



UiT The Arctic University of Norway

Soundproofing the oceans: International regulation of underwater noise from shipping activity in the Arctic

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List of Abbreviations

ABMTs	Area-Based Management Tools
ABNJ	Areas Beyond National Jurisdiction
AMSA	Arctic Marine Shipping Assessment
BBNJ Agreement	Agreement under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction
CAO	Central Arctic Ocean
CDEM	Construction, design, equipment and manning
EEZ	Exclusive Economic Zone
GAIRAS	Generally Accepted International Rules and Standards
GEF	Global Environment Facility
ICC	Inuit Circumpolar Council
ICJ-Statute	Statute of the International Court of Justice
ICP	Open-ended Informal Consultative Process on Oceans and Law of the Sea
ICRW	International Convention for the Regulation of Whaling
IMO	International Maritime Organization
ITLOS	International Tribunal for the Law of the Sea
IWC	International Whaling Commission
MARPOL 73/78	International Convention for the Prevention of Pollution from Ships
MEPC	Marine Environment Protection Committee

MPA	Marine Protected Area
MSC	Maritime Safety Committee
nm	nautical mile
PAME	Protection of the Arctic Marine Environment Working Group
Polar Code	International Code for Ships Operating in Polar Waters
PSSAs	Particularly Sensitive Sea Areas
SDC	Sub-Committee on Ship Design and Construction
SDG	Sustainable Development Goal
SOLAS	International Convention for the Safety of Life at Sea
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers
UNCLOS	United Nations Convention on the Law of the Sea
UNDP	United Nations Development Programme
UNGA	United Nations General Assembly
UNTS	United Nations Treaty Series
VCLT	Vienna Convention on the Law of Treaties

Chapter 1: Introduction

1.1. Background and objective

As global warming and climate change intensify, new challenges arise. The situation is particularly worrying in the Arctic, due to the region's sensitive nature. The Arctic sea ice is currently shrinking at a rate of nearly 13% per decade,¹ creating new shipping routes and allowing the existing ones to remain open for longer periods than before. We are already witnessing increasing levels of shipping, with a 37% rise in the number of ships entering the Arctic in the last decade alone.² This development unfortunately also entails damaging consequences; one of them being the anthropogenic underwater noise generated by shipping activity.

Levels of underwater noise pollution have doubled in 2013-2019, and since then, the traffic volume in the Arctic has further increased.³ Studies show that underwater noise may have adverse effects on marine fauna, in particular marine mammals, who rely on naturally occurring sound for activities such as predator and prey detection, navigation, mating and communication.⁴ With a high density of marine mammals in the Arctic, underwater noise may be detrimental to the ecosystems of the region. Some of the consequences still remain unknown, but the scientific community is unified in its belief that measures need to be taken in order to protect this vulnerable area. Currently, there is no legally binding framework regulating underwater noise, meaning that new legal instruments may be needed. The topic is highly

¹ NASA, *Arctic Sea Ice Minimum* (2022), available at <https://climate.nasa.gov/vital-signs/arctic-sea-ice/?intent=12> (accessed 1 April 2024).

² PAME, *The increase in Arctic Shipping: 2013-2023, Arctic Shipping Status Report (ASSR)* (March 2020, updated January 2024), available at <https://oarchive.arctic-council.org/items/01ddf449-9048-4d6a-a056-65303831bb63> (accessed 1 April 2024).

³ PAME, *Underwater Noise Pollution from Shipping in the Arctic*, (May 2021), available at <https://www.pame.is/document-library/pame-reports-new/pame-ministerial-deliverables/2021-12th-arctic-council-ministerial-meeting-reykjavik-iceland/787-underwater-noise-pollution-from-shipping-in-the-arctic/file> (accessed 1 April 2024), p. 10.

⁴ PAME, *Underwater Noise in the Arctic: A State of Knowledge Report* (May 2019), available at <https://www.pame.is/index.php/document-library/pame-reports-new/pame-ministerial-deliverables/2019-11th-arctic-council-ministerial-meeting-rovaniemi-finland/421-underwater-noise-report/file> (accessed 1 April 2024), p. 4.

relevant, as proven by the attention it has received at the International Maritime Organization (IMO) recently, for instance through the adoption of revised guidelines, as well as a new action plan endorsed at the 81th session of IMO's Marine Environment Protection Committee (MEPC 81) that took place in March 2024.⁵

The main objective of the thesis is therefore to assess the adequacy of the international regulation of underwater noise generated by shipping activity, using the Arctic region as a case study. The intention is to provide an overview of the existing regulation, in order to shed light on an area of the law of the sea which is quite unclear. Following this, the aim is to critically reflect on the current state of the law, by identifying the regulatory gaps, and discussing ways in which these gaps can be filled.

1.2. Research questions

In light of the objective, the research question is as follows: Is the current international regulation relating to underwater noise from shipping activity in the Arctic adequate?

Given the limited specific international regulation of underwater noise caused by shipping, this thesis aims to provide an overview of the general international regulatory framework, conduct a critical analysis thereof to identify its potential shortcomings, and suggest ways to address any identified regulatory gaps.

In view of this, three sub-questions have been formulated:

- What is the current state of the international regulation applicable to underwater noise from shipping activity in the Arctic?
- What are the potential shortcomings of the current international regulation governing underwater noise from shipping activity in the Arctic?
- How can such shortcomings be overcome?

⁵ IMO, *Action plan agreed to reduce underwater noise from ships* (2024), available at <https://www.imo.org/en/mediacentre/Pages/WhatsNew-2032.aspx> (accessed 1 April 2024).

1.3. Delimitation of scope

1.3.1. Geographical scope

The focus of this case study is the Arctic, naturally limiting its scope to this specific geographical area. Therefore, only regulations that apply to the Arctic region will be examined. For this purpose, a working definition of the Arctic is needed. As there is no universally applicable definition of the Arctic nor the Arctic region, the geographical scope of the thesis uses the definition of Arctic waters as outlined by the International Code for Ships Operating in Polar Waters (Polar Code), defined by the precise coordinates found in the International Convention for the Safety of Life at Sea (SOLAS) Chapter XIV reg. 1.3.⁶ The area in question is also illustrated by a figure contained in the introduction chapter of the Polar Code.



Figure 1 – The geographical scope of Arctic waters as depicted by the Polar Code.⁷

⁶ International Convention for the Safety of Life at Sea (adopted 1 November 1974, entered into force 25 May 1980) 1184 UNTS 3, Chapter XIV, reg. 1.3.

⁷ Polar Code text as adopted, p. 9: IMO, *Report of the MEPC on its 68th Session*, MEPC 68/21/Add. 1 Annex 10 (5 June 2015), available at <https://wwwcdn.imo.org/localresources/en/MediaCentre/HotTopics/Documents/POLAR%20CODE%20TEXT%20AS%20ADOPTED.pdf> (accessed 21 April 2024).

1.3.2. Substantive scope

As the aim of the thesis is to examine anthropogenic underwater noise from shipping activity, the substantive scope will be limited to commercial shipping, which is here understood as cargo shipping and cruise shipping, as defined in SOLAS Chapter I reg. 2.⁸ For practical reasons, non-SOLAS vessels such as warships, troopships and auxiliary vessels, smaller leisure ships or fishing vessels, as defined in SOLAS Chapter I reg. 3, will not be considered.⁹ As for the effects of underwater noise, the focus will be on how it impacts marine life, particularly marine mammals. Considering that humans are not able to perceive underwater noise very well, the effects thereof on seafarers and humans on land will be excluded. Consequently, noise in ports and potential port State action to reduce underwater noise from commercial shipping will not be examined. Furthermore, the focus will be solely on noise generated by shipping, and will therefore not include noise from hydrocarbon activities, or wind and tidal turbines. The deliberate introduction of noise for purposes such as sonar and seismic activities is also excluded. As the main emphasis is on international regulation, domestic regulations will not be included.

1.4. Methodology and sources

In this thesis, a doctrinal legal approach will be applied, with the aim of understanding *de lege lata* - the current state of law governing underwater noise generated by shipping activity in the Arctic. The purpose of doctrinal legal research is to systematically present the applicable law, by collecting, interpreting and analyzing relevant legal sources, in order to derive a rule of law that addresses a specific legal question.¹⁰ Adhering to this approach, *de lege ferenda* considerations will also be included, by evaluating the current state of law and suggesting potential amendments. To conduct doctrinal research, it is essential to identify the relevant

⁸ International Convention for the Safety of Life at Sea (adopted 1 November 1974, entered into force 25 May 1980) 1184 UNTS 3, Chapter I, reg. 2.

⁹ *Ibid.*, reg. 3.

