WORKING GROUP 44 - INTEGRATED ECOSYSTEM ASSESSMENT OF THE NORTHERN BERING SEA – CHUKCHI SEA (NBS-CS) (WG 44)

Group Type: Working Group

Group Name: Integrated Ecosystem Assessment of the Northern Bering Sea – Chukchi Sea (NBS-CS)

Reporting to: FIS, HD

Term: Nov. 2019- Nov. 2022

LINKAGE(S) TO PREVIOUS PICES EXPERT GROUPS OR ACTIVITIES (IF ANY):

Complements other current or recent past PICES Expert Groups

- WG39 Joint PICES/ICES/PAME Working Group on Integrated Ecosystem Assessment for the Central Arctic Ocean
- WG 35 North Pacific Ecosystem Status Report
- WG 19 Ecosystem-based Management Science and its Application to the North Pacific
- WG 28 Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors
- S-CCME Climate Change Effects on Marine Ecosystems
- S-MBM Marine Birds and Mammals

Complements WG 39 (WGICA)

This project would complement, not duplicate, the work of WG39 IEA of the Central Arctic Ocean (CAO). The two projects do not overlap geographically. The CAO is LME 13 in the map in Appendix 2, and the Northern Bering Sea – Chukchi Sea is LME 12. It is true that the WGICA considers adjacent shelf systems such as the Chukchi Sea to the extent that ocean currents and migratory species cross from the shelf to the CAO basin. But the WGICA does not explicitly examine all components and processes in adjacent shelf areas. An IEA of the Northern Bering Sea – Chukchi Sea LME would complement the IEA of the CAO by providing better resolution and understanding of the processes that drive currents and migratory species into the CAO. As an inflow shelf, the Chukchi Sea provides essential sources of nutrients, freshwater and heat to the Arctic Ocean, affecting processes in adjacent shelf systems as well as the deep basin.

This project has some unique features that further distinguish it from WG39. Compared to the CAO, there is a wealth of scientific knowledge in the Northern Bering-Chukchi LME. These data come from surveys of oil and gas lease areas, studies of whale foraging areas, groundfish assessment surveys, oceanographic and plankton surveys and Integrated Ecosystem Surveys. In addition, there are a number of indigenous Alaskan and Russian communities that can provide specialized Indigenous and Traditional Knowledge unavailable from other sources about characteristics and changes of the Northern Bering – Chukchi Sea LME.

The Northern Bering – Chukchi LME is a relatively shallow, shelf system and is therefore expected to have different key elements and processes from the deep basin of the Central Arctic Ocean. Each project will also carry forward different management implications from the knowledge gained. One key difference with management implication is that the CAO is largely outside the EEZs of the Arctic nations, whereas the Northern Bering-Chukchi LME is in the US and Russian EEZs.

LINKAGE(S) TO OTHER ORGANIZATIONS AND PROGRAMS (IF ANY):

There are a large number of of potential co-sponsoring /partner organizations, including some key PICES collaborators such as NPRB and ICES. A preliminary list of potential co-sponsoring /partner organizations is provided in Appendix 1.

Fisheries Experts of the Central Arctic Ocean (FisCAO)

Scientific experts on fish stocks in the central Arctic Ocean from the Kingdom of Norway, the United States of America, Canada, the People's Republic of China, the Republic of Korea, Japan, Iceland, the European Union, and the international scientific organizations ICES and PICES, meet on an *ad hoc* basis to develop information supporting diplomatic negotiations to prevent unregulated commercial fishing on the High Seas of the Central Arctic Ocean. One of their recent products is a strategy for monitoring indicators of fish stocks and ecosystem components. A key component of the strategy is using existing national programs that monitor adjacent shelf areas (such as the NBS-CS) to provide an early warning of changes in the adjacent CAO that would merit a survey effort in those, international waters. An IEA of the NBS-CS as proposed for this WG could provide such an early warning.

