PCRC WORKING PAPER SERIES

PCRC 2nd Symposium
"The Future Design of the Arctic Ocean Legal Order"
July 28-29, 2016

PCRC Working Paper No. 9 (March, 2017)

"Large Marine Ecosystems and a Neighborhood Approach to Ecosystem-Based-Management in the Arctic"

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Large Marine Ecosystems and a Neighborhood Approach to Ecosystem-Based-Management in the Arctic[1]

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Introduction

The work of the Arctic Council Task Force on Arctic Marine Cooperation that was launched with the U.S. chairmanship of the Arctic Council in 2015 raises the question of potential models for such cooperation. These remarks investigate how Large Marine Ecosystems (LMEs), which are considered a working tool of the Arctic Council, are already being used in the region, and ways they can better inform marine cooperation there.

[1] This informal paper is based on remarks originally delivered July 29, 2016 at the Kobe University GSICS Polar Cooperation Research Center Symposium on The Future Design of the Arctic Ocean Legal Order in Kobe, Japan.

[2] The author thanks the Polar Cooperation Research Center of Kobe University and its Graduate School of International and Comparative Studies for their generous hospitality and the opportunity to speak at the Symposium. Special thanks go to Professor Akiho Shibata for creating the atmosphere for two days of rigorous and enjoyable exchanges between diplomats, scientists, faculty and students, and for his consistent commitment to spirited discussion between colleagues while training a new generation of Arctic scholars.

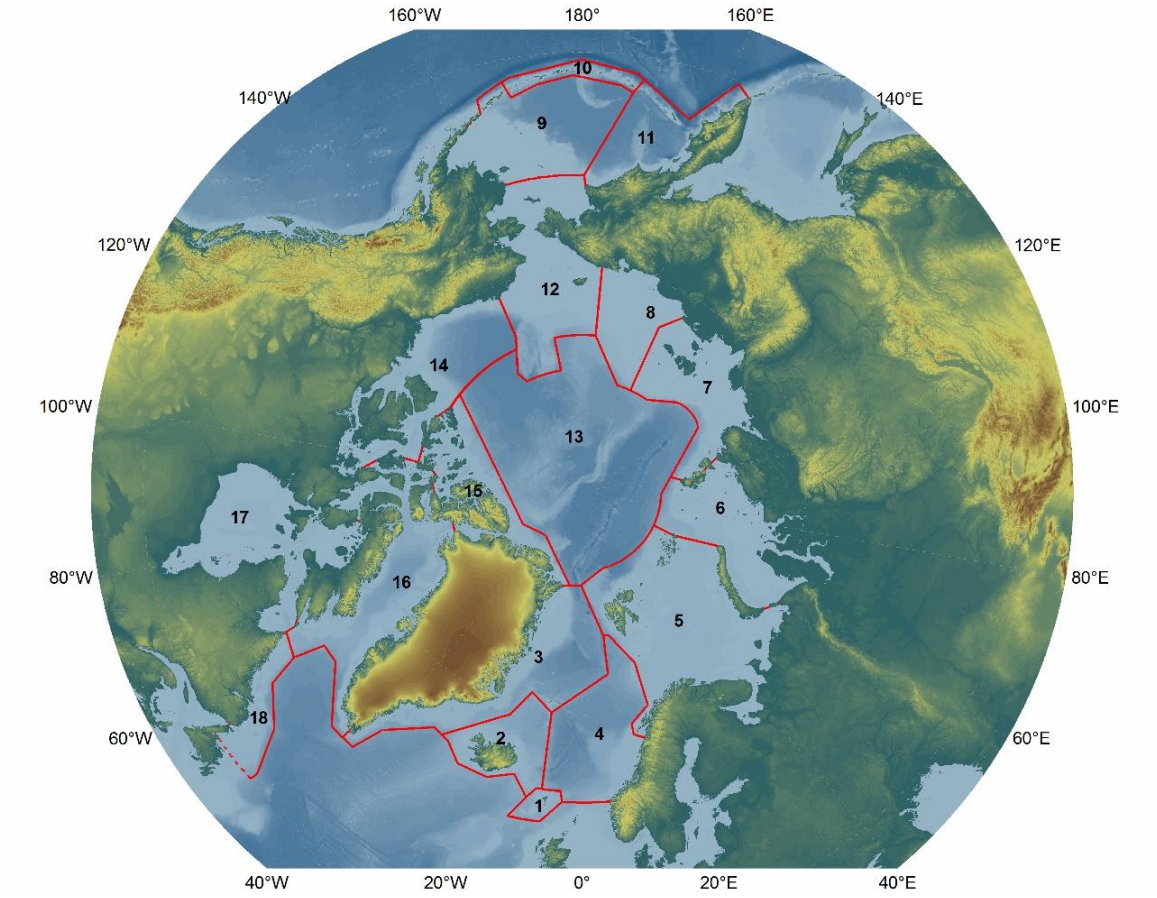

Figure 1. Revised Map of 18 Arctic LMEs (v. 2013)[3]

