REPORT FROM THE PAME WORKSHOP ON ECOSYSTEM APPROACH TO MANAGEMENT

22-23 MARCH, 2012
STOCKHOLM, SWEDEN

PAME
Protection of the Arctic Marine Environment

ARCTIC COUNCIL

Report from the PAME Workshop on Ecosystem Approach to Management

22-23 March 2012

Stockholm, Sweden

Nordic Council of Ministers

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Background

The need to apply the Ecosystem Approach (EA) to management of Arctic marine-related issues has long been recognized. Use of the EA as the foundation of the Arctic Council´s work was included in the Arctic Marine Strategic Plan (AMSP) prepared by PAME and adopted by the Arctic Council in 2004. A first step identified in the AMSP was to identify marine ecosystems based on ecological criteria. Under the lead of the USA, a working map of 17 Large Marine Ecosystems (LMEs) was prepared and adopted in 2006. PAME established in 2007 an expert group (EG) on EA/LMEs led by the USA. Norway joined in as a co-lead from 2010.

As part of the work of the EG, an EA workshop was held in Tromsø in Norway, 22-23 January 2011. This workshop considered two main topics: update of the working map of Arctic LMEs, and status reporting for Arctic LMEs (PAME 2011 at http://pame.is/index.php/ecosystemapproach2). One of the proposals from the Tromsø workshop was that the EG should be broadened with participation of other AC working groups. This was followed up by PAME and positive responses to participate in an expanded joint EG were received from AMAP and CAFF.

With reference to the PAME Work Plan 2011-2013 and the work on ecosystem approach, PAME has broaden the scope and membership of its current ecosystem approach (EA) expert group. A second workshop was held in Stockholm, 22-23 March 2012, hosted by Sweden. The workshop was held just prior to the PAME I-2012 meeting, 26-27 March 2012, and the main results from the workshop was reported orally to the PAME meeting. The aim of the workshop was to:

- ✓ *Facilitate exchange of information on the development of ecosystem status reports.*
- ✓ *Identify possible arrangements and integration of monitoring and assessment.*
- ✓ *Identify possible elements to the development of the Arctic Marine Strategic Plan (AMSP 2004) Phase I 2011-2013 scoping process.*

Workshop program and participants

The workshop agenda is included in Annex 1. All items were dealt with in plenary sessions. The workshop was structured with presentations from workshop participants followed by discussions and tour de table. The workshop was attended by 25 participants as listed in Annex 2. All workshop presentations are posted on the PAME webpage at www.pame.is

Session 1: Background and aims of the workshop

Hein Rune Skjoldal presented the background for the workshop. As part of the work program for the EA expert group, he had prepared a DRAFT 'Concept paper' on the Ecosystem Approach to management (EA) that had been circulated to members of the EG and the registered participants prior to the workshop. In his introduction, Skjoldal emphasized key features of the EA to management as outlined in the 'Concept paper'.

The EA is defined and described as 'integrated management of human activities'. It implies management of human activities guided by information about the environment, with the aim to keep the ecosystem in good and healthy shape where the integrity of the ecosystem is maintained in the long-term. The state of the ecosystem is therefore very much in focus in an EA context. This focus should have two aspects or perspectives to it. One is that we need to describe and assess the current state of the ecosystem including recent trends of how it is

changing relative to previous states. The other aspect is that we need to characterize and define what good status is, where the ecosystem integrity is safeguarded and maintained. The first aspect encompasses integrated assessment, while the other relates to the task of setting operational ecological objectives to guide management decisions.

The concept paper lays out a general framework or scheme for an EA to management with the following 6 elements or steps:

1. Identify the ecosystem
2. Describe the ecosystem
3. Set ecological objectives
4. Assess the ecosystem
5. Value the ecosystem
6. Manage human activities

The work of the EA expert group has dealt with the first item: identifying the Arctic marine ecosystems. A working map of 17 Large Marine Ecosystems (LMEs) was adopted in 2006 and we are now working on a revision of this map with the aim to have a new version ready later this year. Identifying the Arctic LMEs (based on ecological criteria) has been a main follow-up activity under the Arctic Marine Strategic Plan (AMSP) that was adopted in 2004.

