

Policy Responses to New Ocean Threats

Arctic Warming, Maritime Industries, and International Environmental Regulation

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Introduction

A warming Arctic Ocean faces new environmental threats from maritime industries. Climate change enhances the accessibility of the northernmost ocean by diminishing its sea-ice cover. The wintertime maximum extent of Arctic sea ice had never been smaller than in 2017 (Garner, 2017). Better accessibility facilitates maritime shipping and offshore oil and gas production. Trans-Arctic liner shipping may not become commercially viable before mid-century (Ørts Hansen et al., 2016), but ever larger ships navigate Arctic waters: In 2013, *Nordic Orion* carried 73,500 tons of coking coal from Vancouver via Greenland to Finland. In 2016, *Crystal Serenity*, with a capacity of over 1,000 passengers, became the largest cruise ship to have ever transited the Northwest Passage. Offshore hydrocarbon exploitation is also expanding even though low oil prices have slowed down or halted many projects (Harsem et al., 2011). In 2013, Russia's first Arctic offshore oil platform came on stream in the Pechora Sea. Three years later, the world's northernmost offshore oil field, Goliat, was launched in the Norwegian Barents Sea. Both ships and drilling platforms can have numerous negative transboundary external effects on ecosystems and human health. They discharge oil, chemicals, and other harmful substances into the sea; emit greenhouse gases and air pollutants; introduce invasive species; and cause disturbance to marine life.

How have states responded to these new threats to the Arctic Ocean in terms of international regulation? Broadly defined, the realm of international regulation comprises formal and explicit rules, standards, and guidelines agreed by two or more states (Braithwaite and Drahos, 2000: 19–20). Regulations differ greatly in design, yet data on regulatory variance in Arctic shipping and offshore oil and gas remain scarce. Existing datasets focus on larger, relatively stable regime elements or on single international agreements rather than on regulations as more flexible, intermediate units of analysis. Moreover, they take into account only part of all maritime regulations that apply to the Arctic. The International Environmental Agreement Database (Mitchell, 2017) lists conventions, protocols, and their amendments, but it excludes many relevant resolutions and decisions of intergovernmental organizations. The International Regime Database (Breitmeier et al., 2006) covers selected regimes, such as to the regime for the prevention of oil pollution from ships, but it

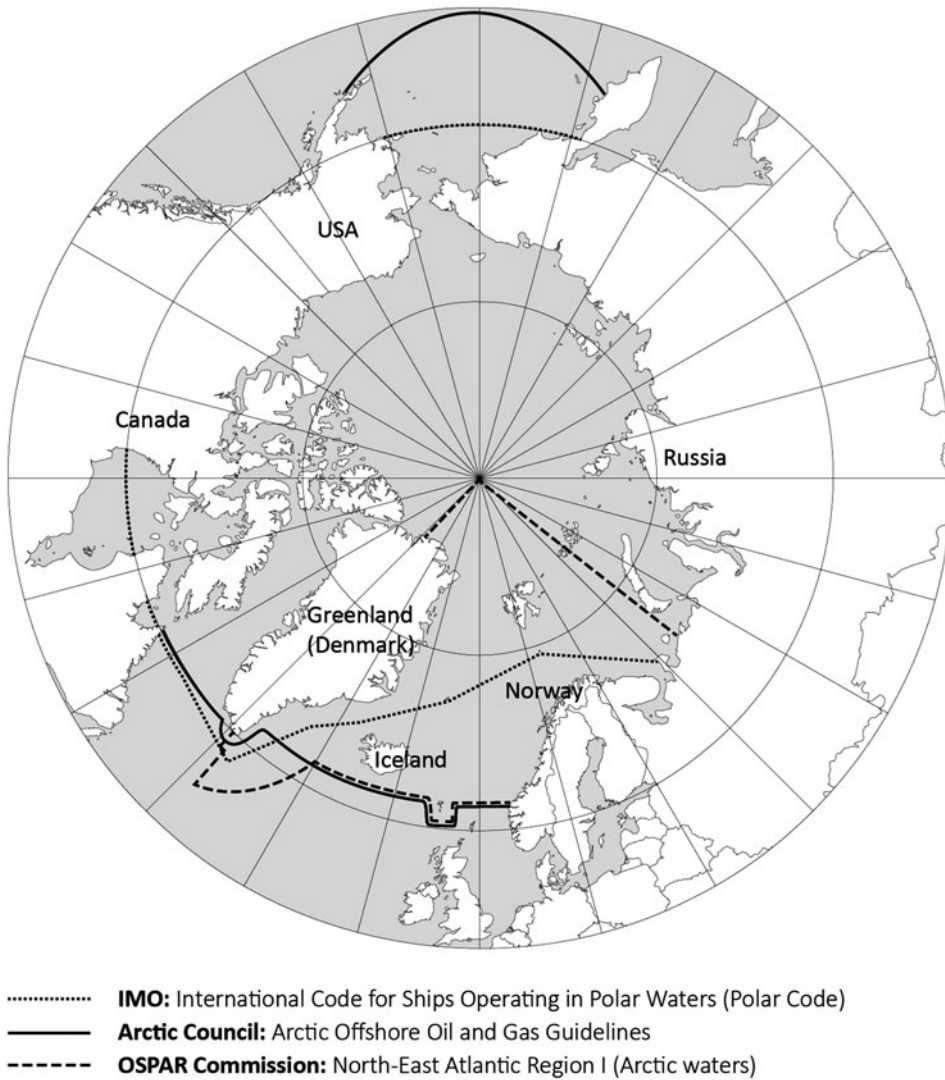
leaves out most other sets of regulations applicable to maritime industries in the Arctic. More comprehensive descriptions of legal instruments are found in qualitative work (e.g., Koivurova and Molenaar, 2009; Jensen, 2016). However, these contributions often face limitations in systematizing and comparing regulatory data. The data gap resulting from these observations becomes increasingly problematic as economic and regulatory activities in the Arctic grow.