To begin, this map of the 18 LMEs in the Arctic[4] helps identify potential 'neighborhoods' where states with shared terrestrial or marine boundaries might usefully cooperate on Ecosystem Based Management (EBM). The LME map is itself an acknowledgment of the Arctic's many different regions, whose diversity is described in ecological and geophysical terms in the supporting information published with the revised map.[5] A more familiar example of how Arctic 'neighborhoods' differ is the winter contrast between relatively less ice-covered waters in the Barents region and the colder more ice rich Beaufort Sea north of Alaska and Canada. The two areas should be managed differently, possibly by joint cooperation between the United States and Canada on the one hand and Norway and Russia on the other. This paper posits the Arctic states as ecosystem neighbors: countries that may find commonalities and efficiencies in working with each other, at least to

[3] PAME Large Marine Ecosystems (LMEs) of the Arctic area, Revision of the Arctic LME map Second Edition, PAME-led Group of Experts on the Ecosystem Approach to Management, co-leads Hein Rune Skjoldal and Phil Mundy, Norden 2013, p. 5 (hereafter PAME LME Map 2d ed. 2015)
[4] A list identifying each of the areas appears in Appendix 1 to these remarks.
[5] See PAME LME Map 2d ed. 2015, note 3, above.

identify shared management concerns, in their part of the Arctic even if they never actually manage the area together.

The Protection of the Arctic Marine Environment (PAME) working group of the Arctic Council created a working map of the Arctic LMEs in 2006 and revised it in 2015.[6] This ongoing review is a reminder that ecosystem boundaries are not static and need to be revisited and revised as we learn more about them. Such a flexible, adaptive approach is critical in a time of rapid transitions and climate change uncertainty.[7]

These remarks begin with an introduction to LMEs generally then proceed to two case studies of how LMEs could be used in the Arctic. Part I addresses characteristics of LMEs and the legal basis for using them, starting with the relationship between LMEs and EBM in the Arctic. Part II presents a pair of Arctic 'neighborhood' case studies. The more formal version of these remarks planned for publication as a research paper in connection with the Kobe Symposium will build on these case studies to suggest how better to use LMEs as a tool for cooperation in the marine Arctic.

Part I. An Introduction to LMEs

A. LMEs and the Ecosystem Approach to Management

LMEs are essential to the Ecosystem Approach (EA) to management.[8] Recently, an entire 2016 thematic issue of the journal *Environmental Development* was dedicated to the EBM of LMEs.[9] At a fundamental level, EBM is premised on properly identifying the scope of the ecosystem to be managed. The Arctic Council defines EBM as

> the comprehensive integrated management of human activities based on best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of ecosystems

[6] Id., p. 1.
[7] See e.g. Clement, J. P., J. L. Bengtson, and B. P. Kelly. 2013. Managing for the future in a rapidly changing Arctic, A Report to the President. Interagency Working Group on Coordination of Domestic Energy Development and Permitting in Alaska (D. J. Hayes, Chair), Washington, D.C.
[8] This paper uses the terms Ecosystem Approach (EA) and Ecosystem Based Management (EBM) synonymously, as does the Arctic Council. See, e.g. Arctic Council, Ecosystem Based Management in the Arctic, Report submitted to Senior Arctic Officials by the Expert Group on Ecosystem-Based Management, May 2013, p. 11.
[9] Thematic Issue - Ecosystem Based Management of Large Marine Ecosystems, Edited by Kenneth Sherman and Hashali Hamukuaya, Environmental Development Volume 17, Supplement 1, Pages 1-356 (January 2016).

> thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity.[10]

The Council's first Arctic Marine Strategic Plan (AMSP) 2004, identified one "Strategic Action" as defining ecosystems in the marine Arctic based on the best ecological information, a step that is "fundamental to implementing EA because of the necessity of knowing the geographic scope over which the negative consequences of human activities are to be identified, assessed, and addressed."[11] PAME revised the AMSP in 2015 for the decade 2015-2025, referencing the delineation of the 18 Arctic LMEs as an important initial step in implementing the new AMSP.[12]

Kenneth Sherman, a central figure in the development of LMEs, recently recalled the innovations that the concept of ecosystems brought to marine management:

> previous management approaches had failed to look beyond individual sectors (such as pollution discharge, mineral extraction, transportation, or fisheries harvest) and political boundaries. Those with regulatory authority over one sector made decisions on each of these uses in isolation from decisions on the others. Fish harvest decisions were made on a single-species basis, without recognizing interactions among species, such as predator-prey or competitive relationships.[13]