A main item for this workshop was the topic of integrated assessment which represents the fourth element in the list above and is a core element of the EA to management. By 'integrated assessment' we mean an assessment of the states and trends of ecosystem components (i.e. species and habitats) and their interactions (ecological processes), allowing an analysis of the overall state (and status) of the ecosystem. The analysis should include the human activities and their impacts on the ecosystem, both individually and collectively (i.e. cumulative impacts). In work of this type we are faced with the challenge of separating impacts from human activities from natural fluctuations and changes driven by climate variability and ecosystem dynamics.

Assessments build on updated information on status and trends from monitoring. Monitoring and assessment are therefore closely coupled ('yin-yang') elements that need to go hand in hand. Assessment requires monitoring, and monitoring should be tailored to the needs of assessment.

Assessment work has been carried out under different Arctic Council working groups. AMAP has carried out extensive and thorough assessments of arctic pollution, including effects of contaminants on human health. AMAP has also assessed impacts of climate change, in the 2005 ACIA report (in collaboration with CAFF and IASC) and the SWIPA report that was recently released. CAFF is assessing the status of biodiversity in ABA (Arctic Biodiversity Assessment) that is currently underway (to be published in 2013). PAME has assessed the future prospects and impacts of Arctic marine shipping in the AMSA report that was published in 2009. AMAP and CAFF have contributed to a follow-up activity of AMSA to identify areas of heightened ecological and cultural significance in relation to shipping, which has been done in a report to be published early next year.

There is an obvious need to coordinate assessment work of AMAP, CAFF and other Arctic Council working groups as we move forward with the issue of integrated assessments as an integral component of EA to management.

PAME has started work to revise the 2004 AMSP. The second main topic of the workshop was to provide input to the first phase of the work on this revision.

Hein Rune Skjoldal presented the following list as the workshop objectives:

- Agree on the use of LMEs as the primary entities and scale for applying the EA
- Agree on the need to further develop integrated monitoring and assessment to support the application of the EA to the management of the Arctic LME
- Suggest ways to use integrated assessments of Arctic LMEs to assessments and reporting for the wider Arctic (e.g. ACA)
- Suggest elements for the further planning of the revision of the AMSP

Session 2: Monitoring and Assessments within the Arctic Council

The CAFF and AMAP working groups of the Arctic Council provided information on their respective activities of relevance to EA work within the Arctic marine environment as presented below.

AMAP

Christine Daae Olseng from the AMAP Secretariat (Norway) spoke to recent developments. AMAP has multiple expert groups organized around types of pollutants (persistent organic pollutants (POP's), radionuclides, mercury, oil, methane, ocean acidification), as well as issues (human health, climate, including 'Short Lived Climate Forcing'). It is noted that many new types of pesticides are now being observed in the Arctic. Human health is being measured from the Canadian health ship *Amundsen* which surveys arctic regions. Of particular interest to EA and integrated ecosystem assessments (IEA's), are the AMAP thematic data centers, located among member states. A new initiative that promises to develop data of interest to many is the project for measuring arctic ice from unmanned aircraft systems (UAS).

CAFF

The CAFF presentation was made by Mark Marissink (Sweden). Mark introduced the Circumpolar Biodiversity Monitoring Programme (CBMP www.cbmp.org). CAFF has four expert monitoring groups (EMG's); Marine, Coastal, Terrestrial, and Freshwater. The marine and coastal EMG's are of particular interest to the EA EG, however, the Coastal EMG is not yet active. CAFF resources of particular interest to the EA EG are the Arctic Biodiversity web site that serves regional data and the Arctic Biodiversity Assessment (ABA) which is due to be delivered to the Arctic Council Ministers in May 2013, including the status and trends report.

'Arctic Change Assessment' proposal (ACA)

Christine Daae Olseng (AMAP Secretariat) briefed on the 'Arctic Change Assessment' proposal Phase 2012-2013. The overall goal of the ACA is to establish integrated and realistic scenarios of change in the Arctic and to assess the consequences of change for Arctic societies and humans, thus creating a basis for more informed, timely and responsive policy- and decision-making in a rapidly changing Arctic through a coordinated, regionalized and integrated assessment process. The ACA will integrate existing products on the Arctic to look at cumulative effects of drivers of change. Based on the stakeholder's workshop in fall 2011 in Oslo, the ACA has a draft implementation plan, terms of reference, methodology, and a

report on the first integrated regional projects. A final decision on how to proceed by the AC Deputy Ministers is expected on May 15, 2012.