NPRB Integrated Ecosystem Research Program of the Northern Bering Sea

The North Pacific Research Board, which funded the recent (2017-2019) Chukchi Sea Integrated Ecosystem Research Project (IERP), a series of ecosystem at-sea surveys, will next fund an IERP for the Northern Bering Sea. The IEA of the NBS-CS proposed here can provide information on connectivity between the two IERP regions (NBS and CS). It can also provide a knowledge gap analysis useful for developing the call for proposals and/or evaluating proposed projects.

United Nations Decade of Ocean Science for Sustainable Development (2021-2030)

The United Nations has proclaimed a Decade of Ocean Science for Sustainable Development (2021-2030) to support efforts to reverse the cycle of decline in ocean health and gather ocean stakeholders worldwide behind a common framework that will ensure ocean science can fully support countries in creating improved conditions for sustainable development of the Ocean. As mandated by the UN General Assembly, the Intergovernmental Oceanographic Commission (IOC) of UNESCO will coordinate the Decade's preparatory process, inviting the global ocean community to plan for the next ten years in ocean science and technology. Our new WG could contribute to efforts of the science and sustainable develop community to define priorities and plan for the global ocean science agenda, develop new science and technologies needed to achieve the Decade's objectives as well as connect ocean science activities with the 2030 Agenda for Sustainable Development.

Of interest to PICES member countries

An IEA of the Northern Bering – Chukchi Sea LME would obviously be of interest to the US and Russia. Both nations conduct fish assessment and ecosystem surveys in the region; and both have commercial fisheries adjacent to the region. Japan, China and Korea have also been carrying out surveys in the Northern Bering and Chukchi Seas. These nations consider themselves to be stakeholders in the Arctic because of tele-connections to fisheries, migratory seabirds, pollution, loss of sea ice and climate change. In addition, PICES countries are engaged through the Arctic Observing Network (AON), the Sustaining Arctic Observing Networks (SAON) and the Arctic Observing Summit (AOS).

LINKAGE/CONTRIBUTIONS TO THE FUTURE PROGRAM (IF ANY):

Supports the FUTURE Science Plan

An Integrated Ecosystem Assessment can help address two of FUTURE research themes: How do ecosystems respond to natural and anthropogenic forcing, and how might they change in the future? How do human activities affect coastal ecosystems and how are societies affected by changes in these ecosystems? With ocean warming and loss of sea ice the traditional PICES area of interest in the Bering Sea is being extended northward and becoming more connected to the Arctic north of Bering Strait.

MOTIVATION AND GOALS AND/OR BACKGROUND

Prolog

This proposal is the result of W17 "Scoping an IEA of the Northern Bering-Chukchi Seas Large Marine Ecosystem (LME)", held October 16, 2019. The workshop was chaired by Libby Logerwell (USA), Kirstin Holsman (USA), Raychelle Daniel (USA, The Pew Charitable Trusts) and Yutaka Watanuki (Japan). There were 19 attendees representing PICES member nations (USA, Japan, Russia, China and Canada), partner organizations (ICES and IASC), funding agencies (North Pacific Research Board), international collaborators (IMR Norway) and Indigenous organizations (Bering Sea Elders Group). Plenary and breakout group discussions accomplished an effective scoping of an Integrated Ecosystem Assessment of the Northern Bering Sea – Chukchi Sea LME. The scoping entailed:

- Review of recent research, scope of Indigenous Knowledge available, activities and priorities related to an IEA of Arctic Ecosystems
- Review of the scientific interest, community interest, data availability and overall feasibility of conducting such an IEA for the Northern Bering-Chukchi Sea region
- Assessment of the opportunities to partner with other organizations to address the issues identified above

The participants of the workshop unanimously agreed to pursue a new Working Group to conduct an Integrated Ecosystem Assessment of the Northern Bering Sea – Chukchi Sea (NBS-CS) LME. In particular, participants from WG39 (WGICA) on the Central Arctic Ocean, PAME, and ICES, noted that:

- A PICES WG on the Northern Bering-Chukchi Sea region would provide detailed assessment of the Pacific Arctic gateway, and would be a complement to the Atlantic gateways IEAs supported through ICES, all of which are linked through the PICES Central Arctic Ocean WG
- It would also provide detailed information that will inform understanding of connectivity of climate and ocean processes, species movements, shelf foodweb dynamics, fishing, trade, subsistence and food security, and human activities beyond the focal scope of WG39/WGICA but of critical importance to the CAO (and therefore identified as a needed component of future analyses).
- In turn a PICES WG on the NBS-CS would be informed by the findings of WG39/WGICA beyond the scope of the new WG but of increasing importance, especially for the NBS where multiple Pacific stocks are increasingly redistributing poleward under warming conditions.