LMEs, like ecosystems, are defined not by political boundaries but by ecological criteria including bathymetry, hydrography, productivity, and related and dependent populations within those boundaries. LMEs are generally regions of ocean space 200,000 km² or larger, adjacent to the continents in coastal waters and areas where primary productivity is generally higher than in open ocean areas.[14] LMEs produce 80% of world's annual marine fish catch, allow ecosystem scale management of vast ocean areas crossing national boundaries and often do so in settings involving transboundary cooperation.[15]

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[10] Arctic Council, PAME, Arctic Marine Strategic Plan 2015-2025, p. 10.
[11] PAME LME Map 2d ed. 2015, note 3, above, p. 1.
[12] Arctic Council, PAME, Arctic Marine Strategic Plan 2015-2025, p. 13.
[13] Kenneth Sherman, Toward ecosystem-based management (EBM) of the world's large marine ecosystems during climate change, Environmental Development (2014), 11: 43–66.
[14] See, e.g., National Oceanic and Atmospheric Administration, http://www.lme.noaa.gov/
[15] See, e.g., Kenneth Sherman, Food for Thought: Sustaining the world's large marine ecosystems, ICES Journal of Marine Science (2015), 72(9), 2521–2531. doi:10.1093/icesjms/fsv136 , at 2521; and National Oceanic and Atmospheric Administration, http://www.lme.noaa.gov/

A 2016 summary of status and trends in LMEs identifies 66 globally, and provides assessments of their functions and effectiveness as management units for national, bilateral and multinational marine ecosystems.[16] The Global Environment Facility (GEF) plays a key role in promoting and funding LMEs in the developing world. For 2014–2018 the GEF has committed to $2.8 billion for initiating new LME projects and augmenting others.[17]

In addition to the ecological criteria used to define LMEs (bathymetry, hydrography, etc.), all LMEs use the same five information modules to assess change: biological productivity; fish and fisheries; pollution and health; and socioeconomics and governance. The five modules are effective because they are transparent to all actors involved in marine resource management.[18] Those actors include scientists, resource managers, ministers of countries participating in management of the LME, and United Nations partners (e.g. UNDP, UNEP, UNIDO, FAO, and IOC-UNESCO). LMEs also generally use the same processes and common methods, which allows for comparability across LMEs. Two steps are common to how LMEs are approached after they have been identified and states have committed to managing them: conducting a Transboundary Diagnostic Analysis or TDA, and developing a Strategic Action Plan (SAP).

B. Legal Foundations for EBM and LMEs

A brief discussion of possible legal foundations for the use of EBM and LMEs as management tools is in order before turning to the case studies. As seen above, LMEs are ecologically defined areas and EBM is an ecologically based management tool. LMEs and EBM are thus both based on ecosystem science, but the legal bases for the two concepts are less clear.

Numerous studies recount how the use of the term 'ecosystem' has developed in soft and hard law sources.[19] The term has developed over some three and a half decades in non-binding instruments on the one hand, such as international conference declarations and

[16] IOC-UNESCO and UNEP, Large Marine Ecosystems: Status and Trends, Summary for Policy Makers. United Nations Environment Programme (UNEP 2016), Nairobi, available at http://www.geftwap.org/water-systems/large-marine-ecosystems.

[17] See http://www.geftwap.org/water-systems/large-marine-ecosystems

[18] Sherman, K. (2015). Sustaining the world's large marine ecosystems, ICES Journal of Marine Science, 72: 2521–2531, p. 2525.

[19] For an arctic context see, e.g. Alf Håkon Hoel, Ocean Governance, the Arctic Council and Ecosystem Based Management, in Leif Christian Jensen, Geir Hønneland, Handbook of the Politics of the Arctic, 2015, Edward Elgar, 265-280, at 27; and Arctic Council, Ecosystem Based Management in the Arctic, Report submitted to Senior Arctic Officials by the Expert Group on Ecosystem-Based Management, May 2013, p. 11: "The ecosystem approach and/or EBM have been referenced in a broad range of international fora, including in Agenda 21, the CBD, the Law of the Sea, the World Summit on Sustainable Development, UNEP, and others." For a European context see also Ronán Long, Legal Aspects of Ecosystem-Based Marine Management in Europe. 26 Ocean Yearbook (2012) 417-484.

plans (e.g. the Johannesburg World Summit for Sustainable Development Joint Plan of Implementation which "Encourage[d] the application by 2010 of the ecosystem approach"[20]), and in binding international agreements on the other.

