Evaluating Arctic State Implementation of Ecosystem-Based Management Recommendations Supported by the Arctic Council: Canada, Norway, and the US

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Abstract

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The Arctic is a dynamic environment with growing global attention stimulated by a changing climate. Because the Arctic Ocean remains a common pool resource, the need for an ecosystem approach to oceans management (EBM) is widely acknowledged on the international level. In 2009 a report supported by the Arctic Council titled, Best Practices in Ecosystems Based Oceans Management, provided recommendations for EBM implementation. This research project consists of a cross-case comparative analysis of Canada, Norway, and the United States and their efforts to implement EBM in the Arctic ecosystem while incorporating the recommendations into their domestic policies. By utilizing document analysis and a series of interviews, I find significant differences in both the commitment of best practices and level of implementation between the countries. Barriers, opportunities, and future actions are also identified and discussed in an effort to promote further implementation of EBM research among both Arctic and non-Arctic states.

Table of Contents

"By transforming its frame from empty fortress to ecological catastrophe, from military theater to business opportunity, climate change is triggering yet another powerful feedback loop in the [Arctic] region, a distinctly human one, that will transform it in very tangible ways" – Laurence C. Smith

1.0 Research Approach

This research project consists of a cross-case comparative analysis of Canada, Norway, and the United States (US) and their efforts to implement Ecosystem-Based Management (EBM) in the Arctic region. I examine how these three key State leaders in Arctic governance are implementing their plans for EBM in the Arctic. More specifically I ask, to what extent are these three countries committing with the EBM best practices developed in the 2009 *Best Practices in Ecosystems Based Oceans Management* (BEPOMAR) report? [1] In addition to evaluating how the levels of EBM implementation between countries differ, I also assess how implementation has changed since 2009. Lastly, I discuss future plans for EBM implementation in the Arctic. Due to lack of manpower and funding, there has been no other studies found that evaluate how the Arctic nations are implementing Arctic Council recommendations (Young 2013).

1.1 Description of Problem/Background

In the areas outside each Arctic nation's Exclusive Economic Zone (EEZ), the Arctic Ocean remains a global common pool resource. Common pool resources have two defining traits: rivalry and non-excludability (Ostrom 1990). A rival good, preventing simultaneous consumption by other consumers, creates challenges in a common pool resource scenario due to the goods and services also being nonexcludable, creating incentives for actors to compete and over-exploit, and potentially leading to the overuse and diminishment of the resource (Dolsak 2009). However,

[1] This research project is primarily using the 2009 BEPOMAR recommendations for this study. The updated 2013 Arctic Council document recommends that a stronger indigenous knowledge and involvement component be added.

sustainable exploitation of common pool resources is established through appropriate institutions (Ostrom 1990; Dolsak 2009). Due to the belief that the Arctic would remain an ice-covered region, unable to become a navigable waterway or large-scale commercial development site, the region is not currently governed or regulated by any comprehensive hard-law norms or institutions (Borgerson 2008). The cumulative decisions by the Arctic Nations have the potential to profoundly develop the future of the region for decades to come.

The current and future transformative challenges in the Arctic as a result of climate change and increased economic activities such as oil drilling, transportation and shipping routes, mining, and tourism, require revised governance practices that better address change with both adaptation and anticipatory responses (Young 2012). In order to achieve this, all relevant players must adhere to cooperation and collaboration. The utilization of an ecosystem-based approach to oceans management is pivotal to the protection and sustainable use of marine ecosystems, especially when collective effects of multiple uses of the oceans are present (Hoel 2009, p8). The Arctic contains many living marine resources including: the polar bear, narwhal, walrus, seabirds, beluga, bowhead and other whales, as well as fish (WWF

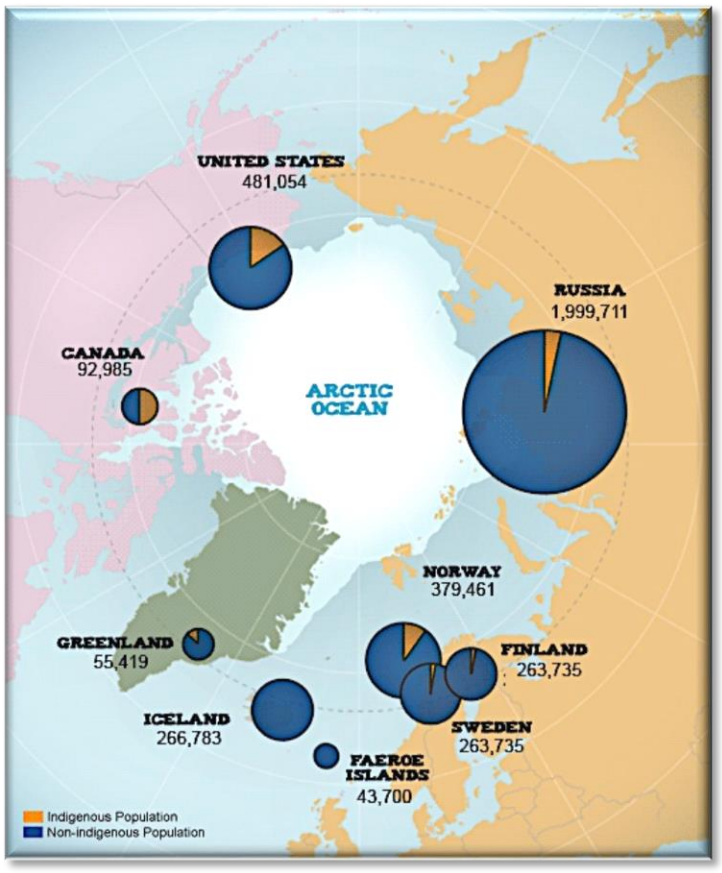


Figure 1: Shows population comparisons of indigenous and non-indigenous peoples of the Arctic nations and the Faeroe Islands. Source: arctic.ru/maps

2013). Certain economic activities have the potential to further threaten the survival of these species, ultimately causing impacts on the human communities residing in the Arctic. The North remains a home to a variety of cultures and communities. "Out of a total of 4 million inhabitants of the Arctic Council region, approximately 500,000 belong to indigenous peoples," as illustrated in **Figure 1** (Arctic Council 2013). These communities not only rely on the sea ice itself, but also on many living marine resources for subsistence harvesting. With a warming climate, the marine species and indigenous communities of the Arctic face a number of challenges that threaten their quality of life and even cultural survival (Arctic Council 2011).

In order to both sustainably utilize and protect the biodiversity and ecosystem functions, adaptive management of natural resources and economic activities is key. EBM is a holistic management concept that incorporates the "interconnectedness and interdependent nature" of ecosystem elements and stresses the importance of ecosystem structures and functions (Curtin and Prellezo 2010). It has the ability to involve the necessary players, aide in protecting the surrounding environment that both people and animals need to survive, in addition to addressing economic needs and potential gains. Ecosystem management is defined as "[…] focusing on ecological systems that may cross administrative and political boundaries, incorporating a 'systems' perspective sensitive to issues of scale, and managing for ecological integrity[2] (Endter-Wada et al. 1998). EBM aims to expand the scope of traditional resource management by emphasizing ecological, environmental and human factors including resource exploitation (Curtin and Prellezo 2010). Some scholars claim that EBM has the potential to maintain the ecosystem structure, thus allowing the ecosystem to have redundancies and resilience to environmental change (Ruckelshaus et al. 2008).

[2] This is just one of many working definitions of ecosystem management.

Economic activities infiltrating the Arctic may provide a basis for a surge of economic growth, with some believing the decrease in sea ice could save the shipping industry billions of dollars annually, and may also hold the "last great undiscovered hydrocarbon resources on earth" (Bogerson 2008). Assumptions such as these have led to an exponential growth in country attention and involvement. The resource uses in the Arctic must be planned and executed sustainably, while targeting adaptable management of the coexistence of activities in different sectors (Hoel 2009, p8). The accrual of benefits to Arctic communities must be a priority by the industry and governing bodies, especially regarding the economic activities that require environmental and safety standards. Due to both climate change and pollution issues, the minimization of negative impacts surrounding commercial activities on the ecosystems and living resources is vital. An EBM approach of Arctic waters exposes a number of issues with commonalities across the Arctic region such as: "ice-covered waters, transboundary cooperation, fisheries management, exploitation of petroleum under severe climate conditions, long-range transport of pollutants, indigenous communities, socio-economic growth and sustainability issues, and the impacts of climate change" (Hoel 2009, p8).

Inclusion of stakeholders in the decision-making process is key when addressing issues such as resource exploitation that have the potential to drastically affect the local communities. EBM requires involvement of stakeholders from all levels including fishermen, local community members, public officials, scientists, recreationists, conservationists, indigenous people and all others throughout the process (Curtin and Prellezo 2010). Stakeholder involvement in management plans improves transparency, enhancing cooperation and communication on all levels, and deflating the oversight that can occur within bureaucratic processes. By including the opinions and knowledge of all stakeholders, it promotes greater participation, learning of

ecosystem processes, and legitimacy to the management structure (Curtin and Prellezo 2010). Humans are an integral part of the complexity of ecosystems. "[T]he issue of humans being embedded in nature is a dominant theme of EBM in that they exert fundamental influences on nature and nature on them" (Grumbine 1994). EBM recognizes the need to manage for the sustainability of humans as well as ecological communities. This requires practicing adaptive management, the incorporation of broad-based involvement [such as Inuit Qaujimajatuqangit (IQ) and] Traditional Ecological Knowledge (TEK), and collaboration in implementation (Endter-Wada et al. 1998). The maintenance of ecosystems for the current and future populations will fail without the cooperation of people (Curtin and Prellezo 2010).

International cooperation is also vital for successful EBM in the Arctic. Eight Arctic nations lie within the Arctic Circle.[3] The term "Arctic Five" corresponds to the five states with territorial borders in the Arctic: Canada, Denmark (via Greenland), Norway, Russia, and the US (Conley and Kraft 2010). The Arctic Council is the primary governance forum of the Arctic region incorporating the eight Arctic nations, indigenous communities, and permanent observers. It has most governance power when all Arctic nations are in agreement, having the potential to create legally binding agreements, which has proven to be a rare occurrence (Ulmer 2012). Within the Arctic Council, working groups oversee assessment studies and produce reports pertinent to the Arctic region deemed important by the Arctic Council (Fenge 2013). With the approval of the Arctic Council Minsters, the study is published with incorporated recommendations, followed by support of the Arctic Council. EBM is currently addressed in over 20 published reports and memos from at least three of the Arctic Council Working and Expert Groups including: Conservation of Arctic Flora and Fauna (CAFF), Protection of the

[3] Eight Arctic nations: Canada, Norway, Denmark/Greenland, Finland, Sweden, Iceland, Russia, and the United States.

