ice clearance, causing bears to come ashore earlier in the summer, has led to increased predation on nesting birds, especially those breeding in large colonies (Rockwell & Gormezano, 2009, Smith et al. 2010). Although the number of bears involved is small and the effect of augmentation of food supplies for bears is likely to be negligible at the population level, such predation can have strong effects on the breeding success of the birds (Rockwell et al. 2011), perhaps leading to changes in breeding sites and nest dispersion (Gaston and Elliott in press). Timing of ice break-up is also known to have a strong effect on the success of breeding for some seabirds, and has been implicated in population declines Gaston et al. 2005a, and Byrd et al., 2008a,b). Conversely, in more high Arctic areas, early ice break-up has been associated with earlier breeding and enhanced reproductive success for some seabird species (Gaston et al., 2005b).

Pollution

Pollution in the Arctic is a well-recognized challenge, and in particular biomagnification of particular concern to Arctic marine mammals and seabirds. Being at the top of a lengthy food chain (primary producers, copepods, larger zooplankton, Arctic cod, seal) polar bears are the recipient of highly biomagnified contaminants (e.g. McKinney et al. 2010). Several species of gulls stand at similarly high levels on the food chain, as a result of feeding on seabird eggs and chicks, or scavenging on polar bear kills and seal afterbirths. Levels of organochlorine contaminants have been identified as a cause of adult mortality in some seabird species (Bustness et al. 2003) and high levels of mercury may be implicated in the decline of Ivory Gulls in Canada (Braune et al. 2006). For more detailed information, see Chapter on Pollution in the Arctic.

Increased Marine Operations

As described in Chapter 3 *Arctic Marine Operations and Shipping*, as the Arctic climate continues to change, it is anticipated that shipping patterns will correspondingly change. For example, changing sea ice conditions in the Arctic will inevitably bring greater ship traffic (PAME, AMSA 2009). With increased ship traffic also comes increased risks to Arctic

seabirds and marine mammals through increased ocean noise, the introduction of alien invasive species through ballast water, the possibility of oil spills, and increased possibility of ship strikes.

Although there are few known incidents of collisions between ships and cetaceans in the Arctic, as ship traffic increases, some species may be affected. It is very likely that seasonally migrant Arctic cetaceans will range farther north and perhaps stay longer, if current trends in sea ice reduction continue For example, fin, humpback, minke, gray, and killer whales seem especially poised for such opportunity (Moore et al. 2008). Other species, such as the bowhead whale may be able to migrate to other areas, through new routes previously inaccessible due to ice (Heide-Jørgensen *et al.*, 2012). The most effective way to reduce collision risk is to keep marine mammals and ships apart. This relies on good data and an understanding of the seasonal patterns of marine mammal distribution, as well as consideration of practicable alternative routes for shipping. Marine mammals' movements do not have always have predictable patterns and their distribution is becoming more unpredictable with climate change, nevertheless regional actions can be taken to increase data on seasonal movements and residence areas, develop Arctic ship traffic monitoring and surveillance, develop traffic routing schemes, and define potential Arctic marine protected areas such as IMO PSSAs.

Seabirds are among the organisms most severely affected by oil spills in marine waters (Heubeck et al. 2003). For example, more than 300,000 seabirds were estimated killed by the Exxon Valdez oil spill in the subarctic waters of Prince William Sound, Alaska (Piatt et al. 1990). Even the small, chronic spills that result from everyday ship discharges and routine oil operations were estimated to kill 300,000 murres and Little Auks annually off Newfoundland in the 1990s (Wiese & Robertson 2004). Seals are also vulnerable to oil pollution, especially when confined by the demands of whelping (SWIPA).

Developments in offshore drilling technology, along with extended open water seasons, have led to increased interest in oil and gas activities in Arctic marine waters. However, responding to spill incidents in ice-affected waters would present a number of technical and logistical challenges. Moreover, the extremely aggregated distribution of many marine organisms, especially the very large colonies of seabirds which are especially vulnerable to oil spills, indicate the importance in examining proposals for offshore oil developments with great care and of locating them at a distance from seabird colonies and seal whelping areas. Since 2010, the Arctic Council has been negotiating a binding Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic (Arctic Oil Pollution Agreement), which is expected to be signed at the 2013 Ministerial. The Agreement will contain provisions regarding pollution preparedness and response, notification of other Parties and interested States of oil pollution incidents, monitoring Arctic maritime areas for possible oil pollution incidents, facilitating information exchange and assistance in oil spill preparedness and response operations, coordinating joint response operations and cooperating in joint exercises and joint reviews of operations.

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4.2.5 Opportunities for Cooperative Action

Measures that can be put into place to address several of these conservation threats can include protection from direct and indirect interactions with fisheries, clean-up of existing contaminants and prevention of further contamination, protection of key reproductive habitat, measures to reduce ship strikes such as vessel corridors, speed limits and observer programs, regulations on increased human activity such as oil and gas and coastal development, and marine protected areas (*ibid*. Table I).

In addition, objective indicators are needed against which to measure population or habitat loss and to assist in assessing trends and measure conservation effectiveness. Recognizing that data for Arctic seabirds and marine mammals are often difficult to obtain, it is essential that basic indicators be identified, such as sea ice extent, population trends in well-studied seabird and marine mammal species, or health and reproductive trends and that efforts be made to better study and monitor lesser known species. Monitoring of populations and stocks is also essential to understand their response to the cumulative impact of all risk factors.

Specific opportunities could include:

- ✓ **Collaborate and cooperate with the International Whaling Commission on its cetacean ship strike database as necessary/appropriate:** Arctic Council members have the opportunity, both independently and collectively, to contribute to the IWC's ship strike database. The IWC has developed a standardized global database of collisions between vessels and whales which includes information on whales (e.g., species, size, observed injuries) and vessels.
- ✓ **Continue to identify and assess emerging contaminants** that may pose a threat to Arctic marine mammals and seabirds. Consider using existing agreements or developing new agreements with producer countries to limit contaminant input into the Arctic.
- ✓ **Finalize the IMO Polar Code**: The Arctic Council states should work closely together on the Polar Code and coordinate their IMO delegations' work in this regard. The mandatory Code is expected to replace existing non-mandatory guidelines for ships operating in Arctic ice covered waters. It is expected to cover the full range of design, construction, equipment, operational, training, search and rescue, as well as environmental protection matters relevant to ships operating in Antarctic and Arctic waters. Additional recommendatory measures would address such things as vessel voyage planning to avoid and minimize interaction with cetaceans.
- ✓ **Promote the IMO Ballast Water Convention:** The IMO's International Convention for the Control and Management of Ship's Ballast Water and Sediments (the Ballast Water Convention) was adopted by the IMO in 2004. Half of the Arctic states have ratified it, and the remaining Arctic States should consider doing so. The Ballast Water Convention is important to controlling the introduction of alien, invasive species to the Arctic marine environment.

Revisions here within as follows: Introduction as of 23rd of Jan - Part A: Fishery Resources –version 14th of Jan and Norway has tabled comments/suggested changes to Part A as a separate document - Part B: Marine Mammals and Seabirds as of 29th of Jan

- ✓ **Implement the Arctic Agreement on Cooperation on Marine Oil Spill Preparedness and Response,** expected to be signed at the 2013 Ministerial.
- ✓ **Increase Arctic Council collaboration with IMO and IWC:** The Arctic states have opportunities to be more proactive in bringing Arctic cetacean issues to IMO and IWC sub-groups on issues such as ocean noise and ship strikes.
- ✓ **Consider Protection of vulnerable Arctic marine ecosystems**, such as through engaging with the IMO's Marine Environment Protection Committee (MEPC) to study designation of protected marine areas in the Arctic, building on AMSA Recommendation II(d). When studying possible designation of protected areas, consideration could be given to controlling activities in the most ecologically and biologically sensitive areas, such as marine bird breeding colonies.
- ✓ **Map Seabird and Marine Mammal Density and Distribution**: To the extent practicable, Arctic Council states should consider the possibility of creating and/or sharing seabird and marine mammal density and distribution maps, perhaps through a common database. One such effort specific to cetaceans that may be useful is the United States' National Oceanic and Atmospheric Administration's (NOAA) CetMap.
- ✓ Guidelines and regulations should be developed **to appropriately manage impacts from human activities** with wildlife. This applies particularly to tourist activity.
- ✓ **Maintain and strengthen** international and sub-national agreements **on harvest of seals, polar bears and seabirds**, with continuing development and planning towards an ecosystem-based approach for science, regulations and management including:
    - Improve data collection on harvest and by-catch (commercial, sport and subsistence); in collaboration with the user communities;
    - Continue international cooperation on monitoring, planning and management.
    - Focus concerted efforts on management of species and populations that are still considerably below former population levels

References for this section appear at the end of this Report.

Chapter 5: Arctic Offshore Oil and Gas

Revisions here within as of 25th of Jan 2013

5.1 Introduction

As offshore oil and gas activity in the Arctic increases,[1] concern also grows over the risk of oil pollution incidents. [The development of international instruments to prevent and respond to spill incidents has the potential to minimize but not eliminate all associated adverse effects on the Arctic marine environment.] [Strict standards for oil and gas activities contribute to minimizing the risk of incidents with potential adverse effects on the Arctic marine environment.]The industrial activity of oil and gas exploration and production is generally subject to a different level of control (national and regional) than is the marine activity of sea transportation and offshore operations (international). Individual Coastal States regulate industrial activity in their offshore areas and gaps may exist in the regulatory framework. Available international instruments generally address marine activity; opportunities also exist for better international collaboration and coordination (Spicer 2012, Chabason 2011). To render exploration and production activities in the Arctic safer, states need to address them in a way that respects the special character of the region (Pew 2011; US Deepwater Commission 2011, NEB 2011). [Jointly deciding on [international] standards for Arctic offshore oil and gas activity – this chapter's lead recommendation – can help states do so.]

The Arctic Council is well-placed to lead a process based on science, discussion, analysis and consensus to further a proposal for developing international standards, building on lessons learned by Arctic and non-Arctic states from the 2009 Montara oil spill in

Figure 5.1 Relevant Working Group Deliverables anticipated for the 2013 Ministerial

PAME – Arctic Ocean Review Report

PAME – Offshore Safety and Environment Management Systems Recommendations

EPPR – Recommended Practices for the Prevention of Marine Oil Pollution (CANADA)

Figure 5.2
The Arctic Council and Offshore Oil & Gas 2004-2013

2004 PAME Arctic Marine Strategic Plan

2004 PAME/EPPR Guidelines for Transfer of Refined Oil and Oil Products in Arctic Waters (TROOP)

2007 AMAP Oil and Gas Assessment

1997, 2002 and 2009 PAME Arctic Offshore Oil and Gas Guidelines

2009 PAME Arctic Marine Shipping Assessment

2011 EPPR Behaviour of Oil and other Hazardous and Noxious Substances on Arctic Waters (BoHaSa)

2011 PAME Arctic Ocean Review Phase I Report; see §4.55 for additional EPPR projects

2013 (anticipated) EPPR Operational Guidelines for the Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic

Ongoing - PAME Management Regulation and Enforcement Web-based Information Resource

[1] See Chapter 1: Introduction for a summary of recent offshore oil and gas activity in the Arctic Ocean.

Australia and the 2010 Deepwater Horizon explosion and spill in the Gulf of Mexico.

The Arctic Council has produced significant outcomes for offshore oil and gas in recent years (Figure 5.2) and, in addition to this Arctic Ocean Review Report, two new working group deliverables are anticipated for the 2013 Ministerial (Figure 5.1). The 2007 AMAP Oil and Gas Assessment identifies the precautionary approach, polluter pays, and environmental, strategic and risk assessments as bases for Arctic offshore oil and gas activity (iii, viii). The 2009 PAME Arctic Offshore Oil and Gas Guidelines (PAME Offshore Guidelines), section 1.3, provide that such activity should be based on the precautionary approach as reflected in Principle 15 of the Rio Declaration, polluter pays as reflected in Principle 16 of the Rio Declaration, continuous improvement, and sustainable development. In its approach to the instruments discussed in turn below, this chapter refers regularly to the PAME Offshore Guidelines.