An early legally binding example is the 1982 UN Convention on the Law of the Sea (LOS Convention[21]). The Convention mentioned ecosystems only once, in specifying every state's obligation to "protect and preserve rare or fragile ecosystems" from marine pollution (Art. 194). More important for ecosystem science was the fact that LOS Convention established Exclusive Economic Zones (EEZs). The broad acceptance of this new maritime zone by parties and non-parties alike paved the way for creation of new tools to manage the enlarged areas of coastal state jurisdiction over marine resources. Ecosystem science and EBM were among the tools[22] developed in the wake of the "national ownership conditions" which also "accelerated the growth of marine institutions, agencies, and academic institutions" and "initiated a period of growth, allowing for practice of fisheries assessment and management to undergo broadening support for fishery ecology and oceanography studies."[23]

The Convention for the Conservation of Arctic Marine Living Resources, also opened for signature in 1982,[24] has developed into a model of EBM.[25] Article II.3.c. includes ecosystem relationships as one of CCAMLR's principles of conservation, stating the principle as:

> (c) *prevention of changes or minimisation of the risk of changes in the marine ecosystem which are not potentially reversible over two or three decades*, taking into account the state of available knowledge of the direct and indirect impact of harvesting, the effect of the introduction of alien species, the effects of associated activities on the marine ecosystem and of the effects of environmental changes, with the aim of making possible the sustained conservation of Antarctic marine

[20] Plan of Implementation of the World Summit on Sustainable Development, http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/WSSD_PlanImpl.pdf
[21] United Nations Convention on the Law of the Sea art. 2(1), Dec. 10, 1982, 1833 U.N.T.S. 397.
[22] See, e.g. Maria Hammer and Alf Håkon Hoel, 2012, The Development of Scientific Cooperation under the Norway–Russia Fisheries Regime in the Barents Sea, Arctic Review on Law and Politics, vol. 3, 2/2012, 244–274, at 247, available at http://site.uit.no/arcticreview/files/2013/09/The-Development-of-Scientific-Cooperation-under-the-Norway%E2%80%93Russia-Fisheries-Regime-in-the-Barents-Sea.pdf
[23] Sherman 2015, p. 2522.
[24] Convention on the Conservation of Antarctic Marine Living Resources, done at Canberra, 20 May 1980, in force 7 April 1982, I-22301; UNTS 1329; 19 I.L.M. 841 (1982).
[25] See, e.g. A. Fabra, V. Gascón / The International Journal of Marine and Coastal Law 23 (2008) 567–598 575, citing to C. Redgwell, "Protection of Ecosystems under International Law: Lessons from Antarctica," in: A.E. Boyle and D. Freestone (eds.), International Law and Sustainable Development: Past Achievements and Future Challenges (Oxford University Press, Oxford, 1999), 205– 224, at 205–06.

living resources. (Emphasis added.)

The use of the term ecosystem has been traced through other treaties and decisions of treaty bodies, including the 1995 UN Fish Stocks Agreement, whose Art. 5 refers to management of same-ecosystem species, and the Convention on Biological Diversity Conference of the Parties Decisions V/6 (2000)[26] & VI/12 (2002),[27] which encourage parties to apply the EA assisting those having difficulty doing so. Softer sources of norms have also encouraged if not required states to adopt the EA or take ecosystem considerations into account.[28] Limited research indicates that Gable offers the most recent and detailed discussion about whether the use of LMEs in the context of EBM has become customary international law (he is inconclusive on this point), but his discussion is already over a decade old.[29] Any formal journal version of this paper will delve more deeply into hard and soft law examples, as well as state practice, to determine whether a duty to apply EBM and LME has reached the point of customary international law.

Part II Case Studies

LMEs in the Arctic Council

Ecosystem Based Management (EBM) is "a cornerstone of the work of the Arctic Council and an important principle to the Arctic States."[30] PAME's Arctic Marine Strategic Plan (AMSP) for the years 2015-2025 reiterates the Arctic Council's vision for the Arctic marine environment: "Healthy, productive, and resilient Arctic marine ecosystems that support human well-being & sustainable development for current and future generations."[31]

LMEs are informational only, but a critical component of the AMSP's efforts to achieve its Goal 2 to "conserve and protect ecosystem function and marine biodiversity to enhance

[26] UNEP/CBD/COP/5/23, annex III.
[27] UNEP/CBD/COP/6/20, annex I.
[28] See, as only one of many examples, General Assembly resolution A/RES/57/142 (2002), encouraging states to apply EA by 2010 to help address illegal, unreported and unregulated fishing.
[29] Frank J. Gable, Emergence of a Science Policy-Based Approach to Ecosystem Oriented Management of Large Marine Ecosystems, in: T.M. Hennessey & J.G. Sutinen (eds), Large Marine Ecosystems: Sustaining Large Marine Ecosystems: The Human Dimension (Elsevier Science 2005), 273-295,at 280-282; Martin H. Belsky**,** Interrelationships of law in the management of large marine ecosystems, in: K. Sherman, L. M. Alexander, and B. D. Gold (eds). Large Marine Ecosystems: Patterns, Processes, and Yields, 224–233, AAAS Press, Washington, DC, 1992; and Martin H. Belsky, *Using Legal Principles to Promote the Health of the Ecosystem*, in PROCEEDINGS, SYMPOSIUM: THE GULF OF MEXICO: A LARGE MARINE ECOSYSTEM (D. Rapport ed., 1996).
[30] Arctic Council, Arctic Marine Strategic Plan 2015-2025, p. 10.
[31] Id., p. 8.