Arctic Marine Environment (PAME), and Sustainable Development Working Group (SDWG) (Arctic Council 2013).

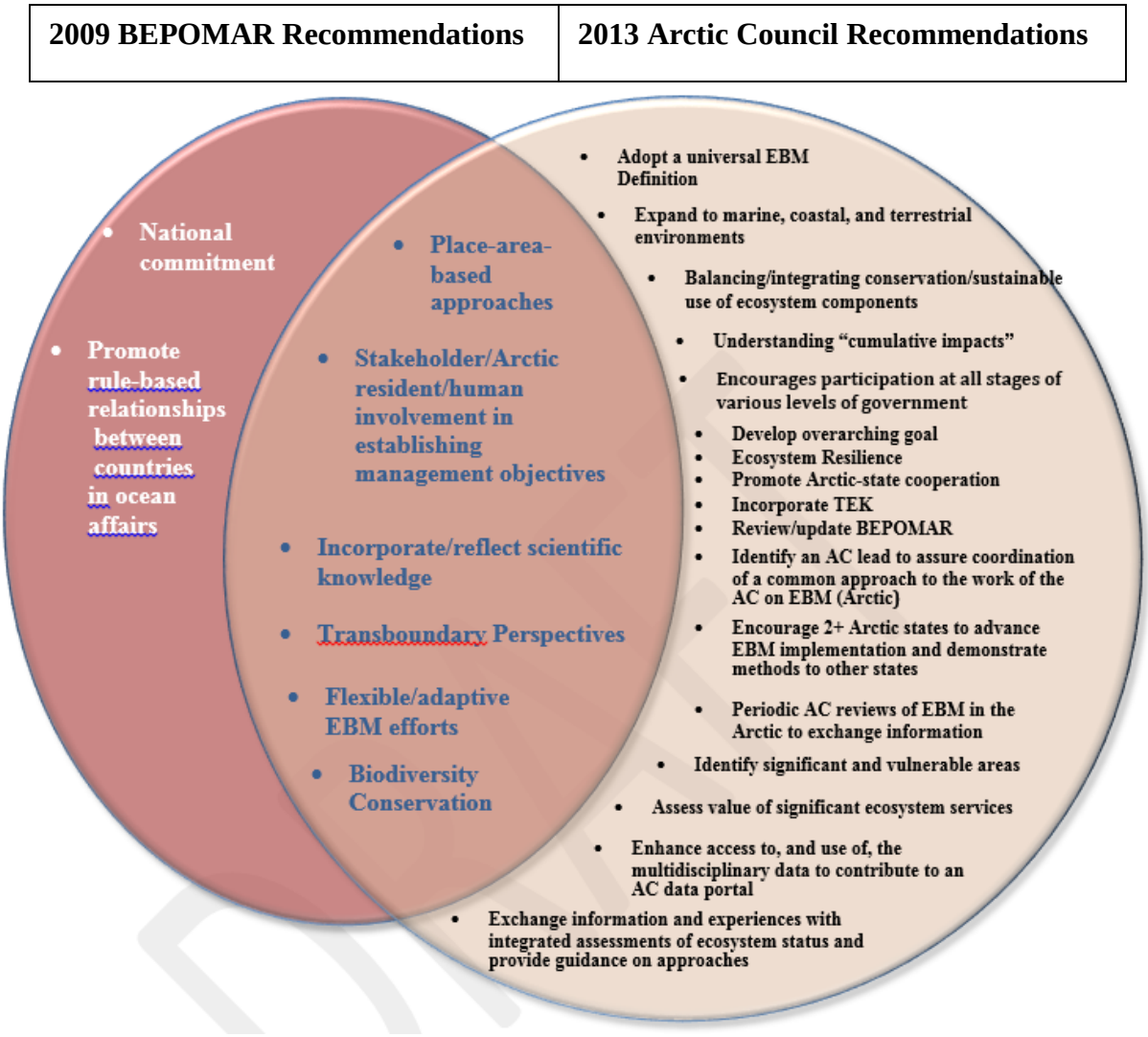
In 2006, the Norwegian chairmanship of the Arctic Council initiated a project on EBM, and was later adopted by the Arctic Council Sustainable Development and the Protection of the Arctic Marine Environment Working Groups in 2007 (Hoel 2009, p5). This project titled, *Best Practices in Ecosystems Based Oceans Management* (BEPOMAR) presents how the Arctic Countries aim to apply an EBM approach to oceans management while also providing six best practice recommendations of EBM implementation: 1) flexible application; 2) science-based and integrated decision-making; 3) national commitment; 4) area-based approaches and transboundary perspectives; 5) stakeholder and Arctic resident participation; and 6) adaptive management (Hoel 2009, p111).

In 2011, the Arctic Council Ministers called for the establishment of an Arctic EBM Expert Group to provide guidelines in advancing EBM in the Arctic. In May 2013, a report was developed by the EBM Expert Group with updated recommendations to the BEPOMAR report by the Arctic Council titled, "Ecosystem-Based Management in the Arctic" (Arctic Council 2013). This updated document helps illustrate how the Arctic Council has adapted over time to be more responsive to EBM. After analyzing both reports, I determined the 2013 recommendations primarily to be more detailed versions of the 2009 recommendations, with a stronger focus on stakeholder involvement (**Appendix A**).[4] Hence, this research project focuses primarily on the six best practices from the 2009 report, with an emphasis on stakeholder involvement and incorporation of traditional ecological knowledge into the decision-making

[4] There is a noted language difference among the six best practices in the 2009 report. In five of the six best practices, the language used includes more aggressive words and phrases such as, "should" and "have to." The remaining best practice regarding stakeholder involvement has much less urgency in the language chosen, for example "can be" and "encouraged."

process. **Figure 2** illustrates the overlap between the recommendations put forth by both documents, showing the progression of the Arctic Council regarding EBM recommendations. Although many of the recommendations listed in the Venn diagram under the 2013 document could be incorporated into most of the six BEPOMAR recommendations listed, each recommendation is listed to provide a thorough overview of what was identified in both documents.

Figure 2



1.2 Analytical Framework and Methodology

Canada, Norway, and the US were specifically chosen based on already existing networking and relationships with contacts in addition to language abilities and time limitations of the researcher. More importantly, these countries can provide a range and distribution of variation regarding EBM implementation among Arctic nations. This study follows a multiple-case design (Yin 2014) while utilizing a triangulation of methods that involve objective evaluation based on content analysis of documents, and subjective evaluation based on interview data. Two evaluative measures were employed to provide scores for each country. In addition, each country was scored for its efforts to implement EBM as of 2009 as a baseline, and again in 2014 to assess implementation. Actions to be implemented after March 2014 constitute as "future" actions.

The first measure to determine levels of EBM implementation in 2009 and 2014, is an analytical framework from previous international regime literature to illustrate how the levels of implementation differ between the three countries (Dolsak, 2009). This framework is applicable due to its ability to measure not only to what extent a country is implementing the regime, but also how regular the implementation is, and how much information the countries communicate to others. Unless a country reports its implementation on an international scale, it cannot influence other countries and their implementation levels. The data source consists of responses of interviews (discussed in following paragraphs) and strategic documents published by each country from 2009 through 2014, including the country-specific sections within the 2009 BEPOMAR report.

Levels of EBM implementation are measured as an ordinal variable with the following levels:

(0) No implementation – Little or no mention of Arctic EBM in strategic documents[5]

(1) The country has developed a strategic document for the Arctic incorporating EBM as a priority, with plans for implementation

(2) The country has begun implementing additional EBM practices

(3) The country has regularly implemented and evaluated its Arctic EBM practices

(4) The country has implemented its EBM practices and is regularly communicating its policies and results on both the national and international level.

The second measure of EBM implementation evaluates the results from a series of anonymous interviews with four key informants from each country, focusing on specific elements of the recommendations and how various stakeholders perceive the level of their implementation. Therefore, it allows for a comparative analysis across issues and stakeholders within a country as well as across countries. At least one interviewee from each country has particular knowledge regarding indigenous involvement, while others are government officials, local non-governmental organization (NGO) representatives, or scholars with intimate knowledge of a country's approach to Arctic EBM.[6][7] The interviews are based off a survey format, using a structured questionnaire and designed to receive open-ended responses (**Appendix B**) (Yin 2014, p112). Each interviewee is asked a broad range of identical questions regarding the country's status of EBM implementation, including specific barriers or opportunities each country has faced or currently faces, future activities, changes in institutional organization, and funding.

[5] The scale provided in the text is for determining the score as of 2009. The 2014 scoring scale is identical except for (0) in 2014, which corresponds to no change since 2009.

[6] Approval and/or exemption for the interviews from the University of Washington's Human Subjects Division (ISR) has been obtained.

[7] It was intended for indigenous representatives to score all best practices, however some interviewees were not comfortable scoring BPs 1-5 and responded with N/A (**Appendix F**).

In a section of the questionnaire, interviewees used an ordinal scale (none, a little, medium, a lot, or completely), to measure how the specific country is incorporating each best practice into its domestic policies both in 2009 and again in 2014. In addition, interviewees used the same scoring method to answer more specific questions regarding incorporation of TEK and indigenous involvement in decision-making processes.[8] Unlike the four-level scale used to measure EBM implementation, this scale provides five possible levels, offering the interviewees with a broader range of options for their responses. The ordinal scores correspond to numerical values to better reflect the verbal description used in the interviews: 0 for none, 2 for little, 4 for medium, 6 for a lot, and 10 for complete, resulting in a potential range from 0 to 80 for each country. This provides the second score of implementation, evaluating the perceived incorporation of the best practices from the BEPOMAR report into domestic environmental policy. Scores are recorded and analyzed, providing values of averages and standard deviations to measure variability among both sectors and countries (**Appendix F**), and summarized in the results section.

This study is limited to three of the Arctic nations as known leaders in EBM practice. Research covering all Arctic Council nations would have provided a greater overview of the commitment of the Arctic nations to EBM. In addition, the research was limited due to the number of interviewees. A larger sample size would have incorporated more perspectives from within each sector and country. There is a substantial variation in scores provided by interviewees within sectors and countries (**Appendix F**).

