WORKSHOP REPORT

PAME, CAFF, AMAP, SDWG
5th Ecosystem Approach to Management Workshop

Methodology and status of development of ecological (quality) objectives for Arctic Large Marine Ecosystems

Bergen - Norway

26-27th May 2015

Arctic Council

PAME, CAFF, AMAP, SDWG – Ecosystem Approach Expert Group

Fifth Ecosystem Approach Workshop

Methodology and status of development of ecological (quality) objectives for Arctic Large Marine Ecosystems

Institute of Marine Research, Nordnesgaten 50, Bergen, Norway

26-27 May 2015

Acknowledgement of funding and support We gratefully acknowledge the financial support provided to this project from the OAK Foundation.

OAK FOUNDATION

PAME Protection of the Arctic Marine Environment

Table of Contents

Workshop Participants

Welcome and introduction

Background and Workshop Objectives

The focus of this workshop is on the topic of ecological objectives which is addressed through summaries and reviews of existing management objectives related to living resources and the environment in current management systems and legislation, and by reviewing the state-of-the-art in developing more comprehensive sets of ecological objectives. Transboundary cooperation to develop a common understanding of the ecological objectives of the Arctic states, the local communities and indigenous peoples is essential to implementing the ecosystem approach to management. Thus the perspectives of Permanent Participants of their value systems and use of traditional knowledge and respect will be taken into account as a basis for the subsistence harvest and use of the environment by indigenous peoples of the Arctic.

The workshop objectives are to:

1. Review existing management objectives for use of living and non-living resources, environmental protection and nature conservation in national legislation and management systems.
2. Review developments and methodologies for defining a comprehensive set of ecological objectives as a step in implementing a more holistic management approach, e.g. the EA.
3. Review/learn about the principles and values embedded in the use and management of living resources and the broader environment by indigenous peoples of the Arctic.

Ecological objectives: role in the ecosystem approach to management

- Hein Rune Skjoldal (IMR, Norway)

The Ecosystem Approach to management (EA) was included as a key principle in the Arctic Marine Strategic Plan that was adopted by the Arctic Council (AC) in 2004. PAME established an EA expert group (EA-EG) in 2007 that has worked on various aspects related to the implementation of the EA by Arctic states. The EA-EG is co-lead by Norway and the USA and is now a joint expert group including AMAP, CAFF and SDWG in addition to PAME. The work of the EA-EG has included preparation of a revised map of division of the Arctic marine area into 18 Large Marine Ecosystems (LMEs) defined according to ecological criteria, and an EA concept paper with a framework with six elements for implementing the EA.

Setting ecological objectives is one of the six elements of the EA (the remaining five are: defining, describing, assessing and valuing the ecosystem, and managing human activities). Ecological objectives serve the purpose of maintaining the ecosystem in good condition. The definition of EA (or Ecosystem-based management EBM) adopted by the AC in 2013 is:

"the comprehensive integrated management of human activities based on the best available scientific and traditional 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".

The last part of this definition contains the overall objectives or goals for the EA which is to achieve sustainable use and maintain ecosystem integrity. These are high level objectives that need to be translated into operational objectives: which features or properties of ecosystem components (such as fish or birds) do we measure in order to know that the use is sustainable and that the well-being of the ecosystem is secured in the long run? Setting the ecological objectives that would deliver on these challenges is equivalent to defining sustainability in practical terms, or drawing the line of sustainability through the ecosystem in a figurative sense. On a use-axis from no or low use to excessively high and over-exploitive use there is an obvious balance point below which the use is sustainable and above it is not. Defining this point is scientifically challenging and in the end a political responsibility as a societal choice of how much caution should be exerted or how risk averse one should be in face of variability and uncertainty.

There is a hierarchy in going from overarching high level policy statements and commitments to operational objectives that are directly linked to management decisions. This hierarchy is typically arranged from qualitative statements at the policy level to quantitative objectives at the level of practical management, and is sometimes described as a sequence of goals, objectives and targets. The issue of ecological objectives versus management objectives is complex both conceptually and practically but it must be addressed and dealt with as a key element when implementing the EA to management.

Session 1: Review of existing ecological objectives in national legislation and management systems

Objectives in US Federal and State of Alaska legislation and management

- Cathy Coon (BOEM, USA) & Phil Mundy (NOAA, USA)

To provide context to the United States Arctic Region approach for ecological objectives for Ecosystem Approach to Management an overview was provided of US environmental regulations. Within the last 150 years the US has developed several approaches for environmental protections that began with the founding of the first National Park (Yellowstone, 1872, in the state of Wyoming). It was not until the 1970s when a series of federal laws were enacted that provided national ecological objectives with the force of law.

Several examples of federal laws were described as they relate to ecological objectives. The National Environmental Policy Act (NEPA, 1970) set ecological objectives for analysis of impacts on the environment from federal actions. The process established for implementing these objectives within US federal agencies requires managers to identify actions that may significantly impact the environment and analyze their impacts.

Two additional national laws extended the reach of national ecological objectives beyond federal managers to all citizens for certain species of plants and animals. Both acts focus on the conservation of species or portions of species as a means to protect the ecosystems in which they occur. Protections for marine mammals (Marine Mammal Protection Act, MMPA, 1972) and any other species of plant and wildlife (Endangered Species Act, ESA, 1973) include prohibitions on killing or harassing any species covered under these laws. Ecological objectives for many marine fish species originated with the Magnuson-Stevens Fishery Conservation and Management Act (MSA, 1976).

Ecological objectives regarding locations, seasons and methods of harvest were applied to all persons operating within a zone that starts at 3 miles offshore and stops at 200 miles offshore, which is roughly the extent of the US continental shelf in most parts of the nation. Ecological objectives under MSA are known as National Standards. The first national standard is to avoid or terminate overfishing which is defined as harvesting at levels that are not sustainable. A substantial body of environmental law now specifies US ecological objectives for enterprises that discharge toxic or potentially harmful substances into the air or waters (Clean Air Act, Clean Water Act, CWA, 1977). Ecological objectives for habitats in coastal marine ecosystems are established by a number of laws and by authorities vested in federal (and state) agencies (Coastal Zone Management Act, CZMA, 1977, Marine Protection Research and Sanctuaries 1972 and the CWA among others). A current policy for the US Arctic came by way of the National Strategy of the Arctic in 2013.

Examples of application of these federal legislations were provided. The first example occurred primarily as a result of implementation of NEPA in the Chukchi and Beaufort Seas for oil and gas exploration and development conducted by BOEM, which provided for inputs from stakeholders and indigenous peoples to provide exclusions to lease sales. The second example involved applications of MSA which encouraged the development of Ecosystem Based Fishery Management within the large scale commercial fisheries within the Bering Sea and Aleutian Islands.

Unlike traditional management approaches that focused solely on the biology of a particular stock, EBFM provides a more holistic approach to fisheries management – one that takes into account the complex suite of biological, physical, economic, and social factors associated with managing living marine resources. Currently US Arctic Waters north of the Bering Straits are closed to fishing by means of the Arctic Fishery Management Plan (NPFMC, 2009).

Ecological Objectives and Integrated Management Plans for Norwegian Seas

- Cecilie von Quillefeldt (Norwegian Polar Institute, Norway)

The Johannesburg declaration of 2002 calls for Ecosystem Approach (EA) to management of all marine ecosystems by 2010. As a result, the management plan for the Barents Sea-Lofoten area was first announced in the white paper: Protecting the Riches of the Sea (St.meld. nr. 12 (2001-2002)). Since then, Norway has established management plans as the basis for integrated ecosystem approach to management of all Norwegian sea areas (Barents Sea 2006, Norwegian Sea 2009, North Sea/Skagerrak 2013). These plans represent a strictly knowledge-based management regime.

St.meld. nr. 12 (2001-2002) states that an ecosystem approach to management of marine sea areas should provide a framework for sustainable use of natural resources and goods derived from the area that at the same time maintain the structure, functioning and productivity of the ecosystems of the area. How do we know if we achieve this overarching objective? In order to answer the question it is necessary to distinguish between overarching objectives which provide a framework for the management, management objectives that provide specific guidelines for the management and environmental quality objectives that indicate the desired state of the environment.

In the management plans presented as several Government white-papers, i.e. St.meld. nr. 8 (2005-2006) and in the update Meld. St. 10 (2010-2011), St.meld. nr. 37 (2008-2009) and Meld. St. 37 (2012-2013) there are listed a number of objectives for the management of the Barents Sea, the Norwegian Sea and the North Sea/Skagerrak respectively, including objectives for management of biodiversity, pollution, littering, safe seafood and value creation. These objectives are consistent with national goals and guidelines. Furthermore, Norway has signed several conventions and agreements (e.g. Law of the Sea Convention, Convention on Biological Diversity, Johannesburg-declaration, Malawi-protocol, UN Agreement on Management of Straddling Fish stocks, Stockholm Convention, OSPAR Convention, SOLAS – Convention for the Safety of Life at Sea, MARPOL – Convention for the Prevention of Pollution from Ships) and participates in international processes (e.g. International Council for the Exploration of the Sea (ICES), North-East Atlantic Fisheries Commission (NEAFC), Arctic Council, EU, Nordic Council, Norwegian-Russian cooperation (environment and fishery) and UN's International Maritime Organization (IMO)) that provide guidance on the design of the Norwegian marine management plans, including the need for objectives and formulation of these.

