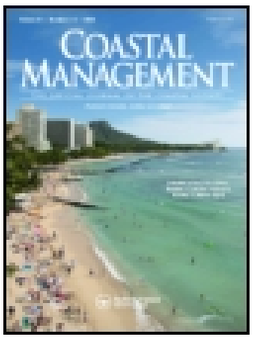

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The Arctic Shipping and Environmental Management Agreement: A Regime for Marine Pollution

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Climate change is predicted to have particularly challenging impacts throughout the Arctic. For instance, there is a great probability of sea ice melting, leading to increased vessel traffic and oil pollution. Eight major nation-states have vested concerns in the potential opening of Arctic sea routes. They each have pledged to take protective action through the Arctic Council. However, there is still a need to develop an international institution to simultaneously address Arctic marine pollution and protect the needs of these states. This article seeks to design a legally binding regime for oil pollution control in the Arctic. In creating this new regime, we shall utilize several shared design elements of historically effective international regimes and take advantage of the legal innovations of these agreements. Our new regime, entitled the Arctic Shipping and Environmental Management Agreement (ASEMA), will take into account both the economic and environmental interests of the parties involved.

Keywords Arctic, climate change, international regimes, marine pollution, vessel traffic

Introduction

Climate Change and the Arctic

Projected climatic change in the Arctic is expected to have major ecological, economic, and social implications. The Polar regions such as the Arctic basin rely on mixing of cold, deep waters from high latitudes and warm, equatorial waters to sustain biological productivity. Changes in cooling and warming patterns throughout Arctic regions are likely to result in alterations in weather patterns, landscape changes, and ecological disturbances. The Arctic Climate Impacts Assessment of 2004 (ACIA) reports that over the last 50 years annual temperatures have increased by an average of 1°C over North West Russia, East Greenland, and Scandinavia, and have cooled by 1°C over Iceland and the North Atlantic Ocean. Additionally, average atmospheric temperatures have increased up to 2–3°C over land and are projected to increase between 6–10°C over the Arctic Ocean by 2090 (ACIA, 2004).

Although ice coverage changes naturally throughout the seasons in the Arctic, recent reports of sea ice coverage have shown decreases to 7 million square kilometers from an

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average 15 million square kilometers (ACIA, 2004). Increased temperatures will only lead to greater alterations in this natural variability. Glaciers, ice sheets, depth and extent of sea ice, and permafrost levels all have decreased significantly and models suggest a continuing downward trend (IPCC, 2007; Comiso, 2006). The International Panel on Climate Change predicts that late-summer sea ice will recede almost completely by the end of the 21st century (IPCC, 2007).

Projected environmental outcomes of Arctic warming trends include changes in productivity at the base of the food web, alterations in fish migration, widespread thawing, forestry changes, and loss of biodiversity (ACIA, 2004). Such changes have strong implications for surrounding marine and terrestrial ecosystems and are expected to have ecological and social consequences worldwide. Additionally, significant economic changes will require planning and research by governments to allow for controlled growth in the Arctic. The continued reduction of sea ice will expose large portions of the Arctic Ocean, consequently extending the length of the navigation season and increasing commercial maritime activity. Fishing, oil and gas extraction, and shipping may all benefit from the shrinking sea ice; however, increased levels of pollution will result from greater shipping and production activity. The combination of retreating sea ice and greater technological capability will only increase the desire of states for access to, and exploitation of, the Arctic.

Relevant Parties and Their Interests

The Arctic Sea links several northern nations that have direct interests in the envisaged ice-free Arctic. The United States, Canada, Russia, Greenland, and Norway are adjacent to the Arctic Ocean and neighboring nations such as Finland, Iceland, and Sweden have vested interests in the potential opening of the region. These states have formed The Arctic Council with a mandate to address sustainable development in relation to social, economic, and environmental issues in the Arctic region. Although these nations have collectively pledged themselves toward protective action regarding marine pollution in this region they have several conflicting interests (Table 1).

Need for a Regime—Why Now?

Major environmental changes in the Arctic will present both opportunities and risks (ACIA, 2005). Advantages include new economic opportunities, empowerment through technological innovation, and improved access to national centers of learning and power. Unfortunately, the benefits tied to this type of growing economic activity do not always accrue to residents of the Arctic (Arctic Council, 2004). It is important that new sustainable development initiatives complement economic and environmental protection objectives, capitalize on available opportunities, and manage associated risks (Arctic Council, 2004). For instance, the opening of Arctic shipping lanes will lengthen the navigation season and lead to increased levels of shipping (ACIA, 2004; Miles, 2007). An increased access to and transport of hydrocarbons will be possible once more vessel traffic is allowed to travel through northern waters. This is particularly appealing for vessels because it drastically reduces the distance traveled around the globe, thus significantly decreasing fuel costs (Dube, 2006). However, there is a high probability of increased pollution due to tanker traffic and production of fossil fuels; oil spills are of primary concern in this region (Miles, 2007). Increased levels of pollution will have several implications for northern communities, such as industrial development of coasts and ocean based production facilities, damage of