¹⁰ "research." In *Australian Law Dictionary*, edited by Mann, Trischa.: Oxford University Press, 2017, available at <https://www-oxfordreference-com.mime.uit.no/view/10.1093/acref/9780190304737.001.0001/acref-9780190304737-e-3397> (accessed 28 April 2024).

sources of international law. Particularly relevant in this regard is Article 38 (1) of the Statute of the International Court of Justice (ICJ-Statute), which lists international conventions, customary law and general principles as the primary sources of international law.¹¹ These primary sources will therefore form the basis of the methodological approach in this thesis. Consequently, the point of departure will be to analyze the relevant international treaties and interpret them in accordance with Part III Section 3 of the Vienna Convention on the Law of Treaties (VCLT).¹² However, given the largely unregulated nature of this area of law, it will also be necessary to examine a considerable number of soft law instruments to determine the current regulatory framework.

Legally binding instruments of relevance are the UN Convention on the Law of the Sea (UNCLOS),¹³ the Polar Code as an amendment to SOLAS and the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78),¹⁴ as well as the Agreement on the Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction (BBNJ Agreement).¹⁵ As for soft law, relevant instruments are IMO draft guidelines, action plans, partnership programs, recommendations and other policy documents. Additionally, a diverse range of legal literature will be reviewed and analyzed during this research, in order to provide insight into the primary sources.

¹¹ Statute for the International Court of Justice (adopted 26 June 1945, entered into force 24 October 1945) USTS 993.

¹² Vienna Convention on the Law of Treaties (adopted 23 May 1969, entered into force 27 January 1980) 1155 UNTS 331, Part III Section 3.

¹³ United Nations Convention for the Law of the Sea (adopted 10 December 1982, entered into force 16 November 1994) 1833 UNTS 397.

¹⁴ International Convention for the Prevention of Pollution from Ships (adopted 2 November 1973, entered into force 2 October 1983) 1340 UNTS 61.

¹⁵ Agreement under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction (adopted 19 June 2023, not yet in force), available at

https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXI-10&chapter=21&clang=_en (accessed 25 April 2024).

1.5. Outline of the paper

The thesis is structured around the three aforementioned sub-questions. Following the introduction chapter, Chapter 2 will provide the scientific background and status of underwater noise, explaining how it is introduced by vessels into the marine environment and how it affects the marine fauna. Thereafter, Chapter 3 addresses sub-questions 1 and 2, outlining the current state of international regulation of underwater noise from commercial shipping in the Arctic, and identifying potential shortcomings. Chapter 4 will then explore possible solutions to such shortcomings and provide a detailed analysis of the effectiveness and feasibility of each option. Lastly, some final conclusions will be presented in Chapter 5.

Chapter 2: Scientific background

2.1. Status of underwater noise from shipping

The problem of underwater noise pollution and how it affects marine mammals was first raised at the IMO in 2004.¹⁶ It was then concluded that continuous anthropogenic underwater noise was caused mainly by shipping.¹⁷ Since then, the issue of underwater noise caused by humans has become an increasing concern globally¹⁸, and the problem is even more pressing in the Arctic, due to the region's particular nature. As mentioned in the introduction, levels of underwater noise in the Arctic doubled during a period of only six years – that is, between 2013 and 2019.¹⁹ Today, due to the increasing volume of marine traffic in the region, the situation is becoming even worse. The traffic in question is international, and as Arctic waters are under the jurisdiction of several States and some areas are beyond national jurisdiction, it is clear that the issue necessitates a coordinated international response.²⁰

In recent years, the problem of underwater noise pollution and its effects on the marine environment have received increased attention and have been recognized by several regional and international agencies and organizations, including the UN, the IMO and the EU.²¹ At the regional level, the issue was addressed by the Arctic Council's working group on Protection of the Arctic Marine Environment (PAME) already in the 2009 Arctic Marine Shipping Assessment (AMSA) Report. Here it was stated that “sound is of vital biological importance to marine mammals and anthropogenic noise produced through shipping and other vessel activity can have various adverse effects on Arctic species.”²² Since then, PAME has released two reports on this specific issue: a State of Knowledge Report published in 2019,²³ and a report

¹⁶ IMO, *Ship noise* (2024), available at <https://www.imo.org/en/MediaCentre/HotTopics/Pages/Noise.aspx> (accessed 28 May 2024).

¹⁷ *Ibid.*

¹⁸ PAME (2019), *supra* note 4, p. 12.

¹⁹ PAME (2021), *supra* note 3.

²⁰ IMO, *supra* note 16.

²¹ PAME (2019), *supra* note 4, p. 4.

²² Arctic Council, *Arctic Marine Shipping Assessment 2009 Report* (April 2009), 2nd print., available at <https://oaarchive.arctic-council.org/items/b01465f9-413d-4555-af59-07ddc7b7499a> (accessed 28 May 2024), as cited in PAME (2019), *supra* note 4, p. 5.

²³ PAME (2019), *supra* note 4.

depicting the trends and levels of underwater noise from Arctic shipping published in 2021.²⁴ Both these reports show that although quieter than other oceans, the Arctic Ocean is experiencing a significant increase in underwater noise. Additionally, they both conclude with open questions, highlighting the numerous knowledge gaps and the unknown extent of potential effects on marine mammals and Arctic marine ecosystems.²⁵

2.2. Impacts of underwater noise on marine life in the Arctic

While there are many naturally occurring sounds in Arctic waters, for a long time the region has practically been free of anthropogenic sound. However, the recent increase in commercial shipping is reversing this trend, causing a rise in anthropogenic noise levels. The Cambridge Dictionary defines noise as “a sound or sounds” that are “unwanted, unpleasant or loud”.²⁶ In other words, one could define underwater noise in the Arctic as sounds that are not naturally occurring in the Arctic marine soundscape, and that may cause a disturbance to mammals or other parts of the ecosystem.

Furthermore, in the literature, underwater noise is usually divided into two broad categories: continuous and impulsive noise. Impulsive noise is characterized by its short duration and its very quick start and stop times.²⁷ Yet, in practice, if impulsive noise is frequent, it may effectively appear continuous.²⁸ Examples of impulsive anthropogenic underwater noise include seismic surveys and sonar. In contrast, continuous noise has a longer duration and often has gradual changes in amplitude.²⁹ Examples of continuous human-made underwater noise include drilling noise and vessel noise. This paper will therefore primarily focus on the effects and regulations of continuous noise.

²⁴ PAME (2021), *supra* note 3.

²⁵ PAME (2019), *supra* note 4; PAME (2021), *supra* note 3.

²⁶ “noise.” In *Cambridge Dictionary*, Cambridge: Cambridge University Press, 2024, available at <https://dictionary.cambridge.org/dictionary/english/noise> (accessed 17 June 2024).

²⁷ PAME (2019), *supra* note 4, p. 13.

²⁸ *Ibid.*

²⁹ *Ibid.*

Underwater noise pollution in the Arctic is worsening due to climate change and the reduction of sea ice. The loss of sea ice opens new sea routes, increasing both shipping traffic and vessel noise. The situation in the Arctic is complex due to the unique acoustic properties of the Arctic Ocean, which differ from those in non-polar waters.³⁰ This is mainly due to the presence of sea ice, which acts as both a source, shield and diffuser of underwater noise.³¹ Generally, the presence of sea ice contributes to reducing acoustic propagation,³² and functions as a diffuser by dampening the impact of wind.³³ However, the sea ice itself can also be a source of underwater noise, due to its constant motion, which generates noise through cracking, shearing and ridging.³⁴ In other words, the reduction in sea ice negatively affects its three roles as a source, shield and diffuser of noise, making the Arctic Ocean more prone to underwater noise. Lastly, the shallowness of the Arctic Basin means that even a few ships can significantly impact the underwater soundscape.³⁵

In water, sound travels at a speed of around 1500 meters per second, which is nearly five times faster than in air.³⁶ It is also estimated that it can travel up to 60 times further.³⁷ The lower the frequency, the further the sound can travel, and most of the noise produced by anthropogenic activities, including shipping, is low-frequency.³⁸ This is particularly problematic since marine mammals depend on sound for critical biological functions such as navigation, communication, mating or foraging, and the fact that the sounds transmitted by such mammals often are low-

³⁰ PAME (2021), *supra* note 3, p. 8.

³¹ *Ibid.*

³² *Ibid.*, p. 14.

³³ Roth, Ethan H. et al. (2012) Underwater ambient noise on the Chukchi Sea continental slope from 2006- 2009. *Journal of the Acoustical Society of America*, 131, p. 104–110.

³⁴ Kinda, G. Bazile et al. (2015) Arctic underwater noise transients from sea ice deformations: characteristics, annual time series, and forcing in Beaufort Sea. *Journal of the Acoustical Society of America*, 138, p. 2034–2045.

