

Acknowledgements:

We would like to gratefully acknowledge the financial support provided to this project from the Nordic Council of Ministers. We would also like to thank PAME countries, experts from other Arctic Council Working Groups and Permanent Participants to the Arctic Council for their support in this work.

Design: Jensson hönnunarahús
Printing: Ásprent-Still hf, Akureyri
Photo Credits: GettyImages



The Ecosystem Approach to Management of Arctic Marine Ecosystems

PAME Secretariat

Address:
Borgir, Nordurslod
600 Akureyri
Iceland

Contact:
Tel: +354 461 1355
Email: pame@pame.is
Website: www.pame.is



Ecosystem approach to management

Integrated management of natural systems, including humans, is a concept known by many different names such as integrated ocean management, ecosystem-based management (EbM), or the ecosystem approach to management (EA). EBM has been used as a term in some parts of the work of the Arctic Council, while EA is the term used in the global UN Biodiversity Convention (CBD). These terms are different names for the same concept.

The EA is a science-based, place-based and adaptive approach to management of ecosystems. EA places emphasis on integration and the need to more fully recognize the integrated nature of ecosystems by having more coordination and collaboration across

management sectors and agencies that regulate human use. Advice in EA starts with due attention to measurements of the state of the ecosystem which are translated into ecological objectives that define what is a good or acceptable state of the ecosystem.

The Arctic Council is not a management organization, and the responsibility for implementing the EA lies fully with the Arctic states for areas within their national jurisdiction. The role of the Arctic Council is to develop a common understanding among states of the meaning of EA, which is especially important for transboundary LMEs where there is a need for management cooperation between countries that 'share' an LME.

"The ecosystem approach 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 ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity."

*Ecosystem approach (EA)
– definition by the Arctic Council.*

A framework for Implementing EA

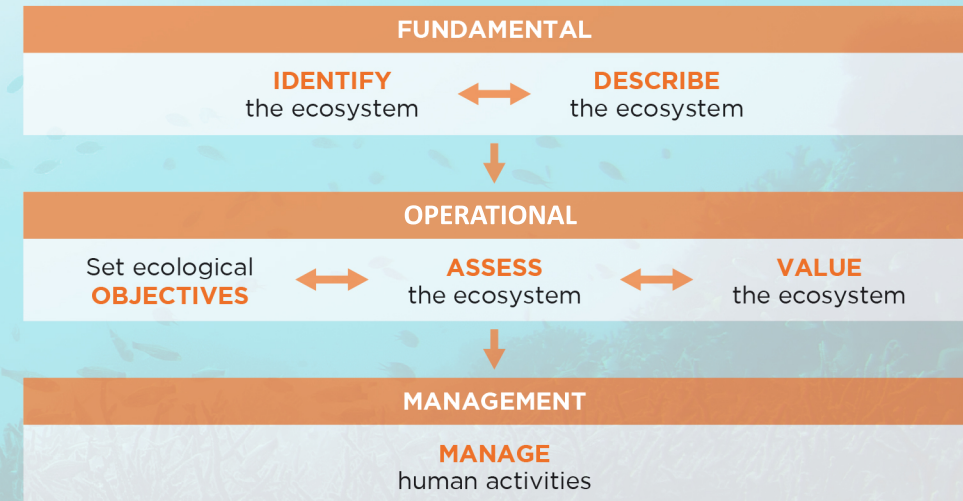
The following 6 elements have been identified as the main components of an EA framework. These elements can be seen as iterative steps in an implementation cycle. Since they are not necessarily sequential, the practical arrangements of how and where the various elements occur in a particular management system can be adapted to its purposes during implementation.

- 1. Identify the ecosystem** as a geographical entity based on ecological criteria (18 Arctic Large Marine Ecosystems have been defined).
- 2. Describe the ecosystem** in terms of its biological and physical characteristics (species and habitats), as well as the physical and biological processes and relationships that define them into an ecosystem. Describing an ecosystem should also identify relevant management systems including responsible agencies and jurisdictional aspects, as well as the indigenous people and the stakeholders residing in that defined geographical area.

- 3. Set ecological objectives** for ecosystem components (species and habitats) and for the overall state of the ecosystem includes a description of sustainability i.e. the overall desirable status/level of pressures. Ecological objectives are translated into management objectives as the final stage in the cycle.
- 4. Assess the ecosystem** by gathering synoptic observations on the status and trends of all relevant ecosystem components in an integrated assessment. Integrated assessment includes measuring or estimating the impacts by various human activities such as fishing, pollution, coastal development, and socioeconomic factors as well as the overall or cumulative impacts of those activities.