Table 1
Relevant nations and their interests in the Arctic Sea

Nation	Arctic Interests
Canada	Northwest Passage access an issue of sovereignty and is part of their territory as an Arctic nation.
	Designated straight baselines around area through Law of the Sea Convention in order to define area as internal waters.
United States	Does not acknowledge Canadian sovereignty claims.
	Northwest passage should be open to protect US security interests (Kaludjack, 2007).
	Fossil fuel and oil interests.
Russia	Developed Northern Sea Route for transit.
	Great expanded shipping route due to sea ice melt.
	Expanded route greatly will enable hydrocarbon production (Miles, 2007).
Sweden/Denmark/Norway	Have agreed to strive for regulation of Arctic environmental pollution while maintaining protection for Arctic communities.
	Will consecutively hold next three chairmanships of the Arctic Council and aim to provide strong leadership toward sustainable development during this time.
Indigenous Peoples	Changes in ecosystem structure due to sea ice melting and increased coastal development could have detrimental effects on community structure.
	Increased oil pollution due to expansion of Arctic shipping that could lead to ecological destruction and health risks for local populations (AMAP, 2007).

existing infrastructure, increased pressure on water resources, and degradation of indigenous cultural and natural resources (ACIA, 2004).

The authors believe that there are two reasons why the political climate is particularly opportune for designing a legally binding environmental regime for the control of oil pollution from ships and production operations. First, the eight aforementioned states have vested interests in establishing an effective environmental regime that balances economic and environmental goals. They have pledged to take protective action and have successfully implemented an Arctic Monitoring and Assessment Program (AMAP). Second, 2007–2008 was International Polar Year (IPY). IPY is a large scientific program focused on the Arctic and the Antarctic that addresses changing snow and ice coverage, global linkages, and impacts on Northern communities (IPY, 2007). Given that International Polar Years occur only a few times per century (there have been 3 in the past 125 years), IPY will provide important political momentum for the creation of an effective environmental regime. The rapid rate of change of the Arctic climate only increases the need for swift action in regards to this topic.

In this article we will address the concerns of northern communities, examine the effects of pollution on local populations, and project issues that will arise as Arctic ice

melts and development increases. It is our intention to determine precautionary measures and resiliency strategies to deal with the impacts of climate change and consequent increases in shipping throughout the Arctic. In order to do this, we shall design a theoretical legally binding regime for oil pollution control in the Arctic. The article begins by focusing on transportable theoretical prerequisites for an effective environmental regime. We will then make use of specific innovations in the International Convention for the Prevention of Pollution From Ships 1973 as modified by the Protocol of 1978 (MARPOL 73/78), the Law of the Sea (LOS) Convention, The United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (the Straddling Stocks Agreement), and the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (the Compliance Agreement) to design our regime. We shall incorporate extant mechanisms such as the Arctic Council and AMAP into our design and identify specific measures to address oil pollution control in the Arctic. We will conclude by projecting the likely direct and indirect effects of the new regime.

Regime Design

What Basic Elements are Needed for an Effective Regime?

Regimes are important vehicles for achieving cooperation among states with shared and competing interests (Stokke, 2007). Effective regimes affect political processes by helping formulate appropriate agendas, contributing to comprehensive international policies, and aiding the creation of national policies to address environmental issues (Keohane et al., 1993). Institutional efforts to promote environmental protection tend to be more effective when they generate increased levels of governmental concern, provide opportunities and establish friendly environments for governments to harmonize international agreements and policies, and aid in the development of sufficient political and administrative capacity in national governments to manage environmental threats (Miles, 2006; Haas et al., 1992). At a minimum, in the design of a new regime, these three conditions must be met.

Also vital is a normative system's ability to cope with the uncertainty and change common to environmental problems (Sand, 1990). When uncertainty is high, it becomes more critical to have flexibility, responsiveness, and a means to monitor and assess the regime performance (Miles, 2006). Given that scientific knowledge of environmental problems is continually evolving regimes must include capacity for institutional learning, policy formulation, and revision (Miles, 2006). Sustainable regimes are those that are able to adapt to changing political and environmental shifts (Stokke, 2007).

Transparency and accountability can help increase adaptability of new regimes. Establishing transparency at the national level is especially critical (Chayes & Chayes 1993). This increases the likelihood that national policy decisions align with international standards. Additionally, accountability at the national and international level will increase the odds of compliance (Keohane et al., 1993). Furthermore, there is a need within regimes for epistemic communities and a clearing-house mechanism. Epistemic communities play a key role in consensus building and indirectly increase coordination at global scales. A clearing-house mechanism provides an appropriate forum for collecting and disseminating information to relevant parties (Miles et al., 2002).

Finally, procedures for monitoring and enforcement are necessary to ensure compliance within the regime. In many cases "the presence of explicit compliance mechanisms is not a necessary condition for progress" (Miles, 2006). Monitoring of environmental quality and national policy measures can be a far more important institutional activity than direct enforcement (Keohane et al., 1993). Strong forms of institutionalized verification can be used to ensure effective implementation; however, in many instances soft forms such as reporting and review will suffice (Miles, 2006).