³⁵ PAME (2021), *supra* note 3, p. 8.

³⁶ Maruf and Warwick Gullett. (2022). Tackling anthropogenic underwater noise through the Convention on Biological Diversity: Progress and future development. *Marine Policy*, 146, 105293, p. 2.

³⁷ Dahl, Torhild. *Topic: Bioacoustics* (2019). Institute of Marine Research, available at <https://www.hi.no/en/hi/temasider/ocean-and-coast/bioacoustics> (accessed 29 May 2024).

³⁸ *Ibid.*

frequency (between 50 and 500 Hertz).³⁹ As such, it is clear that human-made underwater noise might be disruptive to marine life, as it interferes with the ability of mammals to transmit and receive acoustic information, which in turn might be vital for their existence. Moreover, it is widely recognized that this new disturbance has both short-term and long-term effects on marine mammals.⁴⁰ Disruptive noise can negatively impact their behavioral patterns, causing physical damage, increased stress responses, loss of feeding grounds or even displacement, consequently affecting their breeding and survival.⁴¹ This can in turn impact entire ecosystems, and the negative consequences can potentially extend to humans and affect entire societies, in view of how important marine mammals are to Arctic coastal Indigenous peoples.⁴²

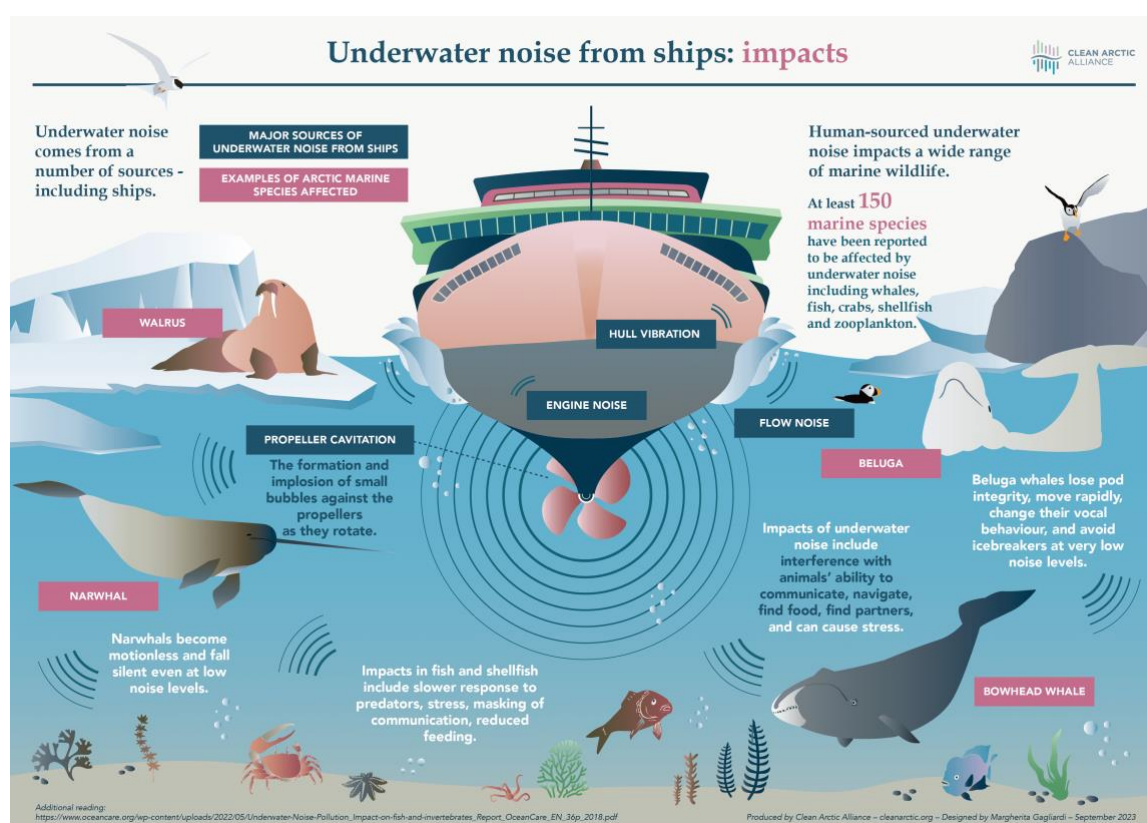


Figure 2 – Infographic showing the impacts of underwater noise from ships.⁴³

³⁹ Ibid.

⁴⁰ Maruf and Gullett. (2022), *supra* note 36.

⁴¹ Ibid.

⁴² PAME (2021), *supra* note 3, p. 8.

⁴³ Designed by Gagliardi, Margherita (September 2023), produced by Clean Arctic Alliance – cleanarctic.org, available at https://cleanarctic.org/wp-content/uploads/2023/09/Underwater-noise-infographic_sept2023_clean_arctic_alliance_ne.pdf (accessed 17 June 2024).

2.3. How to mitigate underwater noise?

The most common sources of human-made underwater noise in the Arctic are vessel traffic and oil and gas exploration activities.⁴⁴ Yet, oil and gas exploration activities in the Arctic vary in both time and space and are limited to only certain parts of the Arctic, in contrast to vessel traffic.⁴⁵ In addition, there has not been any increase in oil and gas exploration in the Arctic as a whole, while shipping has increased throughout the entire region.⁴⁶ Shipping is therefore the principal source of underwater noise in Arctic waters.

In shipping, noise is mainly generated by the propeller and other rotating machinery such as engines, gear-boxes, fans or generators.⁴⁷ Other sources include hull vibration, discharge released through open pipes and flow noise.⁴⁸ Still, the main source of continuous underwater noise in shipping stems from a phenomenon called propeller cavitation, which can be explained as the production of vacuum bubbles by the propeller.⁴⁹ As the propeller turns, it creates a low-pressure zone at the end of the blade which in turn lowers the boiling point of water sufficiently to create small pockets of vaporized water.⁵⁰ As the pressure of the water dissipates in the immediate vicinity of the propeller, these bubbles collapse, creating noise.⁵¹

Thus, the question remains how to mitigate underwater noise pollution stemming from shipping. Noise increases with speed, and we know that the most effective way to reduce underwater noise is by lowering the speed of vessels and the number of ships.⁵² However, given the increasing accessibility of the Arctic and the economic opportunities it offers, a reduction

⁴⁴ PAME (2019), *supra* note 4, p. 7.

⁴⁵ *Ibid.*

⁴⁶ *Ibid.*

⁴⁷ ICES, Underwater noise of research vessels: review and recommendations. (May 1995) ICES Cooperative Research Report No. 209, available at <https://doi.org/10.17895/ices.pub.5317> (accessed 12 June 2024), p. 3.

⁴⁸ *Ibid.*

⁴⁹ Jalkanen, Jukka-Pekka et al. (2018) Modelling of ships as a source of underwater noise. *Ocean Science*, 14, 1373–1383, p. 1373.

⁵⁰ *Ibid.*

⁵¹ *Ibid.*

⁵² Frankel, Adam S. and Chris M. Gabriele. (2017). Predicting the acoustic exposure of humpback whales from cruise and tour vessel noise in Glacier Bay, Alaska, under different management strategies. *Endangered Species Research*, 34, 397–415.

in the number of ships is unlikely, meaning that speed restrictions may be the preferred solution. In addition to reduced cavitation, lower speed will also help reduce onboard machinery noise, sound generated by hull vibration and flow noise. Other mitigation measures include restrictions in or closure of shipping traffic in areas that are known to be inhabited by marine mammals, routing measures to help avoid such sensitive marine areas, or the use of monitoring systems to help establish whether sensitive species are in the vicinity.⁵³ Another measure is to incorporate technologies to reduce noise. This can be achieved already during the ship design phase, by producing propellers that reduce cavitation. When rotated fast enough, all propellers will cavitate, but with the right design, the threshold for cavitation will be lower.⁵⁴ Nevertheless, one must keep in mind that a lot of vessel traffic in the Arctic consists of ice breaking, which generally produces higher levels of noise than regular ships.⁵⁵ The design of such propellers might be more difficult to alter, as they require a certain sturdiness.

⁵³ Dotinga, Harm M. and Alex G. Oude Elferink. (2000). Acoustic Pollution in the Oceans: The Search for Legal Standards. *Ocean Development & International Law*, 31(1–2), 151–182, p. 156.

⁵⁴ Jalkanen et al. (2018), *supra* note 49.

⁵⁵ PAME (2019), *supra* note 4, p. 47.

Chapter 3: Current regulation of underwater noise – a critical analysis

In order to assess the adequacy of the current international regulation relating to underwater noise from shipping in the Arctic, it is essential to first gain thorough knowledge of these regulations. Thus, this chapter will provide a comprehensive overview of the current state of the international regulation applicable to underwater noise from shipping activity in the Arctic, examining various applicable legal instruments. During this review, potential shortcomings of these regulations will be identified and critically discussed.