1.3 BEPOMAR Best Practices

The BEPOMAR study examined the concepts and practices the Arctic nations have developed for an EBM approach to oceans management. Each Arctic nation excluding Sweden

[8] These questions are later labeled as *1 and *2 in graphs located in the results section.

described its experiences in utilizing EBM in the Arctic. Many elements were examined including how these countries are defining EBM, the types of objectives created, and the choice of policy instruments and organization of work such as stakeholder involvement, geographical context, and existing transboundary agreements (Hoel 2009, p8). Two primary questions were asked: "1) which practices and approaches have proved useful in moving toward effective protection and sustainable use of the Arctic marine environment [and] 2) what are the main obstacles and important success elements in moving toward EBM [relevant to the Arctic marine ecosystem]?" (Hoel 2009, p8). The discussion of barriers and successes in EBM by the Arctic nations incorporated other important elements including the process aspects of interagency cooperation and organization, use of science, stakeholder involvement, and the content of EBM, institutions, legislation, policy tools, geographical approaches, and biodiversity considerations (Hoel 2009, p8). Ultimately, the BEPOMAR report summarizes the analytical findings of each nation and identifies the "best possible practices" as recommendations of EBM.

The BEPOMAR project observed six best practices from the Arctic nations that have been proven useful in EBM implementation. It recommends that each Arctic nation apply these Best Practices in order to "provide for sustainable development and protection of the marine environment" (Hoel 2009, p111). The six best practices are (Hoel 2009, p111):

1) Flexible application of effective ecosystem-based oceans management. Due to the variation of ecosystems, EBM must be context sensitive, viewed as a continuous process, and based on best available science.

2) Decision-making must be integrated and science based. This includes: increased communication between states and sectors, cooperation in science and data exchange, addressing knowledge gaps, multiple methods of knowledge (including TEK) must be

incorporated into decision-making processes, and a multi-sector approach and opportunity for stakeholder involvement and comments.

3) National commitment is required for effective management. Each Arctic country must develop a national action plan, emphasizing commitment to conservation and sustainable use of ocean resources. In addition, efforts are required to establish complementary domestic laws, legislation, and enforceable policy tools regarding the governing use of ocean resources. Lastly, an overall framework for EBM implementation is required.

4) Area-based approaches and transboundary perspectives are necessary. Ecosystem management units should be based on ecological criteria, and must consider human elements. Geographical units at various scales must be incorporated, and the identification and protection of key areas and species must be a priority. Regional bodies should be established to aide in international cooperation of shared ecosystems.

5) Stakeholder and Arctic resident participation is a key element. Stakeholder participation can be encouraged by providing for public participation, enabling stakeholders and members of the public to make their voices heard. Stakeholders can be engaged to develop and strengthen cooperative processes and can encourage and achieve compliance through education and enforcement.

6) Adaptive management is critical. Management strategies should reflect changing circumstances, and implementation of EBM should be approached incrementally.

The following section provides evaluations of each country beginning with a detailed baseline as of 2009 in relation to the BEPOMAR recommendations above and strategic documents put forth by the country. For consistency, the baseline is organized with a general overview, followed by summaries of actions categorized by best practices (**Appendices C,D,E**).

Secondly, the section discusses changes in implementation efforts since 2009 including both sets of implementation scores (Table 1 – C,N,U and 2 – C,N,U), based off both document analyses and interview responses. Lastly, it provides an explanation of barriers and opportunities and highlights future actions based of interview responses.

2.0 Results

2.1 A. Canada

Baseline

As of 2009, Canada contains both the legal context and policy framework to support EBM practices, with a plan for moving their concepts and theory into regional implementation (Siron et al. 2009, p82). EBM is being implemented in selected locations, with current efforts being applied in Large Ocean Management Areas (LOMAs). As shown in **Appendix C**, most efforts began within the 2005-2009 time frame. EBM is being implemented incrementally due to barriers such as time, additional resources, size, and complexity of the Arctic marine environment. Beginning in 1970, Canada has enacted legislation managing ecosystems. In 1996, the Oceans Act was the beginning in advancing the EBM approach with the establishment of LOMAs, in addition to promoting national coordination.

Best Practice 1: Flexible Application. The only mention of flexible application found was regarding LOMA ecoregion boundaries. As of 2009, Canada's flexible application is minimal.

Best Practice 2: Science-Based and Integrated Decision-Making. Beginning in 2005, Canada has begun implementing science-based decision-making regarding LOMA establishment, and in many aspects of the Ecosystem Overview and Assessment Reports (EOAR). In addition, Canada seems to incorporate multiple methods of knowledge, including

TEK, due to their comprehensive claims agreements that specify the use of aboriginal traditional knowledge in co-management processes (Berkes, 2007).

Best Practice 3: National Commitment. National commitment is being further developed in Canada. It has been promoted within the Oceans Act and the establishment of an EBM definition and objectives[9],[10]. The Oceans Act required an overarching strategy and policy (Canada's Oceans Strategy (COS)) for oceans management based on three key principles: integrated management, sustainable development, and precautionary approaches (Siron et al. 2009, pp85). The integrated management of human activities in Canada's oceans is incorporated into the "companion document" of the COS.

Best Practice 4: Area-Based Approaches and Transboundary Perspectives. Canada is currently moving forward with their area-based approaches by developing management on a regional scale and the implementation of LOMAs, Regional Coordinating Committees (RCCs), and the growth of international cooperation and agreements. Both MPAs and national parks have also been established, in addition to identifying significant and depleted areas and species. However, Canada has yet to implement EBM in transboundary governance practices.

Best Practice 5: Stakeholder and Arctic Resident Participation. Starting with negotiations and agreements with Aboriginal residents in 1984, Canada has utilized both workshops and focus groups when it comes to LOMAs, in addition to adhering to social,

[9] Canada discusses both EBM and Integrated Management (IM) practices. Canada's operational definition of EBM is applied within the broader context of IM.

[10] Canada's EBM definition: "[EBM] involves managing human activities in such a way that marine ecosystem health is not significantly impacted. [It is] holistic and cross-disciplinary, based on the best knowledge available, a phased implementation process, nationally developed and regionally implemented, area-based, objective-based, applied within the broader context of IM, incorporates the precautionary approach and adaptive management principles" (Hoel, 2009).

cultural, and economic considerations within the EOAR process and establishing land-claim agreements.

Best Practice 6: Adaptive Management. Canada began practicing adaptive management, especially within the 2005-2009 timeframe with the revision of the 2005-2007 Ocean Action Plan into the 2007-2012 Health of the Oceans plan. It has also been highlighted as a key principle in both EBM and integrated management approaches.

Change Over Time 2009-2014

When it comes to EBM implementation in the Canadian Arctic as of 2014, Canada appears to be at a standstill, or perhaps going in reverse (Canada Interview 4 2014). Currently, there is more attention to the cause not action, with continuous discussion leading to strategies and papers around the topic of EBM at only the bureaucratic level. At the political level, an important negative development has emerged due to the current political system lacking in information-based or scientific-based decision-making processes, in addition to a fairly negative and hostile approach to science in general (Canada Interview 4 2014). As a whole, implementation of EBM in the Canadian Arctic is relatively minimal, with priorities remaining at "strengthening of [EBM] principles" (Canada Interview 2 2014). Since 2009, Canada continued exploration of MPA networks and establishment of priority and LOMA regions for future plans (Canada Interview 3 2014). In addition, Canada has set up land claim bodies that were established as a result of aboriginal land claim agreements. These bodies aim to evaluate the ecosystem and the role of the Inuit within those systems, and ultimately attempt to find a balance (Canada Interview 4 2014).

In 2009, Canada earned an overall implementation score of 2 out 4 possible levels (**Table 1 – C**). As the years have progressed, EBM implementation in the Canadian Arctic has not

advanced. As of 2014, Canada earned a zero, as nothing has been done since 2009 to further implement EBM. Interview feedback provided ordinal scores to measure the implementation of the best practices into Canadian domestic environmental policy. The ordinal score for each best practice was averaged and totaled (**Figure 1 – C**). As seen in **Figure 1-C**, there is a slight decrease in implementation of best practices 1-3 and 6. Overall, Canada earned 23.33 out of a possible 80 points in 2009. This has minimally progressed to 28.33 in 2014 (**Table 2 – C)**.

Table 1 - C

Canada	2009	2014
Overall Level of Implementation Score (0-4)	**2**	**0**

Figure 1 – C

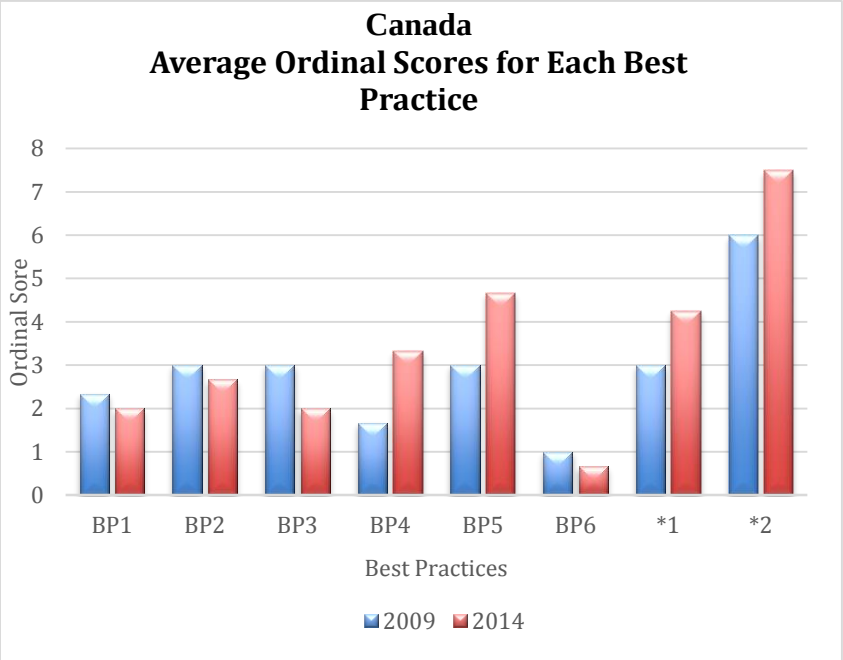


Figure 1 – C: : shows the 2009 and 2014 average ordinal scores from Canada interviews for each of the six best practices and the two additional questions regarding TEK incorporation in decision-making processes (*1) and stakeholder involvement (*2).