Analysis of Current Frameworks

The basic design elements discussed earlier are necessary to ensure regime effectiveness and sustainability. However, to adequately address oil pollution control in the Arctic, more tailored design elements are essential. In order to conceptualize the design and implementation of a new regime for Arctic marine pollution, it is important to understand the existing framework for ship-based pollution. Any new regime will need to take into account the extant mechanisms for managing the discharge of oil from ships; these include the relevant rules of the International Maritime Organization, MARPOL 73/78, and the relevant sections of the Law of the Sea Convention.

Influence and Lessons of IMO, MARPOL 73/78, and OPA 90

According to the Convention on the International Maritime Organization, a purpose of the IMO is to "encourage the general adoption of the highest practicable standards in matters concerning the prevention and control of marine pollution from ships" (Convention on the IMO of 1948). By using the word "encourage" instead of any legally binding terms, the Convention establishes the IMO as a standard setter but not an enforcer. Historically IMO conventions have established standards but leave enforcement of those standards to nation-states (Mensah, 1987). In light of the fact that the IMO is mainly a standard-setting organization and that flag and port states may not have incentives to enforce these standards, it is important to look at ways provisions can be written that encourage compliance and ease the cost of enforcement. An excellent example of this is the MARPOL 73/78 agreement. Because MARPOL 73/78 would also be the basis for any new Arctic pollution regime, it is especially appropriate to look at MARPOL's varying degrees of success in combating maritime pollution.

MARPOL 73 established a complete ban on the discharge of ballast water that left a visible trace of oil within 50 miles from the ship and a prohibition on discharging more than 60 liters of oil per mile outside of 50 miles (Mitchell, 1994). The fundamental problem with this sub-regime is that there is little economic incentive for shipping companies or independent ships to comply; this is coupled with high enforcement costs for coastal states who would have to conduct over-flights to locate visible oil sheens and the ship that produced them (Carlin, 2002). Consequently, industry advocates recommend the use of load-on-top procedures, where a ship transfers all of its ballast water to tanks where the oil and water can separate. The cleaner water on the bottom then can be discharged, and remaining slop may be discharged to port reception facilities. There is an economic incentive against this procedure because it reduces the total amount of oil that a ship is able to receive and carry if discharge facilities are not available. The faults of the discharge sub-regime demonstrate that approaching the issue by placing restrictions on "bad" behavior can be ineffective due to high enforcement costs, few economic incentives, and minimal transparency of compliance by ships (Carlin, 2002).

By contrast, the equipment sub-regime developed under MARPOL 78 provides an exemplary illustration of how standards can be created to encourage compliance. Centered on the requirement for segregated ballast tanks and crude oil wash-down system, the equipment sub-regime of MARPOL 78 had led to enhanced compliance despite its economic disadvantages. Its strength lies in the enforcement mechanisms and the transparency of the regulatory system (Mitchell, 1994). It is easier for port states to check equipment than to watch for illegal oil discharges; while docked port states can inspect vessels for compliance with the equipment requirements. Additionally, the support structure of the shipping industry acts as an enforcement agent and relieves the government of significant enforcement costs. Ship designers, builders, and insurers have incentives to ensure that their ships comply with the rules so that they are not associated with non-compliant vessels and held liable. Furthermore, when enforcement is necessary MARPOL 78 gives port states the authority to detain vessels that are not complying with international standards (Carlin, 2002). By analyzing MARPOL 73/78 as a model for the design of a new regime, one can see that a reliance on an equipment-based regime is much more likely to induce compliance.

Law of the Sea Convention as the Basis for a New Regime

The final framework that is applicable to a new Arctic regime is the Law of the Sea Convention (LOSC). Through the rights and obligations of the LOSC, it is possible to create a legally binding regime to help curtail marine prevention in the Arctic. The basis of any new regime will be Article 234, which states:

> Coastal States have the right to adopt and enforce non-discriminatory laws and regulations for the prevention, reduction and control of marine pollution from vessels in ice-covered areas within the limits of the exclusive economic zone, where particularly severe climatic conditions and the presence of ice covering such areas for most of the year create obstructions or exceptional hazards to navigation, and pollution of the marine environment could cause major harm to or irreversible disturbance of the ecological balance.

This gives Arctic coastal states the right to implement regulations for protection of the Arctic within their Exclusive Economic Zones. Consistent application of these laws will heighten the legitimacy of the agreement by presenting the appearance of a united group of coastal states. This could enhance compliance by preventing any state from having less stringent standards and drawing maritime traffic to their coastal zone due to reduced compliance costs. Interstate consistency will ensure that vessels do not enter the Arctic without meeting the requirements of a new regime, as it is impossible to enter the Arctic Ocean without passing through the EEZ of at least one of the members of the Arctic Council.

Cooperation between the members of the Arctic Council in developing a new regime also is permissible under Article 197 of the LOSC, which allows states to work through international organizations to develop rules and standards for marine environmental protection. Article 197 states that interstate cooperation can be conducted, "as appropriate, on a regional basis." This provision allows for the creation of regional regimes under the guise of the Arctic Council and with the assistance of the IMO.