3.1. Legally binding instruments

3.1.1. UN Convention on the Law of the Sea

UNCLOS is considered the main legally binding international instrument of the law of the sea, as it lays down a comprehensive regime regulating virtually all matters related to the world's oceans and seas. It is frequently described as the “constitution for the oceans” due to its comprehensive scope, framework nature, universal application and durability and flexibility, as it allows for adaptation to new challenges.⁵⁶ The Convention was formally adopted in 1982, after more than 14 years of negotiations.⁵⁷ As of today, there are 169 States Parties to the Convention, which amounts to approximately 85 per cent of UN members.⁵⁸ However, most of the provisions are recognized as reflecting customary international law, meaning that they can also be binding upon non-parties. While the Convention does contain rules regarding amendments, the document has never been formally amended, although it has been supplemented by several subsequent agreements.

UNCLOS lays out a legal framework for maritime zones, where coastal States are entitled to different levels of jurisdiction over waters adjacent to their coastline. Each coastal State can therefore have a territorial sea that extends up to 12 nautical miles (nm) from its baselines,⁵⁹ a

⁵⁶ Churchill, Robin, Vaughan Lowe and Amy Sander. “Introduction.” Chapter in *The law of the sea*, 1–48. (Manchester University Press, 2022), p. 43.

⁵⁷ *Ibid.*, p. 22-23.

⁵⁸ UNCLOS, *supra* note 13.

⁵⁹ *Ibid.*, Art. 3.

contiguous zone extending up to 24 nm from its baselines,⁶⁰ and an exclusive economic zone (EEZ) up to 200 nm from the baselines.⁶¹ Areas beyond that are considered high seas and are beyond national jurisdiction.⁶² Moreover, the Convention provides rules regarding navigation, conservation and management of living resources, the deep seabed, marine scientific research, dispute settlement, and other uses of the ocean. Additionally, the treaty contains a separate part, Part XII, regarding the protection and preservation of the marine environment.

When it comes to the Convention's applicability to address underwater noise, the biggest criticism is that it does not contain any specific provisions regulating noise or requiring States to prevent or reduce underwater noise pollution. This is likely due to the fact that at the time the Convention was adopted, noise pollution had not yet been scientifically recognized as a problem. However, as UNCLOS has been drafted with the intention of being a living instrument with the ability to adapt to new challenges and societal developments, the question is whether noise falls within the definition of pollution in Article 1(4). The provision defines pollution of the marine environment as "the introduction by man, directly or indirectly, of substances or energy into the marine environment (...), which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities".⁶³

It is self-evident that sound is a form of energy. Authors also seem to agree that the definition of pollution in Article 1(4) should be interpreted in light of advancements in the understanding of sources of pollution.⁶⁴ In its recent Advisory Opinion on climate change, the International Tribunal for the Law of the Sea (ITLOS) also emphasized that the word "energy" does have a broad meaning.⁶⁵ In other words, the conclusion must be that the inclusion of "energy" in Article 1(4) will encompass sound. Yet, whether noise constitutes pollution will depend on the

⁶⁰ *Ibid.*, Art. 33(2).

⁶¹ *Ibid.*, Art. 57.

⁶² *Ibid.*, Art. 86.

⁶³ *Ibid.*, Art. 1(4).

⁶⁴ Dotinga and Elferink (2000), *supra* note 53, p. 158.

⁶⁵ Request for an Advisory Opinion submitted by the Commission of Small Island States on Climate Change and International Law, Advisory Opinion of the International Tribunal for the Law of the Sea (21 May 2024), para. 163.

circumstances in each case. The introduction of sound must result in “deleterious effects” to marine life, meaning that underwater noise generated by a ship navigating through an area with no presence of noise-sensitive species would not necessarily qualify as pollution.⁶⁶

Thus, the classification of noise as pollution supports the applicability of UNCLOS Part XII, along with the general obligations of States under Articles 192 and 194 to protect the marine environment and prevent, reduce and control pollution.⁶⁷ In the *Chagos MPA* case, the Arbitral Tribunal affirmed that Part XII covers more than just pollution control, and further clarified that Article 194(5) also extends to measures for conservation and preservation of biodiversity.⁶⁸ This was further confirmed by the Tribunal in the *South China Sea Arbitration*, which emphasized the need to protect endangered species and fragile ecosystems.⁶⁹ These cases therefore support the reasoning that prevention of underwater noise is an obligation under Part XII, as it is necessary to protect and preserve biodiversity.⁷⁰ Still, as of today, no judicial proceedings have been initiated against any State for violating their obligation to protect and preserve the marine environment by not taking measures against underwater noise.

In exercise of their coastal State jurisdiction, coastal States have the authority to adopt laws and regulations to prevent, reduce and control pollution in respect of foreign vessels present within their territorial sea or EEZ.⁷¹ These measures are however limited by the rights of other States as prescribed by the Convention, and cannot interfere with other legitimate uses of the sea, such as navigational rights, unless permitted by UNCLOS.⁷² Hence, within the territorial sea, the coastal State cannot adopt measures that interfere with foreign vessels’ right to innocent passage, nor impose construction, design, equipment or manning (CDEM) standards on foreign

⁶⁶ Churchill, Robin, Vaughan Lowe and Amy Sander. “Protection of the marine environment: an introduction.” Chapter in *The law of the sea*, 600–627. (Manchester University Press, 2022), p. 622.

⁶⁷ Rayegani, Anita. “Synergies Between the Obligations and Measures to Reduce Vessel-Source Underwater Noise and Greenhouse Gas Emissions.” Chapter in: Carpenter, A., Johansson, T.M. and Skinner, J.A. (eds) *Sustainability in the Maritime Domain*, 235–256. (Springer, Cham, 2021).

⁶⁸ *Chagos Marine Protected Area Arbitration* (Mauritius v United Kingdom), Final Award, ICGJ 486 (PCA 2015), para. 538, as cited in Rayegani (2021), *supra* note 67.

⁶⁹ *South China Sea Arbitration* (Philippines v China), Award, PCA Case No 2013-19, ICGJ 495 (PCA 2016), para. 945, as cited in Rayegani (2021), *supra* note 67.

⁷⁰ Rayegani (2021), *supra* note 67, p. 242–244.

⁷¹ UNCLOS, Arts. 21(1)(f), 56, 211(4) and 211(5).

⁷² Dottinga and Elferink (2000), *supra* note 53, p. 161.

vessels unless they adhere to the so-called generally accepted rules and standards (GAIRAS).⁷³ This means that coastal States can still adopt regulations on speed or impose navigational standards such as routing measures to help avoid sensitive marine areas, as long as due publicity is given.⁷⁴

However, the restrictions are even stricter in the EEZ, where according to Article 211(5), coastal States can only adopt laws and regulations related to the prevention, reduction or control of pollution from foreign vessels if they conform and give effect to GAIRAS.⁷⁵ This is a rule of reference, as such rules and standards are to be established through the competent international organization, which in this case is the IMO. In relation to vessel-source pollution, the GAIRAS referred to in Article 211 are generally considered to be those provided by MARPOL. Yet, the definitions used in MARPOL seem to exclude its application to noise.⁷⁶ This raises the question of whether there exist any other GAIRAS related to the control of underwater noise from vessels. This question will be developed further in Section 3.2.1. on the IMO as well as in Chapter 4.

There is however an exception to these strict requirements, namely UNCLOS Article 234 on “ice-covered areas”, which specifically deals with shipping in polar regions. The provision is also known as the “Arctic exception” and provides coastal States with the right to adopt and enforce non-discriminatory regulations for the prevention, reduction and control of marine pollution from vessels in ice-covered areas.⁷⁷ It allows coastal States to adopt and enforce within their 200 nm maritime zones national laws and regulations without requiring them to be in conformity with GAIRAS.⁷⁸ In other words, unlike other UNCLOS provisions on vessel-

⁷³ UNCLOS, Arts. 21(2), 24 and 211(4).

⁷⁴ *Ibid.*, Arts. 21 and 22.

⁷⁵ *Ibid.*, Art. 211(5).

⁷⁶ See the full discussion on this in Section 3.1.2.2. on MARPOL 73/78.

⁷⁷ UNCLOS, Art. 234; Bartenstein, Kristin. (2011). The “Arctic Exception” in the Law of the Sea Convention: A Contribution to Safer Navigation in the Northwest Passage?. *Ocean Development & International Law*, 42, 22–52.