Background

Why now?

The Northern Bering Sea-Chukchi Sea (NBS-CS) region is experiencing unprecedented ocean warming and loss of sea ice as a result of climate change. Seasonal sea ice declines and warming temperatures have been more prominent in the northern Bering and Chukchi seas as almost all other portions of the Arctic. Chronic and sudden changes in climate conditions in this Arctic gateway are increasingly impacting marine species and food-webs and expanding opportunities for commercial activities (shipping, oil and gas development and fishing), with uncertain and potentially wide-spread cumulative impacts. There are strong concerns about the impacts of climate change and industrial activities, and these impacts may be particularly pronounced in Arctic indigenous communities dependent on the health and stability of the ecosystem. The combination of unprecedented, rapid change and increased interest in the Arctic in general and the NBS-CS specifically make this an opportune time for a synthesis of issues and knowledge. An Integrated Ecosystem Assessment (IEA) can accomplish this synthesis.

TERMS OF REFERENCE:

General Terms of Reference

- Convene an interdisciplinary and international working group membership
- Include Arctic peoples and Indigenous Knowledge systems
- Identify and consult with partners and institutions

Specific Terms of Reference, Timeline and Deliverables

3-year plan

Year 1 Activities

- Determine approach and methodology for conducting an IEA in the Northern Bering – Chukchi Sea LME.
- Compile an inventory of scientific metadata
- Development of indigenous knowledge sharing with knowledge holders, to facilitate co-production of knowledge while protecting intellectual property as per the UN Declaration on the Rights of Indigenous Peoples (Articles 11.2, 31).
- Compile an inventory of institutions and programs active in the region.

Year 1 Deliverables

- Inventory of metadata, knowledge, institutions and programs relevant to the Northern Bering Sea-Chukchi Sea LME. PICES or ICES Report. Web-based repository.

Year 2 Activities

- Describe the key physical, biological and human elements of the ecosystem
- Develop shared conceptual models including both Indigenous Knowledge and science; and review of hypotheses for ecosystem dynamics
- Identify potential indicators of the above key elements
- Describe the goals & targets
- Conduct a PICES workshop to discuss and describe the objectives & values

Year 2 Deliverables

- Ecosystem description from both Indigenous world views and science (shared conceptual models), indicators and hypotheses. PICES or ICES Report. Contribution to Arctic Report Card and or ecosystem status report.
- Report on Ecological Objectives (co-produced with PAME)
- Report on Ecological Values Workshop (co-produced with PAME)

Year 3 Activities

- Assess ecosystem status and trends
- Identify potential impacts/risks at the LME-scale; and at the local scale with emphasis on human use and Indigenous Knowledge
- Knowledge gap analysis

Tear 3 Deliverables

- Integrated Ecosystem Assessment for the Northern Bering Sea-Chukchi Sea LME. PICES or ICES Report. Contribution to NPESR. PAME-AMAP-CAFF Report. Contribution to Arctic Report Card
- Journal articles
- Outreach activities
- Knowledge Gap and Next Steps Report. PICES or ICES Report.

Extended to 5-year plan

Should PICES and other cooperating organizations support continued work, we anticipate proposing the following for years four, five or beyond:

- More detailed assessment of impacts and risks at local and ecosystem scale
- Description of interactions between local and ecosystem scale
- Development of ecosystem model(s)

Audience and communication

There will be a diverse audience for the knowledge generated by this WG. We plan to communicate to scientists, communities, NGOs, intergovernmental forums and students (elementary – college). We also plan to communicate to managers although we emphasize that our results can inform management but will not be policy prescriptive. The AFSC Communications Program can provide staff and expertise. In addition, supporting organizations such as NOAA IEA Program, ICES, NPRB and IASC can provide forums, logistical assistance, expertise and potentially financial support for communicating our results.