As part of the implementation of the Norwegian management plans, objectives for the Barents Sea (several times) and the Norwegian Sea (once) has been evaluated. In connection with the evaluations, indicators with reference values and action thresholds were used, both from the coordinated and systematic monitoring program run by the Monitoring Group (one out of two advisory groups responsible for following up the management plans) as well as other national monitoring activities, besides other supplementary information where applicable. In such a process it is important to emphasize reasoning and nuances in the assessments made, i.e. that assessment should not be simple "yes" or "no" on whether an objective has been achieved or not. If the target is not reached, it is important to indicate in which direction it goes, i.e. improvement, deterioration or status quo, as well as to point out the need for measures to be initiated before the next objective evaluation. It is also important to take into account the fact that the influence of different types of human activity affects various aspects of the evaluation. Fisheries affecting fish populations and benthic fauna are central to the assessment of objectives relating to biodiversity. Petroleum activities and maritime transport are central to the evaluation of objectives related to risk management for acute pollution. Possible effects of climate change and ocean acidification are not taken into account in the evaluation of the objectives for the

Norwegian Sea and the Barents Sea due to the formulation of the objectives. For the North Sea, however, there are objectives where this is included.

Some of the objectives have proved difficult to evaluate and therefore it cannot be assessed with reasonable certainty whether they are achieved, especially because of the way they are worded. An example of this is one of the specific objectives linked to the risk of acute pollution. Because such risk is a dynamic state that at any given time is affected by many different factors, one cannot conclude that this target is always fulfilled. Other objectives have been difficult to evaluate because one does not have sufficient data. For some of these objectives, it is not realistic to expect that one will get such data in the future, e.g. direct data on genetic diversity that are sufficient to detect any changes in genetic diversity in the management area. For some of the other objectives where there are deficiencies in the data, it can be expected that increased data collection may make it possible to make better evaluations in the near future.

To conclude, there should be a distinction between strategic/overarching objectives and operational objectives (qualitative and quantitative). Thus, a review of the high-level operational objectives of the Norwegian management plans is necessary, including an assessment of the need for new sub-goals/targets. Objectives should be specific, possible to quantify and clearly defined with realistic targets that are achievable in practice. A timeline should establish the deadline for the fulfillment of the defined targets. Ecological objectives should be linked to concrete actions and be of such a nature that the effect of measures is captured.

Using Ecological Targets to Inform Management Decisions in the Canadian Arctic

- *Bethany Schroeder (DFO, Canada)*

Canada's Arctic region is a broad area which encompasses 5 identified bioregions which are similar in scope and scale to other LME's in the Circumpolar Arctic region. Much of the current work conducted by DFO Canada is focused in the Western Arctic Bioregion (WAB) which borders and covers regions of the Beaufort Sea. The WAB encompasses the Inuvialuit Settlement Region (ISR) and contains 6 primary communities as well as the Kitikmeot region of Nunavut. As a result of settled land claims in 1984 (Inuvialuit Final Agreement) and 1993 (Nunavut Land Claims Agreement), DFO must abide by co-management legislation for governance and management of marine areas and resources within the WAB and other identified regions.

Ecosystem based management is recognized as the guiding principle in Oceans Management in Canada. Science information is used to identify ecological and conservation objectives for broad scale ocean health and sustainability and is coupled with the traditional knowledge of the co-management partners to incorporate cultural and traditional use information into management decisions. Renewed interest in oil and gas development and exploration in the Arctic regions, as well as increased vessel traffic and activities represent current stressors to Canadian waters and the examination of cumulative impacts by these actions will present new challenges for management.

Oceans management decisions in the WAB are supported by the Beaufort Sea Integrated Management system, which is comprised of the Regional Coordination Committee (federal and territorial government partners and co-management organizations) and the Beaufort Sea Partnership representing multiple stakeholders, partners and NGO's.

Tarium Niryutait Marine Protected Area (TN MPA) is the first MPA identified in Canada's Arctic. A suite of 53 indicators has been identified by DFO Science for the MPA, and a subset of those indicators has been selected for implementation within the MPA. Indicators have been identified as either socio-cultural-economic, governance or ecological and are being monitored and managed within the MPA boundaries by government and co-management partners. Ecological indicators outside of this region have not yet been proposed. Anguniaqvia Niqiqyuam Area of Interest (AN AOI) has also been proposed within the WAB and is unique in Canada, as DFO Science has identified boundaries and priorities for the northern section of the AOI, whereas traditional knowledge has been used to identify priorities in the southern portion. A MPA Network is in development in Canada and is expected to be ready for implementation by 2018/19 and will have identified strategic objectives, conservation priorities and operational objectives to guide management decisions.

To support this work, ecologically and biologically significant areas (EBSA's) have been refined in the WAB and eco-units and priority conservation areas have also been peer-reviewed by DFO Science and Oceans. Other decision support tools that are currently being used and explored by DFO include formal risk assessments (including the development of a national risk assessment framework) and the development of pathways of effect for various ecological stressors such as vessel traffic.

Session 2: Review of new developments of comprehensive sets of ecological objectives

Ecological Objectives in EU MSFD and HELCOM

- Hermanni Kaartokallio (Finnish Environment Institute)

In Europe, two major systems of ecological objectives pertaining to the management of human actions and marine environment are in use. Four regional seas conventions (Helsinki commission/HELCOM; Olso and Paris convention/OSPAR, Barcelona convention/UNEP MAP and Bucharest convention) develop and implement their own systems of ecological objectives.

In the European Union, the Marine Strategy Framework Directive (MSFD, 2008) is a key EU legislative instrument for implementation of an Ecosystem Approach through EBM into management of human actions in the European seas. The Directive has an ambitious goal of establishing Good Environmental Status (GES) by the year 2020. The Directive is implemented by EU member states through marine strategies and in close co-operation in European regional seas (Baltic, NE Atlantic, Mediterranean, Black Sea). The directive has its own system of ecological objectives.

Systems of ecological objectives in EU MSFD and in HELCOM were presented. The two systems have a hierarchical structure comprising of vision, description of overall desirable status/level of pressures, criteria to assess the progress towards the desired status and finally system of operational indicators for measuring the status of the environment or level of pressures affecting the environment.

In MSFD the vision consists of an overall qualitative statement of the desired “Good Environmental Status” (GES) of the marine environment, which, according to the directive is pursued by the year 2020. In the next level are 11 generic qualitative descriptors, which encompass a wide variety of ecosystem components, functions and pressures affecting the ecosystem. Detailed criteria and indicators are defined for each descriptor. Criteria and indicators are distinctive technical features, which help to make the descriptors more concrete and quantifiable. Directive implementation consists of 1) initial assessment for each marine region, describing the current status and overall structure of the ecosystem 2) Description of GES with associated indicators, 3) programmes of measures delineating the necessary actions to reach GES and finally monitoring programmes to follow the effectiveness of the actions taken and progress towards GES. The directive is implemented and updated in 6-year cycles.

HELCOM is an international ”soft law” convention for the protection of the Baltic Sea Marine Environment that entered into force in 1974 and is one of the Europe’s four regional seas conventions. HELCOM is also a regional forum for the implementation of MSFD for its contracting parties that are also EU member states (8 out of 9 coastal states). In HELCOM’s system of ecological objectives (2007) an overall vision is pursued under four goals for eutrophication, hazardous substances, biodiversity and maritime activities. Goals are translated into concrete objectives and associated operational indicators to measure the status and progress toward the goals. The HELCOM system of ecological objectives is implemented in the framework of the Baltic Sea Action Plan (2007) and in a close coordination with the MSFD implementation.

Sessions 1 and 2: Discussions and Findings

Main discussion points:

Ecological objectives exist in a hierarchy going from overarching high level policy statements to operational practical objectives directly linked to management decisions. It was noted that there are commonalities in the national legislations reviewed (from Canada, Norway and USA) at a high-level. However, at a more detailed level there are differences related to the specific national legislations.

Several workshop participants pointed to the large natural variability in Arctic marine ecosystems and how this related to ecosystem assessment and the setting of ecological objectives. A particular challenge is the need to balance the static nature of objectives with the natural fluctuations in the ecosystems. With climate change and northwards shifts in species distributions, we are also faced with more directional and permanent changes in the ecosystems. This represents a ‘shifting baseline’ against which ecological objectives need to be assessed.

When addressing more detailed objectives it is important to focus on links to human activities which have both direct and indirect effects (through the food chain). Cumulative effects of multiple human activities are notoriously difficult to assess and pose challenges for setting ecological objectives when also additional effects of climate variability and climate change must be taken into account.