⁷⁸ McDorman, Ted L. “A Note on the Potential Conflicting Treaty Rights and Obligations between the IMO’s Polar Code and Article 234 of the Law of the Sea Convention.” In Suzanne Lalonde and Ted L. McDorman (eds.), *International Law and Politics of the Arctic Ocean*, 141–159. (Brill Nijhoff 2015), p. 143.

source pollution,⁷⁹ the coastal State does not need to obtain prior approval from the IMO. The Arctic exception does however have a limited scope. The rules adopted must have “due regard to navigation and the protection and preservation of the marine environment based on the best available scientific evidence”.⁸⁰ Out of the Arctic States, both Russia and Canada seem to have relied on Article 234 when adopting special legislation in their EEZs relating to polar shipping.⁸¹

3.1.2. Polar Code

The Polar Code is a set of comprehensive mandatory international rules and standards applicable to navigation in polar regions.⁸² It was adopted by the IMO in 2014 and entered into force in 2017.⁸³ The Code applies to both the Arctic and Antarctica and seeks “to provide for safe ship operation and the protection of the polar environment”.⁸⁴ Rather than being a separate treaty, it is an amendment to existing IMO Conventions, namely MARPOL, SOLAS and parts of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW). It covers all aspects related to the design, construction, equipment, operation, training, search and rescue, and environmental protection for ships navigating in the harsh conditions of the two poles.⁸⁵ The Polar Code is divided into four parts: parts I-A and II-A, which address safety and pollution prevention respectively, are mandatory and legally

⁷⁹ See UNCLOS, Art. 211.

⁸⁰ *Ibid.*, Art. 234.

⁸¹ Hartmann, Jacques. (2018). Regulating Shipping in the Arctic Ocean: An Analysis of State Practice. *Ocean Development & International Law*, 49(3), 276–299, p. 282–289.

⁸² Bartenstein, Kristin and Aldo Chircop. “Polar shipping law.” In Karen N. Scott and David L. VanderZwaag (eds.), *Research Handbook on Polar Law*, 371–390. (Edward Elgar Publishing 2020), p. 372.

⁸³ IMO, *International Code for Ships Operating in Polar Waters (Polar Code)* (2024), available at <https://www.imo.org/en/OurWork/Safety/Pages/polar-code.aspx> (accessed 14 July 2024).

⁸⁴ Polar Code, *supra* note 7, Introduction, para. 1.

⁸⁵ IMO *International Code for Ships Operating in Polar Waters (Polar Code)* (2024), *supra* note 83.

binding, while parts I-B and II-B provide recommendatory guidelines.⁸⁶ With the adoption of the Polar Code, the use of Article 234 is now seen as a measure of last resort.⁸⁷

3.1.2.1. SOLAS

The SOLAS Convention is an international treaty concerning the safety of merchant ships. The current version dates to 1974 but has undergone numerous amendments.⁸⁸ The Convention specifies minimum safety standards for the construction, equipment and operation of merchant ships and requires flag States to ensure that vessels flying their flag adhere to these standards.⁸⁹ As for its applicability in the Arctic, SOLAS has been amended to include the mandatory standards of part I-A of the Polar Code. Although the Convention does not specifically address underwater noise, it was amended by the IMO in 2012 to address on-board noise.⁹⁰ The amendment requires ships to be constructed in a way that reduces on-board noise, in accordance with the “Code on noise levels”, adopted by the IMO at the same time.⁹¹ The Code establishes “mandatory noise level limits for machinery spaces, control rooms, workshops, accommodation and other spaces on board ships”.⁹² While these regulations do not explicitly aim to regulate underwater noise, they may have an indirect impact, as some of the underwater noise generated by vessels originates from machinery spaces.

⁸⁶ Polar Code, *supra* note 7.

⁸⁷ Bartenstein and Chircop (2020), *supra* note 82, p. 388.

⁸⁸ IMO, *International Convention for the Safety of Life at Sea (SOLAS), 1974* (2024), available at [https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Safety-of-Life-at-Sea-\(SOLAS\),-1974.aspx](https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Safety-of-Life-at-Sea-(SOLAS),-1974.aspx) (accessed 14 July 2024).

⁸⁹ *Ibid.*

⁹⁰ IMO, *Ship noise* (2024), *supra* note 16.

⁹¹ *Ibid.*

⁹² IMO Maritime Safety Committee, Resolution MSC.337(91) – Adoption of the Code on Noise Levels on Board Ships (Adopted on 30 November 2012), p. 1.

3.1.2.2. MARPOL 73/78

MARPOL 73/78 is the main international convention addressing prevention of pollution of the marine environment by ships, including both accidental and operational pollution.⁹³ Its regulations apply to all ships flying the flag of a State party to the treaty, regardless of where they sail.⁹⁴ MARPOL is divided into six technical annexes based on different categories of pollutants, with each annex addressing the regulation of a specific type of vessel emission.⁹⁵ Yet, none of the annexes relate to noise. Similarly to SOLAS, MARPOL has also been amended to include the mandatory standards of part II-A of the Polar Code. Even though its regulations apply to all vessels navigating in the Arctic, a significant limitation is the fact that MARPOL is designed to address pollution caused by substances such as chemicals or oil, and not energy, therefore excluding noise as a pollutant.⁹⁶ Consequently, this prevents the adoption of measures, such as CDEM standards, under MARPOL to regulate noise emissions from vessels.⁹⁷ Without further amendments and the adoption of a new annex addressing noise emissions, MARPOL can therefore not be used to regulate underwater noise.

3.1.3. BBNJ Agreement

The recently adopted BBNJ Agreement, also known as the “Treaty of the High Seas” is an international treaty on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction (ABNJ).⁹⁸ It is the product of more than a decade of discussions under the auspices of the UN and was adopted in June 2023 as the third implementing agreement to UNCLOS.⁹⁹ It has not yet entered into force. The Treaty aims to

⁹³ IMO, *International Convention for the Prevention of Pollution from Ships (MARPOL)* (2024), available at [https://www.imo.org/en/about/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-\(MARPOL\).aspx](https://www.imo.org/en/about/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx) (accessed 14 July 2024).

⁹⁴ MARPOL, *supra* note 14, Art. 3.

⁹⁵ IMO, *International Convention for the Prevention of Pollution from Ships (MARPOL)* (2024), *supra* note 93.

⁹⁶ Dotinga and Elferink (2000), *supra* note 53, p. 171.

⁹⁷ *Ibid.*

⁹⁸ BBNJ Agreement, *supra* note 15.

⁹⁹ UN, *Agreement on Marine Biodiversity of Areas beyond National Jurisdiction* (2024), available at <https://www.un.org/bbnjagreement/en> (accessed 25 July 2024).

assume a holistic approach to preservation of marine biodiversity and focuses on four main issues: area-based management tools (ABMTs) including marine protected areas (MPAs), benefit sharing of marine genetic resources, environmental impact assessments, and capacity building and transfer of technology.¹⁰⁰ Its legal scope is limited to ABNJ, meaning that in the Arctic, it only applies to the high seas portion of the central Arctic Ocean (CAO), as well as the three high seas pockets, namely the “Loophole”, the “Donut Hole” and the “Banana Hole”.¹⁰¹ However, as anthropogenic underwater noise has been detected even in the CAO,¹⁰² regulating noise emissions in these areas may also be necessary, especially in light of the increasing levels of shipping traffic.

Although underwater noise is not explicitly mentioned in the BBNJ Agreement, noise-sensitive marine mammals constitute an important part of marine biodiversity. Moreover, in its Preamble, the Agreement acknowledges the relevance of several UNCLOS provisions, including the obligation to protect and preserve the marine environment and the obligation to assess the potential effects on the marine environment when the State has reasonable grounds for believing that its activities may cause substantial pollution or significant and harmful changes to the marine environment.¹⁰³ In other words, “pollution” in the Agreement can be understood to also encompass underwater noise. As for ABMTs, the BBNJ Agreement aims to establish a comprehensive system of such tools and offers a clear legal basis for proposing MPAs in ABNJ.¹⁰⁴ The question therefore remains whether the Agreement provides the legal basis for establishing MPAs as a way of addressing the impacts of underwater noise on marine biodiversity. This will be discussed further in Chapter 4.

¹⁰⁰ Ibid.

¹⁰¹ Molenaar, Erik J. “Participation in the Central Arctic Ocean Fisheries Agreement.” In Shibata, A., Zou, L., Sellheim, N. and Scopelliti, M. (eds.), *Emerging Legal Orders in the Arctic: The Role of Non-Arctic Actors*, 132–170. (Routledge 2019), p. 136.

¹⁰² PAME (2021), *supra* note 3, p. 10.

¹⁰³ BBNJ Agreement, *supra* note 15, Preamble.

¹⁰⁴ Ibid., Part III.