5.2 Global Agreements

Arctic states should encourage full participation and implementation by Arctic and non-Arctic states alike of four key global agreements applicable to the maritime aspects of offshore oil and gas activity. The 1982 United Nations Convention on the Law of the Sea (the LOS Convention), the 1973/78 International Convention for the Prevention of Pollution from Ships (MARPOL),the 1990 International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC), and the London Convention and its 1996 Protocol are each designed to address specific aspects of maritime activity. They do not, however, relate to or provide a comprehensive regulatory regime for offshore hydrocarbon activity. Further, none deals specifically with prevention of marine pollution from industrial mineral exploration and production activity such as the operation of fixed stations, or Mobile Offshore Drilling Units (MODUs) when they are on station. This section considers three of these four agreements in turn, omitting further discussion of the OPRC Convention, which the new Arctic Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic discussed in 5.3, below, largely operationalizes in the Arctic Region. Neither does this section discuss the International Convention on Civil Liability for Oil Pollution Damage (CLC Convention), or the Intervention Convention and the Fund Convention, which cover marine – not industrial – activity, namely the transport of oil by ships and its use as fuel, and which are discussed in the shipping chapter of this Report.

The United Nations Convention on the Law of the Sea (LOS Convention): All Arctic States except the United States are party to LOS Convention, which contains provisions relevant to seabed oil and gas exploration in, most notably, Parts VI and XI. In addition, the LOS Convention contains relevant provisions concerning protection and preservation of the marine environment in Part XII, several of which are highlighted here.

Article 197, for example, requires states to cooperate regionally as appropriate in formulating and elaborating international rules, standards and recommended practices and procedures for environmental protection consistent with the LOS Convention, "taking into account characteristic regional features." Given the Arctic's distinctive sea ice, harsh climate and seasonal cycles of light and dark, this general requirement can inform how Arctic States address specific issues covered by other cooperation provisions in the Convention including, for example, harmonizing approaches to regulating offshore industrial activity, responding to transboundary marine pollution, researching effects of pollution on the marine environment, and creating science-based rules for preventing and managing those effects.

Pollution and Harmonization. Article 192 states broadly that "States have the obligation to protect and preserve the marine environment." Under Article 194(1) "States shall take, individually or jointly as appropriate, all measures consistent with this Convention that are necessary to prevent, reduce, and control pollution of the marine environment from any source, using for this purpose the best practicable means at their disposal and in accordance with their capabilities, *and they shall harmonize their policies in this connection*" (emphasis added). Article 194(2) provides that States shall take all measures necessary to ensure, inter alia, "that pollution arising from incidents or activities under their jurisdiction or control does not spread beyond the areas where they exercise sovereign rights in accordance with this Convention," and article 194(3)(c) provides that State measures taken under Part XII shall include those designed to minimize to the fullest possible extent "pollution from installations and devices used in exploitation or exploration of the natural resources of the sea-bed and its subsoil."

Offshore Installations. Article 208 concerns pollution from sea-bed activities subject to national jurisdiction and offers a basis for cooperation among individual states regulating industrial activity in their offshore areas. Under Article 208, coastal states shall adopt laws and regulations and take other measures regarding pollution arising from sea-bed activities subject to their jurisdiction and from offshore artificial islands, installations and structures under their jurisdiction; these measures shall be "no less effective than international rules, standards and recommended practices and procedures." Further, States shall endeavour to harmonize their policies in this connection at the appropriate regional level; and "States, acting especially through competent international organizations or diplomatic conference, shall establish global and regional rules, standards and recommended practices and procedures to prevent, reduce and control pollution of the marine environment" from such installations." Article 214 provides that "States shall enforce their laws and regulations adopted in accordance with article 208.

The dearth of international rules or procedures for exploration and production activities undertaken by mobile offshore facilities gives coastal states little

Possible avenues to develop guidance for states interested in strengthening approaches to compensation for potential impacts of oil and gas activity might include conducting circumpolar comparative studies of:

- ✓ *approaches to liability and financial requirements and how they impact safety culture of the companies conducting offshore activity in the Arctic.*
- ✓ *domestic damage assessment regimes applicable to offshore liability and compensation.*
- ✓ *national liability and compensation regimes to identify arctic best practices.*

against which to gauge their national measures regarding such activities adopted and enforced in accordance with Articles 208 and 214. Adopting regional procedures could help fill that void. [Arctic Council Member States have begun to engage with the International Maritime Organization (IMO) collectively on matters such as the Polar Code for vessels, but less so on Arctic-specific oil and gas measures, due in part to concerns by some that the IMO should not address such activities (Chabason, 2011).]

Liability. It is beyond the scope of this report to address whether individual states have ensured that recourse is available in accordance with their legal systems for "prompt and adequate compensation or other relief in respect of damage caused by pollution of the marine environment by natural or juridical persons under their jurisdiction," as provided in Article 235(2). UNCLOS Article 235(3) says States shall cooperate in developing "international law relating to responsibility and liability for the assessment of and compensation for damage and the settlement of related disputes, as well as, where appropriate, development of criteria and procedures for payment of adequate compensation, such as compulsory insurance or compensation funds." However, international law does not currently address liability for damage from drilling activities in the way the CLC and Fund Conventions have for oil spills from vessels.

In 2012 the IMO Legal Committee declined to extend to offshore installations the coverage of IMO Strategic Direction 7.2, under which the IMO focuses on mitigating and responding to environmental impacts of shipping incidents and operational pollution from ships. It chose rather to develop guidance for States interested in bilateral or regional responses to liability and compensation issues related to transboundary pollution damage from offshore exploration and exploitation activities. One regional avenue could be to examine how approaches to liability and financial requirements impact the safety culture of companies conducting offshore activity in the Arctic. Another avenue could be to conduct a circumpolar comparative study of domestic damage assessment regimes applicable to offshore liability and compensation. Another avenue could be to conduct a circumpolar comparative study of national liability and compensation regimes to identify arctic best practices. This would enable deliberations on possible further regional cooperation.

MARPOL 73/78. All eight Arctic States are party to the 1973 International Convention for the Prevention of Pollution from Ships, and its 1978 Protocol, known as MARPOL 73/78, and three of its six Annexes – I (oil), II (noxious liquid substances in bulk) and III (harmful substances, packaged). MARPOL aims 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 vessel operation. Broadly applicable to seagoing vessels, MARPOL contains no Arctic-specific references and explicitly excludes from its definition of "discharge" the "release of harmful substances directly arising from the exploration, exploitation and associated off-shore processing of sea-bed mineral resources," as well as dumping within the meaning of the London Convention, MARPOL 73/78, Article 2(3)(b). This exclusion did not prevent the PAME Offshore Guidelines from recommending, for example, that with respect to production waste discharges from the operation of offshore industrial facilities, operators apply certain MARPOL 73/78 requirements, or their equivalent (PAME Offshore Guidelines, p. 33).

MARPOL's exclusion of discharges related to seabed mineral activity also excludes discharges from MODUs directly arising from offshore exploration and production activities. MARPOL Annex V, as recently amended, contains provisions on the discharge of garbage from fixed or floating platforms, to the extent such discharge does not fall under MARPOL's

exclusion of discharges arising directly from certain seabed mineral activity. MODUs are the subject of the IMO's free-standing, voluntary 2009 MODU Code, IMO, A 26/Res.1023, adopted by the IMO Assembly 18 January 2010. Different views have been expressed at the IMO Legal Committee as to whether IMO conventions – as opposed to its non-binding guidelines – could accommodate both fixed and mobile drilling units in other regards.

Special Areas may be established under MARPOL 73/78 Annex I, Regulation 15 (prohibiting with very few exceptions oily discharges in the designated area), and Annexes II, IV and V, but no part of the Arctic has yet been so designated.

London Convention and Protocol: All eight Arctic States are party to the 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, known as the London Convention; five of the eight are party to its 1996 Protocol. Similar to MARPOL, the London Convention and Protocol exclude from their scope the disposal of wastes related to offshore seabed mineral exploration, exploitation, and associated processing activity, although they do cover the deliberate disposal of platforms. The PAME Offshore Guidelines note that decommissioning provisions are spread throughout multiple instruments, pointing to two more on the removal of offshore structures: 1989 IMO Guidelines and standards, which consider that complete removal of structures placed on the seabed after 1998 should be feasible; and the 1998 OSPAR Decision 98/3 on the Disposal of Disused Offshore Installations, which generally prohibits the disposal of such installations at sea with exceptions involving a lengthy consultation process that leaves the ultimate decision to the Contracting Party (IMO 1989, OSPAR 1998).

5.3 Regional Agreements

Multiple regional agreements are relevant to offshore oil and gas activity in the Arctic. This section focuses on two agreements recently negotiated between all eight Arctic States and on the OSPAR Convention on the Prevention of Marine Pollution from Land-Based Sources, and briefly mentions several agreements between Nordic countries.

Since 2010, two Arctic Council Task Forces have served as negotiating forums for separate binding agreements between all eight Arctic States relevant to offshore oil and gas activity, although both instruments will have status independent from the Arctic Council. The 2011 Arctic Search and Rescue Agreement (Arctic SAR) aims to strengthen aeronautical and maritime search and rescue cooperation, coordination, and infrastructure in the Arctic generally, but is not related to offshore oil and gas activity per se. The Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic (Arctic Oil Pollution Agreement) is expected to be signed at the 2013 Ministerial. A primary objective of the Agreement is to provide a mechanism for a Party to request assistance when an oil spill exceeds its capacity to respond on its own. The Agreement will contain provisions regarding maintenance of national systems for pollution preparedness and response in the Arctic, notification of other Parties and interested States of oil pollution incidents, monitoring Arctic maritime areas (including, in some circumstances, high seas areas) for possible oil pollution incidents, facilitating information exchange and assistance in oil spill preparedness and response operations, coordinating joint response operations and cooperating in joint exercises and joint reviews of operations. The Parties are also developing non-binding operational guidelines to be followed in any response operations.

Other regional agreements that informed negotiations for the Arctic Oil Pollution Agreement, including the Bonn Agreement for Co-operation in Dealing with Pollution of the North Sea by

Oil, the Copenhagen Agreement of the Nordic States on Oil Pollution, and the Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea, and the Nordic Environmental Protection Convention, are not discussed further here. Similarly, this chapter does not address bilateral arrangements such as the non-binding Canada – United States Joint Marine Pollution Plan.

OSPAR is a robust regional convention with arctic initiatives, an offshore industries strategy and a well-coordinated Joint Assessment Monitoring Program (JAMP) for assessing the marine environment. Unlike the international instruments above, it applies explicitly to offshore installations used to explore for or exploit hydrocarbons, e.g. Article 1 (g), (j – m). The Offshore Industry Committee (OIC) is the responsible body within OSPAR. OSPAR's Region 1, Arctic Waters, includes a sector of the Arctic Ocean. OSPAR's 15 members include all five Nordic members of the Arctic Council. The Arctic Council's AMAP working group is one of OSPAR's sixteen intergovernmental observers; the IMO is another, and maintains a Memorandum of Understanding with OSPAR. PAME and CAFF are not observers but are considered relevant to OSPAR's oil and gas initiatives and JAMP, respectively.

OSPAR's 2010 North-East Atlantic Environment Strategy promotes coordination with the Arctic Council. According to OIC's work program for 2012-2013, Contracting Parties shall assess the suitability of existing measures to manage oil and gas activities in Region 1; information on this process is being shared with PAME. Contracting Parties participating in other forums will endeavor to ensure that initiatives relevant to the work of OSPAR and the OIC developed within those forums (e.g. The European Community, the Bonn Agreement, the London Convention and its Protocol, the Helsinki Commission) are compatible with any OSPAR programs and measures (OSPAR 2010, Article 5.1).

Two of OSPAR's "Strategies" offer potential avenues for cooperation with the Arctic Council on offshore hydrocarbon activity: the Offshore Industry Strategy (OIS) and the Joint Assessment Monitoring Programme (JAMP).

The OIS "Strategic Directions" include coordinated regional information collection, environmental monitoring, and assessment; progressively developing Best Available Techniques and Best Environmental Practices, promoting information and experience sharing between Contracting Parties and maintaining an offshore hydrocarbon installation inventory

The OIC implements the OIS, whose "Strategic Directions" include coordinated regional information collection, environmental monitoring, and assessment; progressively developing Best Available Techniques (BAT) and Best Environmental Practices (BEP), promoting information and experience sharing between Contracting Parties and maintaining an offshore hydrocarbon installation inventory (OSPAR 2010). The Contracting Parties to OIC agree upon recommendations and decisions which contribute to reduced discharges from ordinary operations such as drilling and production. This includes drilling fluids and drill cuttings, oil and other components discharged with produced water, other effluents such as displacement waer and drainage water, and the characterization, use and discharges of chemicals.