PROPOSED MEMBERSHIP:

First Name	Last Name	Country	Institution	Expertise
Bill	Williams	Canada	Department of Fisheries and Oceans	Physical oceanography
Zhongyong	Gao	China	First Institute of Oceanography (FIO), Ministry of Natural Resources (MNR)	Biogeochemical processes
Qi	Shu	China	First Institute of Oceanography (FIO), Ministry of Natural Resources (MNR)	Ocean and climate models
Changun	Xu	China	Third Institute of Oceanography, Ministry of Natural Resources	Fish/fisheries
Taka	Hirata	Japan	Hokkaido University	Biological oceanography
Yutaka	Watanuki	Japan	Hokkaido University	Seabirds
Shigeto	Nishino	Japan	Japan Agency for Marine-Earth Science and Technology (JAMSTEC)	Physical oceanography
Sul La	Hyoung	Korea	Korean Polar Research Institute	Zooplankton, acoustics
Elena	Eriksen	Norway	ICES	Integrated Ecosystem Assessment
Kirill	Kivva	Russia	Russian Federal Research Institute of Fisheries and Oceanography	Biological oceanography
Aleksey	Somov	Russia	Russian Federal Research Institute of Fisheries and Oceanography	Fish/fisheries
Yury	Zuenko	Russia	Russian Federal Research Institute of Fisheries and Oceanography	Co-chair; physical oceanography
Eduard	Zdor	Russia	University of Alaska Fairbanks	Indigenous/Traditional Knowledge
Katrin	Iken	USA	Arctic Marine Biodiversity Observing Network (AMBON); University of Alaska	Benthos
Mellisa	Heflin	USA	Bering Sea Elders Group	Indigenous/Traditional Knowledge
Henry	Huntington	USA	Consultant	Indigenous/Traditional Knowledge
Lee	Cooper	USA	International Arctic Science Committee; University of Maryland Center for Environmental Science	Benthos
Kirstin	Holsman	USA	NOAA Alaska Fisheries Science Center	Integrated Ecosystem Assessment
Libby	Logerwell	USA	NOAA Alaska Fisheries Science Center	Co-chair; fish/fisheries
Lisa	Eisner	USA	NOAA Alaska Fisheries Science Center	Biological oceanography
Alan	Haynie	USA	NOAA Alaska Fisheries Science Center	Economics; human dimension
Megan	Ferguson	USA	NOAA Alaska Fisheries Science Center, Marine Mammal Laboratory	Marine mammals; co-management
Matthew	Baker	USA	North Pacific Research Board	Fish/fisheries
Raychelle	Daniel	USA	The Pew Charitable Trusts	Indigenous/Traditional Knowledge
Kathy	Kuletz	USA	US Fish and Wildlife Service	Seabirds

Proposed Leadership:
Co-chair: Libby Logerwell (USA)
Co-chair: Yury Zuenko (Russia)

APPENDIX 1: PRELIMINARY LIST OF POTENTIAL CO-SPONSORING /PARTNER ORGANIZATIONS

Co-sponsoring Organizations:
ICES (TBC; support has been expressed)
IASC (TBC; support has been expressed)
NOAA IEA (TBC; support has been expressed)
Protection of the Arctic Marine Environment (PAME), Arctic Council (TBC; support has been expressed)
Bering Sea Elders Group

A preliminary list of potential partners for this Working Group:

- Alaska Seagrant – Nome office
- Arctic Monitoring and Assessment Programme, AMAP (Arctic Council)
- Arctic Marine Biodiversity Observing Network (AMBON)
- Arctic Observing Summit
- Arctic Observing Network (AON)
- Association of Village Council Presidents (AVCP) and associated Federally recognized Tribes
- Bering Sea Elders Group
- Conservation of Arctic Flora and Fauna, CAFF (Arctic Council)
- Distributed Biological Observatory (DBO)
- Ecosystem Studies of Subarctic and Arctic Seas (ESSAS)
- Interagency Arctic Research Policy Committee (IARPC)
- International Arctic Science Committee (IASC)
- Inuit Circumpolar Council (ICC)
- Kawerak, Inc. and associated Federally recognized Tribes
- Maniilaq Association and associated Federally recognized Tribes
- National Park Service – Kotzebue and Nome regions; Berengia
- Native Village of Kotzebue
- Northwest Arctic Borough
- North Slope Borough Department of Wildlife Management
- Oceans North
- Pacific Arctic Group (PAG)
- The Pew Charitable Trusts
- Protection of the Arctic Marine Environment, PAME (Arctic Council)
- S-CCME (PICES)
- Sustaining Arctic Observing Networks
- United Nations FAO
- University of Alaska International Arctic Research Center (IARC)
- Western Alaska Landscape Conservation Cooperative
- World Wildlife Fund (WWF)
- Co-management entities (Eskimo Walrus Commission, Ice Seal Committee, Beluga Committee, Alaska Eskimo Whaling Commission, Kuskokwim Intertribal Fisheries Commission; Migratory Bird Commission)

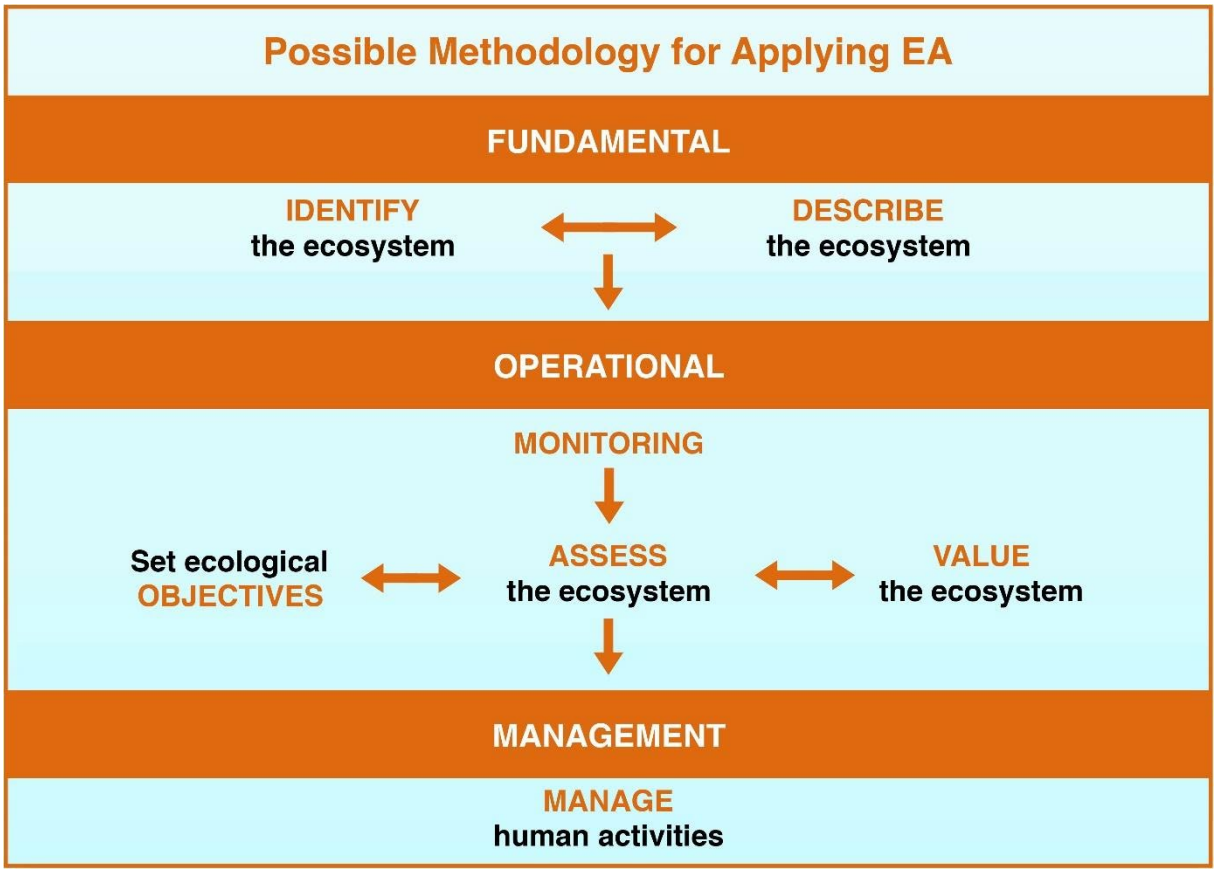
In addition, this project provides an opportunity to partner with Arctic peoples to apply multiple knowledge sources towards evaluating future impacts, risk, and adaptation measures in a changing Arctic.