3.2. Soft law instruments

3.2.1. IMO

The issue of underwater noise was first raised at the IMO in 2004, when it was noted that continuous anthropogenic ocean noise is mainly generated by shipping.¹⁰⁵ Since then, the organization has acknowledged the increasing problems relating to anthropogenic underwater noise caused by commercial shipping and developed several instruments to help address the issue.¹⁰⁶

3.2.1.1. Revised Guidelines for the Reduction of Underwater Noise from Commercial Shipping to address Adverse Impacts on Marine Life

In 2014, the IMO issued the first set of the “Guidelines for the Reduction of Underwater Noise from Commercial Shipping to address Adverse Impacts on Marine Life”, which aimed to provide guidance on how to reduce underwater noise from commercial shipping.¹⁰⁷ A draft revised version was proposed by the IMO Sub-Committee on Ship Design and Construction (SDC) in January 2023, and the official Revised Guidelines were approved by the MEPC at its eightieth session (MEPC 80) in July 2023.¹⁰⁸ The revised version was adopted with a view to enhance awareness, uptake and implementation and took effect in October 2023.¹⁰⁹

The Revised Guidelines acknowledge that commercial shipping is one of the main sources of underwater noise and that it has adverse effects on a wide range of marine wildlife, upon which

¹⁰⁵ IMO, *Ship noise* (2024), *supra* note 16.

¹⁰⁶ *Ibid.*

¹⁰⁷ Guidelines for the Reduction of Underwater Noise from Commercial Shipping to address Adverse Impacts on Marine Life, IMO, *MEPC.1/Circ.833* (7 April 2014), available at <https://cetsound.noaa.gov/Assets/cetsound/documents/MEPC.1-Circ%20883%20Noise%20Guidelines%20April%202014.pdf> (accessed 27 July 2024).

¹⁰⁸ Revised Guidelines for the Reduction of Underwater Noise from Commercial Shipping to address Adverse Impacts on Marine Life (Revised Guidelines), IMO, *MEPC.1/Circ.906* (22 August 2023), available at [https://wwwcdn.imo.org/localresources/en/Documents/MEPC.1-Circ.906%20-%20Revised%20Guidelines%20For%20The%20Reduction%20Of%20Underwater%20Radiated%20NoiseFrom%20Shipping%20To%20Address...%20\(Secretariat\).pdf](https://wwwcdn.imo.org/localresources/en/Documents/MEPC.1-Circ.906%20-%20Revised%20Guidelines%20For%20The%20Reduction%20Of%20Underwater%20Radiated%20NoiseFrom%20Shipping%20To%20Address...%20(Secretariat).pdf) (accessed 25 July 2024).

¹⁰⁹ *Ibid.*

many coastal Indigenous peoples rely on for their livelihoods.¹¹⁰ The aim of the Guidelines is to reduce underwater noise and mitigate its impacts, by providing general advice applicable to designers, shipbuilders and ship operators.¹¹¹ Another purpose is to assist relevant stakeholders in developing mechanisms and programs to help achieve noise reduction.¹¹² Additionally, the document encourages ship and equipment designers, shipbuilders and shipowners and operators, maritime authorities, classification societies, suppliers, manufacturers and other relevant stakeholders to apply the Guidelines to their activities.¹¹³ Furthermore, the Revised Guidelines promote a so-called underwater radiated noise management planning approach, identifying how the different stakeholders can help reduce underwater noise in different phases of shipping.¹¹⁴

Moreover, the Guidelines identify propellers, hull form, onboard machinery, wake flow and operational aspects as the main sources of underwater noise, with propeller cavitation being the primary source.¹¹⁵ The document therefore provides advice concerning the design and modification of the hull, the propeller and the machinery, as well as the improvement of wake flow and the implementation of operational approaches.¹¹⁶ For operators, it advises optimization of ship routing and better voyage planning to help avoid protected areas and shipping routes that overlap with habitats important to marine mammals.¹¹⁷ The Guidelines also identify speed reduction as an effective measure for reducing underwater noise, due to reduced propeller cavitation.¹¹⁸

The Revised Guidelines are to be reviewed and updated on a regular basis.¹¹⁹ Yet, they are not legally binding. The previous version of the Guidelines from 2014, which is now revoked,¹²⁰

¹¹⁰ Ibid., para. 1.1.

¹¹¹ Ibid., para. 3.1.

¹¹² Ibid.

¹¹³ Ibid., para. 3.4.

¹¹⁴ Ibid., Section 5.

¹¹⁵ Ibid., para. 6.1.

¹¹⁶ Ibid., Section 6.

¹¹⁷ Ibid., para. 6.20.

¹¹⁸ Ibid., para. 6.23.

¹¹⁹ Ibid., para. 3.5.

¹²⁰ Ibid.

included a paragraph that specified that the document was not meant to form the basis of a mandatory document.¹²¹ The revised version, however, does not contain any similar paragraph. One could therefore speculate whether the aim is to eventually transform the Guidelines into legally binding regulations. If this occurs, the Guidelines could attain the status of GAIRAS, becoming binding for States Parties to the UNCLOS through the rules of reference in Article 211 of the Convention, thereby facilitating the operationalization of the framework provision. This possibility will be explored in more detail in Section 4.2.6.

3.2.1.2. Guidelines for Underwater Radiated Noise Reduction in Inuit Nunaat and the Arctic

During its eightieth session in 2023, the MEPC also agreed to disseminate the “Guidelines for Underwater Noise Reduction in Inuit Nunaat and the Arctic”, developed by the Inuit Circumpolar Council (ICC), an international Indigenous Peoples Organization.¹²² The supplementary guidelines were intended to offer additional guidance and information to ship operators travelling through Inuit Nunaat and the Arctic, and aim to incorporate engagement of Indigenous communities and Indigenous knowledge in the review of the Revised Guidelines.¹²³ The Inuit Nunaat (also called Inuit Homeland) refers to the area composed of Inuit Nunangat in Canada, Alaska in the United States, Greenland, and Chukotka in Russia.¹²⁴ The supplementary guidelines acknowledge that Inuit Nunaat and the Arctic are unique environments where the adverse impacts of shipping noise on marine wildlife may be considerably increased.¹²⁵ Moreover, the guidelines recognize that sound levels in both Inuit

¹²¹ Guidelines for the Reduction of Underwater Noise from Commercial Shipping to address Adverse Impacts on Marine Life, IMO, *supra* note 107, para. 3.1.

¹²² Guidelines for Underwater Radiated Noise Reduction in Inuit Nunaat and the Arctic, IMO, *MEPC.1/Circ.907* (3 October 2023), available at [https://wwwcdn.imo.org/localresources/en/MediaCentre/HotTopics/Documents/NOISE/MEPC.1-CIRC.907%20-%20Guidelines%20For%20Underwater%20Radiated%20Noise%20Reduction%20In%20Inuit%20Nunaaat%20And%20The%20Arctic%20\(Secretariat\).pdf](https://wwwcdn.imo.org/localresources/en/MediaCentre/HotTopics/Documents/NOISE/MEPC.1-CIRC.907%20-%20Guidelines%20For%20Underwater%20Radiated%20Noise%20Reduction%20In%20Inuit%20Nunaaat%20And%20The%20Arctic%20(Secretariat).pdf) (accessed 27 July 2024).

¹²³ *Ibid.*, para. 1.

¹²⁴ *Ibid.*, para. 3.

¹²⁵ *Ibid.*, para. 5.

Nunaat and the Arctic are lower than elsewhere, making these areas more vulnerable to the effects of underwater noise.¹²⁶ The guidelines also encourage mariners to use Indigenous knowledge in voyage planning to reduce the impact on marine species, and urge for speed reduction to be more widely adopted in these areas.¹²⁷

3.2.1.3. Action Plan for the Reduction of Underwater Noise from Commercial Shipping, developed by the Sub-Committee on Ship Design and Construction

To implement the IMO Revised Guidelines, following instruction by the MEPC, the SDC agreed on an Action Plan to further prevent and reduce underwater noise, with the goal of minimizing its effects on the marine environment.¹²⁸ The Action Plan was agreed on in January 2024, and was endorsed by the MEPC during its 81th session in March 2024.¹²⁹ The Action Plan aims to enhance awareness, uptake and implementation of the Revised Guidelines, by identifying several ways of implementation by relevant bodies, such as increasing public awareness, education and seafarer training, developing underwater noise targets, enhancing information sharing, and encouraging further research on underwater noise.¹³⁰ Another objective is to organize an expert workshop to explore potential co-benefits and trade-offs between reducing underwater noise from shipping and improving energy efficiency.¹³¹ Moreover, in the Action Plan, the Sub-Committee also proposed a three-year experience-building phase, during which Member States and organizations are encouraged to share their best practices from implementing the Revised Guidelines.¹³²

¹²⁶ Ibid., para. 6.