OSPAR requires Contracting Parties to "cooperate in carrying out monitoring programmes" (Articles I/II). JAMP specifies how, requiring Contracting Parties to gather data under agreed OSPAR procedures so that it can be compared across all OSPAR areas and to apply common quality assurance measures to the whole chain of JAMP assessments. The Offshore Oil and Gas Industry is one of six themes to be assessed.

The PAME Offshore Guidelines reference OSPAR practices as providing potential Arctic-wide standards for environmental monitoring of oil and gas activities (pp. 24, 82), testing acute toxicity (p. 35), decommissioning (p. 49) and requiring BAT and BEP (p. 79 ff.).

A separate regional agreement, the Convention on the Protection of the Environment between Denmark, Finland, Norway and Sweden (1974) allows individuals in one state to challenge the legality of and seek damages for activities in another state that affect them and give, or may give, rise to environmental harm. Its broad definition of environmentally harmful activities expressly covers discharges of gas or other substances from installations into the sea or other uses of the seabed or installations "which entails or may entail environmental nuisance." Art. 1.

5.4 Opportunities for Cooperative Action

Ministers of all eight Arctic States endorsed the PAME Offshore Guidelines in 2009. As introduced in 5.1 above, the Guidelines state that "Arctic offshore oil and gas activities should be based on the on the precautionary approach as reflected in Principle 15 of the Rio Declaration, polluter pays as reflected in Principle 16 of the Rio Declaration, continuous improvement, and sustainable development (section 1.3). With respect to the latter, in permitting offshore activity States "should be mindful of their commitment to sustainable development," which includes "the duty not to transfer, directly or indirectly, damage or hazards from one area of the marine environment to another or transform one type of pollution into another" (echoing language from UNCLOS Article 195); promoting "the use of best available technology/techniques and best environmental practices" and "the duty to cooperate on a regional basis for protection and preservation of the marine environment, taking into account characteristic regional features and global climate change effects."

Taking those general principles into account, the following opportunities propose specific steps for the Arctic Council. The first step stands on its own as the primary opportunity in this chapter~~. and the remaining steps are classified under the five categories that Chapter 1 identified as types of actions the Arctic Council and Arctic States might take to address the issues raised in this Report.~~

The Arctic Council should:

- ✓ Convene discussions on developing internationally determined nonbinding standards for Arctic offshore oil and gas activity, building on PAME's work on Safety and Environment Management Systems and EPPR's Recommended Practices for Arctic Oil Spill Prevention Project (RP3).

The Arctic Council should consider

- ✓ Promoting Arctic Council working group interactions with the appropriate treaty bodies on offshore oil and gas issues. Possible actions include consolidating or strengthening existing arrangements (e.g. the OSPAR-AMAP MOU and CAFF-OSPAR cooperation on assessment); developing Arctic-specific procedures on monitoring, assessment and

information exchange modeled on JAMP; and inviting the OSPAR OIC to participate in PAME's work on Safety and Environment Management Systems.

- ✓ Convening an Arctic Council inter-instrument Arctic oil and gas dialog, to consider a pilot mechanism for coordinating information exchange on oil and gas reporting, monitoring and assessment requirements under existing instruments, and to keep abreast of Arctic-specific developments relevant to the respective instruments, based on science and traditional knowledge.
- ✓ Building on expanded industry and regulator involvement in PAME and EPPR initiatives on offshore oil and gas activity by convening an Arctic-specific oil and gas dialog for industry and contractor groups such as the OGP, the International Regulators Forum, the OECD, Barents 2020, IADC and the ISO.
- ✓ Conducting an Arctic Best Practices study on how national approaches to liability and financial requirements impact the safety culture of the companies conducting offshore activity in the Arctic, building on the PAME Safety and Environment Management Report anticipated for the 2013 Ministerial, or on domestic damage assessment regimes applicable to offshore liability and compensation.
- ✓ Continuing to encourage full participation and implementation by Arctic and non-Arctic states of all global and regional instruments identified in this chapter, as appropriate.
- ✓ Using existing studies such as the PAME Offshore Guidelines and the EPPR Recommended Prevention Practices report to move toward circumpolar policy harmonization in discrete sectors such as, e.g., environmental monitoring.

The Arctic Council Member states should consider:

- ✓ [Engaging with the IMO MEPC to study designation of protected marine areas in the Arctic, building on AMSA II.D..]
- ✓ Working with the appropriate OSPAR bodies, IMO committees, and other international entities to consider ways to improve protections against pollution from offshore installations, including MODUs.
- ✓ Identifying ways for Arctic Ocean coastal states not party to OSPAR to coordinate further with OSPAR's JAMP and OIS strategies.

References for each chapter appear at the end of this Report.

Chapter 6: Arctic Marine Pollution

Version here within as of 15th of Jan 2013

6.1 Introduction

The Arctic plays a key role in the global energy budget and global ecosystem processes. Energy and contaminants are transported into the Arctic and redistributed within the Arctic by atmospheric currents, ocean currents, and hydro-biological cycling, and contaminants are biomagnified in the food chains, ultimately reaching apex predators (including humans). For transport of contaminants such as persistent organic pollutants (POPs) and heavy metals into the Arctic, atmospheric currents are by far the fastest transport mechanism. Based on past experience and increased knowledge about the physical behavior of POPs and heavy metals in the environment, the Arctic serves as an indicator region for the persistence of chemicals and their ability for long-range transport (see Figure 6.1 on long-range transport mechanisms of pollutants to the Arctic).

Over the past 20 years, the priority issues of concern for the Arctic environment and its inhabitants with respect to pollution have been associated with: POPs, radionuclides, certain heavy metals especially mercury, acidifying substances, petroleum hydrocarbons, and greenhouse gases and other climate-forcing substances such as black carbon and aerosols. Some contaminants are of circumpolar concern, while others are of more regional or local concern. Several reports documenting the state of knowledge regarding pollution threats to Arctic ecosystems and humans have been produced by AMAP in the past two decades, during which time Arctic climate change has also grown to be a major regional and global concern. A reference list is provided at the end of the report which outlines the applicable AMAP assessments conducted over the past 10 years related to pollution and climate change issues.

Figure 6.1. Long-range Transport Mechanisms of pollutants to the Arctic (Source: AMAP Assessment 2002)

6.2 Status, trends and effects in the environment

The information below on status, trends and effects of contaminants in the Arctic environment is based on current knowledge. Generally, there is a lack of long term trends data for many potentially harmful pollutants in the marine environment. For many Arctic areas, scientific information about contaminant levels and effects are limited and this is especially true for our understanding of cumulative effects in the Arctic.

Petroleum hydrocarbons [AMAP 1998, AMAP 2007]

Petroleum hydrocarbons found in the marine environment have several sources. The main anthropogenic sources of petroleum hydrocarbons entering the marine environment are discharges from land (industrial effluents containing oil, precipitation runoffs, waste oil and sewage), and direct discharges to the sea (chronic releases from oil tankers, commercial fishing and other vessels, dry docking and accidents, and offshore oil and gas activities) and water courses, and atmospheric inputs. The majority of hydrocarbon contamination measured in seawater throughout the Arctic, however, originates primarily from natural oil seeps. Except for local pollution in harbors, the highest levels occur just off river mouths. Away from areas of human activity, levels of petroleum hydrocarbons are generally low and do not pose an ecological or human health risk

While routine oil and gas activities have produced relatively little hydrocarbon contamination, oil spill incidents can kill large numbers of animals, especially birds. An oil spill in Arctic waters, especially in ice-covered or partly ice-covered seas, may remain in the environment for a long period of time due to low degradation rates and difficulties in cleaning up spills in dark and cold conditions. At present, there is no oil combating equipment stored in the vicinity of the Arctic that has proven efficient and effective in ice-covered waters. The ice edge is an important Arctic habitat for primary production, fish, seabirds, and marine mammals. An oil spill in such areas at a critical time of the year might have serious consequences for vulnerable Arctic ecosystems.

Persistent Organic Pollutants (POPs) – Legacy and New [AMAP 2002; AMAP 2009]

Levels of many legacy POPs such as alpha hexachlorocyclohexane (a pesticide) have generally decreased in both air and biota over the past two decades. However, for some POPs (e.g., PCBs, DDTs) there are local variations in patterns over time. The most significant finding, in contrast to the above-mentioned general declining trend, is that the levels of PCBs, HCB, and DDT at the Svalbard Zeppelin station have stopped decreasing or show a slight increasing trend during the last five to ten years. A possible explanation for this may be related to impacts of climate change, for example reduced sea ice. A number of newer POPs, such as flame retardants, polybrominated diphenyl ethers (PBDEs), and the industrial chemicals, perfluorooctane sulfonic acid (PFOS), have also begun to decrease in the Arctic environment as a result of international regulations that are enshrined in the Stockholm Convention on POPs and the LRTAP Protocol on POPs. To date there is limited data to indicate whether the addition of these chemicals to these international treaties will result in further reductions in the Arctic environment.

Due to the persistent and biomagnifying nature of legacy POPs, concentrations found in marine foodwebs still pose a risk to ecosystem and human health. In some regions the level of PCBs in high trophic level species such as polar bear, glaucous gulls and ivory gulls, put them at risk of immune and reproductive effects, which could be exacerbated by the

cumulative effects of other environmental stressors brought on by climate change and development. As a result of their diet, which includes marine mammals, Inuit are exposed to levels of POPs that are of concern to health authorities.

Heavy metals, especially Mercury, Lead, and Cadmium

Mercury: *[AMAP 2011]*

Mercury is a naturally occurring element that has been enriched in the environment by human activities such as coal combustion, waste treatment and mining. Global emissions of mercury to air have been fairly constant since 1990. Although emissions in Europe and North America have decreased over the past two decades, this has been offset by increasing emissions from East Asia. There are some indications that overall emissions from human sources, primarily coal-fired power plants, may increase in the future (AMAP, 2011). Mercury is transported to the Arctic by air currents, ocean currents and rivers. Recent increasing trends, observed in marine species from Canada and West Greenland, could continue if global emissions were to rise.

Methylmercury is the main biomagnifying and most toxic form of mercury. Because mercury biomagnifies through the food chain dietary intake is the main source of mercury exposure in top predators and humans. Biological effects have been documented among Arctic peoples who have a high intake of marine mammals in their diets. As a result health authorities in some jurisdictions have recommended that women of child bearing age limit their consumption of certain traditional foods, such as whale meat

Cadmium: *[AMAP 2002; OSPAR 2010]*

Cadmium occurs naturally in mineral ores and is found at background levels in the marine environment. Long-range transport of cadmium by air is reflected in ice cores from Greenland. Emissions from Eurasia and North America must be considered important sources for cadmium to the Arctic region. While levels of cadmium in some Arctic marine organisms are higher than in other regions of globe, concern is limited since levels appear to be stable and effects have not yet been detected in wild populations.

Lead: *[AMAP 1998; AMAP 2002]*

Atmospheric transport is the major route of lead entry into marine areas. The global reduction of lead air emissions from decreased use of leaded gasoline has resulted in decreased deposition of lead in the Arctic. Lead is considered to be of less toxicological importance in the Arctic than cadmium and mercury. Monitoring data generally show low levels of lead in the marine environment.

Radionuclides [AMAP 2002; AMAP 2009]

Like other long-range contaminants, radionuclides can be transported over long distances and reach the Arctic Ocean. Sources of radionuclides to the Arctic include fallout from atmospheric testing of nuclear weapons in the 1950s and 1960s, discharges to the sea from reprocessing of spent nuclear fuel at Sellafield (UK) and Cap de la Hague (France), and nuclear accidents such as Chernobyl, Ukraine in 1986 and recently Fukushima, Japan in 2011. Due to the wide dispersion and dilution of radionuclides in the marine environment, wildlife and human exposure has been minimal and does not pose significant ecosystem or human health risks. Furthermore, impacts from the largest historic source to the Arctic, fallout from nuclear testing, have steadily diminished over time. At Sellafield and Cap de la Hague, the

application of new technology has greatly reduced the release of radionuclides, which were formerly the largest source of ongoing contamination. The impacts from Chernobyl have also diminished with time (AMAP 2002, 2009), and the impact of Fukushima on the Arctic appears to have been minimal based on recent monitoring results.