An effort should be made to collect similar information from all Arctic Council states on ecological objectives. This would allow more comparison of differences and similarities between Arctic Council states. Finland and Sweden are part of the EU and their contribution could provide more information on the experiences on ecological objectives resulting from implementation of the EU-marine strategy.

The point was made that there are themes related to ecological objectives that may be common to all Arctic Council states. It should be considered whether there are specific tasks for AMAP, CAFF and SDWG that could be included in their work plans. The need for a common set of guidelines on how to define ecological objectives is another item that should be addressed in follow-up work on this topic by the EA-EG.

Findings:

The presentations of this workshop make it clear that ecological objectives exist in a hierarchy that is ordered by specificity. At the highest level, ecological objectives are least specific, being defined by policy statements contained in international treaties or national law. The highest level of ecological objectives define the goals of human societies for sustaining the integrity and function of ecosystems, and also confirm the existence of ultimate boundaries on human uses of natural resources. As national and international policies are translated into implementing laws and regulations, the ecological objectives become more and more specific through the interaction of human needs and scientific information and traditional knowledge with legislative and other public involvement processes. At the base of the hierarchy are found the ecological objectives that are the most specific prescriptions for achieving sustainable use of natural resources within the individual sectors of human activities, such as oil and gas development, shipping, tourism and fisheries.

1. At the highest level all states of the Arctic Council represented at the workshop share a common set of ecological objectives.
2. The common ecological objectives of the Arctic Council states are concerned with sustainable use of living marine resources (LMR) and their habitats.
3. The common ecological objectives of the Arctic Council states are concerned with protecting sustainable use of LMR during the conduct of other human uses of the arctic. Among the common ecological objectives are protections for all species and habitat at risk and for recovering species at risk to sustainable population status.
4. Common ecological objectives include limits on contaminants and pathogens in various environmental compartments, including food safety limits.
5. Common ecological objectives include limits on disturbance of wildlife.
6. The degree of implementation of the common ecological objectives of the Arctic Council states are important elements when evaluating the status of implementation of the ecosystem approach to management in the arctic.
7. The commonality among the ecological objectives of the Arctic Council states decreases as the specificity of the ecological objectives increases. National environmental policies are more similar than the regulations and means of implementing those national policies.
8. Development of Holistic and comprehensive sets of ecological objectives is a challenging task that requires a large effort. Arctic states are in various stages of implementing integrated national environmental policies. Comprehensive sets of ecological objectives have been developed and are undergoing implementation in e.g. the EU MSFD, OSPAR, HELCOM.

Session 3: Perspectives from Indigenous Peoples: values and objectives for use and management of living resources and nature

The Saami Way – Birgen! The Traditional Ecological World View – Stories and Ethics in Traditional Teachings

- Asta Balto

The Saami world-view stems from the Saami traditional way of living; a way of living that was dependent on nature and natural resources for survival. The draft paper aims to reveal how the Saami traditional teachings have an ideology on how to manage and relate to nature and natural resources in a sustainable way. Saami traditional ecological knowledge (STEK) is seen as Berkes defines Indigenous TEK in general; the accumulative

body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission. TEK is the relationship of living beings (including humans) with one another and with the environment (Berkes 99:8.) Saami TEK is first of all embedded in peoples' everyday life, and I have found expressions of Saami TEK in poems, in legends and parts of it in scholarly material as well. I realized that Saami TEK is still living in oral presentations that are not yet written down, but transferred through storytelling tradition and released in storytelling sessions.

Áillohaš, a well-known Saami multi artist and culture revitalizer highlighted that the Saami traditional way of living was a true love of nature where nothing was wasted and where human was part of nature (1985.) Saami proverbs also express similar ideals; you shouldn't take more than you need for survival. This saying still gives direction for the management of resources for some, while for other Saami it does not make sense any longer. In practical terms it means that if you still have salmon from last year in your freezer you have taken too much, or you have not shared with others. You have to share or cook it before the new season starts; otherwise you will not have good luck in the coming season. According to Saami traditional teachings you have to be humble, grateful and responsible if you want to secure the circle of life. The first fish catch has to be shared with all those involved and even those in the neighborhood and you leave some remains from it in the surrounding nature.

The Saami "birgen" mirrors the process of what life is about; to be able to manage life in general, to survive both in sense of one's economy, one's social- as well as one's cultural ways of life and to do it in a sustainable way. Birgen includes both to be able to utilize nature and also to take care of it as a future larder. Traditional teachings have their ethical system and to be recognized as a good Saami person you have to live in "soabalaš" agreeable, peaceful fellowship and mutuality with others, the surroundings and all living things (Oskal, 1995, Balto 1997, 2008, 2014.) The changes in ways of living (birgen) in the Saami villages the last 3-4 decades hand in hand with the effects of the colonization and Christianization of the societies and the minds of Saami people over hundreds of years have weakened and threatened the Saami TEK and the ways of practicing them.

Birgen is also related to act responsibly towards all living beings and stories/legends give guidance on how to behave in a good way. One of them is well known among Saami; the spider that rescued a Saami from being killed by chudes and the outcome is that Saami collectively are so grateful and they can never kill a spider. Also the ancestral root "Máddu" of animals and living creatures is a protector of all living beings as they watch over his/hers descendants. To meet Máddu means you will be confronted with what you have done to the smallest beings in your life, example frog, aunts, wasp or others. The stories create awareness for one's own behavior and also the responsibility towards other living beings. We are all related and what we do to them we do to ourselves is the lesson.

Birgen is dependent on how you relate to the land and surroundings; you ask for permission to set up a lávvu, or a fireplace, or before you start building a house and before you start hunting or harvesting. The permission rituals are still in use and you have to look for signs for admission. The closure is to give thanks to the nature whatever is received and to share the harvest if any.

The Saami related and still relate themselves to the spiritual world, and their traditional belief is that the world is permeated by spirits (hálddit). According to Oskal humans could only be successful in making their living if they cooperated with the natural forces (see: Oskal 1995:140-145.) The world-view mirrors that Saami traditionally relate to nature not as an object, but as a living source to be respected. Secondly, the Saami believe that the nature and all living things are permeated by spirits and this frames the relationship with the surrounding nature. The relationship between humans and nature is reciprocal.

The Saami world-view and TEK is developed in intimate connection with the land, living beings and the dependency on natural resources. It represents an alternative world-view to the one where humans are the rulers, masters and exploiters of nature.

To teach and to re-educate people into their own traditional ecological knowledge and practices is dependent on the faith to the saying; "gal dat oahppá go stuorrola"! The recent book Máhttahit - Re-educate them and us, is a handbook for that mission. Traditional teachings emphasize rituals and ceremonies, and if practiced in a relevant way in good situations the learning and re-learning of TEK can be valuable not only for the Saami, but for the humanity in general.

The principle of building self-control for individuals and for the Saami collectively is essential, because it makes outside control needless or at least less intrusive. It is a part of building the self-sufficient persons and self-sufficient societies. The stories have ethics, but they don't instruct in detail what children or people should do.

The stories leave some mystery and space for imaginations for the listeners, so they can use their independent capability to explore on their own.

Definition of TEK/STEK: a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including human) with one another and with the environment (Berkes 99:8). TEK/STEK is dependent on the continuation of traditional teachings.

The Saami traditional way of life and world-view represent the opposite of a consumer and property-based economy. However the Saami are also part of the way of life that is common in western societies. Saami live in societies with other types of people where the dependence on nature in their daily occupations is not apparent and the awareness of the connection to the land is vanishing. Saami are not born more humble or virtuous than other people, but their traditional way of life has built their world-view.

Wildlife Management System in Nunavut

- Moshi Kotierk, Social Science Researcher, Department of Environment, Government of Nunavut

Nunavut, at about 16 years old one of Canada's newest jurisdictions, was created through the Nunavut Land Claims Agreement. Since Nunavut was created, one of the priorities has been to become more and more representative of the public in Nunavut, mostly Inuit. As a result, there has been a push to be more and more aligned with Inuit societal values.

The Land Claims Agreement describes the wildlife management system in Nunavut as having six characteristics:

- ✓ It will be governed by and implement the principles of conservation.
- ✓ It will fully acknowledge and reflect the primary role of Inuit in wildlife harvesting.
- ✓ It will serve and promote the long-term economic, social and cultural interests of Inuit harvesters.
- ✓ As far as practical, it will integrate the management of all species.
- ✓ It will be inviting of public participation and promoting of public confidence, particularly amongst Inuit, and
- ✓ the Nunavut Wildlife Management Board will be enabled and empowered to manage wildlife management decisions pertaining to those prior characteristics.

There is a need to integrate these characteristics. For example, public participation influences the confidence that people have in the system. Also public confidence in the system will influence their desire to participate in the system. Participation also is a means to determine what the public interest is. There are connections between the conservation principles and the human dimensions of wildlife management. For example, the interpretation of the principles of conservation has to involve more than Government or scientists but also people and Inuit: What does the natural balance mean? How do we apply these conservation principles? How will we protect habitat? How will we restore and revitalize depleted populations? Participation is needed to answer these questions and would lead to greater public confidence and facilitate the implementation of subsequent management decisions.