This chapter contributes to closing this gap by introducing a new dataset of international regulations that address operational environmental impacts of shipping (see also [Chapter 23](#)) and offshore hydrocarbon production in the Arctic. The chapter proceeds in five steps: First, it demonstrates why international regulation is relevant in the Arctic context. Second, it outlines the novel concept of stringency for assessing regulations from an international relations perspective. Third, it describes the scope and structure of the regulation database. Fourth, it empirically assesses and compares regulatory stringency and identifies emerging patterns across four dimensions: time, industry, international organization, and external effect. Finally, it discusses implications for international maritime regulation amidst climate change in the Arctic and beyond, and for future research.

International Maritime Regulations in the Arctic

International regulation will play a vital role in protecting a warming Arctic. I focus on three intergovernmental organizations whose regulations cover the entirety or parts of the Arctic Ocean. The International Maritime Organization (IMO) is a specialized agency of the United Nations that globally regulates environmental impacts of ships (see [Chapter 23](#)) and, to some extent, offshore structures. Its main legal instrument is the International Convention for the Prevention of Pollution from Ships (MARPOL), which works beside other issue-specific instruments (Tan, 2005). The Polar Code contains additional regional regulations for an area including the central Arctic Ocean and coastal waters of the “Arctic Five” (Canada, Denmark-Greenland, Norway, Russia, and the United States). Among the other global instruments that apply to the Arctic is the London Convention and Protocol on the dumping of wastes, whose secretariat is hosted by the IMO.

The Arctic Council is an intergovernmental forum of eight Arctic states that has developed the Arctic Offshore Oil and Gas Guidelines. Compared to the IMO Polar Code, the intended area for application of the guidelines is larger. They additionally include Iceland; the Faroe Islands; and larger parts of the Barents, Bering, and Norwegian Seas. Other offshore initiatives that have been carried out in the Arctic Council context are the Arctic Offshore Regulators Forum and the Russia-USA-Norway-Arctic Offshore Oil and Gas Regime project. However, these initiatives have not produced any international regulations, as their focus has rather been on exchanging best practices and on developing Russian national legislation, respectively. The Arctic Council does not regulate shipping, even though it might facilitate regulatory advances in the IMO (Stokke, 2013).



Basemap by Jürnjakob Dugge. Adapted by the author.

Fig. 14.1. International regulatory frameworks in the maritime Arctic

The OSPAR Commission is a regional organization with 16 contracting parties that deals with marine pollution in the northeast Atlantic. The organization succeeded the formerly separate Paris and Oslo Commissions (hence the name OSPAR). Its geographic definition of the northeast Atlantic includes the region that covers the European part of the Arctic. Within this region, OSPAR decisions and recommendations apply to Denmark, Iceland, and Norway but not to the nonmember Russia. In this area, the three intergovernmental organizations also have the largest geographic overlap (see [Figure 14.1](#)).

Despite this presence of international regimes, the role of international regulation in a warming Arctic is not uncontested (see [Chapter 12](#)). Critics would emphasize that most maritime activity takes place within exclusive economic zones of states, that coastal state jurisdiction is more effective, and that the Arctic Council lacks formal regulatory authority. Although these observations are largely correct, they do not diminish the importance of international regulation. Many arguments can be made for such regulation.

First, the transboundary nature of maritime activities and their impacts call for international regulation. Arctic shipping today concentrates along the coastlines, but international regulation helps to ensure compliance of ships flying non-Arctic flags. Offshore hydrocarbon exploration and exploitation only take place within exclusive economic zones, but international regulation can create a level playing field in the Arctic. A potential role model is the regional framework for North Sea oil and gas (see Leeuwen, [2010](#)). International regulation can also reduce transboundary environmental pressures from border-zone oil and gas fields, for instance, in the Barents Sea (Bambulyak et al., [2015](#)).

Second, coastal state jurisdiction alone does not always have greater leverage than international regulation. Canada and Russia have adopted maritime regulations exceeding international standards based on the “Arctic exception” in Article 234 of the Convention of the Law of the Sea (Rayfuse, [2014](#): 238–41). However, Arctic coastal state jurisdiction is challenged by continued dispute over the international or internal status of the Northwest Passage and the Northern Sea Route (McDorman, [2014](#); Rayfuse, [2014](#): 243). Moreover, regulatory experience shows that at times national jurisdictions might have limited leverage in technologically globalized sectors. For instance, equipment requirements that go beyond MARPOL standards are unenforceable if foreign administrations do not approve such equipment (e.g., US EPA, [2011](#): 5, 78). International regulation can synchronize the flag, coastal, and port states needed for proper enforcement (Tan, [2005](#): 201–29) (see [Chapter 2](#)). National authority can be effective in banning certain activities, as illustrated by recent moratoria for Arctic offshore drilling in Canada and US federal waters. It is not clear, though, how enduring these bans will be given strong opposition from industry and subnational jurisdictions. Besides, hydrocarbon exploration and exploitation continue in other parts of the Arctic, in particular, Norway and Russia.