The enforcement rights of any new regime could be based on the provisions and authority of Articles 217 and 220. Article 217 pertains to enforcement by flag states and requires that states ensure that vessels flying their flag comply with international rules

and standards, "including requirements in respect of design, construction, equipment, and manning of vessels." This should be coupled with the authority granted to coastal states for enforcement under Article 220, which gives coastal states extensive rights to enforce laws and regulations developed in accordance with the LOSC for vessels within their waters. A coastal state has the highest level of enforcement power when, "a vessel is voluntarily within a port or at an off-shore terminal of a State" (LOSC, Article 220). This would be the case for the majority of tanker vessels plying the Arctic.

Finally, concerns by flag states regarding limitations to their right of innocent passage could be countered using the provisions of Article 21. Article 21 vests coastal states with the right to adopt laws and regulations regarding innocent passage through the territorial sea in respect to, "the safety of navigation and the regulation of maritime traffic ... and the preservation of the environment of the coastal state and the prevention, reduction and control of pollution thereof" (LOSC, Article 21). These rules are allowed as long as they are "in conformity with the provisions of this convention," and given "due publicity."

Based on the rights granted under Articles 234 and 197, the members of the Arctic Council could develop a legally binding regime for the prevention of marine pollution, and this regime could be enforced through Articles 217 and 220. Taking into consideration the authority granted by LOSC to coastal states in ice-covered areas to develop and enforce regulations for the safety of marine traffic and protection of the marine environment, we believe that the Arctic Council has the authority to institute a legally binding regime for the prevention of marine pollution in the Arctic.

Important Legal Innovations of Other Regimes

Treaties and conventions that elaborate on the LOSC and make its mandates more specific are not without precedent. Two international conventions of particular note are the Compliance Agreement and the Straddling Stocks Agreement. Just as we wish to create a new legally binding regime based on the rights and obligations of Article 234 of the LOSC (and in conjunction with Articles 21, 197, 217, and 220), the Compliance and Straddling Stocks Agreements are based on Articles 63–67, 116–119, and other fisheries-related provisions. These legally binding agreements contain significant legal innovations that will be of great use in the design of our new regime.

One of the integral aspects of these agreements is the responsibility of flag states in monitoring and enforcement. The main objectives of the Compliance Agreement are the specifications of states' obligations in respect to high seas vessels and an increase in international cooperation toward the conservation of high seas fisheries (Balton, 1999). The Compliance Agreement also states that contracting parties are obligated to take measures to ensure that vessels flying under their flags do not undermine extant conservation and management measures; flag states are required to "actively oversee" the proceedings of their vessels (Balton, 1999). The Compliance Agreement was the first instance explicit definition of these types of rules in an international convention.

Both the Compliance and Straddling Stocks Agreements contain landmark provisions for flag and port state enforcement and jurisdiction. The Compliance Agreement grants flag states with the right to withdraw fishing authorization from a high seas vessel if the vessel has seriously violated the provisions of the Agreement (Balton, 1999). Similarly, in the Straddling Stocks Agreement parties to the treaty who believe a vessel has infracted on extant conservation measures have the right to board the violating vessel and report its activities to the flag state (Hayashi, 1999). Moreover, the Straddling Stocks Agreement vests port states with specific enforcement powers in regards to their treatment of fishing

vessels that have violated conservation and management measures. Article 23(2) stipulates that port states are allowed to inspect the documents and gear of docked vessels at both port and offshore terminals in order to promote the effectiveness of international conservation measures (Hayashi, 1999).

The Straddling Stocks Agreement also contains explicit measures for regional enforcement and cooperation. In areas under jurisdiction of regional organizations and/or arrangements, states party to the Agreement may board a vessel flying under the flag of another state—even if that state is not a party to the treaty—to ensure the vessel is complying with management measures of the regional organization or agreement. This legal mechanism was particularly groundbreaking as it provided a new exception to Article 92(1) of LOSC, which mandates exclusive flag state jurisdiction on the high seas. Furthermore, if there are sufficient grounds for believing that the vessel has violated conservation measures, the inspecting state may secure appropriate evidence and notify the flag state. The flag state is required to respond and react with suitable enforcement mechanisms; however, if they do not, the inspecting state has rights to take regulatory actions that are, "adequate in severity to be effective in securing compliance and discouraging violation" (Hayashi, 1999, 62).

A final important aspect of the Compliance and Straddling Stocks Agreements is the inclusion of the precautionary approach to conservation and management of living marine resources. The Straddling Stock Agreement establishes "precautionary reference points" for fish stocks that should be incorporated into management schemes (Hayashi, 1999). A similarly innovative requirement of the Compliance Agreement is the "compatibility principle," which relates to the harmonization of coastal and high seas conservation measures. This provision states that conservation and management measures of coastal and adjacent high seas areas must be compatible and that coastal conservation measures must not undermine the effectiveness of those on the high seas (Hayashi, 1999).

In relation to an Arctic marine pollution regime, the legal innovations of the Straddling Stocks and Compliance Agreements in regards to flag and port state enforcement, the precautionary approach, and compatibility will be of particular importance in the creation of an effective and legally binding regime. We shall return to these innovations and their application toward our regime in the next section of our proposal, where we will outline our new regime's specific design components.