The social science program tries to conduct research to answer some of these questions and facilitate the use of Inuit societal values in decision-making.

Co-management perspectives from Arctic Canada: A beluga tale...

- Lisa Loseto (DFO-Canada)

The DFO Ecosystem Impacts Group (Winnipeg) studies the effects of regional and local stressors such as loss of sea ice cover, increased shipping and oil and gas development on the structure, function and health of ecosystems. Studies develop information to advice management and decision-making to fulfill Canada's fiduciary responsibility to protect fisheries resources. DFO works with the principals of the Inuvialuit Settlement Region, Northwest Territories and other indigenous interests to jointly manage fisheries resources. Case in point is the populations of beluga whale that aggregate by the thousands on the Mackenzie River delta and estuary adjacent to the Beaufort Sea for a portion of each year.

Session 3: Discussions and Findings

Please note that the bullets below are based on notes taken during a discussion that explored similarities and differences among the existing national ecological objectives (ENEO) and the ecological objectives inherent in indigenous knowledge (IK). The discussion is part of the process of identifying the ideal set of ecological objectives for implementing the ecosystem approach to management from among those currently practiced by nations and indigenous peoples in the arctic.

Main discussion points:

- ✓ Existing national ecological objectives (ENEO) and the ecological objectives inherent in indigenous knowledge (IK) all share common goals for the health and stability of the ecosystem based on the recognition that resources are finite. The concept of man's relationship to nature seems to be based on universal values, although approaches to regulation may appear opposite; top down for ENEO versus bottom up for IK.
- ✓ The focus of Indigenous Peoples (IPs) on food security takes into account a number of factors including cultural values. There is no one set of values applicable to IPs as a whole because of the diversity of cultures. That being said, the following examples are representative of many arctic Indigenous groups. For example some IPs base management on the practice of the individual harvesting only what they need and can reasonably process, combined with a tradition of sharing and caring for the needs of their respective communities. For further examples, natural food resources may fluctuate, so conservation management objectives rely on indicators of population and health status to avoid putting too much pressure on any one species (i.e. Saami People and Inuit).
- ✓ The Inuit indigenous management practices (IMP) are rooted in IK, which provides cultural values with the objective of sustain the entire ecosystem and indigenous cultures. IMP approaches calls for multiple variables to be considered in resource management decisions. IMP among arctic indigenous peoples has concepts in common with the system supported by the World Bank that evaluates fishery management regimes on the degree to which the actions are ecologically sustainable, socially acceptable and community enriching.
- ✓ Understanding the systems of knowledge referred to collectively as Inuit Qaujimajatugagit (IQ) is a useful step to further explore how IK may be factored into the implementation process of the ecosystem approach. IQ represents the many concepts found within Inuit indigenous knowledge (IK). It can also mean that which has long been known by Inuit. While IQ encapsulates a widely accepted body of knowledge, it should be noted that the term, Qaujimajatugagit, is from the Baffin dialect of the Inuktitut language spoken in Nunavut , Canada. The concepts embodied in IQ may be known by other names in other parts of Canada, Alaska, Greenland and Chukotka. IQ and western science share some concepts which originated independently within these cultures.
- ✓ The conceptual frameworks for ENEO and IK are different, with the ENEO tending toward splitting environment, ecological processes and human actions into component parts (reductionism) and the IK taking a holistic view of what is being managed as inseparable from human actions and needs. Conceptual frameworks also differ in the self-regulating, self-limiting approach of IMP versus the top-down external limitations of market driven utilization of natural resources.
- ✓ Understanding the differences in how geographic scales are dealt with between ENEO and IK is important to the process of merging IK and ENEOs into the aspirational set of ecological objectives that are needed as a core component of EA. For example the concept of sustainability in IK is focused on the local scale within the context of the food security of the community, whereas ENEO at the EBM/LME scale are more likely to be oriented toward the needs of global markets. For further example the types of management to which ENEO are scaled vary widely from application of large-scale laws and regulations to the smaller, community scale management of IK. An example of IK-scale management is the community-based harvest closures to inform management decisions from Canada on Beluga whales.
- ✓ IMPs and EA both seek to manage human activities on various scales within the framework of a holistic approach (workshop participants are welcome to provide inputs to a paper on scales that will be prepared as per the EA-EG work plan).

Findings:

Indigenous knowledge is clearly an important constituent of the set of ecological objectives appropriate to implementing EA. Understanding how indigenous peoples approach interactions with, and care for, the suite of species and habitats that are known as ecosystems is essential to developing the ideal set of ecological objectives for the implementation of the ecosystem approach to management in the arctic. Indigenous knowledge is a logical prerequisite for approaching the topic of ecological objectives, as the management practices derived from IK presaged the contemporary concept of the ecosystem approach to management by millennia.

Although there is no monolithic understanding of IK, a common thread throughout the indigenous cultural values is the vision of sustaining an ecosystem from which humans are inseparable, and without which humans perish. As is the case with all ecological objectives, although embedded within an overarching hierarchy of cultural values, management actions emblematic of IK are fundamentally local-scale community based operational rules that provide flexibility in obtaining, processing and storing food, while providing long-term sustainability. As the national environmental management policies of the Arctic states have developed and begun to mature over the past century, national ecological objectives are increasingly converging with those of indigenous peoples, although important differences remain. National environmental policies and associated ecological objectives operate at multiple geographic scales that ultimately may encompass multiple LMEs, whereas IK operates on smaller geographic scales, as noted above. Similarities and differences in national and indigenous ecological objectives are being recognized and reconciled in Canada through the process of co-management of natural resources which incorporates indigenous knowledge (IK) into management objectives.

1. Management practices derived from IK are rooted in cultural values with the objective to sustain the entire ecosystem and indigenous cultures.

2. Management practices based on IK are community based operational rules that provide flexibility in obtaining, processing and storing food and at the same time provide sustainability.

3. Co-management is a legislative requirement under the settled land claim agreements in Canada that incorporates indigenous knowledge into management objectives for mutual decision-making and governance that has led to successful examples of community-based monitoring and resource management based on trust and mutual respect.

4. Understanding similarities and differences among national and indigenous peoples' ecological objectives is essential to the process of developing ecological objectives for implementing EA.

5. The ecological objectives inherent in IK are essential constituents of the ideal set of ecological objectives to be used in implementing the ecosystem approach to management, EA, in the arctic.

"Next Steps" from Session 3:

- ✓ Move forward with the recommendation from the Kiruna EBM Report (2013: "Policy and Implementation") to develop and adopt a policy and best practices for incorporating IK into EBM activities as appropriate.

Session 4: Conclusion and Workshop Recommendations

Based on the discussions in previous sessions the workshop participants agreed to the following recommendations and next steps:

Workshop Recommendations and Next Steps:

- ✓ Arctic states are encouraged to supply overviews of national ecological objectives to the EA-EG for inclusion to the status report on ecological objectives (currently the background document).
- ✓ Permanent Participants are encouraged to supply overviews of their key management practices (footnote: many are not written down but engrained in their cultures) relevant to ecological objectives to the EA-EG for inclusion to the status report on ecological objectives (currently the background document).

- ✓ Compile and further analyze the information received to inform the extent to which there are similarities and differences.
- ✓ Continue to review and learn about Indigenous management practices (IMPs) with the aim to comprehensively document the practices to facilitate their incorporation into the ecological objectives used to implement the ecosystem approach to management in the arctic and elsewhere.
- ✓ Continue to review/compile information on processes to develop and implement holistic and integrated sets of ecological objectives (e.g. EU MSFD, HELCOM, OSPAR).
- ✓ Based on the analysis, explore the need for common guidelines for how to set ecological objectives in the Arctic.
- ✓ Explore mechanisms that allow for equitable incorporation of value systems into ecological objectives.

Annex I - Workshop agenda

Tuesday 26th of May

0900-1000 - Welcome and introduction

- ✓ Hein Rune Skjoldal and Phil Mundy – "Ecological objectives: role in the ecosystem approach to management"
- ✓ Discussion of workshop objectives

1000-1030 - Coffee break

1030-1215 - Session 1: Review of existing ecological objectives in national legislation and management systems

- ✓ Cathy Coon (BOEM, USA & Phil Mundy, NOAA) – "Objectives in US Federal and State of Alaska legislation and management"
- ✓ Cecilie von Quillefeldt (NPI, Norway) – "Ecological Objectives and Integrated Management Plans for Norwegian Seas"
- ✓ Bethany Schroeder (DFO, Canada) – "Using Ecological Targets to Inform Management Decisions in the Canadian Arctic"
- ✓ Discussions

1215-1315 - Lunch

1315-1415 - Session 2: Review of new developments of comprehensive sets of ecological objectives

- ✓ Hermanni Kaartokallio - "Ecological Objectives in EU MSFD and HELCOM"
- ✓ Discussions

1415-1515 - Sessions 1 and 2: Summary discussion of the current situation and developments

1515-1545 - Coffee break

1545-1700 - Session 3: Perspectives from Indigenous Peoples: values and objectives for use and management of living resources and nature

- ✓ Asta Balto – "Saami Values & Traditional Knowledge"
- ✓ Moshi Kotierk - "Wildlife Management System in Nunavut"
- ✓ Lisa Loseto - "Co-management perspectives from Arctic Canada: A beluga tale..."