Third, while the Arctic Council largely remains a soft-law forum (Young, [2009](#): 79), its outputs fall within a broad definition of regulation, which includes nonbinding standards and guidelines. The contents of the Arctic Offshore Oil and Gas Guidelines are structurally similar to sets of nonbinding IMO guidelines and OSPAR recommendations, in that they aim at incorporation into national legislation (Koivurova, [2018](#): 25). Their nonbinding character should thus not prevent us from comparing these guidelines to other, possibly more stringent regulations. Research has shown that under certain conditions soft law can be effective too (Skjærseth et al., [2006](#); Soltvedt, [2017](#)). In sum, this and other arguments justify a more thorough engagement with existing international environmental regulations of maritime industries in the Arctic.

The Concept of Regulatory Stringency

International environmental regulations can be assessed and compared in terms of stringency. Stringency is defined as the function of formal tightness *and* substantive ambition of a regulation. Stringency considers both formal and substantive design elements because both affect intermediaries and targets of international maritime regulation in the Arctic, namely, states and corporations, respectively. Tightness can elicit corporate compliance through shaping domestic implementation. Ambition specifies the substance of compliance in terms of required behavioral changes. Furthermore, formal and substantive design properties are interrelated, considering their potential mutual trade-off in negotiations (Guzman, 2010: 156). For instance, a regulation with demanding greenhouse gas emission standards would not be considered stringent if it was nonbinding and not subject to compliance monitoring. The following subsections briefly present formal and substantive dimensions of stringency, and from that derive a stringency index.

Formal Tightness

The tightness of regulation depends on its legality, precision, and compliance system. Legality matters because binding regulations “tend to ... have a higher capacity to facilitate implementation and compliance” (Andresen et al., 2013: 427). This chapter follows Raustiala (2005: 586–91) in his critique of continuous legality concepts and conceives of legal status as binding or nonbinding. Legality is high when regulations are binding, that is, when states have expressed their consent to be bound by them (Abbott et al., 2000: 410). This is usually the case for conventions, protocols, mandatory codes, and decisions of intergovernmental organizations. Legality is low when regulations are nonbinding, that is, when the aforementioned consent is absent or explicitly negated. Examples are recommendations, guidelines, or reservations on treaties. Legality is intermediate when an environmental impact is regulated by a set of binding and nonbinding instruments.

Precision can enhance regulatory effectiveness by producing clarity about substantive requirements (Böhmelt and Pilster, 2010: 257). Precise regulations leave little room for interpretation by providing clear definitions, stating specific limit values, prescribing technical equipment and procedures, and defining unambiguous conditions for any exemptions (Breitmeier et al., 1996: 82; Abbott et al., 2000: 413–15). Imprecise regulations lack these properties, thus leaving substantial discretion in interpretation. Precision is at an intermediate level when precise and imprecise traits coexist.

The strength of the compliance system affects compliance rates of regulatory targets. Compliance can be achieved through incentives or threats (Reiss, 1984: 91). However, tangible incentives are not yet found in international maritime regulation in the Arctic. Threat-based monitoring and enforcement systems are strong when coercing compliance *ex ante* by means of equipment, certification, and review

requirements or specific permit schemes (Mitchell, 1994: 433–35, 454–56). The deterrence of noncompliance by *ex post* detection through often patchy surveillance, prosecution, and sanctioning of violations, as well as general permit schemes, are on an intermediate level (Mitchell, 1994: 454). Some regulations lack monitoring and enforcement provisions altogether.

In a nutshell, international regulation is tight when it is legally binding, highly precise, and endowed with strong compliance mechanisms. Such regulation is most likely to elicit effective domestic implementation that pushes business actors to comply with its substantive provisions.

Substantive Ambition

Ambition results from the scope of the regulation and its requirement levels in relation to the external effect and compared with other international regulations. Scope reflects how comprehensively a regulation covers the addressed “pollution source population” of contracting parties. The pollution source population is the universe of a source–effect combination, for example, nitrogen oxide emissions from ships. This definition is more instrumental to an analysis of many individual regulations compared to notions of scope that focus on the number of issues covered (Breitmeier et al., 1996: 84; Koremenos et al., 2001: 770–71). Regulations are large in scope when applying to the entire pollution source population without any relevant exemptions. Intermediate scope exempts a limited part of this population, for instance, pollution from smaller engine classes or existing vessels. Scope is small when only a minor part of the present and future pollution source population is covered.

Substantive requirements differ in their potential to reduce external effects. I benchmark these reductions for a single compliant polluter, for example, the decrease of oil content in water discharges from an offshore platform. This corporate benchmark differs from state-centered notions of depth (Downs et al., 1996: 383; Bernauer et al., 2013: 480–81). It also seeks to reduce ambiguities found in other operationalizations of depth (Breitmeier et al., 1996: 85). Requirement levels are high when virtually eliminating the externality, for instance, by means of zero-discharge standards or bans. Intermediate requirements are performance or equipment standards that demand major reductions in the range of 30 to 90 percent compared to a situation without regulation. Low requirement levels hardly demand behavioral changes from corporate actors compared to unregulated activity.

The international comparison of requirement levels is useful because multinational corporations care about regulatory differences that could affect their competitive position (Falkner, 2008: 33). Regionally differentiated regulations also raise race-to-the-bottom-or-top questions, similar to those in the area of national flagging standards (e.g., DeSombre, 2006) (see Chapter 2). Requirement levels are high in cross-regional perspective when they are among the most demanding ones globally at the time of entry into force (only considering other effective international regulations). For instance, emission limits are lower and technical standards less permissive

than in almost all other sea regions. Conversely, low requirement levels are among the least demanding ones internationally. Intermediate requirements are more advanced than those in laggard regions, but they do not reach up to those in leading regions.