APPENDIX 2: CONCEPTUAL FRAMEWORKS AND OTHER SUPPORTING INFORMATION

Conceptual frameworks

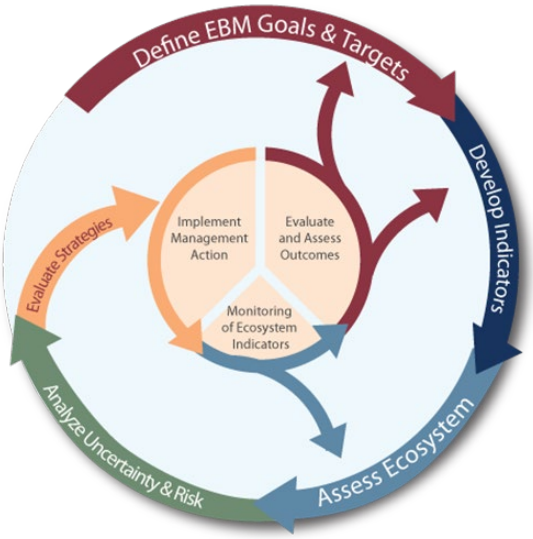
Arctic Council Protection of the Marine Environment (PAME) Ecosystem Approach

The Arctic Council has developed a framework for implementation of the Ecosystem Approach to management (EA) of human activities in Arctic marine and coastal environments. The EA framework consists of six related elements (see figure). While they are numbered, the elements do not necessarily need to be sequential although they are eventually linked in an iterative and adaptive operational management cycle. Monitoring is an essential component of EA as illustrated in the schematic representation of the framework.



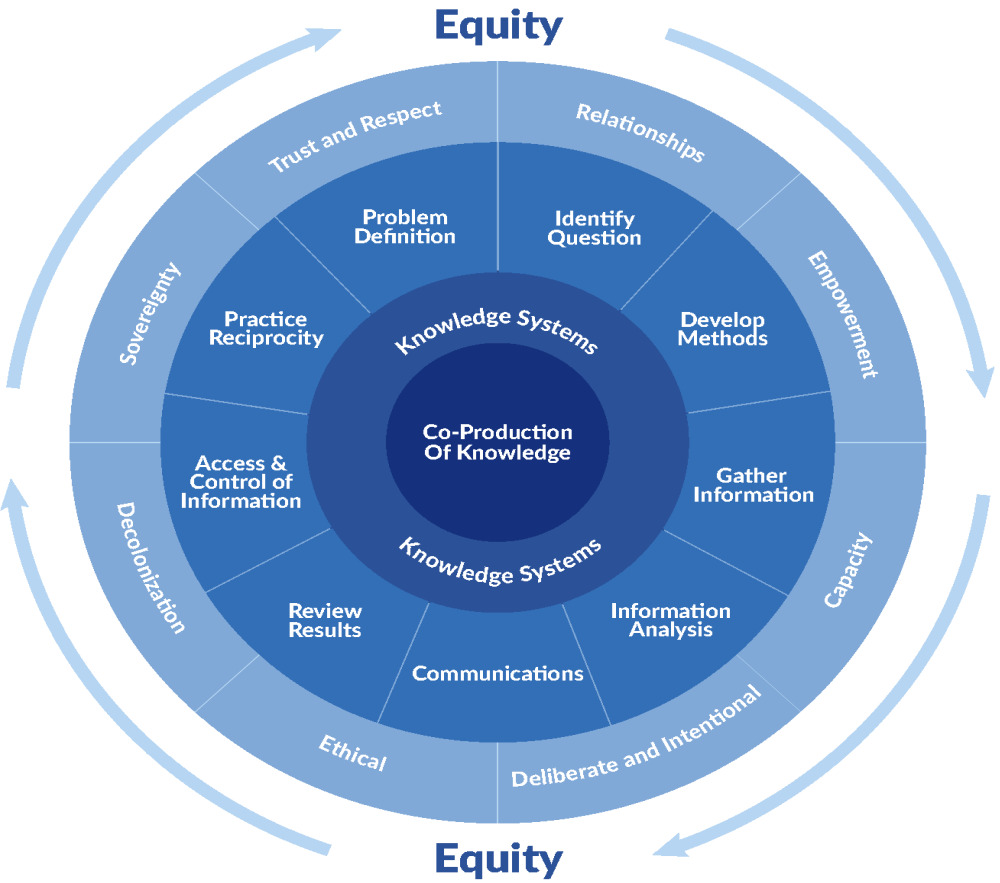
Integrated Ecosystem Assessment.