Table 2 – C

Canada	2009	2014
Average Total Ordinal Score for Implementation of BP's into Domestic Environmental Policy	**23.33**	**28.33**

Barriers and Opportunities

Canada faces many barriers when it comes to EBM implementation. Most of which, stem from an overall lack of knowledge about the ecosystems in the Arctic. Decision-making must be based on information that flows from extensive scientific research (Canada Interview 4 2014). However, science alone doesn't have the capability to make well thought-out decisions, so decision-makers use politics to aide in the process. Currently, the political system in Canada itself seems to be an issue to many (Canada Interview 4 2014). Like the US and Russia, Canada is a large federation with divided powers among different levels of government. Currently there is plenty of talk between the levels of government, but there is a need for better science communication and cooperation in order to accomplish the evaluation and balancing that is necessary for EBM (Canada Interview 4 2014). There is immense confusion regarding the different levels of management and the authority of different groups, resulting in inconsistent application of principles (Canada Interview 3 2014). Decisions cannot be made without the recognition of trade-offs and prioritization. Another presented barrier involves the best methods in prioritizing between and within ecosystems. There is also a challenge in determining geographical and time scales, or how long EBM practices can be sustained (Canada Interview 4 2014). In order to address these barriers, some believe the laws that must be in place are lacking in existence, in addition to the need for institutional changes to better organize for EBM (Canada Interview 2 2014).

Currently, there is an opportunity for someone to take the lead on Arctic EBM. Implementation must be carefully examined on not only a regional and national level, but a global scale as well (Canada Interview 4 2014).

"I often call the Arctic a victim of a drive by shooting, and the guys in the getaway car aren't even in the Arctic."

In order to obtain the desired results from EBM, there must be some sense of how non-Arctic factors and forces are also being managed. Most of the countries causing in-direct effects on the ecosystem, do not actually reside within the Arctic Circle. There is an incredible need to manage the activities in non-Arctic countries that cause these negative effects on a global scale (Canada Interview 4 2014).

Future Actions

From the point of view of all sectors interviewed, Canada's future plans for EBM implementation are limited. There are ongoing processes such as land-use planning in Nunavut, in addition to a follow up to the AMAP project of which Canada plays a leading role (Canada Interviews 2;4 2014). Some leading scientific figures embedded into the government structure are aimed at advancing Arctic science and have the potential to enable EBM beyond the point of recommendation, if the issue of science communication is addressed (Canada Interview 2 2014). Funding is expected to decrease, as the general environment of Canada has become a victim of cutbacks since the 2008 economic crises (Canada Interview 4 2014).

In terms of future economic activities, the Canadian Arctic is not highly active. Certain activities such as shipping and mining are estimated to increase slowly and incrementally (Canada Interview 2 2014). Oil and gas activities in the Canadian basin are exceedingly expensive and far too risky from an environmental viewpoint (Canada Interview 4 2014). Due to a lack of knowledge of the Arctic ecosystem, associated fishery options are largely unknown. Tourism is also limited due to Canada's lack of capacity and infrastructure (Canada Interview 4 2014). However, Canada is advanced regarding shipping activities, as its polar code may be stronger than the code of the International Maritime Organization (IMO) (Canada Interview 2 2014). Ultimately, Canada does not have the ability to manage these activities on a large scale,

but is prepared for the slow development of some activities remaining at a smaller scale (Canada Interview 4 2014).

2.1 B. Norway

Baseline

Norway is a relatively small country that promotes an efficient and homogenous central administration. This enhances domestic coordination between ministries and agencies from different sectors. As seen in **Appendix D**, approaches for international cooperation began before 1994 and continue on as of 2009. International cooperation, particularly with Russia, has been key for satisfactory management of shared fisheries and the Barents Sea in genera (Hoel et al. 2009, p49). In 2005, a joint Marine Environment group was established between the two countries with the goal of enhancing cooperation on EBM of the Barents Sea. A year later, Norway adopted their Barents Sea Management plan for addressing the main challenges relating to pollution and biodiversity maintenance. As the plan was developed, new legislation was also adopted including the 2008 Oceans Resources Act (Hoel et al. 2009, p46). Although Norway seems to have solid foundation of EBM implementation, indigenous involvement in decision-making is considered deficient as of 2009 (Norway Interview 1 2014).

Objective 1: Flexible Application. Within the 2006 Barents Sea Management Plan, Norway emphasizes the system must be dynamic and flexible enough in order to evaluate and update the plan as new knowledge emerges.

Objective 2: Science-Based and Integrated Decision-Making. Norway receives scientific advice regarding fisheries and the status of marine ecosystems provided by the International Council for the Exploration of Sea (ICES). The Institute of Marine Research is the primary marine research institute in Norway. A number of large and challenging knowledge gaps were identified, including monitoring, research, and mapping needs, and are highlighted as a

priority to fill for successful EBM long-term implementation. The Saami Parliament has a consultation agreement with the Norwegian government, mandating a consultation procedure on all matters pertaining to Saami culture. However, the Saami Parliament was not consulted on the Barents Sea Management plan (Hoel et al. 2009 p 46; Norway Interview 1 2014).

Objective 3: National Commitment. Work on the Barents Sea Management plan was organized through an inter-ministerial Steering Committee chaired by the Ministry of the Environment. [11] In addition, the 2008 Ocean Resources Act promotes national cooperation and commitment by consolidating all relevant provisions for management of Living Marine Resources into a single act.

Objective 4: Area-Based Approaches and Transboundary Perspectives. Under the Barents Sea Management plan, special caution is required and special considerations apply to the assessments of standards for and restrictions on activities in areas that are identified as valuable and vulnerable. By 2012, Norway aims to establish a network of MPAs in Norwegian waters. Currently area-based management is in effect for the framework of petroleum activities that are based on an evaluation of valuable and vulnerable areas and assessment of oil pollution risk (Hoel et al. 2009 p47). As mentioned above, a number of bi- and multi-lateral agreements, in addition to joint environment groups, are currently in effect.

Objective 5: Stakeholder and Arctic Resident Participation. As mentioned above, the Saami Parliament and the Norwegian government currently have a consultation agreement. However, the Saami Parliament is not satisfied with the actual use of the procedure (Hoel et al. 2009, p46; Norway Interview 1 2014). Once the Barents Sea Management plan was

[11] Additional members include the Ministry of Labor and Social Inclusion, the Ministry of Fisheries and Coastal Affairs, the Ministry of Trade and Industry, the Ministry of Petroleum and Energy, and the Ministry of Foreign Affairs.

adopted, the Saami Parliament was invited to the meets that considers he implementation of the plan. Regarding fisheries issues, stakeholders are involved through a Regulatory Meeting arranged by the Fisheries Directorate. A stakeholder conference was conducted regarding the 2008 Oceans Resource Act. Norway claims non-state actors such as environmental non-governmental organizations (NGOs), regional political bodies, and indigenous groups are engaged in issues relating to marine policies.

Objective 6: Adaptive Management. Norway implements adaptive management by re-evaluating current strategic plans and legislation regarding EBM implementation. The Barents Sea Management plan aims to be evaluated annually to incorporate new knowledge and changing situations (Hoel et al. 2009, p49). The framework of petroleum activities will also be re-evaluated in 2010.

Change Over Time 2009-2014

In 2009, Norway had a solid foundation for EBM implementation due to its completed Barents Sea plan. Since then, Norway has developed management plans for all Norwegian Sea areas in addition to a follow up system. All plans undergo revisions typically every four years, beginning with the Lofoten plan in 2010-2011 and the current Norwegian revision process (Norway Interview 3 2014). Socio-economic aspects have been further emphasized to balance the growth and conservation with human needs and activities in the ecosystem, and thereby also value creation (Norway Interview 4 2014). As of 2014, Norway has monitoring plans, established goals for the different sea areas, and a system for filling identified knowledge gaps (Norway Interview 2 2014). These efforts are also currently being addressed for risk management, which also undergoes revision due to new technology and activities (Norway Interview 2 2014).

As of 2009, Norway earned a score of two out of a possible of four levels of implementation (**Table 1 – N**). Norway has continued to regularly implement and evaluate its EBM practices, while communicating its policies and results on both national and international levels, primarily with Russia to aid in the development of a Russian Barents Sea management plan (Norway Interview 2 2014). These efforts led to Norway earning a 2014 maximum score of four. The average calculated total ordinal score for best practice implementation for Norway in 2009 was 31 points, and has increased to 35.67 in 2014 (**Table 2 – N**). As seen in **Figure 1- N**, Norway remains relatively consistent among best practices with improvements since 2009, excluding stakeholder and TEK involvement.

Table 1 - N

Norway	2009	2014
Overall Level of Implementation Score (0-4)	**2**	**4**

Table 2 - N

Norway	2009	2014
Average Total Ordinal Score for Implementation of BP's into Domestic Environmental Policy	**31**	**35.67**

Figure 1 - N

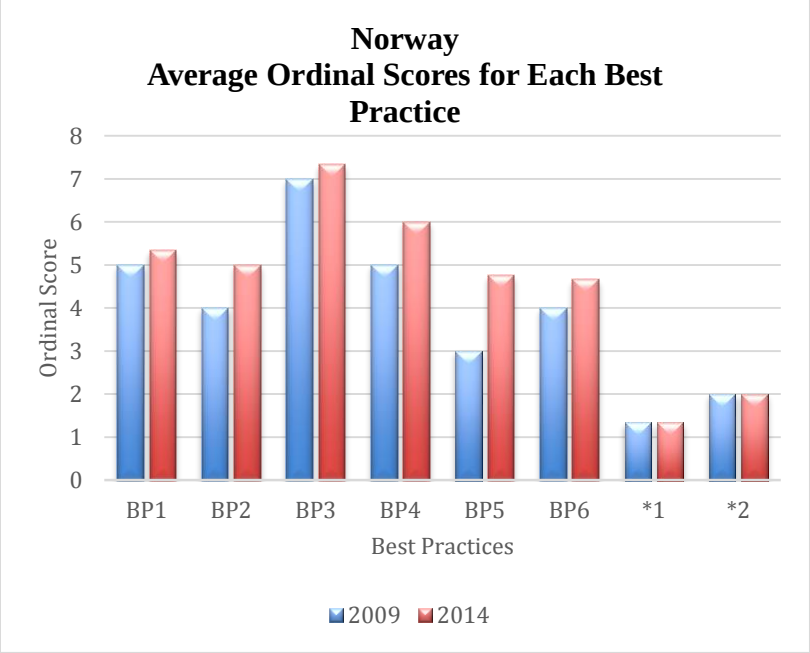


Figure 1 – N: shows the 2009 and 2014 average ordinal scores from Norway interviews for each best practice and the two additional questions regarding TEK incorporation in decision-making processes (*1) and stakeholder involvement.