In short, ambitious international regulation possesses a large scope as well as high requirement levels in relation to the external effect and other international regulation. In case of full compliance, such regulation would virtually eliminate the external effect addressed.

Stringency Index

In this section, the qualitative description of the six design elements is translated into a compound stringency index to assess and compare regulations in absolute terms. The index is formed in three steps: First, the six design elements are coded (high = 1, intermediate = 0.5, low = 0). Second, the design element scores are aggregated separately for form and substance; the scores are added, assuming a family resemblance structure with partial compensation and equal weight of all design elements (Goertz, 2006: 60, 115). This produces two dimension scores ranging from loose (0) to tight (3) and from unambitious (0) to ambitious (3). Third, the two dimension scores are aggregated, assuming that formal tightness and substantive ambition are noncausal necessary conditions of stringency. Regulatory stringency is achieved when overcoming the trade-off between tightness and ambition, but high ambition can also make a difference if tightness is larger than zero, and vice versa. However, regulations are clearly lax if formally loose and/or unambitious. The aggregation rule most accurately reflecting this structure is multiplication of unweighted dimension scores (Goertz, 2006: 111). A final index score is obtained on a scale from zero to nine, which is divided here into five stringency classes to ease interpretation: regulation is lax (0.00 to 0.75), somewhat lax (1.00 to 2.00), intermediate (2.25 to 3.00), somewhat stringent (3.75 to 5.00), or stringent (6.00 to 9.00).

This index orders regulations hierarchically according to absolute levels of stringency and facilitates broader comparative assessments. It is intended to complement rather than to replace descriptive accounts that pay close attention to the particularities of individual regulations. The index scores can neither reflect the size of stringency differentials nor record regulatory changes below coding thresholds. Notwithstanding these limitations, the stringency index is a useful tool for assessing the state and variance of regulation.

International Maritime Regulation Database

The assessment of regulatory stringency in international maritime regulation builds on a new dataset compiled for the Arctic region. The dataset covers international regulations of IMO, the Arctic Council, and OSPAR that apply to the entire Arctic Ocean or to part of it. The analysis of relevant nonmaritime instruments, such as the

United Nations Economic Commission for Europe (UNECE) Convention on Long-Range Transboundary Air Pollution, is left to future research. Within the scope of the database are regulations addressing operational environmental impacts of seagoing ships and fixed offshore oil and gas platforms from 1950 to 2017. Beyond its scope are other maritime activities, such as dumping of onshore wastes, dredging, fisheries, offshore renewable energy, and seabed mining. Also excluded are regulations dealing with nonoperational environmental impacts of industry, for example, accidental harm, such as oil spills, and resource overappropriation. This chapter focuses on operational impacts because they can serve as a policy-relevant and empirically diverse test case for future data collection and analysis in other regulatory areas.

The database seeks to complement existing descriptive accounts by providing a broad and systematic picture of the regulatory development. The unit of analysis is the regulation of an environmental externality from a specified operational source. A single impact can arise from multiple, often differently regulated, sources as the diverse oil pollution sources in offshore hydrocarbon production illustrate. These operational impacts were compiled inductively from regulations and secondary sources (see [Table 14.1](#)). The large number of externalities implies that although the data analysis in this chapter can provide a general overview, it cannot discuss individual regulatory issues in depth. It is important to bear in mind that most of these externalities are likely to increase as the Arctic becomes more accessible due to climate change.

The data compilation and coding proceeded in three steps: Each industry was first coded as to whether an impact and source were regulated in a given year. If so, basic regulatory information was gathered next, drawing on existing datasets where available (Breitmeier et al., 1996; Mitchell, 2017). Basic information includes names of regulatory documents, full texts, international organization, year of adoption, entry into force or effect, geographic scope, and applicability to Arctic states. Applicability benchmarks are the Arctic boundaries as defined in the contexts of shipping (Arctic Five) and offshore oil and gas (Arctic Five plus Iceland). The stringency of formally effective regulations was then assessed according to the stringency index. These data allow for analyzing the number and stringency of international regulations across four dimensions: time, industry, international organization, and externality.

The Stringency of Arctic Maritime Regulations

This section analyzes empirical patterns in the number and stringency of international regulations addressing operational environmental impacts of Arctic shipping and offshore hydrocarbon production. It identifies four major patterns: First, the body of applicable regulations has successively grown, with dedicated Arctic regulation emerging in the 1990s and 2000s in response to accelerating sea-ice melt. Second, regulation is generally more stringent and less fragmented for shipping than for offshore oil and gas. Third, stringent regulations have been adopted by IMO and OSPAR but not by the Arctic Council. Fourth, although some issues, such as oil

Table 14.1. *Operational impacts of ships and offshore oil and gas platforms*

Type	Ships	Platforms	General issue	Specific externality
Air emissions	•	•	Pollutants	Black carbon, carbon monoxide, nitrogen oxides, particulate matter, metals in particulate matter, polycyclic aromatic hydrocarbons, sulfur oxides, ozone, volatile organic compounds, incineration of ship-generated wastes
	•	•	Pollutants GHG	Flaring, venting, and dehydration
	•	•	GHG	Carbon dioxide, methane, hydrofluorocarbons, etc.
	•	•	Ozone depletion	Ozone-depleting substances
Discharges into the sea	•	•	Oil	Bilge water
	•		Oil	Ballast water, oil from cargo areas of tankers, sludge
		•	Oil	Oil-based drilling fluids and cuttings, displacement water, drainage water, well testing
	•		Oil pollutants	Lubricants on underwater hull components
		•	Oil pollutants	Produced water, sand and scale, cutting piles
	•	•	Pollutants	Antifouling systems, washwater and washwater residues from exhaust gas cleaning systems
	•		Pollutants	In packaged form, noxious liquid substances
		•	Pollutants	Offshore chemicals, synthetic-based drilling fluids and cuttings, naturally occurring radioactive materials, carbon dioxide sequestration
	•	•	Sewage	Black water, gray water
	•	•	Garbage	Cleaning agents and additives, food wastes, plastic, etc.
	•		Garbage	Animal carcasses, cargo residues
Other	•	•	Debris	Removal and disposal of vessels/units
	•		Other	Cooling water, desalination brine
	•		Invasive species	Ballast water, biofouling, sediments
	•	•	Disturbance	Light, noise
	•		Disturbance	Mammal strikes, icebreaking