¹²⁷ Ibid., paras. 8–10.

¹²⁸ IMO, *Ship noise* (2024), *supra* note 16.

¹²⁹ IMO, *Sub-Committee on Ship Design and Construction (SDC 10), 22-26 January 2024* (2024), available at <https://www.imo.org/en/MediaCentre/MeetingSummaries/Pages/SDC-10.aspx> (accessed 29 July 2024).

¹³⁰ Ibid.

¹³¹ IMO, *Ship noise* (2024), *supra* note 16.

¹³² IMO, *Sub-Committee on Ship Design and Construction (SDC 10), 22-26 January 2024* (2024), *supra* note 129.

3.2.1.4. Global Partnership for Mitigation of Underwater Noise from Shipping (GloNoise Partnership)

Another effort at implementing the Revised Guidelines is the Global Partnership for Mitigation of Underwater Noise from Shipping (GloNoise Partnership). This initiative, currently being developed by the IMO, the United Nations Development Programme (UNDP) and the Global Environment Facility (GEF), is expected to launch this year.¹³³ The main goal of the project is to create a comprehensive global partnership of stakeholders, to address the issue of underwater noise from shipping.¹³⁴ The project is based on the Revised Guidelines and aims to assist developing countries in raising awareness, building capacity and gathering information to facilitate policy discussions on underwater noise mitigation.¹³⁵ According to the IMO, the project will also help achieve the UN Sustainable Development Goal (SDG) 14: “conserve and sustainably use the oceans, sea and marine resources for sustainable development”.¹³⁶ The GloNoise Partnership project is particularly important in light of the global dimension of shipping and the transboundary nature of underwater noise.

3.2.2. International Whaling Commission

The International Whaling Commission (IWC), established under the 1946 International Convention for the Regulation of Whaling (ICRW) is the global body responsible for the management of whaling and the conservation of whales.¹³⁷ When it comes to noise, both the issue and its effects on noise have been addressed by the IWC’s Scientific Committee.¹³⁸ In 1996, the Sub-Committee on Whale-Watching adopted a set of General Principles for Whale-Watching, a non-binding instrument that recommends ways to minimize the impact of noise on

¹³³ IMO, *GloNoise Partnership* (2024), available at <https://www.imo.org/en/OurWork/PartnershipsProjects/Pages/GloNoise-Partnership.aspx> (accessed 29 July 2024).

¹³⁴ Ibid.

¹³⁵ Ibid.

¹³⁶ Ibid.

¹³⁷ IWC, *Commission Overview* (2024), available at <https://iwc.int/commission> (accessed 1 August 2024).

¹³⁸ Scott, Karen N. (2004). International Regulation Of Undersea Noise. *International and Comparative Law Quarterly*, 53(02), 287–323, p. 298–299.

whales by optimizing vessel, engine and equipment design, and by regulating vessel speed, direction and time spent near whales.¹³⁹ In 2018, the IWC adopted a Resolution on Anthropogenic Underwater Noise, acknowledging the growing concern over underwater noise and outlining steps to better understand and manage the threat.¹⁴⁰ The Resolution takes into account the IMO Revised Guidelines, and recognizes that managing underwater noise will help achieve SDG 14.¹⁴¹ It also supports the adoption of measures, such as noise standards, to mitigate the impact of anthropogenic underwater noise.¹⁴² In 2022, the IWC also endorsed a workplan on anthropogenic underwater noise, identifying specific aims and actions to address the issue.¹⁴³ In other words, although non-legally binding, the IWC has developed a number of instruments to address the issue of underwater noise in relation to cetaceans.

¹³⁹ Ibid.

¹⁴⁰ IWC, *Ocean Noise* (2024), available at <https://iwc.int/management-and-conservation/environment/anthropogenic-sound> (accessed 1 August 2024).

¹⁴¹ Resolution on Anthropogenic Underwater Noise, IWC, *Resolution 2018-4* (2018), available at https://iwc.int/private/downloads/0ymu0VhMN0_3YlwSi-QTcw/RESOLUTION_2018_NOISE.pdf (accessed 1 August 2024).

¹⁴² Ibid.

¹⁴³ IWC, *Ocean Noise* (2024), *supra* note 140.

Chapter 4: Overcoming the shortcomings of the current regulation

4.1. Legal assessment of the current regulation – the shortcomings

The analysis of the current regulation applicable to underwater noise from shipping activity in the Arctic reveals numerous shortcomings and regulatory gaps. The main criticism is that none of the legally binding instruments specifically address noise pollution. As of today, MARPOL 73/78 defines pollutants in a way that entirely excludes the issue of underwater noise. Similarly, SOLAS only indirectly touches upon the problem, through its regulations concerning on-board noise. Even the relatively recent adoption of the Polar Code, which is specifically designed to address the needs of the polar regions, does not amend these two conventions to include noise pollution, thus failing to fill this gap. In other words, despite significant attention to the problem in recent years, the legally binding instruments still overlook the issue.

Both UNCLOS and the BBNJ Agreement contain some provisions that are of relevance, that could be used to address the problem. However, both instruments seem to only provide a legal framework, without further operationalizing the relevant provisions through concrete measures, standards or rules. Scott, in her analysis of the international regulation of undersea noise, reaches a similar conclusion, noting that despite the broad obligation imposed by the UNCLOS framework on States to prevent and reduce all sources of pollution, including underwater noise, the necessary tools for implementing this obligation are currently lacking.¹⁴⁴ She also compares this issue to other types of pollution, noting that, unlike dumping, there is no multilateral treaty specifically seeking to operationalize the obligations under UNCLOS.¹⁴⁵ A similar conclusion can be reached for the BBNJ Agreement, which, despite its aim to assume a holistic approach to preservation of marine biodiversity, does not specifically address the issue of underwater noise. Its limited scope to ABNJ further restricts its applicability to the Arctic, where much of the commercial shipping activity still occurs within areas under national jurisdiction.

The relevant soft law instruments also have significant shortcomings due to their limited legal value, as they are not legally binding. Although the issue of underwater noise from commercial shipping has received increased attention at the IMO in recent years, the organization has not adopted any legally binding instruments. The guidelines, action plans and partnership

¹⁴⁴ Scott, Karen N. (2004), *supra* note 138, p. 297–298.

¹⁴⁵ *Ibid.*

programs, while helpful, do not impose actual obligations on States or stakeholders, limiting their effectiveness. Similarly, the IWC's non-binding instruments only apply to cetaceans, assuming a narrow, sector-specific approach that fails to address the broader impact on marine ecosystems.

Overall, the current state of international regulation concerning underwater noise from commercial shipping can be characterized as fragmented and sectoral, with no single multilateral instrument that regulates all areas and sectors. This fragmentation results in significant regulatory gaps, leaving many aspects of underwater noise unaddressed. The transboundary nature of underwater noise pollution demands a coordinated international response. Marine mammals and other marine life do not adhere to national boundaries, and the effects of noise pollution can extend beyond these boundaries. Consequently, a more unified and holistic approach seems to be needed.

4.2. Potential ways to overcome the shortcomings

In this section, the thesis identifies seven potential solutions to address the shortcomings of the current international regulation governing underwater noise from shipping activity in the Arctic. Each suggestion will be examined in detail, considering its effectiveness and feasibility.

4.2.1. New multilateral legally binding agreement

One could argue that to effectively mitigate underwater noise pollution, there is a pressing need for a comprehensive, legally binding international framework that specifically targets the issue. Developing a new multilateral treaty dedicated to addressing underwater noise could therefore be a viable solution. Such an instrument could operationalize the obligations under existing conventions and ensure that noise pollution is adequately regulated across all relevant sectors and regions. Similar to the Global Plastics Treaty, a UN treaty expected to be finalized by the end of 2024,¹⁴⁶ an underwater noise treaty could be developed under the auspices of the UN.

¹⁴⁶ UN Environment Programme, *Pivotal fourth session of negotiations on a global plastics treaty opens in Ottawa* (24 April 2024), available at <https://www.unep.org/news-and-stories/press-release/pivotal-fourth-session-negotiations-global-plastics-treaty-opens> (accessed 6 August 2024).

Using an established forum would make it easier for States to agree on a binding instrument, and the adoption of the treaty could then follow well-established UN procedures. This approach would also increase the authority of the document and provide States with an incentive to become Parties, potentially increasing its overall effectiveness. On the other hand, the adoption of a new treaty depends on States' willingness to be bound by its obligations. Additionally, from the perspective of States, this process is time-consuming and costly. Binding commitments could also negatively impact a state's economy, for instance through interference with its shipping industry. Therefore, while a separate treaty on underwater noise pollution would be an ideal legal solution, its practical feasibility remains uncertain.