An Arctic Marine Pollution Regime

The first two parts of this article outlined the historical and political context for the creation of an Arctic pollution regime, important theoretical considerations for regime design, and the relevant and extant governance frameworks that will be of use in the creation of an Arctic Shipping and Environmental Management Agreement (ASEMA). In this final section, we will build on the existing framework and theory to outline the specific components of our regime.

A Forum for Negotiations—The Arctic Council

We believe that the Arctic Council is the ideal forum for negotiation of ASEMA. Formed in 1996, the Arctic Council is "a regional forum for sustainable development, mandated to address all three of its main pillars: the environmental, social, and economic" (Artic Council, 2007). Environmental monitoring and assessments always have been key components of the Council; it actively encourages a dialogue between scientists, policy planners, Arctic residents, and decision makers. The framework of the Council encompasses five

separate scientific working groups, including the Arctic Monitoring and Assessment Program (AMAP), the program for the Protection of the Arctic Marine Environment (PAME), and the Emergency, Prevention, Preparedness, and Response (EPPR) working group. These groups provide a common knowledge base for member states and facilitate information dissemination on technological advances and lessons learned from member parties. The Council also has a Secretariat that meets on a regular basis. The working groups and the Secretariat could be used by ASEMA as platforms for regime review.

Two serious limitations to the creation of new regimes are size and complexity (Miles, 2006). The circumscribed structure of the Arctic Council addresses these issues: its size and complexity are limited, thus reducing the transaction costs associated with the creation of a new regime. Furthermore, by working within the extant Council structure, parties can focus on streamlining and harmonizing the existing institutional framework, as opposed to creating the regime *de novo*.

An important standard in the creation of new regimes is the progression from "norms to rules" (Miles, 2000). The Arctic Council may be thought of as an existing normative body with a clearly defined set of principles and goals that can be used toward the foundation of a new regime. For example, when Norway assumed the chairmanship of the Council in October 2006, they felt that the two-year chair did not provide sufficient time to address the major environmental challenges facing the Arctic. Therefore, in conjunction with Sweden and Denmark (the following two chairs), they formed at set of common objectives and priorities for the next six years, including sharing of knowledge related to climatic changes in the Arctic and a resolution to apply "high environmental standards to all activities [in the Arctic]" (Arctic Council, 2007). This strong normative framework will greatly facilitate the negations, adoptio,n and implementation of our new Arctic regime.

A final important aspect of the Council is the emphasis it places on national strategies regarding implementation for member parties. Countries are required to define National Implementation Plans in relation to monitoring and enforcement objectives as defined under AMAP and PAME. National enforcement strategies will be essential to the effectiveness of a new regime. As Keohane et al. (1993, 23) noted, "ultimately, it is national decisions that affect environmental quality." Thus, it is imperative that ASEMA mandates specific measures for the implementation of national policies to target its main objectives and goals. The new regime should not only contain specific instructions for the composition of a these strategies; it must also set deadlines for the formation of such policies, targets for monitoring and review, and agree to impose penalties for noncompliant nations.

The Importance of Transparency—The Arctic Monitoring and Assessment Program

As discussed previously, transparency is a key component of a successful regime (Miles, 2006; Chayes & Chayes, 1993). The framework provided by the Arctic Monitoring and Assessment Program provides an ideal basis for such measures. AMAP is responsible for measuring levels and assessing effects of anthropogenic pollutants, monitoring pollutant trends and pathways, reporting on the overall state of the environment, and providing advice to the Ministers of the Council in regards to actions for the improvement of the Arctic marine environment. These monitoring and assessment devices have already been used to form the Arctic Contaminants Action Program (ACAP), which AMAP submitted to the Council's Ministers in 2004. Currently, AMAP has multiple coordinated monitoring programs in place; they publish periodic progress reports of their data, relevant external scientific information, and traditional knowledge of local indigenous populations (AMAP, 2007).

As opposed to designing a new body for monitoring and facilitating the transparency of ASEMA, the Council can expand on the existing foundation of AMAP. Toward this end, the Council will establish a clearing-house mechanism through AMAP. Effective monitoring is a fundamental and multifaceted component of regimes—not only does it provide information that can be a useful learning component and increase a regime's adaptability; it also serves as a strong compliance incentive and can help prevent cheating (Miles, 2006; Keohane et al., 1993). AMAP already has an extensive database containing information regarding current projects and research relevant to their goals and objectives. The database should be expanded to include information on technological innovations for safer shipping; member countries could then access these records. Furthermore, the database also could include information regarding all shipping activities in the Arctic. For example, if a member country inspected and authorized a ship as meeting the ASEMA gear restrictions (and these restrictions will be addressed in more detail in later sections of the article), the records of this authorization could be made available through the expanded AMAP database. This would alleviate the need for multiple ship inspections and allow for a less redundant and more effective regime. As all participants of the new regime will be familiar with the structure of AMAP, using this existing institution will enhance the legitimacy and transparency of our proposed regime.