GHG: Greenhouse gases

Note: Many externalities have more than one source that can be regulated. For instance, sulfur oxide emissions can be addressed by regulating fuel oil quality or engine exhaust.

Compiled by the author based on regulations and on information from AMAP (2010: chapter 5), Arctic Council (2009a: 136–51), IFC (2015), and OSPAR (2010: 63–70).

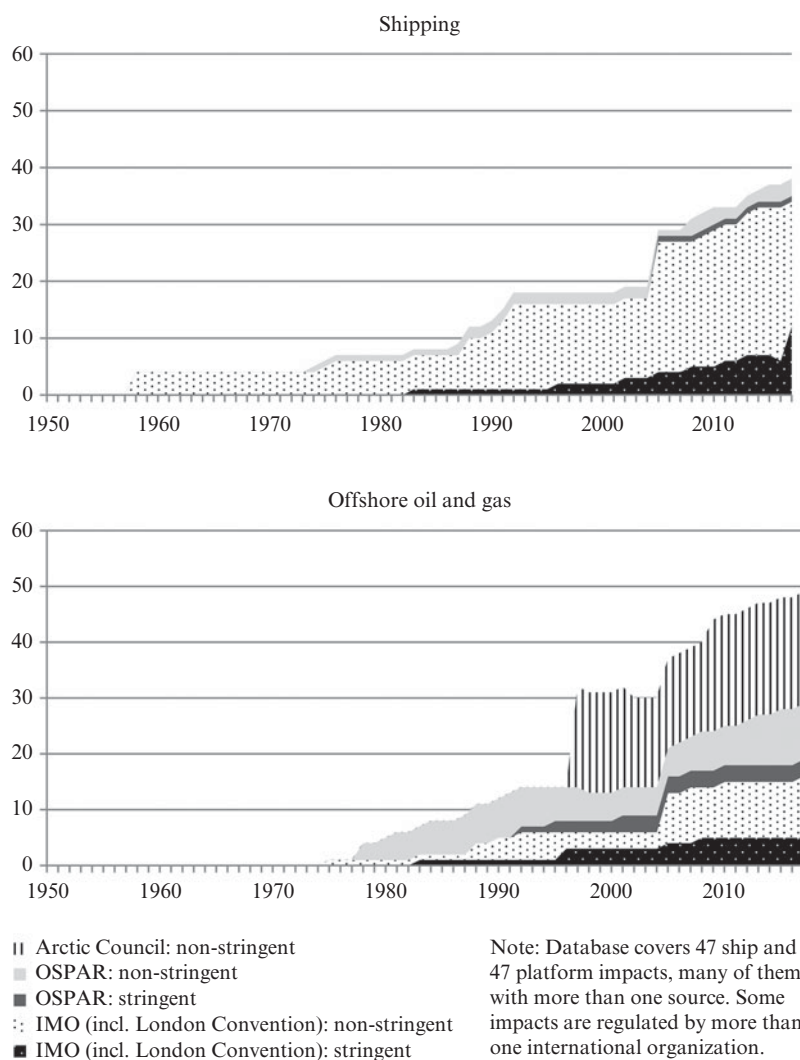
and garbage discharges, are relatively well covered, regulatory gaps persist in both industries. The subsections subsequently illustrate each of these patterns.

Historical Development

The international regulation of Arctic shipping and offshore hydrocarbon production has historically evolved in two spheres: (1) global and regional regulations *applicable to* the Arctic and (2) regulations specifically *designed for* the Arctic Ocean. Regulations in these spheres differ in their timing and stringency. Regulatory sphere (1) emerged in the 1950s and accelerated in the 1970s and 1980s. The regulation of vessel-source pollution initially focused on oil discharges. It was boosted by the MARPOL annexes on oil, noxious liquid substances, harmful substances in packaged form, sewage, garbage, and air pollution that successively entered into force between 1983 and 2005. Many of these regulations were made more stringent in the 1990s and 2000s. Since then, IMO has continued to strengthen existing regulations and to address emerging issues, such as the introduction of invasive species. The regulation of offshore oil and gas, which has centered on discharges of oil and chemicals, as well as on the removal and disposal of disused platforms, exhibits a similar pattern. The Paris Commission developed a growing body of regulations for the northeast Atlantic between the late 1970s and early 1990s. Regulatory stringency increased under its successor OSPAR in the 1990s and early 2000s (Figure 14.2). Relevant offshore regulations of IMO and the London Convention and Protocol on dumping follow the shipping pattern even more closely.