Barriers and Opportunities

Similar to Canada, Norway views the prioritization within ecosystems a challenge they continue to face. There are immense differences when it comes to which sectors are most affected by the management plans. For example, the petroleum industry is greatly affected by the management plans, causing the industry to challenge the government for equality among sectors (Norway Interview 2 2014). Currently, a struggle exists regarding combined cumulative analyses of total impacts of various types of pressures. Norway finds the comparison of environmental impacts among sectors a challenge, especially when you use that information to determine if or how those associated pressures and impacts will interact with each other, and how to put values on everything in the ecosystem (Norway Interview 3 2014). This is complicated further by levels of government with different interests and priorities, and a lack of tracking expenditures (Norway Interview 4 2014). A synergy has developed within levels of government, however between the Directorate and Ministry level, there is room for improvement (Norway Interview 2

2014). There still remains a lack of transparency and indigenous involvement, where there is substantial room for improvement (Norway Interview 1 2014).

The Norwegian government systems realized many opportunities to further EBM implementation. It is recognized that Norway's ability to distinguish and manage coastal areas, is less complicated and more efficient than those of a large Federation such as the US and Canada (Norway Interview 2 2014). Once the Norwegian government tasks the ministries to work together in the development of management plans, one ministry is deemed the lead without dictatorial power. It is then sifted down the "food web" to the Directorate and institutions who cooperate with other sectors to develop the plans (Norway Interview 3 2014). At the Directorate level, multiple working groups involving all sectors have been downsized into two, in order to increase efficiency. One group is primarily for monitoring purposes, while the other addresses all remaining aspects including: development, goals, knowledge gaps, and risk management. These working groups are deemed, "the most effective tool we have developed," and work under a Ministerial level steering committee that annually reports back to the Government (Norway Interview 3 2014). Besides institutional changes, Norway explains that a key building block of their management plan initially began with developing management objectives, operational goals and objectives, and indicators (Norway Interview 3 2014). This framework helped develop better tools, evaluating vulnerabilities, and biological values.

> ***"There is always more things we could do, but at the same time I would stress that the EBM we have implemented in Norway has a quality that as a scientist I can be proud of. It has been done with the best knowledge available at the time."***

Future Actions

To further increase efficiency, Norway intends to downsize their working groups into one comprehensive body, to create a more direct line between recommendations and actions (Norway Interview 3 2014). Increased transparency to incorporate more stakeholder involvement has been mentioned as a priority, but there are no specific plans to address that gap (Norway Interview 1 2014). Currently the Norwegian Sea plan is being updated, hopefully resulting in a white paper by the end of 2014 (Norway Interview 3 2014). Strong collaboration over the Barents Sea with Russia will continue, and Norway voiced for its support of an Arctic Council proposal to strengthen international cooperation in the future (Norway Interview 4 2014). Norway believes it is prepared to handle the most important future economic activities coming to the Arctic. These include shipping and the associated increase of collisions and pollution as a result, and a change in distribution of species that will cause a shift in the management of fisheries and their ranges and quotas (Norway Interview 2 2014). Funding is expected to remain stable with the new Government, and is viewed adequate among sectors (Norway Interviews 2,3,4 2014).

2.1 C US

Baseline

As of 2009, the US can be characterized as "on the road" to implementation of EBM. However, regarding the Artic, the US has yet to move past the initial stage of mentioning and planning EBM implementation, as seen in **Appendix E**. The US has established the high level policy infrastructure necessary to move forward (United States 2009, p106). Due to its various ecosystems, vast size, and isolated Arctic region from the rest of the nation, implementing EBM faces a number of bureaucratic challenges and barriers. EBM development in the US is national in scope, but applied regionally (United States 2009, p102). The National Oceanic Atmospheric

Administration (NOAA) has adopted EBM as a strategic goal and has created the organization mechanisms needed to create implementation programs (U.S. Ocean Action Plan 2004). EBM has been incorporated into a few strategic documents, however the Arctic has not been specifically addressed. Excluding the leadership in implementing the Large Marine Ecosystem (LME) program on a global level, the majority of the US BEPOMAR report consists of future plans for the US and EBM implementation in the Arctic.

Objective 1: Flexible Application. The framework developed by the US for general ocean management is believed to be flexible enough to apply to all US waters.

Objective 2: Science-Based and Integrated Decision-Making. The US has developed a system that anticipates future needs while overseeing coordination of marine research and management activities (United States 2009, p102). NOAA serves as the primary scientific agency for the US government, and is currently conducting research and collecting data to provide better assessments and management of Alaska's LMEs (U.S. Ocean Action Plan, 2004). NOAA was also involved in the Fishery-Oceanography Coordinated Investigations (FOCI), which show how ocean dynamics are key within the ecosystem and survival of the LMRs (United States 2009, p107). There is no mention of indigenous or stakeholder involvement in the decision-making process, and also no mention of TEK.

Objective 3: National Commitment. The US has agreed upon a scientific consensus statement on marine EBM[12][13]. There is no discussion regarding the incorporation of national

[12] The US uses the term Integrated ocean management (IOM) as an additional concept defined as, "a decision-making process that relies on diverse types of information to determine how ocean and coastal resources or areas are best used and protected (NOS 2007).

[13] "[EBM] in an integrated approach to management that considers the entire ecosystem, including humans. The goal of [EBM] is to maintain an ecosystem in a healthy, productive and resilient condition so that it can provide the services humans want and need" (Scientific Consensus Statement on Marine Ecosystem-Based Management 2005).

commitment and Arctic EBM. EBM has been developed on a national scale, but is applied regionally in the US.

Objective 4: Area-Based Approaches and Transboundary Perspectives. The North Pacific Fisheries Management Council has an Optimum Yield approach within the East Bering Sea LME groundfish fishery that has maintained the health of those living marine resources. In 2009, the Secretary of Commerce approved a Fishery Management Plan for the Fish Resources of the Arctic Management, recommended by the North Pacific Fishery Management Council (NOAA Fisheries 2014). The plan encompassing the Chukchi and Beaufort seas, established a framework for sustainable managing Arctic marine resources beginning with banning commercial fishing until more supportive information becomes available (NOAA Fisheries 2014). Area Four LMEs have been distinguished off the coasts of Alaska. LMEs have been incorporated into one of the major priorities of the Arctic Council Working Group (PAME) for 2006-2008. The US provided insight and status of the LME approach, which are thought to serve as the framework for potential EBM practices in the Arctic.

Objective 5: Stakeholder and Arctic Resident Participation. The US claims to include a "robust" involvement of stakeholders, including co-management agreements with several Alaskan native groups regarding the subsistence use of marine mammals.

Objective 6: Adaptive Management. The only mention of adaptive management is regarding a future plan of collaboration with Canada regarding a LME demonstration project in the Beaufort Sea (United States 2009, p106). The US mentions the changing conditions in the region must be better understood and incorporated into a policy as the basis for adaptation actions for sustaining the ecosystem.

Change Over Time 2009-2014

As of 2009, the US was at the initial stages of discussing EBM at a national level, and deciding whether it was something that could be done (US Interview 3 2014). NOAA had programs involving EBM, but nothing had been implemented (US Interview 4 2014). The US earned a zero as of 2009, due to no implementation and little mention of Arctic EBM in strategic documents. When analyzing how the US has progressed since 2009 via the interview process, it was apparent that answers among individuals even in the same sector, were inconsistent. As of 2014, coordination between Federal Agencies has improved, the White House released a National Ocean Policy and associated Implementation Plan, transparency of oil and gas industry's environmental criteria has increased, as well as the transfer of data through web portals (US Interviews 1,2,3,4 2014). One linking factor among interviewees was the large step the US took in releasing the 2013 document titled, "Managing for the Future in a Rapidly Changing Arctic, A Report to the President" (Hayes et al. 2013). This strategic document along with other efforts but continuous lack of actual implementation increased the US 2014 score to one out of a possible four levels (**Table 1 – U**). The average total 2009 ordinal score for implementation of the best practices was 18.33 out of a possible 80 points. In the last five years, that number increased to 27.75 points (**Table 2 – U**). As seen in **Figure 1 – U**, the US has made substantial improvements in incorporating each best practice into its domestic environmental policy. Furthermore, the US has remained constant regarding indigenous and TEK involvement since 2009.

Table 1 - U

US	2009	2014
Overall Level of Implementation Score (0-4)	**0**	**1**

Table 2 - U

US	2009	2014
Average Total ordinal Score for Implementation of BP's into Domestic Environmental Policy	**18.33**	**27.75**

Figure 1 - U

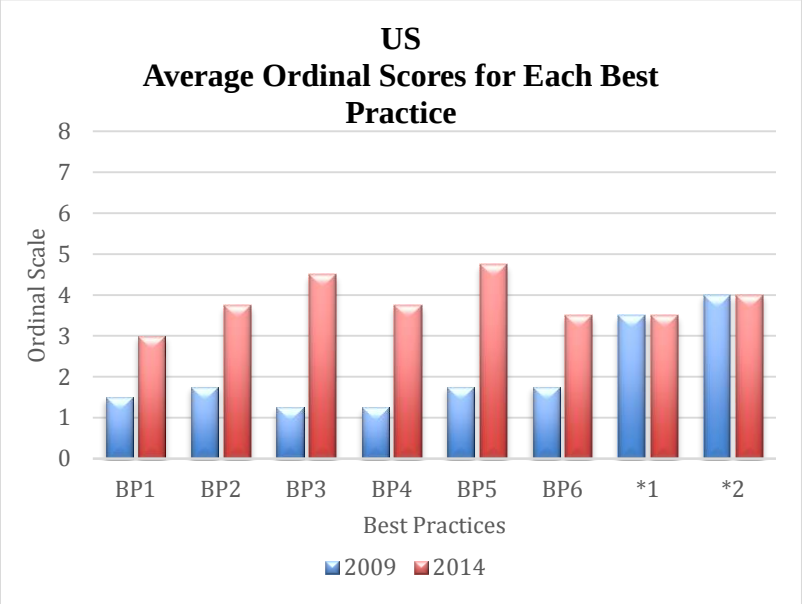


Figure 1 – U: shows the 2009 and 2014 average ordinal scores from US interviews for each best practice and the two additional questions regarding TEK incorporation in decision-making processes (*1) and stakeholder involvement (*2).