AMAP also will facilitate continued access to and interactions with epistemic communities. Epistemic communities play an important role in consensus building and international coordination (Miles, 2002). As AMAP provides a venue for the use and incorporation of current scientific knowledge, the regime will have continued exposure to the most recent scientific data, information, and technological advances. This is of particular importance in relation to the Arctic given the high degree of scientific uncertainty regarding sea ice extent and thickness. AMAP can help with the creation of targets, regulations, and plans related to the monitoring of the Arctic environment and the effects of increased shipping activity. For example, based on the most recent Artic Climate Impacts Assessment and scientific data from International Polar Year, AMAP could formulate new monitoring objectives. Under ASEMA, the member states of the Council will be required to formulate National Implementation Plans to target these objectives within a specific timeframe, as outlined previously.

Accountability and Enforcement—The Importance of Flag, Port, and Coastal States

The legal innovations of the Compliance Agreement, Straddling Stocks Agreement, and the MARPOL 73/78 Agreements will be of great use in the design of ASEMA. We firmly believe that the LOSC gives the Arctic Council the authority to implement similar measures regarding the protection of the marine environment in the Arctic. The LOSC grants sufficient authority to flag, port, and coastal states for effective enforcement of our regime.

The Compliance and Straddling Stocks Agreements vest flag and port states with novel enforcement rights; it is imperative that similar flag and port state capabilities are included in ASEMA. Articles 234 (Ice Covered Areas) and 220 (Coastal State Enforcement) of the LOSC give the Arctic Council sufficient authority to effectively enforce such measures in the context of a new regime. For instance, members of the new regime should be vested with boarding and inspection rights that are similar to those of the Straddling Stocks Agreement if they have doubts concerning the adequacy of vessel construction and gear requirements. These rights will be based on the authority of Article 234.

Enhanced power for enforcement is also available through the LOSC in regards to the rights of port states. In the Compliance Agreement, port states are allowed to inspect the

documents of docked vessels at both port and offshore terminals in order to promote the effectiveness of international conservation and management measures (Balton, 1999). The new regime will include similar jurisdictional measures for port states in relation to gear and vessel construction requirements. Records of these inspections will be made available to all parties through the AMAP clearing-house mechanism. All records relating to infractions and violations of treaty rules will not only be passed on to flag states but also made available to all parties to the agreement and posted on the database. Hopefully, this form of "coercive compliance" will help reduce instances of noncompliance.

MARPOL 73/78 demonstrated that emphasizing gear and design requirements are the best means of preventing oil pollution. We believe this also will hold true in our new regime. By focusing on standards for design, manning, and training developed under the auspices of the IMO, the Arctic Council will have a greater likelihood of preventing marine pollution and ensuring the safety of mariners. Just as the gear restrictions of MARPOL 73/78 increased enforcement capacity, the legally binding standards of ASEMA would be easily enforceable through the authority of flag, port, and coastal states. The aforementioned clearinghouse mechanism will ensure that all states and actors are able to see which ships are compliant and authorized to participate in Arctic shipping. By taking advantage of the authority granted by the LOSC, as well as the innovations and lessons of MARPOL 73/78 and the Straddling Stocks and Compliance Agreements, we believe that a new regime will have high levels of compliance and significantly reduce the threat of marine pollution in the Arctic.

Threats to Shipping and the Requirements of Our Proposed Regime

In designing our new regime, an essential aspect to consider is the threat to Arctic vessels and merchant mariners. Ships and mobile offshore units (MOUs) operating in the Arctic are exposed to considerable risk. Primary risks to navigation and hydrocarbon production arise from low ambient temperatures, poor weather conditions, long periods of winter darkness, and volatile ice conditions.

Sea and glacial ice on the ocean's surface is the most significant and potentially dangerous factor in Arctic operations and presents a serious structural hazard to vessels (IMO, 2002). Ships transiting through ice-covered waters have an obvious need for structural reinforcement in the bow, but ice can also damage propeller blades, shafts, and external steering gear. Ships and MOUs can also become trapped and severely damaged by the crushing forces of "compressive ice." However, ship operations in the Arctic require much more than strengthening of ships and MOUs alone. Furthermore, there are many additional risks to consider. For instance, a vessel trapped in ice can be forced off its intended course and into perilous situations. Surface ice also can create confusing radar return, leading to navigational errors. Similarly, darkness and reduced visibility during poor weather can contribute to navigational errors. In addition, low ambient temperatures cause superstructure icing of vessels, which hampers stability and safety of navigation. Ice accumulation on radar antennas and communication equipment debilitates their ability to function, and ice on deck can also prevent access to emergency response and lifesaving equipment and seize anchoring gear (sometimes needed to avoid grounding or collision). Freezing temperatures can also cause ice accumulation around scuppers (compromises stability), sea suction points (occludes flow of cooling water to engines), and rudder posts (causes loss of steering). Moreover, low temperatures can increase fuel viscosity and freeze ballast water, while exposed valves and pipes can freeze too, which could prevent the flow (or the stoppage of flow) of oil or other fluids. Finally, some shipboard materials, such as rubber hoses,

can lose their structural integrity in cold temperatures and fail (IMO, 2002). Although many of these risks can be minimized by specialized construction and on-board equipment, there are additional hazards that must be addressed by other means.