An Arctic regulatory sphere (2) did not emerge until the 1990s when climate change awareness and prospects of a more accessible circumpolar region were rising in most Arctic states (Borgerson, 2008). The first regulations in this sphere were the Arctic Offshore Oil and Gas Guidelines adopted by the Arctic Council in 1997. These guidelines addressed numerous operational impacts of hydrocarbon production but did not regulate them stringently (see Figure 14.2). Updates in 2002 and 2009 brought some changes in issue coverage and content but no major advances in stringency. Therefore, several more stringent, non-Arctic regulations remain relevant in this sector. Dedicated Arctic shipping regulation initially also took the form of guidelines. The IMO issued Guidelines for Ships Operating in Arctic Ice-Covered Waters in 2002 and updated them in 2009, including an extension to all polar waters. These guidelines primarily dealt with safety issues and only contained a general provision on minimizing operational pollution without mentioning specific pollution sources. The IMO Polar Code, which entered into force in 2017, has been a dual turning point because it addresses specific impacts *and* regulates most of them rather stringently. However, although it covers discharges of oil and other substances into the sea, emissions into the air remain subject to global IMO regulations.

In short, regulations applicable to the Arctic have successively increased in numbers and stringency since the regulatory take-off in the 1970s and 1980s. Regulations designed for the Arctic emerged in the 1990s and 2000s in conjunction with Arctic



Compiled by the author

Fig. 14.2. Number and stringency of regulations, years of entry into force, 1950–2017

warming. Since then, shipping and offshore hydrocarbon regulations have developed differently in terms of stringency (see [Figure 14.2](#)).

Industries

The historical analysis in this chapter identified different regulatory trajectories for Arctic shipping and offshore hydrocarbon production. Indeed, present international regulation of both industries varies in its fragmentation and stringency. Fragmentation denotes the extent to which an industry is covered by more than one

regulatory framework. International regulations for offshore oil and gas are more fragmented than shipping regulations (see [Figure 14.2](#); see also Lyons, 2015). Offshore hydrocarbon production is subject to regulations of IMO, the Arctic Council, OSPAR, and other international regimes. Their regulations partially overlap; in particular, the Arctic Offshore Oil and Gas Guidelines address various issues already regulated by other regimes. By contrast, almost all international shipping regulation is developed by IMO. Issues addressed by other regimes have been the dumping of vessels (London Convention and OSPAR), as well as antifouling paints and ballast water exchange (IMO and OSPAR). The IMO thus faces little competition from other international organizations in the regulation of Arctic shipping.

Regulatory stringency in the two industries varies, too. Shipping is subject to more stringent Arctic-wide regulation than offshore oil and gas. More than 30 IMO regulations cover Arctic Ocean shipping, including all or most of the Arctic Five. Over one-third of these regulations are stringent. A few additional OSPAR rules or guidelines apply in the European Arctic. Operational impacts of platforms are covered by more than 35 international regulations (IMO and Arctic Council) applying to all or most of the Arctic Five and Iceland. However, only every seventh of these regulations qualifies as stringent. Another 13 OSPAR regulations exist in the European Arctic, of which 3 are stringent. Unlike in shipping, stringent offshore oil and gas regulation thus concentrates in one Arctic subregion. Also, the number of regulated impacts differs across industries. A meaningful comparison is difficult, however, because both the operations of ships and platforms and the regulatory delineation of source–impact combinations differ. Therefore, the chapter turns to another analytical dimension that partly accounts for the cross-industry variance in regulatory stringency: the international regulators.

International Organizations

The international organizations that regulate maritime industries in the Arctic differ in their levels of regulatory activity and their ability to adopt stringent regulations. The IMO and Arctic Council address large numbers of impacts; IMO and OSPAR stand out in terms of regulatory stringency. The IMO and related global agreements regulate large numbers of operational impacts, and many of them rather stringently. They address 50 impacts in the two industries and regulate one-third of them stringently. Stringency largely arises from formally tight MARPOL and Polar Code regulations that are typically binding, precise, and endowed with compliance systems. Variance in stringency is usually due to different ambition levels. Ambition is high for issues covered by the Polar Code, such as discharges of oil, noxious liquid substances, and garbage. It is lower for issues under global MARPOL regulations; in particular, air pollutant standards are more demanding in special areas outside the Arctic. Additional IMO guidance tends to be less stringent because of its formal looseness.

The Arctic Council (2009b) addresses many impacts of offshore hydrocarbon exploitation but does not regulate them stringently. The nonbinding status of the

Arctic Offshore Oil and Gas Guidelines limits their formal tightness. Imprecision and the absence of strong compliance systems increase their looseness even further. In particular, the lack of proper monitoring programs weakens the effectiveness of nonbinding instruments (Soltvedt, 2017). Moreover, the guidelines only contain modest requirements, especially when compared to other sea regions, such as the northeast Atlantic.

The OSPAR Commission covers fewer maritime industry impacts than IMO but has adopted several stringent regulations. Out of 17 present regulations, 4 are stringent. The focus of OSPAR is on offshore oil and gas production for which it has adopted both binding decisions and nonbinding recommendations. Both tend to be very precise, except for recommendatory guidelines on recently addressed issues, such as platform lighting impacts on birds. The organization has also developed extensive monitoring and improvement programs for priority issues, such as oil discharges and offshore chemicals. Ambition levels are generally high, but some requirements are less restrictive than in other sea regions, notably the Baltic Sea where only minor offshore hydrocarbon activity takes place.

Overall, regulatory activity and stringency vary considerably across the three intergovernmental organizations. Arctic Council regulations are broad and lax, OSPAR regulations are more stringent, and IMO aligns high regulatory activity with stringency. The analysis also suggests that variance in stringency within the regulatory frameworks developed by each organization should be examined more closely.