Within the Arctic region there are a significant number of sites that represent potential sources of radioactive materials to the Arctic, particularly in Northwest Russia. The risks associated with these sites have been significantly reduced through national and international cleanup efforts, which have overseen the decommissioning of nearly all obsolete nuclear submarines. Technologically enhanced naturally occurring radioactive material (TENORM), a byproduct in the process water from oil and gas production, may represent a risk to the marine environment in the future, if oil and gas activity increases. Finally, Russian plans for building floating nuclear power plants raise concerns over risks to the marine environment associated with the storage and handling of waste and increased marine transport of spent fuel in the Arctic.

Climate change **[**ACIA 2004**;** The Impact of Black Carbon on Arctic Climate 2011, Combined Effects of Selected Pollutants and Climate Change in the Arctic Environment 2011, SWIPA 2011]

Since the 1980s, the Arctic has been warming at a rate twice the global average. The recent five-year period (2005-2010) exhibited the highest yearly surface air temperatures since measurements began in 1880. The greatest increase in surface air temperature occurs in autumn in regions where sea ice has disappeared by the end of the summer. There is evidence that feedbacks associated with albedo and cloud cover are accelerating Arctic warming and sea-ice loss. The summer 2012 marked the greatest loss of sea ice on record.

The largest and most permanent bodies of ice in the Arctic, namely, multi-year sea ice, mountain glaciers and ice caps, and the Greenland Ice Sheet, have all declined faster since 2000 than they did in the previous decade. Loss of ice and snow leads to increased absorption of solar energy, which could release large amounts of carbon dioxide and methane from currently frozen reservoirs (e.g. permafrost) of these powerful greenhouse gasses. Ultimately, the impact of warming could change large-scale ocean currents.

Climate change is expected to result in considerable changes in the Arctic marine ecosystem. Ice-dependent species will be under increasing pressure from loss of ice habitats. Southern species are expected to move northwards, resulting in competition with native Arctic species and altering food webs. Contaminant uptake, accumulation, and effects on Arctic biota will be altered and potentially magnified by changes in food web structure and increased environmental stress on Arctic species. Changes in meteorological and cryospheric conditions will also alter contaminant processes (e.g. emissions, depositions and cycling in the marine environment), which may enhance or diminish contaminant accumulation.

Ocean acidification *[AMAP Arctic Ocean Acidification Report 2013]*

Anthropogenic emissions of CO_2 are causing acidification of the world oceans because CO_2 reacts with seawater to form carbonic acid. The cold surface waters of the Arctic Ocean absorb atmospheric CO_2 more rapidly than warmer waters, leading to a disproportionately higher fraction of the global net CO_2 uptake. However, over the past three decades melting of more summer sea ice cover has added freshwater to the ocean, increasingly exposed shelf waters, and allowed greater CO_2 exchange to occur in these cold waters. The combination of

these processes accelerates the rates at which both the pH and the carbonate mineral saturation state decrease.

There are limited observations and research on effects of ocean acidification on Arctic marine ecosystems. The direct effects are expected to be most pronounced for phytoplankton, zooplankton and benthos. However, ocean acidification has the potential to constrain and marginalize species distribution, including fish. Fish, seabirds and marine mammals can be affected indirectly. An assessment of the status, trends and effects due to ocean acidification of the Arctic Ocean will be released by AMAP in May 2013.

Physical disturbances

Physical disturbances from human activities such as bottom trawling, gravelling, oil and gas activities, and harbor construction have not been specifically analyzed for the Arctic marine areas. In the North Sea such human-induced disturbances have documented effects on bottom ecosystems in areas with high human activities. There are also some studies on the scale of damage to coral reefs in the Barents Sea–Lofoten area. In the areas that have been mapped, approximately 20 percent of the coral reefs are damaged to some extent, and about 6 percent of all reefs that have been inspected in the Barents Sea–Lofoten management plan area have been destroyed. Much of the damage that has been observed is several years old.

Noise [OSPAR 2009; IMO 2007]

Noise from commercial shipping operations and oil and gas activity is increasingly being recognized as a potential threat to many marine animals, in particular whales, seals, and fish. Scientific data, while not conclusive, suggest that commercial shipping and navy ships are causing significant increases in the overall underwater sound environment in many ocean areas, particularly coastal zones. Incidental noise from commercial shipping occurs within the same low frequencies used by some marine animals for communications essential to key life functions such as reproduction and locating prey. Interference with (or "masking" of) such communications could have significant impacts on marine life, particularly migratory species and related subsistence fisheries and traditional economies.

6.3 International Pollution Instruments

International (global and regional) agreements and other instruments are of major importance in order to control and reduce the amount of pollution to the Arctic marine environment. These legal instruments include the regulation of activities and restrictions on the use of or ban on hazardous substances. (Chapter 5 on *Arctic Offshore Oil and Gas* has already examined instruments relating to petroleum hydrocarbons.) Below are key gaps in legal instruments that continue to put Arctic people and the environment at risk from pollution related impacts.

While there have been some key successes in global and regional legal agreements and conventions to control and reduce the amount of pollution to the Arctic marine environment, particularly on hazardous substances such as POPs, gaps do remain to be filled. These include seeking further controls for substances at both the global and regional levels that have been shown to affect Arctic peoples and the marine environment.

Long-range transport of contaminants of concern to the Arctic are at the heart of global agreements such as the Stockholm Convention on POPs and a new UNEP legally-binding, global agreement for mercury (completion anticipated for 2013). These agreements aim to

have a positive effect on the health of the Arctic environment and its peoples, particularly the Inuit who rely on marine mammals and fish as a major part of their diets. Significant gaps exist on control of pollutants related to climate change including GHGs and SLCFs such as black carbon. Also the influence of climate change on the effects and trends of hazardous substances in the Arctic such as POPs and mercury has not been fully evaluated and needs further scientific attention to determine its effects and any consequences for consideration under existing legal regimes.

Persistent Organic Pollutants (POPs)

The Arctic marine environment is particularly impacted by POPs. The chemical industry is estimated to introduce thousands of new chemicals to the commercial market every year. While these chemicals can be screened for persistence and long-range transport potential, these characteristics are most easily demonstrated through measurements in the field. The Arctic is one of the few areas left in the world where remote, long-range transport can be demonstrated and used as a criterion for adding new POPs to the UNEP Stockholm Convention on POPs. Thus, Arctic POPs data continues to be critical for adding new POPs to the Convention for control.

The importance of states providing such data remains critical despite the fact that recent years have seen increased international efforts to reduce the use and emission of a number of persistent organic pollutants and have resulted in generally declining levels of legacy POPs such as PCBs, DDTs, HCHs, and HCB. National policy efforts to reduce the use and emissions of these POPs have been extended regionally and globally through the regional UN ECE Convention on Long-range Transboundary Air Pollution (LRTAP) POPs Protocol and the UNEP Stockholm Convention. Currently 22 POPs are being banned or restricted for use and production under the Stockholm Convention (9 new POPs were added in 2009 and one in 2011). It is critical that Arctic POPs data and trend information is provided in a timely manner to enable parties to evaluate the effectiveness of these legal regimes (e.g., Global Monitoring Plan's coordinating committee under the Stockholm Convention) and determine whether new substances should be added. Finally, the influence of climate change on POPs is a new area of research for which limited monitoring and data are available. The nascent understanding of this area renders it critical that states provide relevant data and support related research.

A Strategic Approach to International Chemicals Management was adopted by a consensus of Environment Ministers, Health Ministers and other delegates including members of civil society and the private sector from more than one hundred countries participating in the International Conference on Chemicals Management (ICCM), held in Dubai, February 2006. The Strategic Approach to International Chemicals Management (SAICM) is an international policy framework to foster the sound management of chemicals. The Strategic Approach supports the achievement of the goal agreed at the 2002 Johannesburg World Summit on Sustainable Development of ensuring that, by the year 2020, chemicals are produced and used in ways that minimize significant adverse impacts on the environment and human health.

Heavy metals

The **Heavy Metals Protocol** to the UN ECE Convention on Long-range Transboundary Air Pollution (1998) targets mercury, lead and cadmium and parties to the protocol are required to reduce their total annual emissions to below the levels emitted in 1990 or another year between 1985 and 1995 identified by the party.

In 2000, the Arctic Council called on UNEP to initiate a global assessment of mercury that could form the basis for appropriate international actions, and in February 2001 the UNEP Governing Council decided to initiate the Global Mercury Assessment. In 2003, UNEP agreed that there was sufficient evidence of significant global adverse impacts of mercury to warrant future international actions to reduce the risk to human health and the environment from the release of mercury and its compounds to the environment. In 2009, counties began a process under UNEP aimed at negotiating, by 2013, a legally binding agreement to control mercury pollution, including emissions to the atmosphere. Implementation of such an agreement could help significantly reduce Arctic mercury contamination over the long-term. Since 2005, AMAP has worked closely with UNEP to support the UNEP mercury process and recently through its Intergovernmental Negotiating Committee (INC). Based on the recent AMAP Mercury Assessment, the impacts of global sources of mercury on Arctic people and the environment calls for urgent global action to reduce mercury emissions so as to reduce depositions of mercury in the Arctic marine environment. Finally, the influence of climate change on mercury is a new area of research and monitoring and limited data are available. Here, too, it critical for states to provide relevant data and support research related to climate change-mercury interactions.

Radionuclides: The main legal instrument controlling radionuclide pollution is the London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (1972) and its Protocol (1996). The International Atomic Energy Agency (IAEA) has a role in controlling global sources from nuclear accidents that may impact on Arctic environment such as Chernobyl and recently Fukushima in Japan.

Climate Change: Recent legal instruments include: UNFCCC, Kyoto protocol, Copenhagen Accord and the international "Climate and Clean Air Coalition to reduce Short Lived Climate Pollutants".

Physical Disturbances. Increased development in the Arctic marine environment, e.g. from oil and gas, shipping and mining operations due to climate change influences (e.g., melting sea ice) and the corresponding increased levels of accessibility to natural resources and seasonal ice-free seas for shipping navigation, may result in increased levels of pollution to the Arctic marine environment from these industrial sectors. Existing international guidelines have been developed by the International Maritime Organization (IMO) and Arctic Council (Arctic offshore oil and gas guidelines) (PAME 2009). Still, there is a need for Arctic states to consider mechanisms and control measures above and beyond current regulatory regimes to ensure protection of the Arctic marine environment and its peoples. This could include consultations and cooperation with IMO on the prospective mandatory polar code, and investigate further options for protecting marine sensitive areas.

Noise: As a result of the potential significance of incidental noise to commercial shipping interests and the marine environment, the International Maritime Organization (IMO) has charged its Marine Environment Protection Committee (MEPC) with investigating and developing papers on these issues.

6.4 Opportunities for Cooperative Action

- ✓ **Encourage participation in relevant agreements:** The Arctic Council should encourage Member States' participation in relevant agreements in three areas:

- ✓ with respect to **Persistent Organic Pollutants**, to provide timely POPs data and trend information, emphasizing identification of new chemicals, as part of encouraging all Arctic States to implement their obligations under the Stockholm Convention and the UNECE LRTAP Convention – POPs Protocol or to consider ratifying that Convention and Protocol if they have not yet done so. AMAP, through national monitoring and research programs and its POPs Expert Group, should continue to provide these data products for the Conventions' use, with a particular emphasis on identifying new chemicals with the potential to contaminate the Arctic.
- ✓ with respect to **mercury,** to implement their obligations under the Heavy Metals Protocol to the UNECE Convention on Long-range Transboundary Air Pollution, or to consider ratifying that Protocol if they have not done so, and to participate actively and lead in negotiating and concluding a robust global agreement to address mercury pollution through the UNEP INC process, expected to be completed in 2013. Based on national monitoring and research programs, AMAP Mercury Expert Group may be able to play an important role in implementing the new convention in ways similar to how the AMAP POPs Expert Group does for the Stockholm POPs Convention by providing important Arctic monitoring data and information to evaluate the effectiveness of a new agreement.
- ✓ with respect to **conventions and negotiations relevant to climate change,** to support research on climate change influences on POPs and mercury. This is a new area of research and limited monitoring and data are available. It is therefore important that Arctic Council States support this area of research and ensure that the data and information is made available to the Stockholm Convention, the UNEP Intergovernmental Negotiating Committee process and forthcoming mercury convention, the UNFCCC, IPCC and the UNECE - LRTAP Convention. These data can be used to determine if control measures for these harmful pollutants are effective or need to be revised based on new research and monitoring results.
- ✓ **Consider strengthening or creating new mechanisms to address oil and gas Development.** [The Arctic Council] [Member States of the Arctic Council] should consider mechanisms and control measures above and beyond current regulatory regimes to ensure protection of the Arctic marine environment and its peoples. This could include consultations and cooperation with IMO on the prospective mandatory polar code, and investigate further options for protecting marine sensitive areas.
- ✓ **Reinforce Monitoring.** [The Arctic Council] [Member States of the Arctic Council] should reinforce AMAP's and CAFF's mandate to maintain and increase long-term monitoring efforts for pollutants in the Arctic marine environment and encourage member states to continue or where lacking, develop such long-term monitoring programs to support this effort These monitoring efforts combined with complementary research and modeling must ensure proper assessment of effectiveness of controls on pollution to the Arctic marine environment (e.g., monitoring of POPs, mercury and climate pollutants, biodiversity and combined effects as conducted by AMAP and CAFF).
- ✓ **Continue or increase involvement in IAEA review of nuclear safety standards.** Concerning radionuclides and following the 2011 Fukushima accident, IAEA member states have been active in reviewing, with an aim to improving, safety standards. Those Arctic [Council Member?] states currently involved in this work should continue to

engage with the IAEA, and those who have not been engaged should be encouraged to engage with the discussions in the IAEA, as appropriate.