Existing navigational charts for the Arctic Ocean are substandard, and there is a lack of navigational aids (buoys, lights, etc.) and systems for communication (IMO, 2002). Thus, information on ice and weather conditions is not readily available to mariners. Additionally, traffic in the Arctic is increasing, but there is no traffic separation scheme or standardized Vessel Traffic System (VTS) system in place. Icebreaker assistance is limited, and weather/ice conditions and breakdowns can cause stoppages in icebreaker operations. Also limited is the availability of adequately trained and experienced crew. This is particularly important because of the challenges of conducting spill response and rescue operations in ice conditions. In general, current shore-based contingency arrangements are not sufficient and will need to be strengthened in a new regime (Liukonnen, 2006).

As we discussed previously, Arctic trade is likely to play an important role in future delivering energy. Steps now must be taken to minimize the risk of oil pollution from increased navigation and oil production in the Arctic and preempt "regulation by disaster" (Koren, 2006). ASEMA would serve as a binding legal instrument that establishes technical and operational standards for ships and mobile offshore units operating in the Arctic. The agreement should also include provisions for vessel traffic management and emergency preparedness.

We propose the following structure for the technical requirements of ASEMA: At its core are standards for vessel and MOU design, classification, and requirements for on-board equipment to be developed within the context of the IMO. These standards will be made legally binding by the authority granted by the LOSC, as outlined previously. As was discussed in relation to the equipment sub-regime of MARPOL 73/78, equipment and design requirements have historically done more to address oil pollution from ships than efforts to change actor behavior, and thus should form the bulk of ASEMA. Peripheral to this are a series of provisions to address the following: vessel traffic management, crew training and vessel manning, operational rules, standards for emergency response, an assistance fleet (icebreakers), methods for gathering and disseminating information on weather and ice conditions, and an exemption for military vessels.

Articles for Vessel and MOU Design, Classification, and Required Shipboard Equipment

The Arctic environment places additional demands on ship systems, and not all ships that transit the Arctic Ocean will be able to navigate safely in all areas throughout the year. A system of vessel classification has been developed by the International Association of Classification Societies (IACS) to designate different levels of ice capability. So-called Polar Class ratings range from P-1 to P-7, and each rating has specific requirements that address all essential aspects of ship construction. Only P-1 vessels are classified for year-round operation in all Arctic waters, whereas P-7 vessels are limited to summer and autumn operation in thin first-year ice. The IMO endorses this classification system. In addition, the IMO has developed a reasonably progressive set of *Guidelines for Ships Operating in Ice-Covered Waters* (hereafter, the Guidelines), to which ASEMA should defer (IMO, 2007). We feel that the IMO is the most credible organization for the establishment of guidelines for vessel design requirements. Furthermore, if these guidelines can be made binding by the Arctic Council using the authority of the LOSC, compliance by convenience-flagged ships

would be greatly enhanced. The IMO Guidelines cover everything from general structural reinforcement and minimum stability requirements to fire safety and navigational equipment. They also include AIS systems, which use GPS to input specific vessel information into a real-time monitoring database. As mentioned earlier, the IMO Guidelines are not mandatory; however, the Guidelines would be formally adopted by the Arctic Council through ASEMA and made legally binding. Nonetheless, prior to negotiations, the Arctic Council should approach the IMO and urge them to include guidelines for MOUs, and draft more stringent guidelines for Arctic tankers. The recommendations of risk management experts lead us to conclude that all Arctic tankers in the future should be configured for double-acting (breaking ice in both ahead and astern modes of propulsion); as Koren (2006) stated, "ice breaking performance backwards is better than forward, with half the power required." Arctic tankers should also be fitted with steerable azipod thrusters, as opposed to conventional propellers and rudders. The existing guidelines are vague on this topic, stating only that, "attention is drawn to the *possibility* of interaction between directional control systems and propulsion systems" (IMO, 2007). Finally, efforts should be made during negotiations to establish restrictions on deadweight tonnage and/or ship dimensions for Arctic tankers (we suggest a cap at 200,000 DWT or 300 meters overall), and minimum horsepower requirements. Presently, the Guidelines only state that, "the installed propulsive power should be sufficient to ensure that the ship can navigate safely and without risk of pollution under the design ice, weather and operational conditions," though they do not explicitly define "sufficient" (IMO, 2007).

Articles for Vessel Traffic Management

To accommodate the expected increase in shipping traffic and mitigate collision risk, the Agreement should stipulate establishment of a vessel traffic separation scheme to include a system of shipping lanes with wide separation zones and precautionary areas with radar reflective buoys. Other aids to navigation should also be installed to mark reefs and other navigational hazards. ASEMA should also incorporate provisions for a Vessel Traffic System (*Arctic Canada Traffic*), which would require improved radar coverage and communication systems from shore-based facilities.