Wednesday 27th of May

0900-1030 - Session 3 Cont'd

- ✓ Discussion and conclusions

1030-1100 - Coffee break

1100-1215 - Session 4: General discussion on next steps and conclusions and recommendations from the workshop

1215-1315 - Lunch

1315-1700 - Session 4 Cont'd

- ✓ Conclusions and recommendations

Annex II - Workshop Participants

First name	Last name	Position	Institution	Country	E-mail
Phillip	Mundy	Director	Auke Bay Laboratories AFSC NMFS NOAA	USA	phil.mundy@noaa.gov
Hein Rune	Skjoldal	Senior Scientist	Institute of Marine Research	Norway	hein.rune.skjoldal@imr.no
Lis Linda	Jorgensen	Senior Scientist	Institute of Marine Research	Norway	lis.lindal.joergensen@imr.no
Marianne	Olsen	Adviser, marine section	Norwegian Environment Agency	Norway	marianne.olsen@miljodir.no
Cecilie H. von	Quillfeldt	Senior adviser	Norwegian Polar Institute	Norway	cecilie.von.quillfeldt@npolar.no
Anja	Elisenberg	Senior Adviser	Ministry of the Environment	Norway	Anja.Elisenberg@kld.dep.no
Bethany	Schroeder	Senior Oceans Biologist	Department of Fisheries and Oceans	Canada	bethany.schroeder@dfo-mpo.gc.ca
Lisa	Loseto	Ecosystems Impacts, Section Head	Department of Fisheries and Oceans	Canada	lisa.loseto@dfo-mpo.gc.ca
Hermanni	Kaartokallio	Senior Research Scientist	Finnish Environment Institute	Finland	Hermanni.Kaartokallio@ymparisto.fi
Catherine	Coon	Marine Biologist	Bureau of Ocean Energy Management	USA	catherine.coon@boem.gov
Carolina	Behe	TK and Science Advisor	ICC	USA	carolina@iccalaska.org
Moshi	Kotierk	Social Science Researcher	Government of Nunavut	Canada	mkotierk@gov.nu.ca
Gunn-Britt	Retter	Head of Arctic- and Environmental Unit	Saami Council	Norway	gbr@saamicouncil.net
Asta	Balto	Expert	Saami Council	Norway	marehanieida.amb@gmail.com
Martin	Sommerkorn	Head of Conservation of the Global Arctic Progr.	WWF	Norway	msommerkorn@wwf.no
Becca	Robbins Gisclair	Arctic Policy Manager	CCU	USA	bgisclair@oceanconservancy.org
Hyun Kyo	Seo	Researcher	Korea Polar Research Institute (KOPRI)	South-Korea	shkshk@kopri.re.kr
Jon	Fuglestad	Deputy Executive Secretary	AMAP Secretariat	Norway	jon.fuglestad@amap.no
Hjalti	Hreinsson	Project manager	PAME Secretariat	Iceland	hjalti@pame.is
Soffía	Guðmunds-dóttir	Executive secretary	PAME Secretariat	Iceland	soffia@pame.is

Annex III – Background document

Introduction

All types of human enterprises such as transport, labor, housing, or environment need to be guided by objectives that give direction to management and communicate to all concerned about what is to be achieved. Existing management of natural resources, environment and nature has objectives arising from necessity and public policies that form the basis for management measures. Among them are objectives for healthy status of commercially exploited fish stocks, objectives for water quality, objectives or standards for contaminant levels in environmental compartments such as water, sediments and biota, food safety standards, objectives for recovery of threatened species of wildlife, objectives for protected areas and nature conservation, and possibly others.

Ecological objectives play a central role in the Ecosystem Approach to Management (EA), by expressing the desired overall good status or 'health' of the ecosystem. In the EA concept paper (PAME, 2014 download here) we describe a framework for implementation of the EA where ecological objectives constitute one of the six main elements: i) identify the ecosystem, ii) describe the ecosystem, iii) set ecological objectives, iv) assess the ecosystem, v) value the ecosystem, vi) manage human activities. EA is an overall principle or strategy for management that puts emphasis on integration. The definition adopted by the Arctic Council (AC) in 2013 states that EA means "comprehensive integrated management of human activities" with the aim of "achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity". Achieving sustainable use and maintaining ecosystem integrity need to be translated into operational objectives for management.

The difference between sector-wise management of the past and the EA is the emphasis on integration in the latter. Integration is the recognition of the consequences of management actions in any single sector on other sectors and on the environment in concert with incorporation of management actions to remove or mitigate the consequences. To implement EA it is essential to more fully recognize the integrated nature of ecosystems (with humans included as an integral part) by having more coordination and collaboration across management sectors and agencies that regulate human use and impacts on the natural ecosystems. Central to implementation is an integral set of ecological objectives that define and communicate the desired or acceptable state of the overall ecosystem and its component parts. Developing such an integral set of objectives is not simple and straightforward but it is indeed very challenging from a scientific perspective. The complexity of the task is partly due to the dynamic and shifting natural state of marine ecosystems where objectives that are 'static' in location or time may not be appropriate or sufficient. 'Dynamic' or shifting objectives may be required but they pose their own problems by putting us in a 'floating' situation that may be as challenging to communicate as it is to understand.

While development of integral sets of objectives is challenging, we are fortunately not starting from scratch. Ecological objectives in existing management and legislation can form the basis for an incremental development towards the more fully developed sets of objectives that are required for effective implementation of the EA.

The work on the topic of ecological objectives in the EA context is seen with these basic steps:

1. Summary and review of objectives in existing national legislation and management.

2. Review of progress in Arctic states and internationally in developing more complete and holistic sets of ecological objectives as part of EA implementation.

3. Review/learn about the principles and values embedded in the use and management of living resources and the wider nature by indigenous peoples of the Arctic.

4. Prepare a scoping white paper on the issue of developing Ecological Objectives and a report "Status of Setting Ecological Objectives in the Arctic" in 2016.

Ecological objectives and management objectives

Ecological objectives are management objectives but they may have to be translated into more specific objectives to be of practical use to managers. This distinction relates to a hierarchy of objectives from general value statements to specific targets that are informing and guiding management approaches and decisions. This can be illustrated with the example provided by the Marine Strategy Framework Directive (MSFD) of the European Union. The MSFD sets an overall ambition and goal to maintain the marine environment in 'Good Environmental Status' or GES in abbreviated form. Environmental status and GES are defined in the directive in Article 3:

> *"4. 'environmental status' means the overall state of the environment in marine waters, taking into account the structure, function and processes of the constituent marine ecosystems together with natural physiographic, geographic, biological, geological and climatic factors, as well as physical, acoustic and chemical conditions, including those resulting from human activities inside or outside the area concerned;*
>
> *5. 'good environmental status' means the environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations, …. "*

The definition of GES emphasizes clean, healthy and productive seas and sustainable use of the marine environment as part of the overarching objectives of maintaining or achieving GES. GES is further specified in the directive (in Annex I) with 11 statements or so-called 'qualitative descriptors'. By way of illustration, three of the descriptors are listed as examples:

> *Descriptor 1 - Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions.*
>
> *Descriptor 3 - Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock.*
>
> *Descriptor 6 - Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.*

The 11 descriptors are more detailed and provide a clearer description of the aspects of the environment which need to be in management focus but they are still qualitative. Further steps in the MSFD implementation has been guidance from the European Commission on criteria and indicators which should be used when seeking quantitative objectives that can be used to guide management decisions. Such objectives could be that commercially exploited fish stocks should be kept above minimum levels or that contaminants should be kept below maximum acceptable levels.

The EU MSFD serves to illustrate the issue and relationships between general and specific management objectives. Ecological objectives may reflect policy commitments and be used as general management objectives. In some cases they can be turned into quantitative objectives or targets that can be used as specific and operational management objectives. There is a hierarchical structure from overarching objectives through qualitative descriptors and criteria to quantitative targets to be aimed for or limits to be avoided in practical management. How far we should go down the road of specifying quantitative targets or limits is an open issue for continued debate. On the one hand we may want to quantify as much as we can to have maximum precision in our management decisions. On the other hand we may have to accept that many aspects of the environment are truly dynamic and changing and therefore difficult to pin down with rigorous quantitative targets or limits. A balance may have to be struck between quantitative targets for some aspects and qualitative objectives for others, with integrated ecosystem assessment being the step in the EA that allows us to link the two types and levels (general-specific) of objectives.