- ✓ **Seek to control Short Lived Climate Forcers (SLCF).** Concerning climate change and based on recommendations from the SLCFs Task Force under the Arctic Council, [The Arctic Council] [Member States of the Arctic Council] should seek opportunities at various global and regional levels, including through enhanced multilateral cooperation, to control black carbon emissions and other short-lived climate pollutants such as methane and tropospheric ozone. For example, Arctic States should consider supporting the recent amendments, made in May 2012, to the Gothenburg Protocol to the UN-ECE Convention on Long-Range Transboundary Air Pollution. These amendments include voluntary actions to address black carbon. It will be important that Arctic Council states avoid duplication at various levels, seeking instead to work in concert with on-going and new initiatives and instruments.
- ✓ **Exercise Arctic Leadership on Ocean Acidification.** Because of the impacts of climate change on the oceans including Arctic Ocean acidification, [The Arctic Council] [Member States of the Arctic Council] should reaffirm the importance of their engagement in the UNFCCC to reduce global greenhouse gas emissions as a matter of urgency. Member States of the Arctic Council should also increase their leadership role in the study of ocean acidification in Arctic waters.
- ✓ **Strengthen protections against Land-Based Sources of Marine Pollution.** [The Arctic Council] [Member States of the Arctic Council] should strengthen implementation of the Regional Program of Action (RPA) on the Protection of the Arctic Marine Environment from Land-Based Sources of Marine Pollution that may arise from current and future activities in the Arctic (such as mining or oil and gas development). [They/it] should also consider the need for a binding regional instrument on Land-Based Sources of Marine Pollution.

References for all chapters appear at the end of this Report.

Chapter 7: Ecosystem Based Management in The Arctic

Version here within as of 7th of Feb 2013

7.1 Why ecosystem-based management and why the Arctic Council?

The complexity inherent in the marine environment, with high biophysical dynamics, biological diversity and ecological interaction, combined with the *common pool* characteristics of the marine resources does not supports single management approaches which abstract from interactions. Single sectoral approaches, drastically reduces the ability of users, researchers and managers to have a complete picture and predict outcomes of both use and management . (Píriz.L, 2004). These general statements apply also to the Arctic which, still a rather pristine area, exposes to new and increasing demand for natural resources (or ecosystems goods and services) bringing more complexity to the picture.

Population growth, technological development and the economic changes associated with globalization (in the Arctic) place increasing pressures on the entire earth system including the Arctic. Over the last few decades these strains have intensified concerns about the impact of economic development and accompanying effects such as climate change, ocean acidification, pollution and changes in biodiversity on natural systems.

Integrated approaches to managing human uses of nature, such as ecosystem-based management and the ecosystem approach (to management), are increasingly considered important strategies for confronting these challenges. This Report uses the terms interchangeably and applies the abbreviation EBM as shorthand for both terms. The protection of ecosystems structures and functions is at the core of these strategies.

Many of the challenges related to EBM are regional in nature and this holds true in the Arctic as well. As each of the preceding chapters in this report indicate, EBM is key to framing and understanding both human uses and interests in ecosystems and in responding to the stresses and opportunities that increased shipping, oil and gas, marine pollution are bringing to the Arctic, its people, the ecosystems and the living marine resources. An important question for the Arctic Ocean Review is therefore what the future role of the Arctic Council should be in EBM. This chapter addresses that question and, because sound ecosystem-based approaches are intimately tied to the science that supports them, it also sets the stage for the Report's concluding chapter on the role of science in addressing issues raised in the Arctic Ocean Review.

EBM has been on the agenda of the Arctic Council for more than a decade, and given particular emphasis of the PAME working group. The Arctic Council's Arctic Marine Strategic Plan, endorsed by the Arctic Council Ministers in 2004, pointed to EBM as key to "achiev[ing] the sustainable development of the Arctic marine environment" (PAME 2004, sec. 1.3). The 2009 Arctic Council Ministerial endorsed Best Practices for the Ecosystem-Based Oceans Management in the Arctic (BEPOMAR). These guidelines were the outcome of a joint project of PAME and the Sustainable Development Working Group. EBM is also a guiding principle in CAFF's work. More recently, in May 2011, Arctic Council Ministers called for the establishment of an Expert Group on Arctic ecosystem-based management (EBM). This group was tasked with "fostering a common understanding of EBM and EBM

principles across the Arctic Council and providing guidelines or recommendations for advancing EBM in the coastal, marine, and terrestrial ecosystems of the Arctic".

[US alternative to the two preceding paragraphs:

[EBM has been an important focus in the Arctic Council for more than a decade, and a particular emphasis of the PAME working group. In 2004, The Arctic Council Arctic Marine Strategic Plan, endorsed by the Arctic Council Ministers in 2004, pointed to EBM of oceans management as critical to "achiev[ing] the sustainable development of the Arctic marine environment" (PAME 2004, sec. 1.3). The 2009 Best Practices for the Ecosystem-Based Oceans Management in the Arctic (BEPOMAR) was an approved project of PAME and SDWG. CAFF's work is also informed by ecosystem considerations. Broadly speaking, the Arctic Council's current EBM initiatives center around two on-going expert groups: the PAME-led expert group on the ecosystem approach in the marine environment, established in 2007, and, most recently the broader Ecosystem-Based Management Expert Group established by the Arctic Council Ministers in 2011.]

A critical step in implementing EBM is the definition of the marine ecosystems, which relates in turn to defining the areas involved. While the former is to be defined on ecological grounds the latter is often defined on social or administrative grounds. The Arctic marine environment can be defined in a number of ways, but can broadly be understood as including the northern North Atlantic, the North Pacific and the Central Arctic Ocean (see map). This is a vast region, with enormous differences in natural conditions, ranging from temperate waters, in the north Atlantic, to the ice-covered Central Arctic Ocean. The Arctic thus understood, is very diverse in terms of economic development, population, and administrative systems. The management needs and what EBM would mean in practice, varies therefore from region to region.

The diversity of the Arctic marine environment is recognized in PAME's work identifying and defining 17 Large Marine Ecosystems (LMEs) with very different characteristics (PAME 2011-2013). Ecosystems can be delimited in different ways, and using large marine ecosystems (LMEs) is one approach to this. The LME are relatively large regions (~200,000 km^2) characterized by distinct bathymetry, hydrography, productivity and trophic dependent populations (Sherman et al. 1993).

7.2. What is ecosystem-based management?

[Dozens of definitions exist for ecosystem-based management and the ecosystem approach. The concept has been studied, debated and elaborated in diverse fora and bodies for many years, and no universally agreed definition has been arrived at, even though most cover the same ground.]

[The concept of EBM has been studied, debated and elaborated in diverse fora and bodies for many years, and no universally agreed definition has been arrived at, even though most cover the same ground. Dozens of definitions exist for ecosystem-based management and the ecosystem approach.]

In European contexts (OSPAR/HELCOM 2003 Joint Ministerial Statement in 2003; the EU Marine Strategy Directive) the "ecosystem approach" to the management of human activities is defined as:

> *'The comprehensive integrated management of human activities based on the best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity.'. (OSPAR/HELCOM 2003, paras. 4, 5)*

The four parts of this definition reflect central elements that are commonly found in EBM definitions. The first states that it is the integrated management of human activities. The other three are about assessing or conserving the ecosystem itself: best available knowledge, scientific and traditional, appropriate measures, and the dual objectives of sustainable use and conservation.

For the purpose of this report, EBM can be defined as the comprehensive integrated management of human activities based on best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences that are critical to the health of ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity.

This definition reflects the elements found in many efforts to define ecosystem-based management: the integrated management of human activities, assessing or conserving the ecosystem itself through best available science, appropriate measures, and the dual objectives of sustainable use and conservation.

7.3 Global and regional efforts to enable ecosystem-based management

The Arctic marine environment is largely under the jurisdiction of states that, from a global perspective, are relatively well endowed with the legal, financial and administrative resources to implement EBM. Regional oceans management bodies in the North Atlantic and the North Pacific – both seas with substantial Arctic and sub-Arctic components – have taken an active role in developing EBM.

Ecosystem-based management of the marine environment is advanced through developments in marine science, through increasing number of binding and non-binding international instruments, and the development of EBM strategies at the national level. At the global level, the legal foundations for ecosystem-based management trace to the 1982 UN Convention on the Law of the Sea (the LOS Convention). The term EBM was not sufficiently developed when the Convention was negotiated, but Article 194 refers to fragile ecosystems and the preamble explicitly states that "… the problems of ocean space are closely interrelated and need to be considered as a whole."

The LOS Convention is the basis for international and many domestic efforts relating to oceans management. It lays down global rules for the use of ocean space, for sovereign rights over living and non-living marine natural resources, for their management, for how international and regional cooperation and marine scientific research are to take place, and for enforcement and dispute resolution (Ebbin et al. 2005). A dynamic framework evolving over time in response to new challenges, the Convention has been supplemented with additional instruments such as the 1995 UN Fish Stocks Agreement, which explicitly refers to ecosystem-based management in Article 5(e).

Efforts to develop principles for applying EBM can be found in a range of international and regional instruments. These include UN General Assembly Resolutions, the 1992 Convention on Biodiversity and three landmark UN environmental summits.

The UN General Assembly included a paragraph related to ecosystem-based oceans management in its 2006 resolution on oceans and the law of the sea (Resolution 61/222 Please check if this ref is correct). Paragraph 119 is based on agreed consensual elements relating to ecosystem approaches and oceans developed by the UN Open-ended Informal Consultative Process on Oceans and the Law of the Sea earlier in 2006 (Document A/RES/61/156). The agreed elements include a comprehensive listing of components that an ecosystem approach to oceans management should consider, as well as requirements for improved application of an ecosystem approach. This paragraph has been reaffirmed by the General Assembly every year since 2006, as, e.g., in paragraph 157 of the 2011 resolution (Resolution 66/231). Various documents, the Resolutions included, refer to "principles", "elements" and "criteria" relating to ecosystem-based management. The use of such concepts across the various documents is not consistent, but the concepts are.

The global environmental summits in 1992 (UN Conference on Environment and Development - UNCED), 2002 (World Summit on Sustainable Development -WSSD), and 2012 (Rio+20) all addressed EBM. The CBD, which arose from the 1992 UNCED, uses the ecosystem approach to address Coastal and Marine Biodiversity. In Agenda 21, UNCED's action plan for the global environment, Chapter 17 on oceans specifically addresses integrated oceans management. The 2002 WSSD Johannesburg Joint 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. " The 2012 Rio+20 meeting adopted "The Future We Want" declaration, in which the oceans chapter addresses ecosystem concerns.

Regional conventions like the North East Atlantic (OSPAR) and the Antarctic (CCAMLR) as well as scientific organizations such as the International Council for the Exploration of the Sea, (ICES) and the North Marine Science Organization (PICES) address ecosystem concerns. Cooperative arrangements between regional seas conventions, fisheries management organisations and scientific organizations e.g. OSPAR, NEAFC and ICES, offer a robust framework. Other examples of regional cooperation for the EBM of oceans include work under the Benguela Current Commission (Cochrane et al. 2012), the Northeast Atlantic Fisheries Commission, and other regional groups.