resilience and the provision of ecosystem services." According to the Plan, achieving Goal 2 "will require an ecosystem approach" which in turn will build on LMEs, requiring[32]

> *attention to all key activities affecting not only the marine ecosystem but also related coastal zones*. Initial steps already taken include the identification and delineation of *eighteen Arctic Large Marine Ecosystems (LMEs)* and the description of Areas of Heightened Ecological and Cultural Significance within them. In addition CAFFs CBMP network has identified marine areas to harmonize and integrate efforts to monitor the Arctic's living resources and to facilitate Arctic biodiversity conservation and the sustainable use of the region's natural resources. These marine areas correlate with the LMEs.[33]

The essential border-spanning character of LMEs renders them a particularly effective tool for structuring Arctic Marine cooperation. A critical feature of all Arctic LMEs is their disregard of political boundaries. As seen in Part I, LMEs are not defined by national borders or maritime zones, but by four general ecological and geophysical criteria.[34] Some Arctic LMEs are contained within one nation's ambit, but many comprise areas that are both within (Exclusive Economic Zones) and beyond (High Seas) national jurisdiction.

LMEs that either span both maritime zones or involve two or more countries have the potential to stimulate Arctic marine cooperation. They provide states with a framework to apply their own domestic versions of EBM in areas under their national jurisdiction, while experimenting in cooperation with other states to harmonize or coordinate EBM in areas that are either under their neighbor's jurisdiction or beyond any national jurisdiction. The two case studies were chosen in part because they involve Arctic neighboring coastal states that border on shared LMEs.

[32] "Goal 2: Conserve and protect ecosystem function and marine biodiversity to enhance resilience and the provision of ecosystem services." AMSP2015, id., p. 6.
[33] AMSP 2015, id., p. 13., emphasis added.
[34] PAME Large Marine Ecosystems (LMEs) of the Arctic area (2013), note 3 above, p. 5.

A. Barents Sea Case Study: The Ocean-1, -2, and -3 Project of the Joint Russia-Norway Commission on Environmental Protection

The Ocean-1, -2, and -3 Project of the Joint Russia-Norway Commission on Environmental Protection (CEP) does not formally invoke the Barents Sea LME (LME 4 on the map in Figure 1).[35] The Joint Norwegian - Russian environmental status Report on the Barents Sea Ecosystem for 2013, which is related to the Ocean 1-2-3 Project, notes that "[i]nternationally, the Barents Sea has been identified as a Large Marine Ecosystem (LME),[36] but makes no reference to the PAME Arctic LME map or supporting materials. Nonetheless, the fact that the Barents Sea LME overlaps substantially with the project area and crosses the Norwegian-Russian maritime boundary renders the Ocean-1, -2, and -3 Project a relevant case study. It also highlights the practical difficulties of translating the 18 Arctic LMEs identified by PAME, which are purely informational, into national management schemes, which may have different definitions of the relevant ecosystem management area than those identified by the 18 Arctic LMEs.[37]

The Ocean-1 phase of the CEP project has the longest timeline; its goal is to develop an EBM plan for the Russian side of Barents Sea.[38] The Ocean-2 component, the Barents Portal, already exists as a joint instrument for mutual exchange of information on integrated ecosystem management and a platform for environmental status reports.[39] Ocean‐3, ecosystem monitoring in the Barents Sea, will support components 1 and 2 and "will establish a base for the joint ongoing Norwegian‐Russian monitoring of Barents Sea ecosystem."[40]

This three-prong project represents nascent steps toward EBM on the Russian side of Barents Sea[41] by the joint CEP and its working group on the Marine Environment. The