The definition of EA adopted by the Arctic Council in Kiruna in 2013 contains the overall and general objectives for the EA: sustainable use of resources and maintenance of ecosystem integrity.

> *Ecosystem-based management is the comprehensive, integrated management of human activities based on best available scientific and traditional 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.

The two high-level objectives of sustainable use and maintenance of ecosystem integrity mirrors the dual objectives of the UN Convention on Biological Diversity (CBD, Article 1) which is conservation of biological diversity and sustainable use of its components (in addition there is a third objective which is the fair and equitable sharing of the benefits arising out of the utilization of genetic resources). The issue at hand is how to make operational the overall objectives of sustainable use and maintenance of ecosystem integrity by defining and formulating more specific ecological and management objectives.

Ecological objectives and sustainability

Ecological objectives relate very much to the concept of sustainability and are in practical terms defining where the border zone between sustainable and non-sustainable use of the ecosystem and its components lies. The balance between conservation and sustainable use is what determines ecological sustainability as the main pillar of the concept of sustainable development. Sustainable use is (almost) by definition the same as conservation. True sustainable use should not lead to depletion and degradation but conserve all components and functional features of the ecosystem so that the ecosystem goods and services can benefit future generations. There is obviously somewhere along the axis of use (from no use to heavy use) where the transition lies between use that are within the bounds of what the ecosystem can withstand (due to the regenerative properties of nature) and excessive use that leads to degradation and ultimately to loss of biodiversity.

Setting ecological objectives for ecosystem components (species and habitats) and for the overall state of the ecosystem is equivalent to defining the line of sustainability through the ecosystem (or rather the envelope of conditions for ecosystem state that is compatible with sustainable use). As we have alluded to already, the ecological objectives need to be translated into management objectives and regulations of human activities that will ensure ecosystem conservation and sustainable use.

This is nice in principle and extremely important in relation to sustainability. However, it is also very challenging and demanding from both scientific and practical perspectives. This is for (at least) two main reasons. One is that our basic understanding of how ecosystems work (as systems) is still lacking. Another is that the ecosystems are dynamic and changing and it is intrinsically hard to set objectives for highly dynamic systems. What is the acceptable state for a changing system, and how do we translate this into management decisions for regulating human activities? Part of the answer of how we address this lies in the issue of Integrated Ecosystem Assessments (which we will not consider further here).

The ecosystem is composed of species and habitats, and ecological objectives should reflect the status of species and conditions of habitats. At a very general level, no species should be assessed as being threatened and commercially exploited species should be maintained at high and safe levels. Habitats should be maintained in sufficient amount and quality so that they serve the various ecological functions for wildlife species dependent upon them in their life or annual cycles.

Setting the overall and specific ecological objectives is a political responsibility and in the end a societal choice. This is reflected in the first 'Malawi principle' of CBD: 'The objectives of management of land, water and living resources are a matter of societal choice'. This relates to how cautious we like to be or how much risk we are willing to take when it comes to use and management of living resources and nature in a fluctuating and changing climate and environment. The choices we make are in the end value-based and reflect our basic attitudes to Nature, God and the big existential question of 'the meaning of life'.

The values of the Indigenous Peoples in their cultures and relationship with Nature are of relevance and importance in this regard. Peoples that live with Nature and depend on what the land and waters provide for their wellbeing may have different perspectives on long-term risks and precaution than industrial companies that are driven more by prospects of short-term profit.

Types of Objectives

Objectives for commercial fish stocks

US Example- Integrated Ecosystem Assessment (IEA)

http://www.noaa.gov/iea/

As developed within NOAA, Integrated Ecosystem Assessment, IEA, is an iterative science-based process that provides products to resource managers who are operating under the principles of ecosystem based management, EBM, and as an application to exploited fish stocks, Ecosystem Based Fishery Management, EBFM. NOAA Fisheries, Alaska Fisheries Science Center, is implementing EBFM in four Arctic Large Marine Ecosystems, LMEs, as an active part of the NOAA Integrated Ecosystem Assessment Program. Under the US Arctic Research and Policy Act (ARPA 1982) (Figure 1) the waters of the US arctic occur in the following LMEs: Aleutian Archipelago (10), East Bering Sea (9), Northern-Bering Chukchi Seas (12), and Beaufort Sea (14) (Figure 2). The fisheries in the Bering Sea were perhaps the first in the United States to be managed under an ecosystem-level annual harvest cap implemented about three decades ago. Under the ecosystem-level cap, the North Pacific Fishery Management Council, NPFMC, limits annual harvests of all fish species to no more than two million metric tons. NPFMC is also guided in its management decisions by an Alaska Marine Ecosystems Considerations Report, which is an annual snapshot of ecosystem indicators and their time trends. In addition, estimates of the risks posed to twenty-two types of fish habitats, such as rocky coastal habitats, by twenty risk factors, such as ecotourism. The ecosystem level information is synthesized into a written report which is factored into the decisions on total allowable catch, TAC, made by the NPFMC each year. Observations from physics, through primary and secondary production are also used to estimate the impacts of climate change on fish species in a vertically integrated coupled biophysical model driven by IPCC climate projections. The upper trophic level component of the biophysical model is known as Forage and Euphausiid Abundance in Space and Time, FEAST. FEAST exchanges information on distribution and abundance of upper trophic level organisms with the lower trophic level model and the economic and spatial fishery predictions model in this vertically integrated series of models. At the base of the models are the IPCC climate scenarios, which drive the physical oceanographic model which in turn drives the lower trophic level model that interacts with FEAST. Work is continuing to extend FEAST beyond the eastern Bering Sea LME to make predictions about the impact of climate change on other species and other locations.

Norway

Norway has since 2002 developed and implemented integrated management plans (IMP) for the waters under Norwegian national jurisdiction in each of the three Large Marine Ecosystems: the Barents Sea, the Norwegian Sea and the North Sea. The IMPs represent coordination of national policies at the level of the national government with coordination bodies established with participation from the various relevant agencies and ministries. The 'institutional landscape' of the marine management system in Norway is complex and involves many institutions and players as illustrated in the figure below (from the MESA Barents Sea case study; see below).

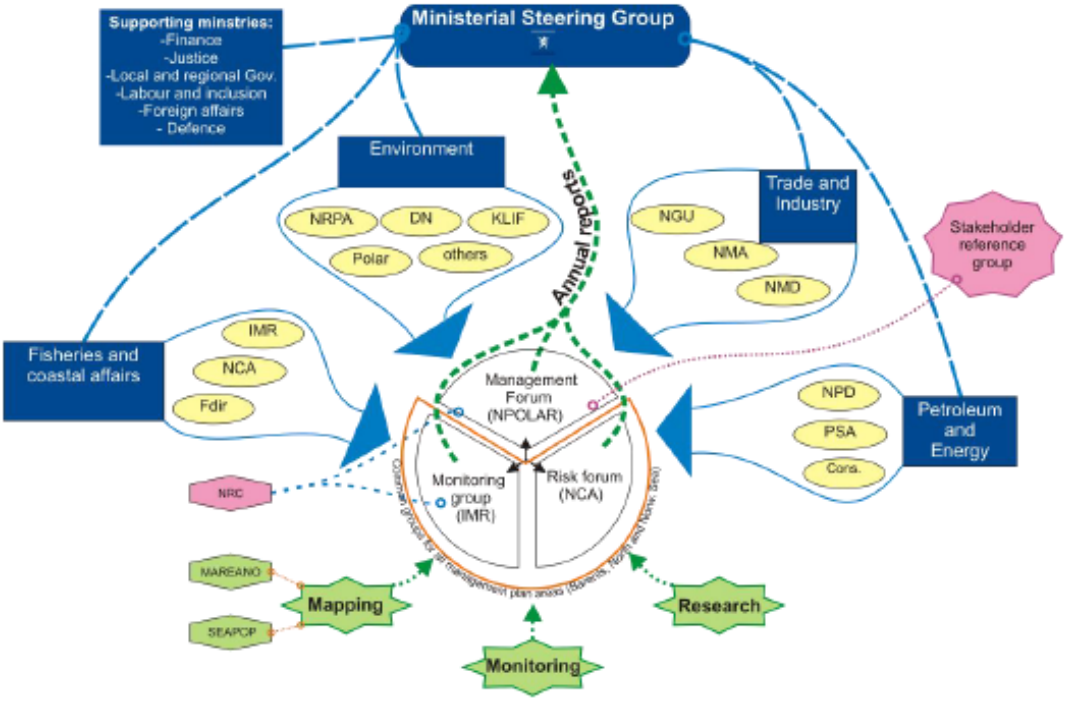

Figure 2. The organizational and governance structure of the integrated management plan for the Lofoten – Barents Sea area. The ministries (blue) of fisheries and coastal affairs, environment (chairing the steering group), trade and industry and petroleum and energy have been leading the process. Institutions and directorates (yellow) have participated on demand by their parent ministry (figure from MESMA - WP6).