Barriers / Opportunities

Although the US has made strides in their incorporation of the best practices, it has its own set of barriers hindering its ability to implement EBM in the Arctic. On July 1, 2011 Alaska withdrew from the National Coastal Zone Management Program, illustrating the embedded distrust of the Federal government within Alaska state government (Skagway Coastal Management Program 2013). This also has a negative effect on stakeholder outreach (US Interview 4 2014). Due to this lack of an official connection, there is a need for improved "cross-talk" between the state and the Federal levels of government (US Interview 2 2014). In Alaska, the agencies seem to cooperate with the state. Overall, some Federal agencies have increased their cooperation and communication, such as Bureau of Ocean Energy Management (BOEM) and the National Oceanic Atmospheric Administration (NOAA) (US Interview 3 2014). Other

agencies are afraid to work collaboratively, as if they may be streamlined or will eventually lose funding. They may be better at communicating, but it has become increasingly difficult for many of them to work together due to barriers that exist (US Interview 1 2014).

Another major barrier for the US is a serious disconnect of knowledge regarding activities and actions on a national level, even at the agency level (US Interview 2 2014). People are working hard at different levels, completely unaware of others working on similar projects, decreasing overall efficiency. Upper management must take a stronger leadership role, designate priorities and assign lower management to those specific priorities (US Interview 2 2014). Politics, funding, and economics in general have also proven themselves as a barrier to the US moving forward with EBM in the Arctic (US Interview 3 2014).

The US capitalized on multiple opportunities to further EBM practices. Private industry has become involved by funding scientific programs and addressing community and management needs through local science consortiums to increase involvement of science and management (US Interview 2 2014). In addition NGOs and non-profit organizations are also doing useful work and providing support for EBM implementation. The US also values public relations, communication, and academic awareness especially at the graduate student level for furthering efforts (US Interview 3 2014).

Future Actions

In April of 2014, NOAA released its Arctic action plan that outlines its national strategy to advance US security interests, pursue responsible Arctic region stewardship, and strengthen international cooperation (US Interview 2; NOAA 2014). The North Pacific Marine Fisheries Council (NPMFC) plans to address Alaska's decision to dissolve their CZM program (US

Interview 3 2014).[14] Lastly, the US plans to implement the national strategy in the next four years (US Interview 4 2014). Some US representatives view near-future economic activities as non-existent, excluding the expected increase in shipping (US interview 4 2014). Inconsistencies arose among results of the US interviewees itself regarding the preparedness of the US when it comes to Arctic activities such as shipping, oil drilling, mining, and tourism pollution control. Currently, funding for Arctic programs is not adequate, and it is expected to slightly decrease in 2015 (US Interviews 1,2,3 2014).

3.0 Discussion

3.1 Overview

Each of the three countries examined is currently at different stages of EBM implementation in the Arctic. Canada is stagnant, Norway continues successful EBM practices, and the US has produced a specific plan for the Arctic with future plans of implementation. In 2009, Norway was incorporating the best practices from the BEPOMAR at a level much greater than either the US or Canada (**Figure 2 - A**). As of 2014, Norway continues to be the most diligent, however the US has dramatically increased its commitment to the best practices in its strategic plan for the Arctic (**Figure 2 - B)**. There is room for improvement for all countries, as the highest score earned was by Norway, scoring approximately 36 out of a possible 80 points. Regarding the calculated variation of interview responses, the 2009 scores from Norway and the US produced average standard deviations of approximately 1.2. Canada doubled that value in 2009, and reached over 3.0 in 2014. Also in 2014, Norway has an average standard deviation of

[14] This comment from the interview process remains unclear, as further clarification was unable to be obtained from original interviewee.

approximately 1.0 and the US follows with 1.5. This variation helps illustrate both lack of synergy both within countries and among sectors, primarily in Canada.

Figure 2 – A. B

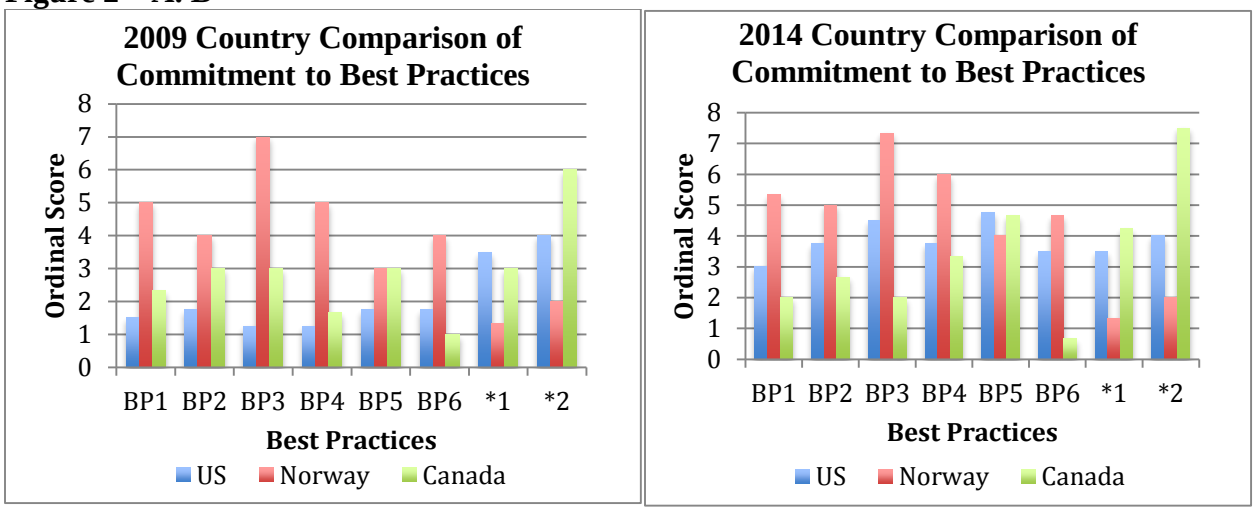


Figure 2 – A.B: shows the 2009 and 2014 average ordinal scores from Canada (green), US (blue), and Norway (red) interviews for commitment of each best practice and the two additional questions regarding TEK incorporation in decision-making processes (*1) and stakeholder involvement (*2).

Regarding future actions, Norway is the only country which appears to be following a plan of steady progress toward EBM implementation at a national level. Both Canada and the US have internal affairs that need to be resolved in order to implement large scale EBM in the future. As the US becomes the Chair of the Arctic Council in 2015, it will be interesting to observe whether the US will further adhere to the best practices and prioritize EBM off the Alaskan coastline, or if EBM will become less of a priority.

3.2 TEK and Indigenous Involvement

TEK is included primarily in land agreements, and not at the governmental level in Canada. The industry sector tries to work with indigenous groups and produce agreements, however indigenous communities are protective of their knowledge (Canada Interview 4 2014).

In Norway, TEK is receiving increased recognition, however it is still considered almost completely non-existent for marine areas (Norway Interview 3 2014). Unanimously among all sectors in the US, is the shared belief that there is a strong desire to incorporate TEK, with most providing a score between "a little" and "medium."

A consultation process is required before development can occur in Canadian aboriginal lands, but not necessarily for the offshore areas. Canada is almost completely incorporating indigenous participation, at least probably better than any other country (CcCat3 2014). In Norway, indigenous involvement is not considered applicable due to the views of certain sectors that view its indigenous communities related to activities on land, not coastal areas (CnCat3 2014). However, that viewpoint was not received well by the Saami people (CnCat1 2014). It is believed that the Norwegian government has lacked in its efforts in attempting to understanding the community and building opportunities to further their engagement (CnCat1 2014). Within all sectors, indigenous involvement is lacking, with areas for improvement. The EBM process is a national one as opposed to regional or local, so the development processes are less transparent and inclusive in Norway than in the US or Canada (CnCat2Indiv2 2014). In contrast to the views regarding TEK incorporation, there is an evident disconnect between and within sectors of the US regarding indigenous involvement. All view it as important, however those interviewed within the government sector believe indigenous involvement is incorporated "a lot," while the indigenous representatives responded with, "a little." In addition, there is a disagreement within the academic sector as to the extent of stakeholder involvement, with strong variations between answers.

3.3 Shared Barriers

In the previous results sections, barriers and opportunities are discussed for each country. However, there are six overlapping barriers identified by at least one of the countries in this study. The fourth barrier listed below was identified by all three Arctic nations. These are important to highlight, as they may be applicable to the remaining five Arctic nations not evaluated in this study.

1) **Current political system**
2) **Lack of communication and cooperation**
3) **Ability to prioritize between and within ecosystems**
4) **Ability to put values on aspects of an ecosystem**
5) **Lack of synergy or a disconnect between sectors**
6) **Funding**

4.0 Recommendations

EBM has the potential to take into account all aspects of an ecosystem and its potential economic benefits, thus providing the ability to manage risks. This is a necessity for each Arctic nation, as climate change creates more opportunities for economic activities and incentives for countries on a global scale.

For the US and Canada, the future of Arctic EBM remains relatively unclear. Many issues must be addressed before implementation of EBM can occur. In Canada, EBM is not currently a priority to the government. Until EBM is valued by the Canadian government, implementation in the Arctic is not possible. As climate change progresses and stimulates economic activities such as shipping, Canada's coastal communities will be affected, and must prepare for these future changes. A shipping accident resulting in an oil spill has the potential to

affect the animals and indigenous communities that survive in the Arctic. Because Canada has the greatest indigenous to non-indigenous population ratio among the Arctic nations, this should be a top priority for its government in the future.

Norway will continue to steadily improve their EBM implementation practices in the future. As Norway's practices become routine, the Government should use the opportunity to assign further research projects to address many of the barriers expressed in these case studies, including establishing a new framework for determining values of and prioritization between ecosystems. In addition, Norway needs to address their lacking efforts of indigenous involvement and TEK incorporation, by improving their collaboration efforts with the Saami Parliament. EBM implementation in all Norwegian waters has a solid foundation and resources, thus it is time for Norway to take a leadership approach and partake in new studies that could result in overcoming barriers that could be applicable for all Arctic nations, creating a universal surge forward.

In the US, the top priority should be to overcome the large political silos that have developed between the Alaskan state and Federal government. By overcoming that communication barrier, it is possible to accomplish a more balanced approach to EBM. In addition, it should come to no surprise that one of the main barriers for the US is stronger leadership and balancing of sector involvement. The US will remain less effective at EBM implementation if knowledge is not shared and leadership is unaware of studies and actions taking place on a national level.

Once internal affairs are resolved, the US and Canada should follow Norway's framework incorporating of establishing goals, objectives, and indicators early on in the implementation process. In addition, they should create a monitoring and evaluation system to

prepare themselves for adapting their management plans as new science and activities present themselves. The US has begun this process in 2014 with NOAA's Arctic Action Plan, which provides explanation for its monitoring actions primarily related to biodiversity and physical changes in the Arctic ecosystem (NOAA Action Plan 2014).