Integrated Ecosystem Assessments (IEA) synthesize understanding regarding all components of an ecosystem, including humans, to inform the decision- making process and provide Ecosystem- Based Management advice. While IEAs are policy relevant they are not policy prescriptive. A key element of each step of the IEA process (see figure) is collaboration and co-production of knowledge. IEAs can be useful for coordinating synthesis, consideration of multiple perspectives, informing management decisions, and evaluating tradeoffs, risk, and cumulative impacts.



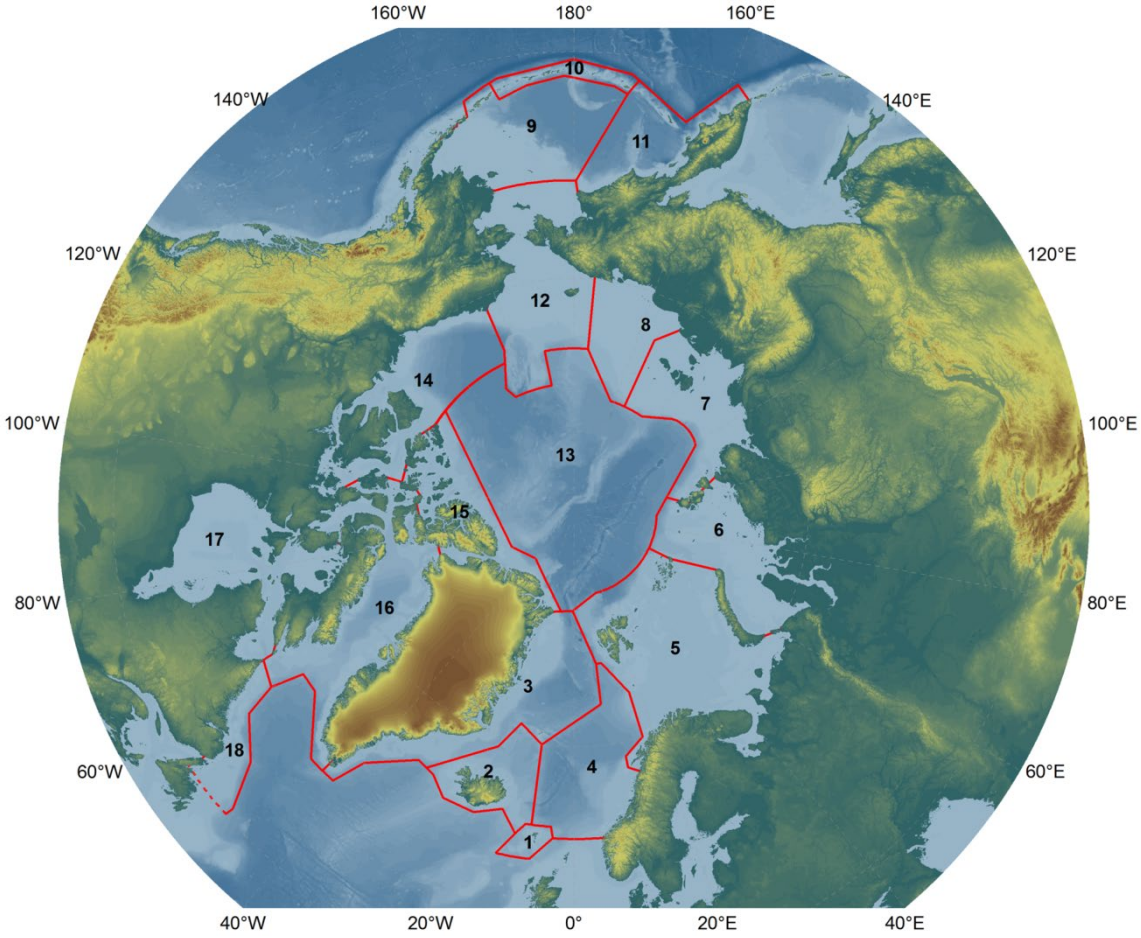
Indigenous Peoples Knowledge Systems and the co-production of knowledge approach