This Report does not enter into the issue of bilateral cooperation but in practice this is an important aspect of EBM: ecosystems shared between countries necessitate cooperation in bilateral management. A case in point is the Barents Sea, which is divided between Norway and Russia but can be said to constitute one LME. Norwegian and Russian fisheries cooperation as well as cooperation on environmental issues underpins EBM in the Barents Sea. Their cooperation on fisheries management dates to the 1950s, the Joint Fisheries Commission was established by an Agreement from 1975 and an agreement on reciprocal fisheries relations was entered into in 1976. The maritime delimitation treaty between Norway and Russia from 2010 confirms the continuation of the fisheries cooperation between Norway and Russia in the whole of the Barents Sea.

7.4 Science - policy interaction

EBM is a knowledge intensive approach to the management of human activities in ecosystems. Science is a fundament underpinning of EBM. An essential component of EBM is the description and definition of the structure and functions of ecosystems, just one task that requires substantial scientific effort. The Law of the Sea Convention obliges states to take into

account the "best scientific evidence available" in the management of the living marine resources in their exclusive economic zones. Also, critical to EBM is monitoring over time of key elements of the ecosystems. This too, requires a scientific effort. Scientific knowledge, as opposed to other forms of knowledge, is universal and subject to procedures and methods which ensure that confidence can be vested in it. In addition, there are other types of expert knowledge that can enrich EBM. There is knowledge also by users or watchers of nature that is based on long-term practice and/or repeated observation. This latter type is commonly referred to as traditional and/or local knowledge. This type of knowledge is situational and rather limited in space and time.

The science that contributes to operational, day-to-day EBM is mostly found at the national level, the application of which is beyond the scope of the *Arctic Ocean Review*. However, a number of international science bodies have programs relevant to the Arctic. These include ICES, PICES, the International Arctic Science Committee (IASC), the Sustained Arctic Observing Network (SAON), the International Polar Year (IPY) and its follow-up, and others. Significant funding of research programs comes from Arctic Council states as well as other interested parties. The need to establish baseline data of ecosystem properties at a pan-Arctic level has been raised in a number of these bodies and programs. . International science programs are important in setting research agendas and fostering international scientific collaboration,

7.5 The role of the Arctic Council in EBM

As noted above, in practice most of the actual work on implementing the ecosystem approach take place at the domestic level. Arctic countries have for some time invested substantial efforts in developing and implementing EBM at the domestic level (Hoel et al. 2009). This is where the legal, financial and administrative means to actually do EBM exist. There is a need to also develop such means at other scales or units. Advances in scientific understanding of ecosystems and experiences in the implementation of EBM means that EBM will evolve over time.

This is not to say that regional and international cooperation is unimportant for EBM. The international legal framework, and regional cooperation on science and on developing principles for EBM, are both important for the subsequent domestic EBM efforts. Regonal and international cooperation are also important for sharing of experiences and learning from each other as the practice of EBM evolves.

The Arctic Council has been significantly engaged in [increasing] [promoting] understanding of EBM for some time. A PAME expert group has studied EBM; the Arctic Council Ministers endorsed a joint SDWG/PAME project on Best Practices for Ecosystem-Based Oceans Management in the Arctic in 2009 and, in the Nuuk Declaration in 2011, they established an expert group on EBM which will report in 2013. Further, the Arctic LME map has had practical implications for how information about ecosystems is presented.

This EBM work is consistent with the objectives of the Arctic Council Declaration (1996) which states that the Council should "promote cooperation, coordination and integration 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 Council's work also

incorporates lessons learned from international policies that encourage EBM globally and institutional frameworks that enable EBM regionally.

The Arctic Council can contribute to the further development of EBM in its member countries by underpinning management efforts at domestic and international levels in the five areas identified below. Background information on these five areas is presented here. Opportunities for action associated with each of these areas can be found in the concluding section of the chapter.

1. Definition and principles. A common understanding on what is meant by EBM is an important basis for advancing the work on this issue in the Arctic Council.

The Arctic Council EBM expert group has been requested to elaborate on a possible EBM definition. The Expert Group has also identified a number of principles that can represent common elements of a potential approach by the Arctic Council.

2. Identification and description of ecosystems. A critical first step when implementing the ecosystem approach to management is defining specific ecosystems based on ecological criteria. This not an easy task in the sea where the ecological boundaries are fuzzy, and the temporal and spatial coordinates of multiples species are so different, particularly considering the movement of highly migratory species like cetaceans and birds.

Large marine ecosystems (LMEs) in the Arctic have been identified in the format of the Arctic LME map, introduced at the end of section 7.1.

The question of how to define ecosystem boundaries for management purposes at smaller and large scales suggests that ecosystems should be seen as hierarchically nested across scales. This supports the idea of starting with large scale management units such as the LME. For example, CAFF, through CBMP, has already defined arctic marine areas which conform to the LME boundary. A suite of common parameters, sampling approaches and indicators are being applied in these areas.

An ecosystem description would include elements of the system such as the seafloor, currents and water masses, plankton, benthos, fish stocks, marine mammals and birds. Descriptions could include lists of species, the biology and ecology of the dominant species, accounts of food webs, trophic interactions, animal migrations, and several other aspects of ecosystems. Such basic descriptions may remain valid over time, although periodic updates to reflect new knowledge and/or changes in the ecosystem may be needed.

Valuable and vulnerable areas, where ecosystem properties are particularly important for the functioning of the ecosystem and the delivery of ecosystem services, are an important feature of LMEs.

While an Arctic LME map exists, actual management will often require more substantial assessments of the ecosystems in question. Several Arctic countries, for example, Norway, already manage their oceans on the basis of ecologically defined areas (not necessarily LME). In order to be useful in the context of management of large marine ecosystems or similar geographically defined eco-regions, ecosystem assessments should be based on the LME map as far as practicable and complimented by other processes. Since identified ecosystems can overlap within two or more countries, bilateral and international cooperation is important.

3. Ecological objectives. An important step in implementing EBM is developing ecological objectives for management. The OSPAR Commission for the Northeast Atlantic has developed Ecological Quality Objectives (EcoQOs) for the North Sea as part of its ecosystem approach. The work has taken a long time and remains a work in progress. Another example is how ICES advises OSPAR in the work of defining Ecological Quality Objectives.

The Marine Strategy Framework Directive of the European Commission implements the ecosystem approach in the European Union. The directive sets ecological objectives, with Good Environmental Status as an overarching objective. Good environmental status is defined and characterized by 11 qualitative descriptors, such as no adverse effects from pollution, eutrophication, introduced species, noise, and hydrological changes.

The diversity of marine ecosystems in the Arctic may preclude the development of one, universal set of ecological quality objectives for the Arctic marine environment as a whole. But the Arctic Council could play a role in initiating work on such objectives and the establishment of overarching ambitions that such ecological quality objectives are to address. Inspiration for such ambitions can be found for example in the 1982 Convention for the Conservation of Antarctic Marine Living Resources or the FAO Technical Guidelines for Responsible Fisheries, Fisheries Management-2. The ecosystem approach to fisheries. Such a standard would need to incorporate conservation as well as use concerns. Also, work on ecological quality objectives in an Arctic context could address possible methods for identifying and operationalizing them.

4. Assessing ecosystems. While management objectives identify a desired status that management measures are to achieve, ecological quality objectives provides more detailed standards against which developments can be measured. Ecological quality objectives need to be continuously monitored in order to assess progress towards management objectives. Integrated assessments of ecosystems are therefore a core element of the ecosystem approach. (Rice et al. 2010). By evaluating the status and trends in significant ecosystem components the overall state of the ecosystem can be assessed. This includes impacts from human activities such as fishing, pollution, coastal development, etc., as well as the overall or cumulative impacts of those activities. Integrated assessments also include socioeconomic factors.

Marine ecosystems are inherently dynamic. Physical forcing, expressed by variability in ocean climate (currents, water masses etc.), has large influences on populations of fish and other organisms and on ecological processes. The large natural variability of marine ecosystems in the Arctic poses a challenge when it comes to assessing the impact of human activities. Assessments need to distinguish anthropogenic effects to be distinguished from the natural fluctuations in ecosystem components.

The role of indicators and ecological modeling as tools for carrying out integrated assessments are being explored in many contexts. Indicators may have limitations in assessments because of the complex and dynamic nature of marine ecosystems. The Arctic Council through the CBMP is implementing a marine monitoring biodiversity plan. This plan identifies eight Arctic marine areas where a suite of common

parameters, sampling approaches and indicators will be used with the first state of the marine environment scheduled for 2015.

The development and testing of assessments that are informed by different knowledge forms (scientific and practical or traditional) and different disciplines, is implemented around the world. Integrated assessments provide a framework for organizing different knowledge forms and scientific knowledge in order to inform decisions on the management of the marine ecosystems at multiple scales and across sectors.

Suggested addition by Sweden on Integrated Assessments:

The description and understanding of marine ecosystems encompasses geophysical, biological and ecological science, as well as numerous applied fields of related sciences. The description and analysis of the assignment, access to, and appropriation of resources, modalities of use, technological externalities and pressures as well as the social, economic and institutional conditions enabling these multiple functions and uses, encompasses also a group of fields of research and disciplines commonly grouped under the social sciences. The comprehensiveness of marine science is further elaborated in chapter 8; suffice here to elucidate that shortcomings in the knowledge base mobilized for management of marine ecosystem has been a critical issue in situations characterized by unsustainable outcomes. It is in this context that the development and testing of assessments that are informed by different knowledge forms (scientific and practical or traditional) and different disciplines, is implemented around the world. Integrated assessments provide a framework for organizing different knowledge forms and scientific knowledge in order to inform decisions on the management of the marine ecosystems at multiple scales and across sectors.

5. Common understanding and the mutual exchange of lessons learned. One of the most important legacies of the Arctic Environmental Protection Strategy and the Arctic Council is their ability to foster a common understanding among Arctic countries of challenges facing the Arctic. Many examples exist of the Arctic Council's promotion of such collaboration over time between scientists, administrators and Northern Peoples from different countries, including the Arctic Climate Impact Assessment, the Arctic Marine Shipping Assessment, the Arctic Human Development Report, and ongoing work such as ABA, SWIPA and the Arctic Oil and Gas Assessment. These initiatives have greatly contributed to enhanced mutual understanding of the driving forces and effects of change in these areas.

Such common understanding is also critically important in the context of Arctic EBM, where. there is a need for a flexible and adaptive management approach.. Arctic ecosystems and human activities are dynamic and understanding of these systems and activities is constantly evolving. Furthermore, ecosystems are not discrete, isolated geographical areas with tightly-defined boundaries. Rather, Arctic ecosystems are nested within larger dynamic regional and global systems. EBM provides an inclusive framework for balancing competing priorities and interests. Ongoing efforts are required to foster common understanding of coastal, marine and terrestrial ecosystems, and to find ways to effectively implement EBM.

.A possible role for the Arctic Council in the context of EBM is to develop a mechanism for countries to exchange lessons learned as they implement integrated assessments, best practices, and other measures adopted by the Council.]

7.6 Opportunities for Cooperative Action

The preceding discussion in section 7.5, of five areas in which the Arctic Council has a role in EBM, suggests the following actions for the Arctic Council. In turn, in carrying out such actions the Council could take into account the ABA and the anticipated first stage of the marine biodiversity report scheduled for 2015.

Agree on definition and principles

- ✓ Adopt the definition of and principles for ecosystem based management proposed by the Expert Group on EBM which was established by the Arctic Council Ministers in Nuuk in May 2011.

Identify and describe ecosystems

- ✓ Endorse the need for revisions to ecosystem understanding based on changing conditions in the Arctic, and for data and information in Arctic Council marine assessments to be organized on the basis of the LME map as appropriate.

Set ecological objectives

- ✓ Establish a project to develop ecological objectives, with a view to exchanging experiences and learning, and to consider developing an overarching "conservation and use standard" for EBM in Arctic marine environments.

Assess and value ecosystems

- ✓ Develop Best Practices for assessment work in Arctic Council working groups.
- ✓ Develop methodologies for integrated assessments and discussion of indicators, through workshops that encourage the exchange of experiences.