ICES work on integrated ecosystem assessment

An effort to work toward integrated ecosystem assessments by coordinating the activities of oceanography and fisheries working groups of the International Council for the Exploration of the Sea (ICES) was presented by Yvonne Walther (Institute of Marine Research, Swedish University of Agricultural Sciences), who is chair of the ICES steering group on integrated ecosystem assessment (MSFD – SG) An example of an integrated ecosystem assessment in progress from the ICES area, the Baltic Sea Integrated Ecosystem Assessment, was presented. For another example, an IEA now in progress is the joint Norway-Russia effort to build on the more than 50 years of surveys of oceanography and fish stocks in Barents Sea. Similarly in ICES, the North Sea, NW Atlantic, and the Western European Shelf Seas each has its own working group (WGNARS, WGIAB, WGINOSE, WGEA, WESS) in ICES. The Advisory Committee (ACOM) of ICES works with the working groups to provide advice to fisheries management as well as advice on many environmental issues. Work is in progress to produce updated ecosystem overviews of each eco-region for the Atlas of ecosystem overviews that was last updated in 2008. The next ICES Annual Science Conference will be held 17-21 September 2012 in Bergen Norway. See the ICES "inside out" web page for more information.

Session 3: Monitoring and assessments - National/international/case presentations

Canada, Norway (working with Russia), USA, WWF and UArctic provided examples on their respective activities of relevance to EA work within the Arctic marine environment as presented below.

Canadian Arctic

Update on Canadian activities was provided by Cal Wenghofer (DFO) who described Canada's integrated management process for the Canadian arctic. The Ecosystem Approach in Canada's Arctic Marine Environment is specified in Canada's Oceans Act (1996). Of particular interest to the EA EG is the Ecosystem Status and Trends Report for the Canadian Beaufort which is now available, as is the annual State of the Oceans Report for the Beaufort Sea.

Barents Sea Norway/Russia

Ulf Lindstrom (Institute of Marine Research, Norway) made a presentation on Ecosystem Modeling of the Barents Sea. The Barents contains some of the world's largest fisheries for species such as cod, herring and capelin. Fish stocks are controlled by climate forcing; hence the interannual variation is large. The very large body of oceanographic and fisheries observations has been compiled into a book; *The Barents Sea - Ecosystem, Resources, Management. Half a century of Norwegian-Russian Cooperation*, edited by Jakobsen and Ozhigin. The Joint surveys for fish and mammals covered in Jakobson and Ozhigin span the time period 1958 – 2009, and have utilized 4-5 survey vessels every autumn. Within the No-Ru cooperative program TAC's for cod, capelin and haddock are set jointly. One important result of the monitoring and modeling work is that cod and minke whales are eating annually about as much cod as the fishery removes. The Barents Sea group is presently running the 'Atlantis' model, described as an "End to End" model.

Alaska - USA

Phil Mundy (NOAA) presented an overview of activities relevant to the ecosystem approach to management in waters of the U.S. Arctic. An extensive body of surface and subsurface biological and physical observations is accumulating for the continental shelf and adjacent seas. Arctic observations are being made available over the web by the Alaska Ocean Observing System (AOOS www.aoos.org). National marine research programs of interest are the Bering Sea Integrated Ecosystem Research Program (BSIERP, www.nprb.org), and the Distributed Biological Observatory (DBO, http://www.arctic.noaa.gov/dbo/). International research in US waters includes the fisheries oceanography surveys of Bering Aleutian Salmon International Survey (BASIS, http://www.npafc.org/new/science_basis.html) and its US counterparts conducted in the Gulf of Alaska, and the Bering and Chukchi Seas (EMA, http://www.afsc.noaa.gov/ABL/EMA/EMA_default.php), and the Russian-American Long-term Census of the Arctic (RUSALCA, http://www.arctic.noaa.gov/aro/russian-american/). An important development in implementing the ecosystem approach to management in the Arctic is the relatively new Fishery Management Plan for Fish Resources of the Arctic Area (Arctic FMP, http://www.fakr.noaa.gov/npfmc/fishery-management-plans/arctic.html) adopted by the North Pacific Fishery Management Council in 2009. Under the Arctic FMP no fishing is permitted until such time as sufficient scientific information may permit the fisheries to be managed sustainably.