[35] It is also important to note the preliminary research reported in this section is constrained by the author's reliance on English language sources only, due to her inability to read Norwegian and Russian.
[36] McBride, M.M., Hansen, J.R., Korneev, O., Titov, O. (Eds.) Stiansen, J.E., Tchernova, J., Filin, A., Ovsyannikov A. (Co-eds.) 2016. Joint Norwegian - Russian environmental status 2013, Report on the Barents Sea Ecosystem. Part II - Complete report, IMR/PINRO Joint Report Series, 2016 (2). ISSN 1502-8828, at 349. A web version of the Full Report (Part II) is published on www.barentsportal.com.
[37] Canada, for example, was still using Large Ocean Management Areas as the management unit for the Beaufort Sea, with no mention of the Beaufort LME in its 2012 status report.See A. Niemi, et al., State of the Ocean Report for the Beaufort Sea Large Ocean Management Area, Canadian Manuscript Report of Fisheries and Aquatic Sciences 2977, 2012.
[38] Oleg Korneev, Oleg Titov, Gro I. van der Meeren, Per Arneberg, Julia Tchernova, Nina Mari Jørgensen, Final report 2012 – 2015 Joint Russian-Norwegian Monitoring Project – Ocean 3, BRIEF REPO RT SERIES/ KORTRAPPORT 030 NORSK POLARINSTITUTT 2015, p. 6, available at https://www.afsc.noaa.gov/Arctic_fish_stocks_third_meeting/meeting_reports/Appendix-A9-Final_report_Joint_Russian_Norwegian_Monitorig_Project-Ocean3-Npolar_30_2015.pdf , at 349.
[39] http://www.barentsportal.com/barentsportal/index.php/en/
[40] Korneev et al. Final Report-Ocean 3, note 37, above, p. 6.
[41] The Russian contribution to a seminal Arctic Council report on EBM in the Arctic (BePOMar) contains multiple references to the use of LMEs in Russian marine research, see V. V. Denisov and Yu. G. Mikhaylichenko, Management of the Russian Arctic Seas, in: Alf Håkon Hoel (ed.), Best Practices in

Norwegian waters of the Barents Sea, by contrast, are managed under a long-standing program of EBM. Norway was among the first countries globally to establish integrated marine management plans for all its marine areas,[42] in part to provide certainty for industrial operators.[43] The Norwegian legislature introduced its Integrated Oceans Management Plan for the Barents Sea in 2006 and revised it again in 2011.[44]

This contrast in EBM experience between the two countries renders the Ocean 1-2-3 Project especially instructive for Arctic states with either different levels interest in EBM, or different levels of development of EBM mechanisms. Norwegian project participants do not impose their more detailed national EBM approaches on Russia. Rather both countries may use the project to jointly collect and share scientific information, and to exchange their respective experiences with the ecosystem approach to management in the Barents Sea.

Institutional nesting and interplay is another important feature of the Ocean 1-2-3 project.[45] The Project is nested within two larger and longer-running joint Russian-Norwegian cooperative structures. At one level, the Ocean 1-2-3 project is not just a product of the Joint CEP, which was established in the 1990s. Arguably formation of the CEP was itself possible only because the Joint Norwegian-Russian Fisheries Commission (JFC) established in 1975[46] had a proven track record on marine management related matters and could serve as a model for successful cooperation between the two countries.[47] A further institutional layer was the creation in 2006 of a new CEP working group, The Norwegian-

Ecosystem-Based Oceans Management in the Arctic, Norwegian Polar Institute Report Series No 129, 2009, 19-35. The extent to which Russia incorporated aspects of EBM in its oceans and arctic laws and policies since then remains to be researched for the final paper.

[42] Timing: First Barents Sea and Lofoten Area Plan, 2006, revised 2011; Norwegian Sea 2009; Barents/Lofoten plan updated 2011, North Sea and Skagerrak 2013; see http://miljodirektoratet.no/no/Havforum/Forside/English/

[43] Erik Olsen, Silje Holen, Alf Håkon Hoel, Lene Buhl Mortensen, Ingolf Røttingen, How Integrated Ocean governance in the Barents Sea was created by a drive for increased oil production, Volume 71, September 2016, Pages 293–300, http://dx.doi.org/10.1016/j.marpol.2015.12.005

[44] For a detailed discussion of Norway's IOMP see Alf Håkon Hoel, Integrated Oceans management in the Arctic: Norway and Beyond, Arctic Review on Law and Politics, vol. 1, 2/2010 p. 186-206. ISSN 1891-6252, available at http://site.uit.no/arcticreview/files/2012/11/AR2010-2_Hoel.pdf

[45] Graham Marshall, Nesting, Subsidiarity, and Community-based environmental Governance beyond the Local Scale. International Journal of the Commons. 2(1), (2007), 75–97. DOI: http://doi.org/10.18352/ijc.50, at 78: "The potential advantages of nested governance for robustness can arise also from how they complement a relatively decentralized system with higher governance levels capable of dealing with problems which exceed the current capacities of at least some lower-level units to solve by themselves ... The overlapping and redundancy of management units in nested arrangements may itself contribute to robustness."

[46] See The Agreement between the Government of the Kingdom of Norway and the Government of the Union of Soviet Socialist Republics on co-operation in the fishing industry of 11 April 1975 and the Agreement between the Government of the Kingdom of Norway and the Government of the Union of Soviet Socialist Republics concerning mutual relations in the field of fisheries of 15 October 1976.