Promote common understanding and the mutual exchange of lessons learned

- ✓ Continue the work of the PAME Ecosystem Approach expert group with regular meetings to share information, strategies and plans and, as appropriate, with the cooperation of other working groups.
- ✓ Convene as appropriate periodic Arctic-wide meetings for States to exchange knowledge and lessons learned with respect to management and science across Large Marine Ecosystems.
- ✓ Institute periodic Arctic Council reviews of EBM in the Arctic, including BEPOMAR, to exchange information on integrated assessment and management experiences, including highlighting examples from Arctic States.
- ✓ Develop as needed a mechanism for acknowledging and fostering the implementation of EBM related measures in the Arctic.

References for each chapter appear at the end of this Report

Chapter 8 Arctic Marine Science

Version here within as of 29th of Jan 2013

8.1 Introduction

A goal of the AOR is assist Arctic Council Ministers in their efforts to strengthen governance and to achieve environmental, economic and socio-cultural outcomes in the Arctic through a cooperative, coordinated, and integrated approach to the management of the Arctic marine environment [AOR Phase I Report, p. 3]. Science plays an important role in this process across a broad range of disciplines and issues.

Science as a means to build understanding of the natural world can be distinguished from social sciences, which are primarily directed at understanding the human condition, including human behaviors and interactions. While science involves pure research in relation to biological, geophysical and human-oriented fields, it also includes numerous applied sciences in relation to the Arctic marine environment such as marine engineering, renewable and non-renewable resource development technologies, navigation systems, monitoring and communication technologies, to name just a few.

In this context, increasing the effectiveness of Arctic marine science, by necessity, requires ongoing research and development, better acquisition, storage, management and dissemination of data and information, more reliance on science-based decision-making, better knowledge-to-action or science-to-policy approaches, and more coordination and cooperation across disciplines and among Arctic states. A related issue is integration among scientific disciplines to provide a more holistic or balanced understanding of the dynamic systems at play in the Arctic, in respect of both natural systems and human-built systems.

As Chapter 2 highlights, other forms of knowledge acquisition and dissemination are also relevant for governance and management processes in the Arctic marine environment. Integrating this indigenous/local knowledge with the various fields of natural and social science to effectively inform management processes will require considerable ongoing efforts. Indeed, there is some urgency in conducting appropriate studies of local practices to provide information while there is still time to use it.

8.2 Translating Knowledge into Action

The scientific community today faces an increasing demand for reliable, policy-actionable information (USARC, 2010). The phrases "science to policy" and "knowledge to action" are commonly used to describe the processes involved in addressing this demand.

It is important to note that not all science leads to policy-making and law-making. There is no predictable timescale for the translation of science to policy or knowledge to action. Some scientific knowledge might incubate for generations before its practical application is recognized or possible. In addition, the phrases "science to policy" and "knowledge to action" imply that science and knowledge follow a linear, uni-directional path to practical policy, law or action: science leads to policy, knowledge leads to action. In reality, the relationships among science, knowledge, law and policy are complex and involve a range of factors such as time scale, geographical (spatial) scale, budget cycles, political philosophies, socio-cultural priorities and national and geopolitical interests.

Whether science should lead policy and law or whether policy and law should direct science is an ongoing discussion. In reality, science, law and policy should reinforce each other. There are many situations where policy and law directly influence research agendas, how science is conducted and how scientific knowledge is applied or utilized. For example, institutional mandates and budgets for research and scientific activities are based on policy choices that are often driven by attempts to resolve conflicting or competing human interests.

Similarly, science contributes to and influences the development of laws and policies over time. The science cooperation within the Arctic Council provides a number of examples that are cited in this report. Science is also important in ongoing processes for monitoring and assessing the successes and shortcomings of the existing laws and policies in meeting their stated objectives in respect of environmental integrity, sustainability, and other issues relating to economic, social and political efficiency and effectiveness.

As Chapter 2 observes, given the rapid increase in interest in marine shipping, mining, petroleum development, tourism, and other activities in Arctic waters, it is important that decisions be made based on best available information. A lack of data, information or knowledge, coupled with imperfectly understood complex relationships within and among Arctic ecosystems and Earth systems, present significant challenges for policy makers and governance systems. In addition, positive relationships among science, indigenous/local knowledge, policy and law are important in translating new knowledge into practical measures to implement existing instruments and to develop new instruments for the Arctic marine region.

8.3 Some Challenges and Emerging Issues

The foregoing chapters contain many references to the importance of science, and more generally, knowledge, in the management of the Arctic marine environment. Some of those references are tied directly to the individual instruments that are the focus of this AOR Phase II Report; others suggest how the instruments could benefit from a better flow of information between scientists and knowledge-producers on the one hand, and those that need that information to make good decisions on the other.

Chapter 2 on *Indigenous Peoples and Cultures* stresses the importance of local and traditional knowledge in Arctic marine management systems. It highlights that the people and communities of the Arctic have long-term connections to coastal and marine environments that enable them to understand these ecosystems in ways that science is only beginning to appreciate. The challenge is to find ways to work with existing instruments, institutions of governance, private companies, and even other local communities to develop responses that can minimize the negative impacts of environmental and social change, while allowing Arctic residents to maximize any benefits or opportunities that arise. Chapter 2 notes, however, that studies of the use areas or harvest levels for many renewable resources are often decades out of date.

Similarly, Chapter 3 on *Arctic Marine Operations and Shipping* points to the vital need for improved Arctic charting and greatly enhanced marine observations to improve operational safety. Most of the coastal Arctic requires extensive hydrographic surveying. Chapter 4, *Marine Living Resources* , observes that there is not a lot known about the existence of fish stocks or the potential for the existence of fisheries resources in large parts of the central Arctic Ocean, both within and beyond areas under national jurisdiction (USA). Chapter 5,

Arctic Offshore Oil and Gas, notes that there is speculation about development of offshore petroleum resources, but projections are based on undiscovered and unproven fields. Science to support environmentally-responsible exploration, development and delivery of petroleum resources in Arctic marine areas is ongoing [see for example: USGS, 2011, An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas, Alaska, circular 1370].

Chapter 6 on *Arctic Marine Pollution* notes that there is a need for long-term monitoring efforts for pollutants in the Arctic marine environment, in part to assess the effectiveness of pollution control measures. Chapter 7 on Ecosystem-based Management [stresses that a prerequisite to this approach is the description and definition of the structure and functions of ecosystems,] a task that requires substantial scientific effort. Long-term monitoring of key elements of ecosystems is critical to ecosystem-based management and this also necessitates considerable scientific effort.

Increasingly rapid physical changes in the Arctic have also led to a resurgence of interest in jurisdictional issues and access to resources. While the Arctic has few unresolved territorial disputes, there are problems related to differing national policies regarding access for scientific observations and research in the Exclusive Economic Zones (EEZs) and territorial seas, and data availability from these regions in real time. Canada, Denmark/Greenland, Norway, Russia and the United States directly border the Arctic Ocean and peripheral seas and therefore have a particular interest as to how *in situ* ocean observing is to be conducted in their respective inland and territorial seas and their EEZs.International governmental coordination is critical, both in observing capacity and in sharing, consolidating and archiving the data streams and associated metadata.

8.4 Some Instruments Relevant to Arctic Marine Science

A number of existing international instruments provide a framework for scientific cooperation to guide and regulate the conduct of marine scientific research, globally and regionally. These instruments, which are applicable in the Arctic, present opportunities to develop inter-treaty linkages, which is one of the objectives of this AOR II report. The UN Convention on the Law of the Sea is a primary 'hard law' instrument in this context, while the *Declaration Establishing the Arctic Council* is a key 'soft law' instrument, particularly in the context of integration of science into policy and law. While there is no single comprehensive, legally binding global or regional instrument in relation to Arctic environmental protection and sustainable development, current legal regimes at the global, regional, national and local levels constitute complex, detailed management frameworks (Molenaar, 2012; Young, 2012) that can support the promotion of sustainable, integrated and/or ecosystem-based approaches.

AMAP's assessments on Arctic contaminants in the 1990s, led Arctic Council Ministers to express their support through Arctic Council Ministerial declarations for legally binding instruments to control emissions and discharges of persistent organic pollutants (POPs). As a part of their commitment to take AMAP findings into consideration in their policies and programmes, Ministers agreed 'to work vigorously for the early completion and implementation of a protocol on the elimination and reduction of persistent organic pollutants (POPs) under the framework of the United Nations Economic Commission for Europe (UN ECE) Convention on Long-range Transboundary Air Pollution' (Alta Declaration, 1997) and to promote international cooperation to secure support for international actions in order to address the serious pollution risks reported by AMAP (Iqaluit Delaration, 1998). The

Convention on Long-Range Trans-boundary Air Pollution] adopted the Protocol on Persistent Organic Pollutants in June 1998 in Aarhus, Denmark.

Ecosystem-Based Management

Chapter 7 on *Ecosystem-based Management* examines the use of "best scientific evidence available" for the management of the marine environment and the importance of science for implementing EBM. These matters will not be re-examined here, other than to mention the importance of local and indigenous knowledge in the setting research agendas, building cooperation among local, national and regional management organizations and giving proper consideration to competing uses and priorities.

> "Ecosystem-based management requires recognition of all the factors that can affect an ecosystem and therefore trans-boundary issues also need to be taken into account. This necessitates international science cooperation and a framework of common or compatible standards."

While not related specifically to EBM, the preamble to the 2001 Stockholm Convention on Persistent Organic Pollutants acknowledges that Arctic ecosystems and indigenous communities are particularly at risk because of the biomagnifications of persistent organic pollutants and that contamination of traditional food is a public health issue. A similar preambular clause is also included in the UN Economic Commission for Europe POPs Protocol to the Convention on Long-range Transboundary Air Pollution. The references to indigenous peoples and the Arctic region in these hard law international instruments reflects, in part, the prominence of Arctic data presented by the Arctic Council as the context in which the negotiations took place, and the very effective participation of a coalition of Arctic indigenous peoples as observers in the negotiations. In practice, incorporating indigenous knowledge in decision-making is proving challenging.

As Chapter 7 points out, science contributing to actual day-to-day EBM is mostly found at the national level. However, EBM, and the science that supports it, must recognize all the factors that can affect an ecosystem and therefore regional and global issues also need to be taken into account. This necessitates international science cooperation and a framework of common or compatible standards, systems and policies for monitoring, accessing and sharing of data. Given the operational costs in Arctic marine areas, opportunities for sharing platforms and other infrastructure should be examined.

Arctic Council working groups [such as AMAP, CAFF, PAME and SDWG] and a number of international science bodies (marine and terrestrial) have the capacity to provide advice on such matters to the Arctic Council to support EBM in Arctic marine areas and to inform the sectors discussed in other chapters of this Report. These include the *International Council for the Exploration of the Sea (ICES)*, the *Pacific International Council for the Exploration of the Sea (PICES)*, the *International Arctic Science Committee (IASC)*, the *International Arctic Social Sciences Association (IASSA);* the *International Study of Arctic Change (ISAC);* the *Pacific Arctic Group* (PAG); a circum-arctic network of terrestrial field bases referred to as ScanNet; the *Arctic Regional Ocean Observing System (Arctic ROOS);* the *Sustaining Arctic Observing Networks (SAON)*; and the *International Network for Terrestrial Research and Monitoring in the Arctic (InterAct).*

Marine Scientific Research

At the global level, Part XIII of the *Law of the Sea Convention*, which is applicable in the Arctic, contains provisions that address the rights and obligations of States with respect to the conduct of marine scientific research in the different maritime zones. The Convention also contains general principles for the conduct of marine scientific research. However, the term "marine scientific research" is not defined in the Convention though it does not appear to include social sciences. Part XIV deals with Development and Transfer of Marine Technology and includes references to development of marine technology and marine science.

Several scientific-related fields are covered by other provisions of the Convention or other legal regimes and are not part of the MSR provisions, for example, hydrographic surveys, exploration and exploitation of natural resources (including fish), and underwater cultural heritage.

While the LOS Convention protects freedom of marine scientific research on the high seas (Article 87) and marine scientific research in the Area (Article 143), subject to certain conditions, a coastal state may exclusively regulate, authorize and conduct MSR within its territorial seas and internal waters. With respect to the Exclusive Economic Zone and Continental shelf, a coastal state (NOR: shall in normal circumstances grant their consent to MSR) (has a somewhat more limited jurisdiction in relation to MSR). Nonetheless, states have a duty to promote and facilitate the development and conduct of marine scientific research.