Articles for Information on Meteorological and Ice conditions

Our regime should also include provisions for founding the *Arctic Weather Observations and Routing Directory* (AWORD), an international co-op for gathering weather and ice information by satellite and ship observation, and disseminating that information to mariners by continuous radio broadcast (using the same network of VTS communication facilities) and weatherfax. Furthermore, the Agreement should contain articles for Arctic nations to cooperate to produce a complete catalog of updated navigational charts for the navigable Arctic.

Articles for an Assistance Fleet

ASEMA should call for the development of an icebreaker fleet to assist navigation by Arctic nations. At least two large icebreakers should be devoted to maintaining open shipping lanes and incident response, and a fleet of smaller icebreakers should serve as escorts for transiting vessels over 200 meters. The icebreaking fleet should be fully equipped for rescue towing and oil spill response. Currently, there are few icebreakers available for this purpose. The

Agreement should include provisions for Arctic governments to collaborate on solutions to this issue.

Articles for Operational Standards

We suggest that the Agreement focuses on setting operational standards for ships transiting Arctic ice-covered waters, such as maximum vessel speeds (relative to ice thickness), procedures for landings and departures at MOUs, procedures for the discharge of bilge water, and specific operational standards for transfer of oil, LNG, and other hydrocarbon products between ships and MOUs. The Arctic Council should call on industry experts to partake in these negotiations. The agreement should mandate that all ships operating in Arctic ice-covered waters should carry on board a licensed "Ice Navigator" while transiting the Arctic trade route. If the master does not hold an "Ice Navigator" endorsement on his or her license, the vessel must hire an "Ice Pilot" for the duration of the transit.

Articles for Crew Training and Vessel Manning

One of the biggest concerns expressed by risk assessment experts is the inefficient supply of adequately trained and experienced crew for Arctic marine trade, and the additional stressors placed on the crew by the Arctic environment (Koren, 2006). Therefore, ASEMA should include provisions for establishing minimum training and experience requirements for Arctic mariners and incorporate international standards for "Ice Navigators." It should also require all nations with Arctic shipping interests to create training programs capable of meeting standardized program requirements. Finally, navigation and cargo operations on Arctic ice-covered waters warrant additional crewmembers and shorter watch periods; the Agreement should also require these measures.

Articles for Emergency Response Standards

The fact that shipboard and MOU emergencies in the Arctic can be gravely serious and difficult to manage with little possibility of assistance by other vessels demands a detailed set of standards for emergency response. ASEMA should call for an increase in shore-based facilities and suitable resources for responding to vessel and MOU fires, spills, disabled and ice-trapped vessels, medical emergencies, collisions, groundings, and so on. These shore-based facilities would need detailed contingency plans for each area. MOUs and transiting cargo vessels should also be required to have detailed contingency plans on board for the above named emergencies. The contingency plans themselves would be subject to standards set forth in the annexes of ASEMA.

Articles for the Exemption of Military Vessels

Because the Agreement would be difficult to negotiate without it, we recommend ASEMA include an exemption for military vessels. This would appease the concerns of the United States over freedom of navigation and increase the likelihood of their support.

Conclusions

There will be many direct and indirect effects of the ASEMA regime, and these shall determine its efficacy. For instance, gear provisions will enhance the safety of shipping and

merchant mariners operating in the Arctic, thereby increasing the likelihood of compliance by flag states. Additionally, to increase regime effectiveness, our agreement specifically addresses the interests of the three major nation states. The military exemption and environmental provisions of the agreement ensure U.S. support; the environmental provisions guarantee Canadian backing; and finally, the provisions allowing the extraction of hydrocarbons satisfy Russian interests. Because the interests of these major players are appeased, our regime is likely to be successfully adopted and implemented.

The most significant direct effect of ASEMA will be the creation of a legally binding document. It is likely that there will be both positive and negative indirect effects of the regime, although most will be positive. These may include the following: enhanced regional cooperation, monitoring, and enforcement; increased scientific knowledge and research; increased learning at the community, regional, and global levels; widespread sharing of knowledge, and increased weather information and weather prediction capabilities. Epistemic networks via AMAP will be encouraged and a clearing-house mechanism will be established through the Arctic Council. There may also be increased economic benefits for nation-states that choose to utilize the Arctic shipping lanes.

Negative indirect effects may include problems of "vertical disintegration of policy" (Hanf & Underdal, 1999). Currently there is a complete lack of capability for monitoring and enforcement that will require significant development; therefore, large-scale investment by major players is necessary. There is hope that this can be overcome by the fact that all nations on the Arctic Council are developed and have the economic and technological capacity to mitigate this potential negative effect.

We hope that an agreement such as ASEMA would be a great help in the control of oil pollution in the Arctic. We believe that the foundations, framework, and specific articles of the regime we have designed could achieve a high level of performance. By taking advantage of the authority granted by the LOSC, as well as the innovations and lessons of MARPOL 73/78 and the Straddling Stocks and Compliance Agreements, we feel that a new regime will facilitate compliance and significantly reduce the threat of marine pollution in the Arctic. The exigencies of environmental change in the Arctic, the resulting political interests in this issue, and the impetus of International Polar Year make 2008 an excellent time to begin to construct a new Arctic regime.

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