[47] See generally Hammer and Hoel, 2012, note 22 above.

Russian Working Group on the Marine Environment. Notably, the forty-year dispute between the two countries as to their maritime boundaries in the Barents Sea did not prevent the JFC from functioning effectively. Indeed, the 2010 agreement that resolved that boundary dispute makes explicit reference to the fishery cooperation and extends it into the future.[48]

Another example of institutional interplay is the fact that information gathered for the Joint Fishery Commission also plays a key role in monitoring the ecosystem status of the Barents Sea.[49] Joint ecosystem surveys have been ongoing since 2004 by Norwegian Institute of Marine Research and Russian PINRO. Based on their joint monitoring, the two institutes have co-published reports on the state of the Barents Sea ecosystem since 2006, most recently for 2013.[50] Most of the monitoring and science is carried out under the fisheries cooperation, not the environment cooperation, which is still rather limited. Generally speaking, the southern part of the Barentshavet Sea is among the most thoroughly surveyed in the world. The northern part, which is ice covered in winter, is less well surveyed. The ecosystem surveys take place in fall and cover the entire ice-free areas. When a new ice going research vessel is launched in 2017, also ice-covered waters will be included.[51]

B. Central Arctic Ocean (CAO) Case Study

The Central Arctic Ocean LME [13 on the map in Figure 1] is well suited as a pilot area for arctic marine cooperation, for several reasons. First, most of the CAO LME is high seas and thus beyond national jurisdiction, but it also includes parts of all five Arctic Ocean coastal state EEZs. This allows coastal states to cooperate with each other beyond national jurisdiction while being firmly grounded in their own national versions of EBM as applied in their respective EEZs. The CAO is also the site of current, active coordination between states. Arctic and non-Arctic states alike have indicated a willingness to work together in the CAO in such venues as the Arctic Council agreement on Search and Rescue (Arctic states only), the ongoing negotiations for a possible commercial fishery moratorium, and

[48] Treaty between the Kingdom of Norway and the Russian Federal concerning Maritime Delimitation and Cooperation in the Barents Sea and Arctic Ocean, available in Norwegian, Russian and English at https://www.regjeringen.no/en/aktuelt/treaty/id614254/.
[49] See Barents Portal, Barents Sea Environmental Status, A Norwegian Russian Collaboration, http://www.barentsportal.com/barentsportal/index.php/en/joint-russian-norwegian-monitoring-project/103-pdf-downloads
[50] McBride, et al. 2016, note 36 above.
[51] Conversation with Alf Håkon Hoel, July 2016, notes on file with the author. An unpublished paper with more detail and analysis of factors that have made the Joint Norwegian Russian Cooperation work as well as it has, and suggestions how lessons from this 'neighborhood' might be applied to other LMEs in the Arctic, is on file with the author: Betsy Baker, "Cooperation for Stewardship of the Marine Arctic: Ecosystem Based Lessons from Antarctica and the Barents Sea".

the ICES/AMAP/CAFF/PAME Working Group on Integrated Ecosystem Assessment in the Central Arctic Ocean (WGICA).[52]

The CAO also generally sees less human activity than other parts of the Arctic marine area, rendering its more untouched condition appropriate for EBM related conservation measures. At the same time, atmospheric transport of pollutants and other impacts highlight the role of non-Arctic states in affecting the arctic marine environment. The CAO is also in a position to benefit from institutional interplay with other entities. The WGICA identified in the preceding paragraph links Arctic Council working groups to ICES. PAME has identified Areas of Heightened Ecological and Cultural Significance for the CAO, and CAFF's Circumpolar Biodiversity Monitoring program connects the CAO (and other parts of the Arctic marine area) to international efforts under the Convention on Biological Diversity. These linkages also have the potential to draw effectively on science and indigenous knowledge for EBM in the region.

To be sure, the CAO LME is neither pristine nor a blank slate. Still, its relative absence of regulatory measures provides an opportunity for the Arctic States, in their special role as arctic ecosystem stewards, to lead in shaping cooperative mechanisms for balancing conservation and use.[53] As Rochette and others assert in discussing options to strengthen the efficiency of regional initiatives in ABNJ, "interaction may be most successful if it occurs early in the process of establishing conservation and management measures, and if developed into an ongoing process."[54]

The CAO is also a prime venue for the Arctic and non-Arctic states to perform their duty under the law of the sea Convention and International Law to "cooperate with each other in the conservation and management of living resources in the areas of the high seas."[55]

[52] See, e.g. ICES WGICA REPORT 2016, SCICOM/ACOM STEERING GROUP ON INTEGRATED ECOSYSTEM OBSERVATION AND MONITORING ICES CM 2016/SSGIEA:11 REF. ACOM AND SCICOM, First Interim Report of the ICES/PAME Working Group on Integrated Ecosystem Assessment for the Central Arctic Ocean (WGICA).