A strong theme in discussions at EA workshops is that Indigenous Peoples knowledge systems are important to different aspects of EA from developing guidelines to implementing the approach. Another recurring theme is the importance of communication, participation and inclusivity. EA benefits from including rightsholders, knowledge and stakeholders in the different stages of the process. This includes co-production of knowledge, which can provide a more comprehensive and holistic understanding of the Arctic ecosystems and the changes that are occurring. An inclusive process will help build interest, expand participation and create settings for those who live and operate in the Arctic to be part of the EA process. “Communicate and engage early and often” is the message from Indigenous Peoples and local Communities.



The Northern Bering Sea – Chukchi Sea LME

The 18 LMEs in the Arctic (see figure) provide a delineation and boundaries, which are useful for implementation of the EA in the Arctic. The LME boundaries define areas of coherent ecological and geophysical processes and provide an appropriate scale for assessing the structural and functional integrity of ecosystems, including the separate and cumulative impacts of human activities. The Northern Bering Sea – Chukchi Sea LME that is the focus of this proposal is Area 12 in the figure below.



APPENDIX 3: DATA SETS AND KNOWLEDGE AVAILABLE

A preliminary list of the data sets and knowledge potentially available:

Survey/Program	Nation(s)
Aerial Surveys of Arctic Marine Mammals (ASAMM)	US
Arctic Marine Biodiversity Observation Network (AMBON)	US
Arctic Integrated Ecosystem Survey	US
Arctic Ecosystem Integrated Survey	US
Chukchi Sea Acoustics, Oceanography, and Zooplankton (CHAOZ)	US
Chukchi Sea Environmental Studies Program	US
Chukchi Sea Ecosystem Observatory	US
Chukchi Sea Offshore Monitoring in the Drilling Area—Chemical and Benthos study and Hannah Shoal	US
Distributed Biological Observatory	US, Korea, Japan, Canada, Russia, China
K-PORT Project for Understanding and Utilizing Environmental Change in the Polar Regions	Korea, US and Canada
Indigenous Knowledge/Local and Traditional Knowledge	Russia and US
Local Environmental Observer Network	Canada and US
AFSC Groundfish Assessment Program	US
Outer Continental Shelf Environmental Assessment Program	US
Oshoro Maru surveys	Japan
Russian-American Long-term Census of the Arctic (RUSALCA)	Russia and US
Shell Oil and Gas Lease surveys	US
TINRO surveys	Russia
Western Arctic Shelf–Basin Interactions (SBI) Project	US
MV Xue Long (Snow Dragon) surveys	China