- 5. Value the ecosystem** by identifying and valuing its goods and services in order that economic, social and cultural values may be more fully incorporated into mainstream socioeconomics. Socioeconomics in the broadest sense comes into play in all elements of the EA. Social, cultural and economic values of ecosystem goods and services are essential information for the sustainable management of the Arctic.
- 6. Manage human activities** to maintain the agreed ecological objectives. In a process that occurs outside the Arctic Council managers apply methods for shaping human behavior that are adaptive, meaning that actions are regularly tailored to the shifting ecological and social conditions. Making the best use of available scientific and other knowledge, the outcomes of integrated assessments need to be translated through a scientific advisory process into clear and transparent advice to inform adaptive management.

Possible Methodology for Applying EA



Arctic LMEs and geographical scale

One of the actions of the Arctic Council's Arctic Marine Strategic Plan (2004) was to identify the large marine ecosystems of the Arctic based on the best available ecological information. Consequently a working map of Arctic LMEs was developed and adopted in 2006. It was revised in 2013 (above) to encompass 18 Arctic LMEs.

The issue of scale is important since there is a need to deal with ecological features and processes and human activities that operate on many different scales in a nested approach. Scale recognition and integration are key aspects for both the scientific supporting elements (e.g. monitoring and assessment) and the management system when implementing the EA. The LMEs represent the appropriate and primary units for applying the ecosystem approach to management of the marine environment recognizing that it accommodates management at other spatial scales. In that respect the LMEs offer a framework for dealing with scale integration in a structured manner from both scientific and management perspectives. For example the CAFF working group has identified Arctic Marine Areas for the purpose of their biodiversity monitoring purposes (Arctic Marine Biodiversity Monitoring Plan) that are essentially coincident with the LME boundaries, although some LMEs are subdivided. The AMAP working group uses the 18 Arctic LME map for descriptive purposes in the Adaptation Actions for a Changing Arctic (AACA) project.

The scale of LMEs is appropriate for in-depth analysis of interactions between species in food webs and between species and their habitats within an LME. At smaller scales, an LME can be represented as a mosaic of habitats with different physical and biological attributes (rocky bottoms, muddy sediments, kelp forests, ocean fronts, etc). The overall state and integrity of the ecosystem is a reflection of the status of species and habitats and their interactions at all appropriate scales within the LME.

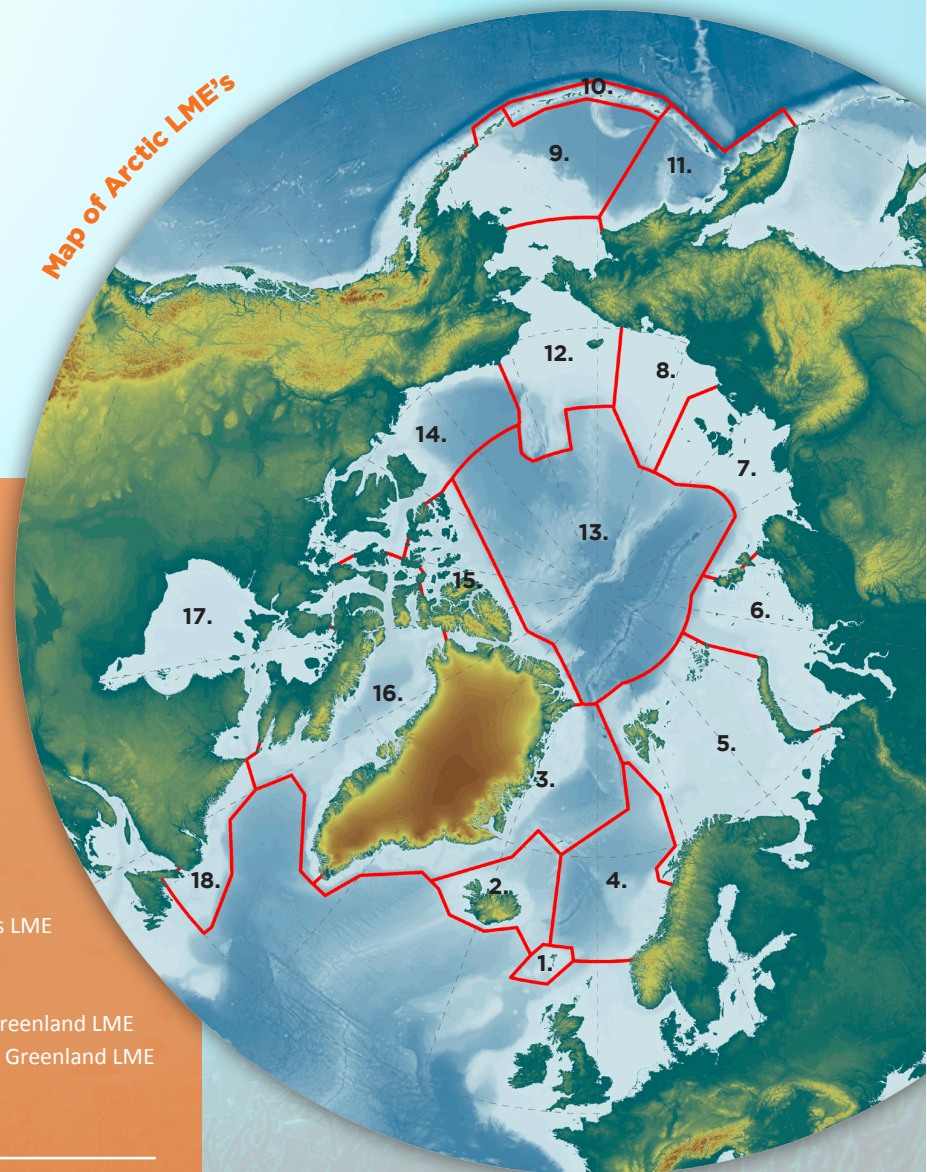
The Arctic LMEs do not sit in isolation. On the contrary, they are open ecosystems where exchanges between them are important system characteristics. Water flows across the boundaries transporting plankton, organic matter and pollutants. Mammals, birds and fish swim or fly across the boundaries, and neighboring LMEs are functionally connected through such transports and migrations. Many stocks of migratory birds and mammals (e.g. whales) use two or more Arctic LMEs during their annual cycle (and many move south to winter in ecosystems at lower latitudes and even the southern hemisphere for many birds). These larger scale migrations need clearly to be taken into account in the management of the migratory species. One way this can be done is to focus on the relationship between the migratory animals and specific habitats and food web interactions in each of the Arctic LMEs they are frequenting during their seasonal visits.