World Wildlife Fund RACER Project

Martin Sommerkorn (WWF) described WWF's 'Rapid Assessment of Circum-arctic Ecosystem Resilience' (RACER) program (http://wwf.panda.org/what_we_do/where_we_work/arctic/), which uses long term satellite data to identify places that are exceptionally productive, in addition to promoting understanding of the drivers behind the productivity, such as polynas and sea ice. RACER estimates the persistence of the key features of productivity. The operating principle of RACER's approach is to identify and manage the drivers, not the species. RACER has so far done a marine pilot in the Beaufort Sea and one on land in Chukotka, Russia. Of special interest to the EA EG is that the hotspots identified are organized by geographic areas called eco-regions (Spalding et al. 2007). Ecoregion is the smallest of three biogeographic areas defined by Spalding et al.. The middle sized area is known as a Province, the largest is Realm. Some combination of Ecoregions, Provinces and Realms should match closely the defined Large Marine Ecosystems (LME's) of the Arctic.

UArctic Thematic Network

Hreidar Valtyrsson (Iceland, University of the Arctic, Akureyri) informed participants of the *Thematic Network on Arctic Coastal and Marine issues* which is a collaborated effort between the University of the Arctic and both the University of Akureyri and the University Centre of the Westfjords. North Icelandic currents include polar waters, Arctic waters, and Atlantic waters, with extreme variability in location of frontal boundaries. Icelandic waters support large fisheries in a number of unique habitats (http://www.fisheries.is/ecosystem/).

The aim of this network is to increase the cooperation between teachers, researchers and students and help them to work on a topic together and establish joint courses. Topics on sustainable utilisation and conservation of arctic coastal and marine environment include:

- ✓ Exploitation of resources
- ✓ Transportation
- ✓ Tourism

- ✓ Sustainable fisheries
- ✓ Aquaculture
- ✓ Indigenous utilisation of coastal environments.

The program supports a web portal of visual images from underwater, targeting local Icelanders as the audience.

Session 4: Input to updating of the Arctic Marine Strategic Plan (AMSP)

Barbro Thomsen provided a status on the updating of the AMSP on behalf of the co-leads (Norway and the United States) and noted since the AMSP was adopted in 2004, the Arctic Marine Environment has been, and will continue to be subject to increasing preasures such as climate change, economic activities and pollution. Most of the strategic actions in the AMSP 2004 have been or are in the process of being completed and the update of the AMSP will provide a platform for more coordinated and integrated actions and can support decision making at international, regional, national and local levels. The update also responds to commitments by the global community to sustainable development and protection of marine biodiversity and environment through the application of the ecosystem approach and integrated coastal and ocean managment.

The co-leads emphasized that the updating of AMSP should be considered a stand-alone activity. In the original project document the update was planned as a two step approach but the co-leads are considering merging the work into one phase in an effort to better align the process with other relevant Arctic Council products and follow-up recommendations that can feed into the update of the AMSP.

The work of the EA Expert Group will be of direct relevance to the updating of AMSP which will incorporate the core elements of EA work.

Session 5: Other issues: LME map and inventory of ecosystem status reports

Hein Rune Skjoldal provided an update status on the revision of the Arctic LME map and the consultations to date on the LME boundaries. A meeting was held in Seattle on 3 February 2012 where the boundary between the Bering Sea and Chukchi Sea LMEs was discussed. There was agreement to move the boundary south from the Bering Strait to a position along an E-W line south of St. Lawrence Island between the Yukon-Kuskokwim Delta in Alaska to Cape Navarin in Russia. The aim is to present a revised map of the 17 Arctic LMEs with an accompanying text that explains and justifies the various boundaries to the 2013 Arctic Council Ministerial meeting.