[53] F.S. Chapin III et al. Ecosystem stewardship: A resilience framework for arctic conservation, / Global Environmental Change 34 (2015) 207–217, offers a persuasive case for framing Arctic state cooperation in the region in terms of ecosystem stewardship.

[54] J. Rochette et al. The regional approach to the conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction / Marine Policy 49 (2014) 109–117, 115.

[55] UNCLOS Art. 118: "States shall cooperate with each other in the conservation and management of living resources in the areas of the high seas. See also Hammer and Hoel, 2012, note 22 above, at 249.

Conclusion

The Ocean-1, -2, and -3 Projects of the Joint Russia-Norway Commission on Environmental Protection (CEP) involve the two countries that share the Barents Sea (large) marine ecosystem. Norway and Russia are at different stages of realizing EBM, and have contrasting governance frameworks for applying it, yet together are building step-wise on existing bilateral science cooperation to extend the ecosystem approach to the entire Barents Sea. By nesting the three projects in established institutions, these neighboring states are able more easily to share EBM methods, fill information gaps, and leverage existing monitoring platforms and data.

As noted above, the Barents Sea LME (LME 5 on the map in Figure 1 above) overlaps substantially with the Ocean-1, -2, and -3 project area and encompasses the Norwegian-Russian maritime boundary, but the projects do not formally invoke the LME. This fact highlights the practical difficulties of translating the 18 Arctic LMEs identified by PAME, which are purely informational, into national management schemes, which often have different definitions of the relevant ecosystem management area than those identified by the 18 Arctic LMEs.[56]

The problem of translating informational LMEs into national management schemes may be somewhat less difficult to overcome in the Central Arctic Ocean LME. The CAO is the site of current, active coordination. Arctic and non-Arctic states alike have indicated a willingness to work together in the CAO in such venues as the Arctic Council agreement on Search and Rescue, the ongoing negotiations for an anticipated commercial fishery agreement, and the ICES/PAME/CAFF/AMAP Working Group on Integrated Ecosystem Assessment in the Central Arctic Ocean (WGICA).[57] In addition, most of the CAO LME is high seas and thus lies beyond national jurisdiction, but it also includes parts of all five Arctic Ocean coastal state EEZs. This allows coastal states to cooperate with each other beyond national jurisdiction while being firmly grounded in their own national versions of EBM as applied in their respective EEZs. The cross-jurisdictional character of the CAO LME makes it a strong candidate for cooperation between neighboring states to improve ecosystem based management of shared Arctic marine areas, even if only through exchange of scientific information and best practices.

[56] Canada, for example, was still using Large Ocean Management Areas as the management unit for the Beaufort Sea, with no mention of the Beaufort LME in its 2012 status report. See A. Niemi, et al. 2012. State of the Ocean Report for the Beaufort Sea Large Ocean Management Area, Canadian Manuscript Report of Fisheries and Aquatic Sciences 2977, 2012. On LMEs as purely informational constructs, see note xx, above.
[57] See, e.g. ICES WGICA REPORT 2016 SCICOM/ACOM STEERING GROUP ON INTEGRATED ECOSYSTEM OBSERVATION AND MONITORING ICES CM 2016/SSGIEA:11 REF. ACOM AND SCICOM First Interim Report of the ICES/PAME Working Group on Integrated Ecosystem Assessment for the Central Arctic Ocean (WGICA), May 2016.

APPENDIX I

Table 1. List of the 18 Arctic Large Marine Ecosystems (LMEs) and their areas.

No	Name	Area (million km^2)
1	Faroe Plateau LME	0.11
2	Iceland Shelf and Sea LME	0.51
3	Greenland Sea LME	1.20
4	Norwegian Sea LME	1.11
5	Barents Sea LME	2.01
6	Kara Sea LME	1.00
7	Laptev Sea LME	0.92
8	East Siberian Sea LME	0.64
9	East Bering Sea LME	1.38
10	Alutian Islands LME	0.22
11	West Bering Sea LME	0.76
12	Northern Bering-Chukchi Seas LME	1.36
13	Central Arctic LME	3.33
14	Beaufort Sea LME	1.11
15	Canadian High Arctic-North Greenland LME	0.60
16	Canadian Eastern Arctic-West Greenland LME	1.40
17	Hudson Bay Complex LME	1.31
18	Labrador-Newfoundland LME	0.41

References:

DFO. 2009. Development of a Framework and Principles for the Biogeographic Classification of Canadian Marine Areas. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2009/056.
DFO. 2009. Development of a Framework and Principles for the Biogeographic Classification of Canadian Marine Areas. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2009/056.