Acronyms for the government institutions.
FDir: Fisheries directorate
NCA: Coastal Administration
IMR: Institute of marine research
NRPA: Radio protection agency
Polar: Polar institute
DN: Directorate for nature conservation
KLIF: Climate and pollution authority
NGU: Geological survey
NMA: Mapping authority
NMD: Maritime directorate
NPD: Petroleum directorate
PSA: Petroleum safety directorate
Cons.: consultants hired by the Ministry of Petroleum and Energy

The marine management system in Norway has been described in some detail in the BePOMAR Report from 2009 (http://www.pame.is/index.php/projects/ecosystem-approach) and in a case study report in the MESMA project (http://www.mesma.org/default.asp?ZNT=S0T1O733; /Publications and media, MESMA Case study 3: Barents Sea and Lofoten).

The most important maritime industries are fisheries and aquaculture, petroleum development, and shipping, while there is a wide range of activities and issues related to coastal development and management including issues of pollution and nature conservation. The legal basis for management decisions lies to a large extent in sector-wise legislation like the 2008 Marine Resource Act in fisheries and the 1996 Petroleum Act. The 2009 Biodiversity Act and the 1982 Pollution Act are general instruments that apply across sectors.

The Norwegian environment policy has been formed around six identified topics or result areas with environmental goals formulated for each of them. Work is on-going to develop indicators for the various environmental goals.

National Norwegian Environmental goals 2014-2015	
Topic	**Environmental goals**
1. Biodiversity	1.1 The ecosystems will be at good status and deliver ecosystem services. 1.2 No species or nature types are to be eradicated. Threatened and near-threatened species and nature types will be recovered. 1.3 A representative selection of the Norwegian nature is to be protected for future generations.
2. Culture and historical monuments	No relevant goals for marine life and environments.
3. Recreation and tourism	3.2 Areas of value for recreation are to be protected and managed to secure the natural basis. 3.3 The public rights are to be maintained
4. Pollution	4.1 Release and use of chemicals that constitutes a serious threat to health and the environment will be continuously reduced, with intended stop in all releases by 2020. 4.2 Release and use of chemicals that constitute a hazard to health and environments are to be minimized. 4.3 Distribution of environmental pollution from polluted sediments is to be stopped or significantly reduced. Distribution of other health and environmentally threatening chemicals are to be reduced, based on factual risk assessments. 4.4 Sediments at sea with a level of health and environmental toxic pollution are not to be causing any risk for a major pollution. 4.5 Releases from operations at sea are not to be causing damage or risks to health and environments or to increased basic level of oil or other environmentally hazardous components. The risk for acute pollution is to be kept at a low level and a continuous development to further reduce the present risks. 4.6 Release and risks for release by nuclear materials that are a threat to health and environments are to be kept to a practical minimum level. All nuclear waste is to be kept safe according to recognized regulations. 4.8 The aim for waste recovery is to be near 80 %, based on an increase in waste recovery adjusted to social-economic and environmental best practice. 4.9 Toxic wastes are to be kept safe and either sent to recovery or kept safe by the national capacity of storing toxic waste. 4.10 Health and environments are not to be damaged by air pollution caused by SO^2, No_x, VOC, ammonia or particles. Releases to the sea are not to lead to any damage.
5. Climate	Norway will be carbon neutral by 2050.
6. Polar regions	6.1 The extent of areas of natural wilderness at Svalbard are to be maintained, the biodiversity to be kept at a negligible levels of impacts by local activities and motorized movements, and the protected areas are to be secured as reference area for natural science. 6.3 Negative human impacts and risks for impacts on the polar environments are to be reduced.

Ref.: Stortingsproposisjon no. 1 2014-2015, Ministry of Climate and Environment (in Norwegian)
Translated by G.I. van der Meeren, IMR Austevoll research Station May 2015.

In the context of the IMP for the Barents Sea a set of high-level operational objectives have been formulated and specific sub-objectives or indicators are sought that will provide more direct links with management decisions. The hierarchy and list of operational objectives are provided below (MESMA Barents Sea case study).

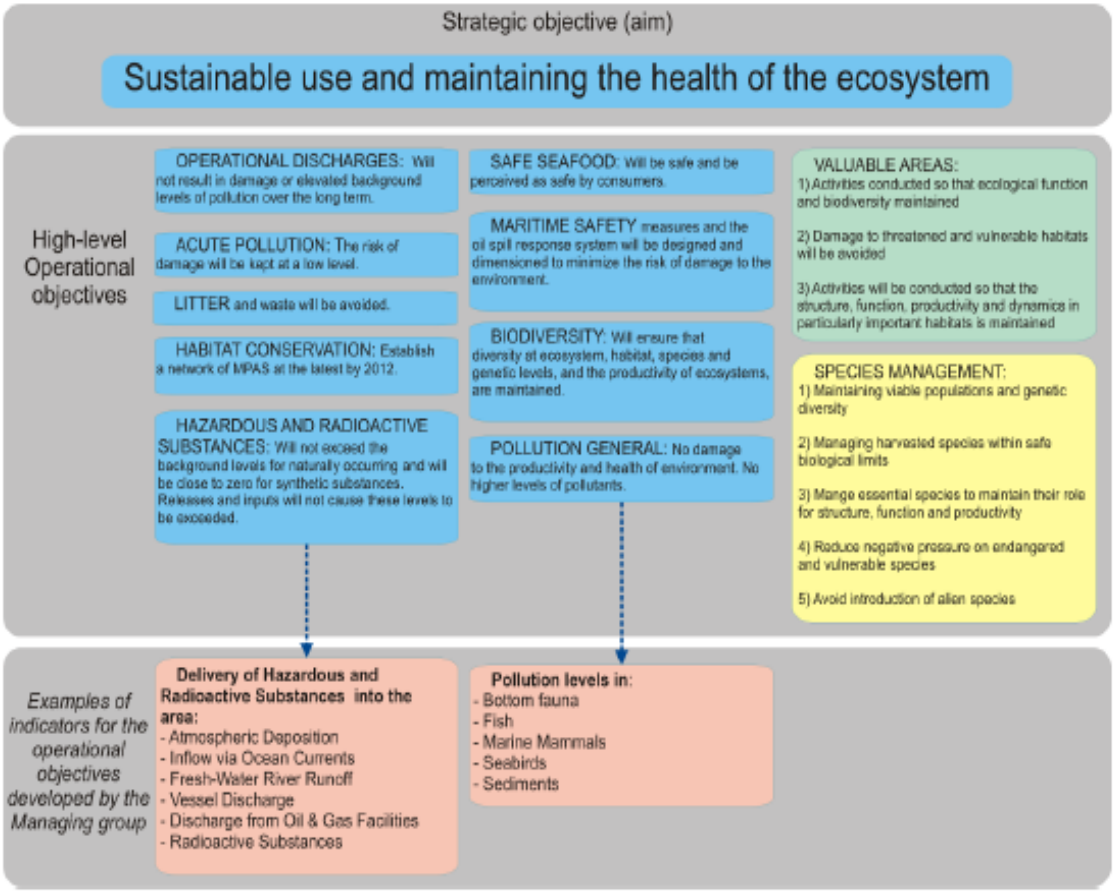

Figure 3. The hierarchy of aims and operational objectives and sub-objectives (indicators) of the management regime of the Norwegian integrated management plan for the Lofoten – Barents Sea area.

Operational objectives of the BSMP. **Revision cycle: every 4 years started in 2010/2011** **Year achieved:** This is generally not applicable for case 3 but see objectives related to habitat conservation SVO*: Particularly valuable and vulnerable areas defined by the BSMP (see figure 7).	Area for goals
POLLUTION GENERAL: Releases and inputs of pollutants to the Barents Sea–Lofoten area will not result in injury to health or damage the productivity of the natural environment and its capacity for self-renewal. Activities in the area will not result in higher levels of pollutants.	Whole area
HAZARDOUS SUBSTANCES: The environmental concentrations of hazardous and radioactive substances will not exceed the background levels for naturally occurring substances and will be close to zero for man-made synthetic substances. Releases and inputs of hazardous or radioactive substances from activity in the area will not cause these levels to be exceeded.	Whole area
OPERATIONAL DISCHARGES from activities in the area will not result in damage to the environment or elevated background levels of oil or other environmentally hazardous substances over the long term.	Whole area
LITTER and other environmental damage caused by waste from activities in the Barents Sea–Lofoten area will be avoided.	Whole area
SAFE SEAFOOD: Fish and other seafood will be safe and will be perceived as safe by consumers in the various markets.	Whole area
ACUTE POLLUTION: The risk of damage to the environment and living marine resources from acute pollution will be kept at a low level and continuous efforts will be made to reduce it further. Activity that involves a risk of acute pollution will be managed with this objective in mind.	Whole area
MARITIME SAFETY measures and the oil spill response system will be designed and dimensioned to effectively keep the risk of damage to the environment and living marine resources at a low level.	Whole area
BIODIVERSITY: Management of the Barents Sea–Lofoten area will ensure that diversity at ecosystem, habitat, species and genetic levels, and the productivity of ecosystems, are maintained. Human activity in the area will not damage the structure, functioning, productivity or dynamics of ecosystems.	Whole area
VALUABLE AREAS (1): Activities in particularly valuable and vulnerable areas will be conducted in such a way that the ecological functioning and biodiversity of such areas are not threatened.	**SVO*** areas
VALUABLE AREAS (2): Damage to marine habitats that are considered to be threatened or vulnerable will be avoided.	**SVO*** areas
VALUABLE AREAS (3): In marine habitats that are particularly important for the structure, functioning, productivity and dynamics of ecosystems, activities will be conducted in such a way that all ecological functions are maintained.	**SVO*** areas
SPECIES MANAGMENT (1): **Naturally occurring species** will exist in viable populations and genetic diversity will be maintained.	Whole area
SPECIES MANAGEMENT (2): Harvested species will be managed within safe biological limits so that their spawning stocks have good reproductive capacity.	Whole area
SPECIES MANAGEMENT (3): Species that are essential to the structure, functioning, productivity and dynamics of ecosystems will be managed in such a way that they are able to maintain their role as key species in the ecosystem concerned.	Whole area
SPECIES MANAGEMENT (4): Populations of **endangered and vulnerable species** and species for which Norway has a special responsibility will be maintained or restored to viable levels. Unintentional negative pressures on such species as a result of activity in the Barents Sea–Lofoten area will be reduced as much as possible by 2010.	Whole area
SPECIES MANAGEMENT (5): The introduction of **alien species** through human activity will be avoided.	Whole area
HABITAT CONSERVATION: A representative network of protected marine areas will be established in Norwegian waters, at the latest by 2012. This will include the southern parts of the Barents Sea–Lofoten area.	Whole area