External Effects

International regulatory coverage and stringency not only vary over time, across industry, and across intergovernmental organization. Shipping and offshore petroleum regulations are also diverse when compared across external effects. Five groups can be distinguished for analytical purposes. A first group of externalities is stringently regulated in the entire Arctic Ocean. Many ship impacts fall into this group, including most types of oil and garbage discharges, all discharges of noxious liquid substances, and antifouling paints (see Table 14.2). The Polar Code notably prohibits discharges of oil sludge, oily bilge water, oily cargo tank washings, and noxious liquid substances (IMO, 2015: part II-A, chapters 1–2). The implementation of these discharge bans depends on appropriate reception facilities (PAME, 2017). In offshore hydrocarbon production, only antifouling paints as well as discharges of oily bilge water and garbage are subject to stringent Arctic-wide regulation.

A second group of external effects is subject to Arctic-wide, yet nonstringent, regulation. Ship impacts in this group include oily ballast water, lubricants used on underwater hull components, some garbage discharges, biofouling, underwater noise, and the dumping of vessels into the sea. Applicable global standards for energy efficiency and air pollutant emissions fall into this group, too (see Chapter 23). Platform impacts are laxly regulated under the Arctic Offshore Oil and

Table 14.2. *Stringency and coverage of regulations for selected impacts from ships, as of January 2018*

Operational environmental impacts		Applicability to Arctic states		
		All (5)	Most (3–4)	Some (1–2)
Oil discharges	Sludge, bilge water, oil from cargo area of tankers	■■■■■		
	Ballast water	■■■■		
Discharges of harmful substances	Lubricants on underwater hull components	■■■■		
	Noxious liquid substances	■■■■■		
	Antifouling systems	■■■■■		
Air emissions	Nitrogen oxides, sulfur content of fuel, black carbon from heavy fuel oil use	■■■		
Invasive species	Ballast water and sediments		■■■■	■■■
	Biofouling	■■		
Garbage discharges	Animal carcasses, cargo residues not contained in hold washing water, plastic	■■■■■		
	Food waste, cargo residues, and cleaning agents contained in hold washing water	■■■■		
	Sewage discharges	Black water		■■■■
	Gray water			
Disturbance	Underwater noise	■■		
Debris	Disposal of vessels at sea	■■■■		■■■■
Regulation		International Organization		
■■■■■	Stringent	■	IMO (incl. London Convention)	
■■■■	Somewhat stringent	■	OSPAR	
■■■	Intermediate			
■■	Somewhat lax			
■	Lax			
	None			
<i>Compiled by the author</i>		Note: Aggregated impacts share same level of regulatory stringency but may be subject to different regulatory provisions.		

Compiled by the author

Gas Guidelines, including air pollutant emissions; noise; and discharges of oil, chemicals, cuttings, and sewage (see Table 14.3). The global London Convention rules and IMO guidelines for the removal and disposal of disused offshore structures are not stringent either.

Table 14.3. *Stringency and coverage of regulations for selected impacts from platforms, as of January 2018*

Operational environmental impacts		Applicability to Arctic states		
		All (6)	Most (4–5)	Some (1–3)
Oil discharges	Produced water			
	Displacement water			
	Bilge water			
	Oil-based drilling fluids and cuttings			
Discharges of harmful substances	Synthetic-based drilling fluids and cuttings			
	Chemicals, produced water			
	Antifouling systems			
Air emissions	Air pollutants from flaring of gas			
	Nitrogen oxides in engine exhaust			
Garbage discharges	Garbage: food wastes, cleaning agents, plastic, all other			
Sewage discharges	Black water, gray water			
Disturbance	Light			
	Underwater noise			
Debris	Disposal of disused platforms at sea			
Regulation		International Organization		
	Stringent		IMO (incl. London Convention)	
	Somewhat stringent		OSPAR	
	Intermediate		Arctic Council	
	Somewhat lax			
	Lax			
	None			
		Note: Aggregated impacts share same level of regulatory stringency but may be subject to different regulatory provisions.		
Compiled by the author				

Compiled by the author

A third group of impacts is stringently regulated but not in the entire Arctic. In shipping, this is true for the OSPAR ban on the dumping of vessels into the sea, which only applies to the European Arctic. The group of stringent international regulations with limited geographic application is somewhat larger in offshore oil and gas. It consists of OSPAR decisions and recommendations on the use and discharge of drilling fluids and cuttings, as well as on the disposal of disused platforms.

A fourth group of regulations is neither stringent nor Arctic-wide. In shipping, both the regulatory frameworks for black water discharges and ballast water management have a limited ambition. In addition, the United States is not a party to the relevant MARPOL annex IV and to the global Ballast Water Management Convention and enforces its own demanding requirements instead. More issues abound for offshore hydrocarbon production. They include nonbinding OSPAR regulations on impacts, such as oil and harmful substances in produced water, radioactive substances, the management of cuttings piles, and lighting. The stringency of these recommendations and guidelines is also weakened by the fact that, often for technological reasons, they do not aim to completely eliminate the externality for all installations. Nevertheless, OSPAR regulations have proven successful in reducing the amount of oil discharged from offshore platforms (OSPAR, 2017). In addition, MARPOL annex VI provisions on air pollutant emissions from platforms will soon apply to all Arctic coastal states (Iceland from February 2018) but are not stringent. However, the larger limitation here is that annex VI does not apply to operational emissions directly arising from hydrocarbon extraction, such as flaring and venting.