At the first EA workshop in Tromsø in January 2011, one of the topics was to start compiling information on status reports on ecosystems and ecosystem components (se the report from the Tromsø workshop). Workshop participants were asked to provide information on any updates or new reports on status of species, thematic assessments, and integrated or ecosystem status assessments. The PAME secretariat will prepare an inventory with links to reports where such are available.

Workshop summary

The presentations and discussions at the workshop are summarized under three main themes in the following. The three themes, which are related in the context of the EA, are the issue of scale and use of LMEs as unit for applying the EA to management, the need for and role of integrated assessment as a key component of the EA, and various data issues related to the need of and access to a broad range of data and information for conducting integrated assessments for effective implementation of the EA.

Scale issue - use of LMEs

Ecological features and human activities operate at different spatial and temporal scales. The scale issue is therefore of central importance in relation to the EA to management. The EA has to deal with issues operating at different scales and must include ways to integrate across various scales.

It was emphasized during discussion that the identified LMEs were at a scale that allowed in-depth analysis of ecological relationships between species in food webs and between species and the habitats upon which they depend. The LMEs usually contain populations of species that are permanent inhabitants and interact within the boundaries of LMEs. These populations convey system characteristics to the ecosystems along with specific features of the oceanography and productivity in the area.

The LMEs offer an ordered structure to deal with scale integration. Smaller scale issues such as various coastal zone development or offshore energy projects can be seen as habitat issues, where the local developments or activities impacts local habitats. One aspect of this is the need to assess the influence of local scale habitat disturbances or alterations for the overall well-being of the larger ecosystem (LME) to which they belong. Larger scale issues can to some extent be regarded as drivers for change in the LMEs, such as the biological and ecological effects of pollution or climate change. For migratory species that operate at larger scale, such as many marine mammals and birds, the focus should be on their use of habitats when they are in an LME and on the roles that those habitats play for the migratory populations.

It was agreed that the identified Arctic LMEs were the appropriate scale for implementing the EA to management of the Arctic marine environment recognizing that it accommodates management at other spatial scales. There is still a need to deal with issues at different scales from both scientific and management perspectives. This must be recognized and the application of the EA at the scale of LMEs should be in a way that allows scale integration to be done in a structured and transparent manner.

Integrated assessment

The presentations by AMAP, CAFF, national representatives and others illustrate the large efforts spent by national laboratories and AC working groups in the area of monitoring and assessments. The presentations also demonstrated steps taken to move towards more integrated approaches.

From the discussion there was general agreement on the need to achieve better integration of monitoring and assessment across the various ecosystem components and sectors of human activities. The central role of integrated assessment for effective implementation of the EA to management was also recognized.

Within the AC, AMAP has established groups and networks of experts that contribute to assessments of pollution and climate impacts (e.g. SWIPA). CAFF has established similar

groups and networks of experts on various biodiversity components that have contributed to ABA and form part of the CBMP. PAME has experts on Arctic marine shipping and oil and gas activities contributing in its work, while SDWG involves experts on human health and human communities and development in the Arctic. There is a clear need to integrate the activities and expertise of these various groups into more effective integrated assessments in the future. There is a particular need to strengthen the collaboration between AMAP and CAFF in achieving a more holistic approach to assessments of the status of species and habitats and the impacts on them by climate change, pollution, harvesting, and other human activities such as shipping, oil and gas activities, and coastal development.

Integrated assessments are to serve as a basis for management decision (based on scientific advice) as part of the EA to management. Keeping strong links to management is therefore a key to success in the future. The information we collect at present on the status and pressures on Arctic marine ecosystems originates from monitoring by national agencies or collaborative mechanisms such as the AC working groups. The information is collected for current management purposes and needs. As we move forward towards more integrated assessments the links to current management agencies and structures should be maintained and possibly strengthened.

The LMEs are regional ecosystems such as the Barents Sea LME and the East and West Bering Sea LMEs. Implementation of the EA at the scale of LMEs is primarily a national responsibility, often with a need for bilateral (or in some cases multilateral) cooperation among Arctic states.

Data issues

Integrated assessments clearly require data and information of a wide range of types and from many different sources. Data need therefore to be available and accessible for use in the assessment process in a timely manner; that is we need fresh and updated information from monitoring that allow us to to characterize the current state of the ecosystem as close to the present time as possible. This is a challenge and requires dedication from data providers and attention and commitments from cooperating agencies.