"International Cooperation" is specifically dealt with in the MSR provisions (s.2 of Part XIII) of the Convention but this provision does not create obligations in relation to regional cooperation. Other provisions of the Convention (Part XII) do create obligations to cooperate, on a global and regional basis, in respect of marine environmental protection, but do not specify the form of cooperation (Molenaar 2012).

The *International Hydrographic Organization Convention* contains objectives that encourage regional cooperation (Article II) and the Arctic Region Hydrographic Commission (ARHC) was accordingly established in 2010.

The OSPAR Commission was established by the 1992 Convention for the Protection of the Marine Environment of the North-East Atlantic. In 2008 the OSPAR Commission adopted a Code of Conduct for Responsible Marine Research in the Deep Seas and High Seas of the OSPAR Maritime Area that includes an Arctic marine region adjacent to the northeast Atlantic. In view of the potential impact of scientific activities on the marine environment, the OSPAR Commission requests scientists working in the deep seas and high seas of the OSPAR maritime area to adhere to the code of conduct when planning and carrying out their research (Takei 2012).

The Arctic Council could provide leadership in this area by developing certain principles or guidelines for marine scientific research conducted in the Arctic. These precepts could be based on principles and rules of the international law of the sea applicable to marine scientific research (Baker 2012).

In addition to the instruments already mentioned, several multilateral bodies can help coordinate activities relevant to Arctic marine science (e.g. IASC, IASSA, ICES, PICES, IOC). For example, through memoranda of understanding, the IOC cooperates with the ICES

in the North Atlantic, and with the 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 (AOR I Report 2011). Additionally, there are several non-governmental organizations which are already associated with the Arctic Council and which have played a significant role in cooperative initiatives relating to Arctic marine science.

So while it is not uncommon to see in the literature statements lamenting the lack of baseline information or data in many sectors of Arctic science, at the same time there seems to be no lack of bodies and organizations - governmental and non-governmental - working on Arctic science and regulation. Some of these organizations are already observers within the Arctic Council system, while others, such as ICES and PICES, count Arctic states among their members. Provisions in the LOS Convention, OSPAR, and the PICES and ICES Conventions and other instruments present opportunities for better coordination, cooperation and management in relation to Arctic marine scientific research. However, there is no comprehensive or readily available "network map" that identifies relevant Arctic research and science organizations and governance organizations on an integrated or multi-sectoral basis. In order to foster cooperation and build linkages, a better understanding of the machinery underlying these organizations is required within the Arctic Council and among officials and scientists. Some effort could be made to better represent the wide range of players in the field and their relationship to various instruments.

8.5 Cooperation and Coordination in Relation to Science-based Instruments

Promoting cooperation and improved coordination of reporting between science-based instruments are not new proposals for the Arctic. A 2006 UNEP/Grid-Arendal workshop studied the effectiveness of Multilateral Environment Agreements (MEAs) in the Arctic, and recommended that Contracting Parties, governing bodies and secretariats of multilateral MEAs "*Work to improve communication among secretariats of related MEAs and together look at opportunities for more effective division of labour and increased collaboration on consultation, implementation, reporting and outreach"* (UNEP/GRID-Arendal et al. 2006, para. 2.5.3). It also suggested a survey of the "status of co-operation between MEA secretariats and between the Contracting Parties to MEAs on addressing Arctic issues at Meetings and Conventions of the Parties" (*ibid*., para. 3.3.6).

"Provisions in the LOS Convention, OSPAR, and the PICES and ICES conventions and other instruments present opportunities for better coordination, cooperation and management in relation to Arctic marine scientific research.

However, there is no comprehensive or readily available "network map" that identifies relevant Arctic research and science organizations and governance organizations on an integrated or multi-sectoral basis."

A 2010 assessment of Arctic Biodiversity, prepared by CAFF and UNEP/GRID-Arendal, and part of the ongoing ABA process, recommended that "[m]ore work and greater attention needs to be directed at the harmonization of national reporting among MEAs" (Johnsen et al., 2010). The report was limited to biodiversity and environmental agreements but many of its conclusions are directly relevant to instruments applicable to other sectors discussed in this AOR Report. Referencing

an earlier UNEP study, the 2010 report suggested closer cooperation between "core" MEAs (Johnsen 2010, 28, referencing UNEP 2001).

By extension, closer cooperation among Arctic States that are parties to the agreements discussed in this Report, on matters relating to those instruments, could bring improved implementation and information gathering and distribution.

Increasingly scientists and policy-makers are recognizing that the Arctic today is a tightly-coupled component of highly dynamic global biophysical, geopolitical and socio-economic systems. Such systems can involve shifts that may be both non-linear and abrupt. (Fenge et al., 2008). Modeling of key environmental and socio-economic processes will be required to strengthen management institutions and achieve practical outcomes (Turner 2000).

Integrated oceans management and ecosystem-based management have as their cornerstones development and application of scientific knowledge. While these developing fields of management provide new approaches to ensure the protection and sustainable use of the Arctic's marine legacy, there are still many challenges to overcome before they become effective management tools on a sufficiently large scale. However, as indicated in most other chapters of this report, there is a need for more research to generate adequate baseline information for decision-makers and indeed to fuel the field of scientific inquiry itself.

Ultimately, Arctic marine and terrestrial systems must be understood in the context of global systems, because, as many Arctic Council assessments have noted, non-Arctic activities are drivers of some of the most fundamental changes taking place in the Arctic today, including production of greenhouse gases, trans-boundary pollutants, demand for natural resources, interests in new transportation routes, Arctic tourism, and so on. While climate change and globalization have potentially profound impacts on the ecosystems and peoples of the Arctic, changes in the Arctic also have significant implications for non-Arctic regions that are poorly understood. The evident interest of non-Arctic actors in Arctic affairs, and the existence of a number of instruments and organizations that could foster greater trans-regional cooperation, present significant opportunities for scientific cooperation and collaboration for the Arctic Council.

8.6 Opportunities for Cooperative Action

Several Arctic Council activities, and the structure of the Council itself, are directed at finding ways to bring the science and policy disciplines together in meaningful ways. The Arctic Council provides a high level forum for consideration and better integration of Arctic sciences and Arctic state policies. Joint projects and cooperation among the working groups are the main processes for this integration of natural and social sciences, including indigenous and local knowledge. Discussions in the Arctic Council among Ministers, Senior Arctic Officials, Permanent Participants, Working Groups and Observers, provide a mechanism for consideration of science and indigenous/local knowledge in a policy-relevant context.

Scientific input has been critically important to Arctic Council assessment projects. Based on their mandates, the six Arctic Council working groups use science and indigenous/local knowledge in their work in different ways. The need to establish baseline data relating to ecosystem properties, at a pan-Arctic level, has been raised in a number of these bodies and programs. In addition, there is a growing need for research and analysis of the economic and socio-cultural dimensions of the Arctic in the context of global and regional change.

Factors such as political priorities, enforcement capability, the state of Arctic infrastructure, budgetary resources for monitoring and carrying out implementation and compliance measures, all affect the conduct of Arctic marine science. Based on the preceding discussion, numerous opportunities for cooperation in Arctic marine science exist. These include:

Develop Policies regarding access for scientific monitoring and observations The Arctic Council could be the body to undertake this coordination and arrive at an international set of principles and practices to be followed by all countries doing research and operations in the Arctic region.

Enhance Scenario-building capacity within the Arctic Council Consideration could be given to ways to develop appropriate scenario-building capacity within the Arctic Council to integrate natural and social sciences, economics, and other matters relating to the human dimension as these relate to Arctic marine areas.

Develop a Science Network Map linking existing instruments and entities No comprehensive or readily available "network map" identifies relevant Arctic research/science organizations and governance organizations on an integrated or multi-sectoral basis. In order to build stronger networks among existing organizations and to foster cooperation, opportunities and linkages (USA), a better understanding of the machinery underlying these organizations is required within the Arctic Council and among officials and scientists. Some effort could be made to identify the wide range of players in the field and their relationships to the various instruments identified in the AOR Reports.

Promote Scientific Cooperation with Non-Arctic states through existing Instruments The Arctic Council could encourage the working groups to explore opportunities to develop stronger linkages with ICES and PICES on matters of Arctic marine science and Arctic-relevant policy matters. (Three Arctic states are members of PICES; all eight Arctic states are members of ICES). This cooperation with sub-Arctic organizations in the "gateway" regions of the North Pacific and North Atlantic might provide avenues for the development of trans-regional mechanisms within the Arctic Council to allow relevant non-Arctic states to improve their contributions to the Council.

Identify Research Priorities relating to Arctic-Relevant Instruments As a follow-on to AOR II, and to support the implementation of an EBM approach, the Council could consider directing working groups to collaborate to develop a strategic research agenda using key global and regional instruments as frameworks.

Strengthen Shared infrastructure and platforms for research and monitoring Given the broad need for Arctic marine science (USA) and monitoring identified in this Report, the Arctic Council could encourage Arctic Council States to examine the potential for sharing of infrastructure and platforms for these scientific activities and develop appropriate policies and agreements to implement this approach.

Improve coordination of information gathering and exchange under relevant agreements. Improving coordination between States' reporting and other information-based activities under relevant international instruments has the potential to enhance protection of the Arctic marine environment by:

i. building on science, local and traditional knowledge, and other information gathered to fulfill reporting or assessment obligations;

ii. informing ecosystem based management approaches;

iii. improving communication between science and policy arms of existing treaties; and,

iv. moving toward coordinated assessment, monitoring, and reporting, where appropriate.

References for all chapters appear at the end of this Report

Chapter 9 Conclusions and Recommendations

*[**To be negotiated:** The co-lead authors recognize that most of this chapter will be revised because it is to be a negotiated chapter. **Accordingly, we have taken a slightly different approach than with v 1.0 discussed at Halifax**. We simply tag each recommendation chapter-by-chapter with the category it falls under rather than splitting up the chapter recommendations under the five different headings.] Not having heard back from our request on October 15, 2012 for feedback on how to approach chapter 9, we decided on this new approach in order to expedite delivery of this October 16, 2012 version to you.]*

This concluding chapter presents the opportunities and recommendations that each chapter discusses separately and identifies them by type. For example, some opportunities exist for cooperation in knowledge development and dissemination. These sorts of cooperative activities are qualitatively different than actions to amend or create new legal instruments. Similarly, institutional coordination, investments in infrastructure, and better instrument implementation and compliance efforts also constitute qualitatively different categories.

In considering the range of opportunities for actions, it is evident that they can be grouped under five themes, as follows:

Coordinate across Institutions

Cooperate on Knowledge

Adjust Existing Instruments

Improve Implementation and Compliance

Invest in Infrastructure

Rather than grouping the recommendations by type, we present them chapter-by-chapter. The recommendations were developed by considering the full range of opportunities for action and choosing ones that would most benefit from profiling in this report.

Before categorizing individual recommendations, we highlight six specific action areas for which opportunities have been noted in numerous chapters:

Finalizing the Polar Code is called for in four chapters: Shipping, Living Marine Resources; Offshore Oil and Gas and Arctic Marine Pollution.

Developing International standards for offshore oil and gas development is called for in three chapters: Living Marine Resources; Offshore Oil and Gas and Arctic Marine Pollution.

Special, Protected or Critical Areas. The study or designation of such areas is called for in five chapters: Peoples and Cultures, Shipping, Living Marine Resources; Offshore Oil and Gas and Arctic Marine Pollution.

Better monitoring of the Arctic marine environment, from baseline data to ongoing, cumulative effects of various activities is called for in every chapter: Peoples and Cultures, Shipping, Marine Living Resources, Offshore Oil and Gas, Arctic Marine Pollution, Ecosystem-based Management and Arctic Marine Science.

Cumulative Effects and the need to better understand them is called for in five chapters: Peoples and Cultures, Living Marine Resources, Arctic Marine Pollution, Ecosystem-Based Management and Arctic Marine Science.

Ecosystem-based approach. The need to address stressors in an integrated manner, taking account of ecological functions and limits is repeatedly raised in a number of the chapters and noted as key to address change. [This point is new as a result of the PAME mtg.]

The following recommendations are considered important actions in the face of the dynamic changes occurring in the arctic marine environment:

[List of proposed recommendations forthcoming]