A fifth group of operational pollution sources is unregulated. Regulatory gaps in Arctic shipping concern black carbon exhaust emissions and gray water discharges. Black carbon is an air pollutant and climate-forcing agent. The IMO Polar Code only indirectly addresses black carbon, as it recommends not using heavy fuel oil (see [Chapter 15](#)). Gray water refers to all wastewater streams except for those from toilets. It is not covered by the present sewage provisions of the Polar Code. Both issues are thus candidates for consideration in a second phase of Polar Code negotiations. Another unaddressed issue is disturbance from icebreaking activity. Unregulated operational impacts of offshore oil and gas include the venting of gas and minor discharges into the sea (cooling water and desalination brine). However, knowledge gaps persist regarding different chemicals and compounds contained in water produced during hydrocarbon extraction (OSPAR, 2016: 7). Future scientific evidence for negative environmental effects may bring additional issues to the fore.

In sum, variance in the regulatory coverage of external effects and in the stringency of these regulations suggests that gaps persist in both industries. The five groups of externalities identified here can be matched with different priorities for future action: (1) enforcement, (2) increases in regulatory stringency, (3) geographic extension of existing regulations, (4) improvements in stringency and extension, and (5) additional regulation. Whether or not these routes shall and will be pursued for individual impacts depends on environmental, economic, and societal considerations that go beyond the scope of this chapter.

Implications for Arctic Regulatory Governance

Climate change poses threats to the Arctic Ocean beyond warming. A warming Arctic Ocean will be a more accessible ocean – for cruise ships, cargo ships, and

offshore oil and gas production. Maritime industries can cause different types of operational pollution in the fragile Arctic environment. This chapter examined how states have responded to these new threats in terms of international regulation. International regulation plays a role in mitigating maritime industry impacts in the Arctic for three reasons: the transboundary nature of the industries and their impacts, the additional leverage gained by international regulation, and the regulatory function of both hard and soft law. The analysis used new data on the stringency of all relevant international maritime regulations that are applicable to the Arctic Ocean or part of it and that have entered into force between 1950 and 2017. Stringent regulations were defined to be tight in form and ambitious in substance as measured on an index with six design elements.

The empirical analysis revealed that regulatory activity and stringency vary over time and across industries, international organizations, and externalities. Regulations designed for the Arctic emerged in the 1990s and 2000s in response to accelerating sea-ice melt. Since then, unified and rather stringent regulations have evolved for shipping with the IMO Polar Code, while offshore oil and gas regulation has remained fragmented and less stringent. These differences are rooted in the regulatory approaches pursued by the three dominant intergovernmental organizations. The IMO has been an active and rather stringent shipping regulator and an occasional offshore regulator. The OSPAR Commission has been a partly stringent, yet less broad, hydrocarbon regulator in the northeast Atlantic and European Arctic. The Arctic Council has addressed numerous offshore oil and gas impacts, but only through lax guidance. In both industries, regulatory gaps persist in geographic coverage, regulatory stringency, and issue coverage.

These findings have concrete policy implications for governing the Arctic as the climate changes. Arctic shipping regulation seems to be on a promising track. Where stringent shipping regulation already exists, implementation is the major concern. Arctic coastal states need to establish sufficient numbers of reception facilities for oil, noxious liquid substances, and other ship-generated wastes (PAME, 2017). Furthermore, flag, coastal, and port states need to collaborate in enforcing regulations through proper surveys, surveillance, and inspections. Where additional protection of the Arctic marine environment is needed, the designation of Particular Sensitive Sea Areas under IMO could be an option (DNV, 2014). Where regulatory gaps persist, additional stimuli from the regional level – for example, from the Arctic Council (Stokke, 2013) – could trigger a second phase of IMO Polar Code negotiations.

The road ahead in Arctic offshore oil and gas regulation is more challenging due to regulatory fragmentation and the institutional weakness of the Arctic Council. Given that a binding Arctic Ocean treaty is unlikely for various reasons (Young, 2011), three alternative strategies merit further exploration: First, IMO could increasingly regulate offshore oil and gas impacts. Second, OSPAR regulations could be gradually extended to larger parts of the Arctic, especially to northwest Russia and western Greenland. Third, the Arctic Council could develop more

ambitious and precise standards, and properly monitor and economically incentivize their implementation. Pursuing any of these options, or a combination of them, also needs to consider governance challenges arising from continued fragmentation (Humrich, 2013). While these insights pertain to the realm of operational environmental regulation, they might also be useful for future maritime safety regulation in the Arctic.

Conclusion

The findings highlight a number of general difficulties surrounding international policy responses to climate-induced ocean threats. Climate change provokes changes beyond Arctic shipping and offshore hydrocarbons. Other chapters in this volume point to the accessibility of Antarctic resources (see Chapter 13), fish population changes (see chapters in Part III), ocean renewable energy (see Chapter 24), and geoengineering efforts (see Chapter 26). Many of these changes have environmental implications that call for international policy responses. When should such policies be developed, by whom, on which issues, and how? The findings in this chapter suggest no easy answers. Early action might pave the way for more advanced policies or cement a lax policy trajectory. Those international organizations supplying stringent policies might have inadequate geographic coverages, and vice versa. Moreover, knowledge and technology determine possibilities for regulation. Ocean governance in an era of climate change needs to carefully consider these aspects.

Future research can help to further improve ocean governance. For example, more political science research into drivers and effects of international maritime regulation in the Arctic is needed. Scholars could use the data analysis presented here to investigate the effectiveness of different regulatory designs. They could also link the identified stringency patterns to competing theoretical explanations of regulatory decision making. Together, these lines of research would elucidate under which conditions effective international regulation is likely to emerge – for a warming and more threatened Arctic Ocean, as well as for other sea regions amidst climate-induced changes.

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