United States

Background:

The origins of ecological objectives within the United States may date to the mid-nineteenth century, but the founding of Yellowstone National Park in 1872 is the traditional milestone from which progress in implementing the ecosystem approach to management in the United States is measured. Nonetheless it would require almost a century for the nation to implement a national environmental policy with the force of law. The National Environmental Policy Act (NEPA, 1970) set ecological objectives for the protection, maintenance, and enhancement of the environment by federal managers. The process established for implementing these objectives within US federal agencies requires managers to identify actions that may significantly impact the environment and analyze their impacts. The Environmental Assessment (EA) and Environmental Impact Statement (EIS) required by NEPA may be seen as the earliest instances of implementing the ecosystem approach to management on a national level in the United States.

Following closely on the adoption of NEPA, two national laws extended the reach of national ecological objectives beyond federal managers to all citizens for certain species of plants and animals. Both acts focus on the conservation of species or portions of species as a means to protect the ecosystems in which they occur. Protections for marine mammals (Marine Mammal Protection Act, MMPA, 1972) and any other species of plant and wildlife (Endangered Species Act, ESA, 1973) include prohibitions on killing or harassing any species covered under these laws. In most cases under ESA protections are extended to populations below the level of a taxonomically identified biological species, whereas marine mammals are protected at the species level with certain exceptions.

Although the MMPA is concerned with protection of marine ecosystems, the ESA is only rarely applied to solely marine species. Ecological objectives for many marine fish species originated with the Magnuson-Stevens Fishery Conservation and Management Act (MSA, 1976). Ecological objectives regarding locations, seasons and methods of harvest were applied to all persons operating within a zone that starts at 3 miles offshore and stops at 200 miles offshore, which is roughly the extent of the US continental shelf in most parts of the nation. Ecological objectives under MSA are known as National Standards. The first national standard is to avoid or terminate overfishing which is defined as harvesting at levels that not sustainable. The national standards are online (NMFS 2015).

Originating primarily in the golden decade of environmental legislation of the 1970's, a substantial body of environmental law now specifies US ecological objectives for enterprises that discharge toxic or potentially substances into the air or waters (Clean Air Act, Clean Water Act, CWA, 1977).

Ecological objectives for habitats in coastal marine ecosystems are established by a number of laws and by authorities vested in federal (and state) agencies (Coastal Zone Management Act, CZMA, 1977, Marine Protection Research and Sanctuaries 1972 and the CWA among others).

US national ecological objectives are elaborated and reinforced by participation in or cooperation with international agreements (i.e. Convention on International Trade in Endangered Species of Wild Fauna and Flora, CITES, 1975).

US Federal Processes:

There are many overarching policy documents that the US government has created that outline goals for a long-term management framework for the Arctic that recognizes both the resource potential of the region and the irreplaceable natural resources it contains. The broadest was issued by Executive Order from The President entitled 'National Strategy for the Arctic' (NSAR). Specific environmental policies (including National Ocean Policy (NOP)) tier under the NSAR by way of its implementation plan with associated milestones to measure success. The NOP suggests that federal agencies utilize Ecosystem Based management and identifies areas of special focus including: Resiliency/adaptation to climate change and ocean acidification; Regional ecosystem protection and restoration; Water quality and sustainable practices on land and measuring/monitoring changing conditions in the Arctic. Federal agencies conduct their own implementation of these focus areas which in turn describe ecological objectives.

The National Strategy includes one goal to Pursue Responsible Arctic Region Stewardship. The plan states that responsible stewardship requires active conservation of resources, balanced management, and the application of scientific and traditional knowledge of physical and living environments. That central goal has three actions that relate directly to Ecosystem Management (EA): 1) Protect the Arctic Environment and Conserve Arctic

Natural Resources; 2) Use Integrated Arctic Management to Balance Economic Development, Environmental Protection, and Cultural Values; and 3) Increase Understanding of the Arctic through Scientific Research and Traditional Knowledge. Each policy goal is then carried out through specific scientific programs that identify ecological objectives, which would feed into an Integrated Ecosystem Assessments (IEA).

- ✓ **Conserve Arctic Ecosystems**

NOAA has produced an Arctic Action plan based on US National Arctic Policy a document that provides NOAA scientists, stakeholders and partners a roadmap to make shared progress in monitoring, understanding, and protecting region. Additionally NOAA identified a base set of criteria for incorporation into an annual Arctic report card. The report card, which considers a wide range of environmental observations throughout the Arctic, is a timely and peer-reviewed source for clear, reliable and concise environmental information on the current state of different components of the Arctic environmental system relative to historical records. Additionally, implementation of the Distributed Biological Observatory, which coordinates observations linking biological changes to physical drivers in the rapidly-changing Pacific Arctic marine ecosystem, is a key component of the coordinated approach to baseline exploration and monitoring. New research is being implemented to examine biodiversity in the Arctic Marine Biodiversity Observation Network (AMBON) (NOAA, BOEM, Shell, principal investigators through University of Alaska Fairbanks).

- ✓ **Use Integrated Arctic Management (IAM) to Balance Economic Development, Environmental Protection, and Cultural Values.**

The premise of IAM is to strengthen key partnerships with the State of Alaska, local governments, and Alaska Native organizations and develop an engagement plan to involve partners and stakeholders in management discussions and provide transparency of the process. Federal agencies are advised to integrate IAM and EBM, under existing regulatory and legislative authorities such as National Environmental Policy Act, the Endangered Species Act, and the Marine Mammal Protection Act into agency- specific programs and associated actions (e.g., risk analyses and permit reviews).

- ✓ **Increase Understanding of the Arctic through Scientific Research and Traditional Knowledge**

Specific actions across multiple levels of the terrestrial and marine ecosystems are identified and are to be implemented by an Interagency Arctic Research Policy Committee (IARPC). The specific actions include better modeling to support forecasting and prediction of sea ice; Implement the Distributed Biological Observatory in the Pacific Arctic; Develop Integrated Ecosystem Research in the Beaufort and Chukchi Seas; Improve Understanding of Glacial Dynamics; Understand Terrestrial Ecosystem Processes, and Understand Atmospheric Processes to Improve Climate Predictions.

Chukchi and Beaufort Sea research focus on the marine ecosystem in general, and on an increased understanding of its functioning, structure, and sensitivities to changes in physical and chemical environmental conditions in particular. This information will improve model prediction capabilities and better inform management decisions. This scientific information has societal implications in key areas, e.g. ecosystem services, climate change research and biodiversity. The Distributed Biological Observatories are a successful method to monitor changes in the Arctic Ecosystem.

The implementation of responsible stewardship continues established initiatives in the National Ocean Policy, IARPC, and the Interagency Working Group on Coordination of Domestic Energy Development and Permitting in Alaska, as well as Integrated Ocean and Coastal Mapping efforts. A new Executive Order, signed in 2015, on Enhancing Coordination of National Effort in the Arctic creates an Arctic Executive Steering Committee (AESC) to provide clarity to departments and agencies and enhance coordination of Federal Arctic policies. In addition, the AESC will develop a process to improve coordination and the sharing of information and knowledge among Arctic partners and stakeholders.

PAME

Protection of the Arctic Marine Environment

PAME International Secretariat
Borgir
Nordurslod
600 Akureyri
Iceland

Te: + 354 461 1355
Email: pame@pame.is
www.pame.is