The data issues are related to the scale issue. Since integrated assessments need to be done primarily at the scale of regional ecosystems, LMEs, this is also the scale for bringing data and information together. Since existing data is provided (to a large extent) by existing management agencies to cover their needs, integration of data use should involve the scientific institutions and experts that take part in the current and more fragmented use of data. Data availability and flow need therefore to be addressed in an institutional context that involves data providers, scientific experts, and managers as end users of information.

Some of the data and information need to be accessible also at scales larger than the regional ecosystems (LMEs), e.g. the pan-Arctic scale. There is therefore a need for ways and means to distribute and store data and information, including distributed and central databases, overviews of metadata, and data and information portals. The infrastructure related to data management and data flow must in the end be tailored to the needs for data and information at the LME and pan-Arctic scales, as well as the interdependencies and synergies between them.

It was generally recognized that the data issues were composite and complex and of great importance for integrated assessments and effective implementation of the EA to management. It was therefore suggested that the next workshop related to the work of the PAME-led EA EG should focus on data issues.

Conclusions and Next Steps

There was agreement that the Arctic LMEs were the primary units and scale for applying the EA to management of arctic marine ecosystems, realizing that many separate issues still would need to be dealt with at different scales as appropriate. The choice of LMEs allows scale integration to be done in an orderly fashion, both from a scientific perspective and in an institutional management context.

Integrated assessment is a core element of the EA to management. The need for such assessments is primarily at the scale of regional ecosystems (LMEs) where they form an essential component of the scientific work needed to support the EA to management.

Integrated assessments at the scale of LMEs, as a core element of the EA to the management of those ecosystems, could potentially in the future provide an important basis of information for aggregated reporting on the state of arctic marine ecosystems at pan-Arctic and global levels. At the same time, assessments at the pan-Arctic scale of drivers for change, such as climate variability and change, persistent pollutants, shipping etc., and assessments of status of migratory animal populations, may provide important information to be used in integrated assessments of LMEs. Within the Arctic Council, there needs to be further consideration of the relationship between the LME and pan-Arctic scales in terms of assessments and scientific basis and support for the EA to management.

An expert EA workshop will be held in early 2013 to discuss data management, availability, integration, and communications as essential to implement the ecosystem approach to management. The workshop will review the status of the web based arctic information resources and explore possible synergistic efforts among sites. The goal is to provide information resources that support implementation of EA in arctic ecosystems.

The report from the workshop will be presented at the PAME meeting in the fall 2012 (PAME II-2012). The report will be made available from the PAME webpage.

Annex 1 – Workshop Agenda

Thursday 22nd of March

09:00-10:30 Session 1 - Background and inventory of status reports

- Welcome
- Background and aims for the workshop - Hein Rune Skjoldal

11:00-12:30 Session 2 - Monitoring and assessments

- ***Presentations by AMAP and CAFF***
    - AMAP recent developments in assessments (Christine Daae Olseng, AMAP)
    - Arctic Change Assessment (Christine Daae Olseng, AMAP)
    - Biodiversity/CBMP (Mark Marissink CAFF Swedish representative)
- ***Discussion***

12:30 - 13.30 Lunch

13:30-17:00 Session 3 - Monitoring and assessments

- ***National/international/case presentations***
    - Barents Sea - Norway/Russia
    - Canadian Arctic (Cal Wenghofer)
    - Alaska - USA (Phil Mundy)
    - WWF RACER Project (Martin Sommerkorn)
    - UArctic Thematic network (Hreidar Thor Valtysson)

Friday 23rd of March

09:00-10:30 Session 3 - continued

- Plenary discussions

11:00-12:30 Session 4 - Input to AMSP

- Introduction
- 1st round of plenary discussion

13:30-15:00 Session 5 - LME map and workshop summary

- Revision of the Arctic LME map - status
- Workshop summary and next steps

Close of Workshop at 15:00

Annex 2 - List of participants

PAME Workshop on Ecosystem approach to management (EA)

22-23 March 2012, Stockholm, Sweden

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