The Arctic ecosystem is bigger than any one country, it encompasses eight different nations and their coastlines as well as the interests of other states. Overall, it appears that EBM is becoming more of a priority within the Arctic Council. There is still a need to engage the other Arctic nations, to aid in promoting progress among the nations who appear to be farther behind the countries studied, i.e., Russia, Greenland/Denmark and Iceland. In addition, there is a strong need for increased leadership from the "Arctic Five." These nations have the ability to build further EBM opportunities and lead to a coordinated EBM research project that could incorporate the non-Arctic states who are actively trying to become more involved in the region. All Arctic Council nations need to embrace international collaboration. Interviewees from Canada, Norway and the US commented on the need for stronger leadership by the Arctic Council to become the best driver for leadership and strong governance in the region. As climate change continues to instigate further physical and biological changes, human dimensions are also becoming increasingly relevant. It is crucial for the Arctic Council to take a stronger leadership role, and plan for the inevitable impacts associated with future activities coming to the Arctic.

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6.0 Appendices

Appendix A

Table 1 *lists all recommendations from both the 2009 and 2013 reports.*

2009 BEPOMAR Report	**2013 AC Expert Group Recommendations**
1) Flexible application of effective ecosystem-based oceans management	1) AC adopt a policy commitment to EBM: "*We will work together to advance EBM in the coastal, marine and terrestrial environments of the Arctic and, where relevant, work through the Arctic Council structure to coordinate ongoing and prospective EBM approaches to maximize the benefits of such efforts within and across boundaries of such efforts within and across boundaries and for the Arctic as a whole."*
2) Decision-making must be integrated and science based	2) AC adopt a definition of EBM relevant to its work in the Arctic: "*EBM is the comprehensive, integrated management of human activities based on best available scientific and traditional knowledge about the ecosystem and its dynamics, in order to identify and take action on influences that are critical to the health of ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity."*
3) National commitment is required for effective management	3) (Principle 1/9): EBM supports ecosystem resilience in order to maintain ecological functions and services.
4) Area-based approaches and transboundary perspectives are necessary	4) (Principle 2/9): EBM recognizes that humans and their activities are an integral part of the ecological system as a whole, and that sustainable use and values are central to establishing management objectives.
5) Stakeholder and Arctic resident participation is a key element	5) (Principle 3/9): EBM is place-based, with geographic areas defined by ecological criteria, and may require efforts at a range of spatial and temporal scales (short-, medium-, and long-term).
6) Adaptive management is critical	6) (Principle 4/9): EBM balances and integrates the conservation and sustainable use of ecosystems and their components.

	7) (Principle 5/9): EBM aims to understand and address the combined, incremental effects (known as "cumulative impacts") that multiple human activities impose upon ecosystems, resources, and communities.
	8) (Principle 6/9): EBM seeks to incorporate and reflect scientific knowledge as well as expert, traditional, and local knowledge.
	9) (Principle 7/9): EBM is inclusive and encourages participation at all stages by various levels of government, indigenous peoples, stakeholders (including private sector) and other Arctic residents.
	10) (Principle 8/9): Transboundary perspectives and partnerships can contribute significantly to the success of EBM efforts
	11) (Principle 9/9): Successful EBM efforts are flexible, adaptive, and rely on feedback from monitoring and research because ecosystems and human activities are dynamic, the Arctic is undergoing rapid changes, and our understanding of these systems is constantly evolving.
	12) Develop an overarching Arctic EBM goal, derived from established AC goals and visions, and provide guidance on how to develop and operationalize objectives supporting this goal.
	13) Explore ways in which Arctic States can cooperate to advance conservation and management of biologically, ecologically, and culturally significant areas.
	14) Develop and adopt a policy and best practices for incorporating traditional knowledge into EBM activities as appropriate.
	15) Encourage initiatives between two or more Arctic States to advance implementation of EBM in the Arctic and demonstrate how knowledge is collected, shared, processed and used to contribute to EBM in the Arctic.
	16) Review, update and adjust the Observed Best Practices in Ecosystem-

	based Ocean Management in the Arctic, endorsed by the 2009 AC Ministerial, to be applicable to all environments, including marine, coastal, and terrestrial.
	17) Identify a lead to assure coordination of a common approach to the work of the AC on EBM in the Arctic and ensure appropriate reporting of progress to the Senior Arctic Officials.
	18) Institute periodic AV reviews of EBM in the Arctic to exchange information on integrated assessment and management experiences, including highlighting examples from Arctic States.
	19) Encourage the use of revised map of 17 Large Marine Ecosystems to inform EBM implementation; and explore the development of terrestrial assessment unites (Landscape equivalents to LMEs) based upon ecological criteria or existing ecoregions.
	20) Identify biologically, ecologically, and culturally significant areas in the coastal, marine and terrestrial environments, and consider EBM-related needs for these areas. Identify the coastal, marine and terrestrial areas most vulnerable to human impacts.
	21) Assess the value of significant Arctic ecosystem services relevant to the well-being of local communities and regional economies, and those of particular global significance.
	22) Enhance access to, and use of, the multidisciplinary data required for the implementation of EBM by building upon ongoing work in the AC to contribute to an AC data portal.
	23) Exchange information and experiences with integrated assessments of ecosystem status, trends and pressures for coastal, marine, and terrestrial areas and provide guidance on approaches for integrating existing assessments.

Appendix B

Interview Questions:

1. In order to compare the "initial" conditions within countries, what would you consider [country's] baseline conditions in respect of the various aspects that is addressed in the 2009 Best Practices?
2. What do you consider the most important developments since 2009, along the same dimensions as above?
3. Generally, would you consider [country] farther along in EBM implementation in 2014 than in 2009?
4. If progress is being made, what is being done?
5. If there is no or minimal progress, what are the barriers to implementation of Best Practices?
6. Is there good cooperation among ministries/levels of government?
7. On a scale (none, a little, a lot, completely) how disciplined is [country] when incorporating the BEPOMAR/Arctic Council recommendations? (Will list all six recommendations)
8. Regarding Best Practice #2, on a scale (none, a little, a lot, completely) how strongly is TEK included in all levels of decision-making for Arctic EBM practices?
9. Regarding Best Practice #5, on a scale (none, a little, a lot, completely) how strongly is indigenous involvement and participation incorporated in Arctic EBM practices?
10. How has indigenous knowledge and involvement changed since 2009?
11. Are there actions other than Best Practices that are being implemented for EBM?
12. If so, why are they important and how do they better serve to implement EBM?
13. Have you made institutional changes to better organize for Arctic EBM?
14. What further actions are planned to implement Best Practices in the near future 1-5 years?
15. What do you anticipate in terms of international collaboration for Arctic EBM in the future?
16. What type?
17. What topics?
18. What economic activities do you anticipate being developed in the Arctic ecosystem, and do you consider [country] prepared to manage those from an Arctic EBM perspective?
19. Is there a way to track the level of expenditure on these activities?
20. Is funding expected to increase or decrease?
21. To what extent is funding adequate?

<u>Appendix C:</u> shows a breakdown of the Canada baseline established by the researcher. Actions are categorized by years up through 2009 and which BEPOMAR recommendations it qualifies under.

Canada

2009 Objective 1: Flexible application				LOMA Ecoregion boundaries							
2009 Objective 2: Science based and integrated decision-making				LOMAs served as pilots to test and apply science-based management tools	EBM definition	EOAR report	Determining conservation objectives	Ecosystem indicators	Beaufort Sea LOMA		
2009 Objective 3: National commitment		1996 Oceans Act: promoting coordination		EBM definition	Determining EBM objectives						
2009 Objective 4: Area-based approaches and transboundary perspectives				Management developed on regional scale	MPA and national park implementation	Oceans Action Plan and LOMAs: Beaufort Sea and RCC, international cooperation and agreements	EBM definition	Identifying ecologically and biologically significant areas	Identifying degraded areas and depleted species	Sector-specific initiatives	
2009 Objective 5: Stakeholder and Arctic resident participation		Agreements negotiated with Aboriginal residents		Land-claim agreements	EOAR-social, cultural, and economic considerations	Beaufort Sea LOMA workshops and focus groups					
2009 Objective 6: Adaptive management				Health of the Oceans is adapted continuance of 2005 OAP	EBM definition	EOAR report	Highlighted as a key principle in EBM/IM approach	Beaufort Sea LOMA			
Enacting Legislation, Statements and Released Strategic Documents	1970 Arctic Waters Pollution Prevention Act 1984 Inuvialuit Final Agreement 1985 Fisheries Act 1992 Canadian Environmental Assessment Act 1994 Migratory Birds Convention Act	1996 Oceans Act 1999 Canadian Environmental Protection Act	2000 Canada National Parks Act 2001 Canada Shipping Act 2002 Canada National Marine Conservation Areas Act 2002 Species at Risk Act 2002 Canada's Oceans Strategy	2005 Federal Marine Protected Areas Strategy 2005 Statement of Canadian Practice for Mitigation of Seismic Noise in the Marine Environment 2005-2007 Ocean Action Plan 2006 Ballast Water Control and Management Regulations 2007-2012 Health of the Oceans							
	Before 1994	**1995-1999**	**2000-2004**	**2005-2009**							**Overall EBM Score = 2**

Canada

Works Cited

Siron, Robert, David Vanderswaag, and Helen Fast. *Best Practices in Ecosystem-based Oceans Management in the Arctic: Ecosystem-based Ocean Management in the Canadian Arctic*. Rep. Vol. 129. Pp 81-100.: Norbye & Konsepta, 2009. Print.

Appendix D: shows a breakdown of the Norway baseline established by the researcher. Actions are categorized by years up through 2009 and which BEPOMAR recommendations it qualifies under.