"Large Marine Ecosystems are regions of the world's oceans, encompassing coastal areas from river basins and estuaries to the seaward boundaries of continental shelves and the outer margins of the major ocean current systems. They are relatively large regions on the order of 200,000 km² or greater, characterized by distinct bathymetry, hydrography, productivity, and trophically dependent populations."

Large Marine Ecosystems (LME) definition.

List of Arctic LME's

1. Faroe Plateau LME
2. Iceland Shelf and Sea LME
3. Greenland Sea LME
4. Norwegian Sea LME
5. Barents Sea LME
6. Kara Sea LME
7. Laptev Sea LME
8. East Siberian Sea LME
9. East Bering Sea LME
10. Alutian Islands LME
11. West Bering Sea LME
12. Northern Bering-Chukchi Seas LME
13. Central Arctic LME
14. Beaufort Sea LME
15. Canadian High Arctic-North Greenland LME
16. Canadian Eastern Arctic-West Greenland LME
17. Hudson Bay Complex LME
18. Labrador-Newfoundland LME



Circumpolar Community of Practice

PAME has established a project with the goal to support implementation of the EA on ecosystem approach to management (EA) in the Arctic marine environment through development of a functional Community of Practice (CoP) specializing in Arctic EA. The project is specifically aimed to support the management part of the implementation and to consolidate gains in knowledge base relevant to EA by establishing (www.pame.is) a web-based inventory of relevant information products such as papers and reports on EA and components such as Integrated Ecosystem Assessments. The project is identifying and establishing communications among specialists from relevant agencies of the Arctic States, the circumpolar indigenous communities, and non-governmental entities. Many of these specialists came together for the first time in Fairbanks, Alaska USA in 2016 when PAME and partners hosted the first international EA conference focused on the Arctic. Students and practitioners of EA from throughout the Arctic and the world gathered to consider the status of implementation of EA.

Joint EA Expert Group

PAME established in 2007 an EA expert group to better focus its work on EA within its mandate for the protection of the Arctic marine environment. The scope and membership of this expert group was extended in 2011 to include the participation of relevant Arctic Council working groups addressing marine related issues, with representation from PAME, CAFF, SDWG, AMAP, permanent participants, and observers. This joint EA-EG membership collectively contributes to the integration of EA implementation into the overall work of the Arctic Council. It also provides a mechanism to facilitate the exchange and review of information and experiences gained to support the development of a common and coordinated approach to the implementation of the EA by Arctic states. See PAME's website for publications by the Expert group, including the EA Concept Paper, the LME report and others.