Norway

Norway

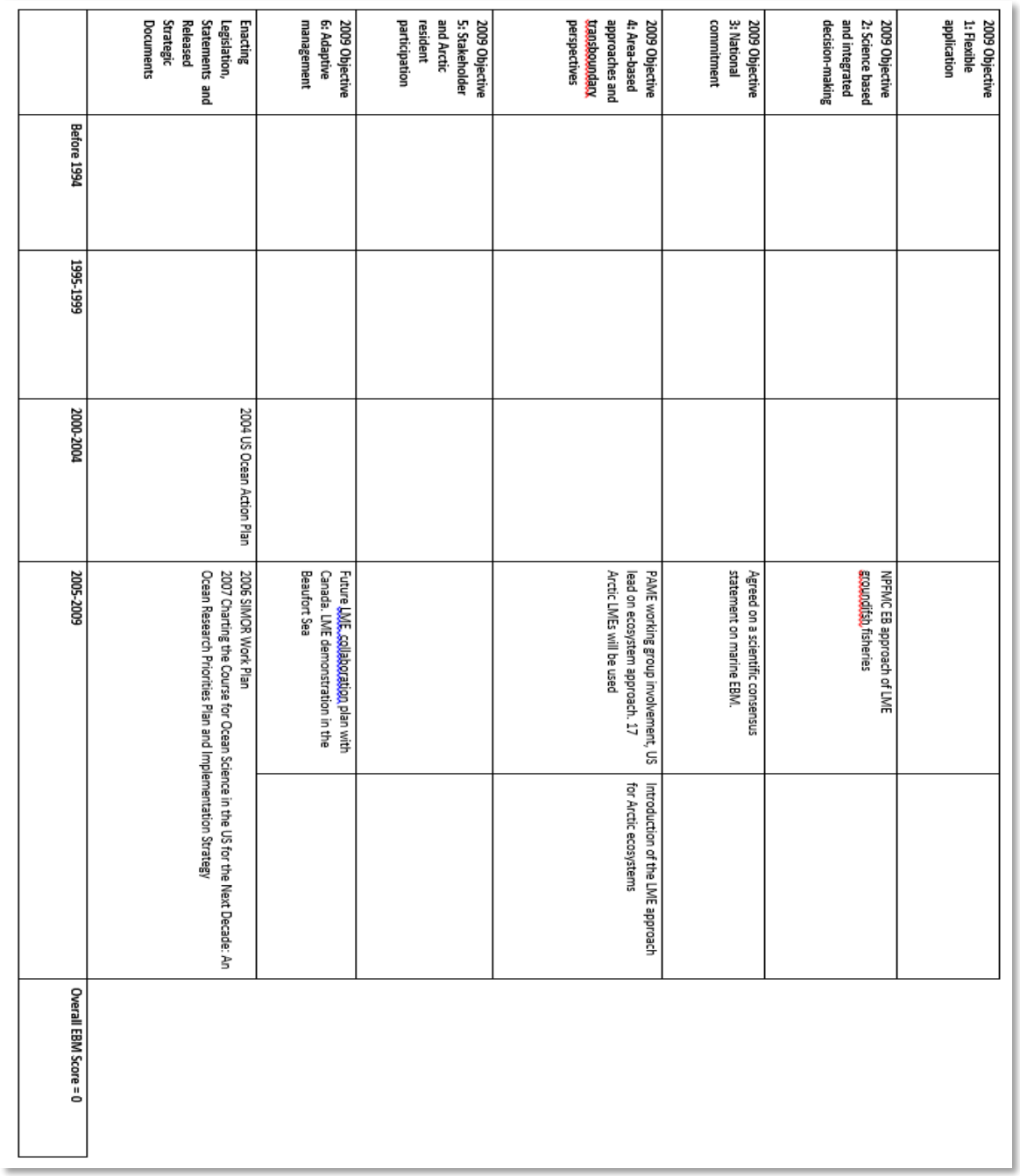
2009 Objective 1: Flexible application				Barents Sea Plan implementation						
2009 Objective 2: Science based and integrated decision-making				Fisheries scientific advice from ICES	Institute of Marine Research	Aggregate analyses in 2002 plan				
2009 Objective 3: National commitment				ORA consolidated all relevant provisions for management of LMR into single act	Inter-ministerial Steering Committee					
2009 Objective 4: Area-based approaches and transboundary perspectives	Bi-multi-lateral agreements, international agreements	Bi-multi-lateral agreements, international agreements	Bi-multi-lateral agreements, international agreements	Integrated management of the Barents Sea and Sea Areas off the Lofoten Islands	ORA: Legal basis for MPAs	2002 Management Plan locations	Bi-multi-lateral agreements, international agreements	Barents Sea Plan: MPAs, petroleum activities, mandatory routing and traffic separation scheme, closure of areas to types of fishing gear	2005 Marine Environment Group: Russia/ Norway	
2009 Objective 5: Stakeholder and Arctic resident participation				2005 Consultation Agreement with Saami Parliament	NGO, regional political bodies, and indigenous groups engaged	Regulatory Meetings for fisheries stakeholders	Stakeholders conference for ORA	Development of 2002 plan and conference		
2009 Objective 6: Adaptive management				Barents Sea Plan, yearly evaluation						
Enacting Legislation, Statements and Released Strategic Documents	1976 Economic Zone Act 1981 Pollution Control Act 1991 Carbon dioxide tax 1993 unilateral quotas of Minke whales	1996 Petroleum Act	2002 White Paper 2002 Management strategy	2005 Consultation Agreement 2006 Barents Sea Management Plan 2008 Oceans Resources Act						
	Before 1994	**1995-1999**	**2000-2004**	**2005-2009**						**Overall 2009 EBM Score = 3**

Works Cited

Hoel, Alf Hakon, Cecilie Von Quillfeldt, and Erik Olsen. *Best Practices in Ecosystem-based Oceans Management in the Arctic: Norway and Integrated Oceans Management – the Case of the Barents Sea*. Rep. Vol. 129. N.p.: Norbye & Konsepta, 2009. Print.

Appendix E: shows a breakdown of the Norway baseline established by the researcher. Actions are categorized by years up through 2009 and which BEPOMAR recommendations it qualifies under.

US



	Before 1994	1995-1999	2000-2004	2005-2009
2009 Objective 1: Flexible application				
2009 Objective 2: Science based and integrated decision-making				NPFMC EB approach of LME groundfish, fisheries
2009 Objective 3: National commitment				Agreed on a scientific consensus statement on marine EBM.
2009 Objective 4: Area-based approaches and transboundary perspectives				PAME working group involvement, US lead on ecosystem approach. 17 Arctic LMEs will be used
2009 Objective 5: Stakeholder and Arctic resident participation				Introduction of the LME approach for Arctic ecosystems
2009 Objective 6: Adaptive management				Future LME collaboration plan with Canada. LME demonstration in the Beaufort Sea
Enacting Legislation, Statements and Released Strategic Documents			2004 US Ocean Action Plan	2006 SIMOR Work Plan 2007 Charting the Course for Ocean Science in the US for the Next Decade: An Ocean Research Priorities Plan and Implementation Strategy
Overall EBM Score = 0				

Works Cited

United States. *Best Practices in Ecosystem-based Oceans Management in the Arctic: USA: An Integrated Approach to Ecosystem-based Management*. Rep. Vol. 129. Pp 101-108.: Norbye & Konsepta, 2009. Print.

Appendix F

Canada

2009	BP1	BP2	BP3	BP4	BP5	BP6	*1	*2	Total
CcCat1	N/A	N/A	N/A	N/A	N/A	N/A	2	6	N/A
CcCat2indv1	0	2	2	2	2	0	4	6	**18**
CcCat2indv2	6	6	6	2	6	2	6	10	**44**
CcCat3	1	1	1	1	1	1	0	2	**8**
Averages	**2.333**	**3**	**3**	**1.667**	**3**	**1**	**3**	**6**	**23.33**
St Dev	3.215	2.646	2.646	0.577	2.646	1	2.582	3.266	**2.322**
2014	**BP1**	**BP2**	**BP3**	**BP4**	**BP5**	**BP6**	***1**	***2**	**Total**
CcCat1	N/A	N/A	N/A	N/A	N/A	N/A	2	6	N/A
CcCat2indv1	0	2	4	4	4	0	4	6	**24**
CcCat2indv2	6	6	2	6	10	2	10	10	**52**
CcCat3	0	0	0	0	0	0	1	8	**9**
Averages	**2**	**2.667**	**2**	**3.333**	**4.667**	**0.667**	**4.25**	**7.5**	**28.33**
St Dev	3.464	3.055	2	3.055	5.033	1.155	4.031	1.915	**2.964**

Norway[15]

2009	BP1	BP2	BP3	BP4	BP5	BP6	*1	*2	Total
CnCat1	N/A	N/A	N/A	N/A	N/A	N/A	0	2	N/A
CnCat2indv1							2	2	
CnCat2indv2	6	4	10	6	2	4	0	2	**34**
CnCat3	4	4	4	4	4	4	2	2	**28**
Averages	**5**	**4**	**7**	**5**	**3**	**4**	**1**	**2**	**31**
St Dev	1.414	0	4.243	1.414	1.414	0	1.155	0	**1.205**
2014	**BP1**	**BP2**	**BP3**	**BP4**	**BP5**	**BP6**	***1**	***2**	**Total**
CnCat1	N/A	N/A	N/A	N/A	N/A	N/A	2	2	N/A
CnCat2indv1	4	5	6	6	4	4	2	2	**33**
CnCat2indv2	6	4	10	6	2	4	0	2	**34**
CnCat3	6	6	6	6	6	6	2	2	**40**
Averages	**5.333**	**5**	**7.333**	**6**	**4**	**4.667**	**1.5**	**2**	**35.67**
St Dev	1.155	1	2.309	0	2	1.155	1	0	**1.077**

[15] Interviewer CnCat2indiv1 was unable to be reached for follow up questions regarding commitment to best practices in 2009.

US

2009	BP1	BP2	BP3	BP4	BP5	BP6	*1	*2	Total
CuCat1	N/A	N/A	N/A	N/A	N/A	N/A	3	2	N/A
CuCat2indiv1	2	2	2	2	2	2	2	2	**16**
CuCat2indiv2	0	2	0	0	2	0	6	6	**16**
CuCat3	2	2	2	2	2	4	3	6	**23**
Averages	**1.33**	**2**	**1.33**	**1.33**	**2**	**2**	**3.5**	**4**	**18.33**
St Dev	1.155	0	1.155	1.155	0	2	1.732	2.309	**1.188**
2014	**BP1**	**BP2**	**BP3**	**BP4**	**BP5**	**BP6**	***1**	***2**	**Total**
CuCat1	N/A	N/A	N/A	N/A	N/A	N/A	3	2	N/A
CuCat2indiv1	4	3	4	4	2	4	2	2	**25**
CuCat2indiv2	0	4	6	6	8	4	6	6	**40**
CuCat3	4	5	5	5	5	4	3	6	**37**
Averages	**3**	**3**	**3.75**	**3.75**	**3.75**	**3**	**3.5**	**4**	**27.75**
St Dev	**2.309**	**1**	**1**	**1**	**3**	**0**	**1.732**	**2.309**	**1.544**