4.2.2. Amendment of UNCLOS

Another potential approach to addressing the shortcomings of the current regulation is through amendment of UNCLOS. The amendment procedures are outlined in Part XVII of the Convention, which contains its final provisions. UNCLOS provides two different methods for adopting amendments: through the formal procedure detailed in Article 312 and the simplified procedure outlined in Articles 313 and 314. Under the formal procedure, States Parties can propose specific amendments to the Convention by requesting the Secretary-General to convene a conference to consider the proposed amendments.¹⁴⁷ The simplified procedure allows a State Party to propose an amendment which is considered adopted if no Party objects within 12 months from the date it was communicated to all States Parties.¹⁴⁸ However, regardless of the procedure used, amendments do not take effect until they have been ratified by two-thirds of the Parties.¹⁴⁹ This stringent requirement likely explains why no formal amendments to UNCLOS have been adopted to date and suggests that it is improbable any will be adopted in the near future.¹⁵⁰

Furthermore, even if an amendment were to be considered, a key question remains: is the issue of underwater noise significant enough for States to undergo a lengthy and costly amendment

¹⁴⁷ UNCLOS, Art. 312.

¹⁴⁸ *Ibid.*, Arts. 313–314.

¹⁴⁹ Churchill, Lowe, and Sander. (2022), *supra* note 56, p. 40–42.

¹⁵⁰ *Ibid.*

process? From a legal point of view, this would be the preferable course of action, as UNCLOS already provides the framework for addressing such issues. Yet, given the practical challenges and the strict amendment procedures of the Convention, this option seems unrealistic.

4.2.3. New implementing agreement

To build on the legal framework of UNCLOS, the UN General Assembly (UNGA) has previously adopted three implementing agreements: the 1994 Agreement Relating to the Implementation of Part XI of UNCLOS,¹⁵¹ the 1995 UN Fish Stocks Agreement,¹⁵² and most recently, the BBNJ Agreement. A potential way of addressing the shortcomings of the international regulation of underwater noise could therefore be for the UNGA to adopt a new implementing agreement specifically targeting this issue. This could help give more substance to UNCLOS Part XII on the protection and preservation of the marine environment and the provisions on vessel-source pollution, thereby strengthening their applicability to underwater noise pollution, without modifying or amending the Convention itself. Currently, there are no implementing agreements specifically addressing any types of pollution, raising questions about whether this is the appropriate channel for such issues. Nonetheless, a dedicated implementing agreement on underwater noise pollution could provide a more focused approach to mitigating the impacts of noise on marine ecosystems.

The adoption of a new implementing agreement would still require initiation by the UNGA or other relevant UN bodies. It is therefore noteworthy that the issue of anthropogenic underwater noise has already been addressed at the UN level in recent years. For instance, it was mentioned in the Report of the Secretary-General on Oceans and the Law of the Sea, which was presented

¹⁵¹ Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982 (adopted 28 July 1994, entered into force 28 July 1996) 1836 UNTS 42.

¹⁵² 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 (adopted 4 December 1995, entered into force 11 December 2001) 2167 UNTS 3.

to the States Parties to UNCLOS during the 2018 Meeting of States Parties.¹⁵³ Such meetings, convened by the Secretary-General in accordance with Article 319(2)(e), are intended to keep the operation of UNCLOS under regular review and are part of the elaborate annual cycle of review.¹⁵⁴ This signifies that the issue of underwater noise pollution has been formally recognized and discussed by the States Parties to UNCLOS. Another element in the annual cycle of review is the meeting of the Open-ended Informal Consultative Process on Oceans and Law of the Sea (ICP), which takes place shortly after the Meeting of States Parties, and typically focuses on a single topic during each of its sessions.¹⁵⁵ The nineteenth meeting of the ICP, also held in 2018, focused its discussions on anthropogenic underwater noise.¹⁵⁶ Once again, the dedicated focus on underwater noise pollution at this meeting highlights the increasing awareness of the issue within the UN framework. While these acknowledgements represent a significant step forward, it remains to be seen whether they will translate into concrete action at the UNCLOS level.

4.2.4. Amendment of MARPOL 73/78

As discussed in Chapter 3, the main limitation of MARPOL in addressing underwater noise pollution is that it only applies to pollution caused by substances, excluding energy and thereby not recognizing noise as a pollutant. To address this gap, it is proposed that the Convention be amended to expand its definition of pollution to also include “energy”, so that it encompasses underwater noise. Article 16 of MARPOL outlines the detailed rules regarding the amendment

¹⁵³ Report of the twenty-eighth Meeting of States Parties to the 1982 United Nations Convention on the Law of the Sea, UN General Assembly, *SPLOS/324* (9 July 2018), available at <https://documents.un.org/doc/undoc/gen/n18/217/00/pdf/n1821700.pdf?token=2MGtZsFaOQEjAAGU61&fe=true> (accessed 7 August 2024).

¹⁵⁴ Churchill, Lowe, and Sander. (2022), *supra* note 56, p. 29, 38–40.

¹⁵⁵ *Ibid.*, p. 38–40.

¹⁵⁶ Report on the work of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea at its nineteenth meeting, UN General Assembly, *A/73/124*, (9 July 2018), available at <https://documents.un.org/doc/undoc/gen/n18/216/69/pdf/n1821669.pdf?token=NRDqzPgsSutcgVa3Sb&fe=true> (accessed 8 August 2024).

procedures.¹⁵⁷ Amendments are however typically adopted by the MEPC, normally by consensus.¹⁵⁸ MARPOL has undergone multiple updates over the years, both through amendments to the Convention and its annexes and through the addition of new ones.¹⁵⁹ Therefore, there seems to be no obstacle to amending the text of MARPOL to broaden its definition of pollution.

As for the annexes, they are subject to amendment by the tacit amendment procedure, where an amendment automatically comes into force on a specified date for all parties to the annex unless objections are raised beforehand.¹⁶⁰ The annexes have been amended on numerous occasions to follow advancements in technology, reflect enhanced scientific knowledge and take account of the increasing commitment of States Parties to accept more stringent environmental standards.¹⁶¹ Currently, none of the annexes address underwater noise, meaning that there may be a need for a new annex dealing specifically with noise emissions. This still requires initiation by the IMO, which at the moment appears somewhat hesitant to add new annexes to MARPOL. In recent years, the Organization has chosen to adopt three separate conventions to address pollution by other substances, such as ballast water, instead of creating additional annexes.¹⁶²

Alternatively, inclusion of underwater noise could be done by amending the Polar Code to include noise pollution. In fact, the Code has already been amended since its initial adoption. In 2023, the IMO's Maritime Safety Committee (MSC) adopted a first set of amendments, expected to take effect on 1 January 2026.¹⁶³ In other words, the MSC could potentially decide to adopt additional amendments to include measures addressing anthropogenic underwater

¹⁵⁷ MARPOL, *supra* note 14.

¹⁵⁸ Churchill, Robin, Vaughan Lowe and Amy Sander. "Protection of the marine environment: controlling marine pollution." Chapter in *The law of the sea*, 629–717. (Manchester University Press, 2022), p. 630.

¹⁵⁹ IMO, *International Convention for the Prevention of Pollution from Ships (MARPOL)* (2024), *supra* note 93.

¹⁶⁰ Churchill, Lowe, and Sander. (2022), *supra* note 158.

¹⁶¹ *Ibid.*

¹⁶² *Ibid.*, p. 639.

¹⁶³ IMO, *Shipping in polar waters* (2024), available at <https://www.imo.org/en/MediaCentre/HotTopics/Pages/Polar-default.aspx> (accessed 8 August 2024).

noise in Part II-A of the Polar Code, with the aim of making these measures mandatory under MARPOL.

4.2.5. MPAs under the BBNJ Agreement

As mentioned above in the context of the BBNJ Agreement, noise-sensitive marine mammals are a crucial component of marine biodiversity. Consequently, regulating underwater noise clearly falls within the legal scope of the BBNJ Agreement. The treaty offers a legal foundation and a comprehensive framework for establishing MPAs in ABNJ. Therefore, it is suggested to use the Agreement as a legal basis for creating MPAs in the Arctic, as a way of mitigating the impacts of underwater noise on marine biodiversity. The detailed rules for establishing MPAs are outlined in Part III of the Agreement, with Article 19 specifying that the identification of ABMTs should be based on the indicative criteria listed in Annex I.¹⁶⁴ Although the current criteria do not explicitly mention underwater noise, the issue could be encompassed within the broader criteria such as the “uniqueness” or “sensitivity” of the area, “vulnerability, including to climate change and ocean acidification,” or the “special importance of the species found therein,” all of which are highly relevant to the Arctic.¹⁶⁵ Moreover, the Agreement allows for the criteria to be further developed and revised as necessary by the Scientific and Technical Body for consideration and adoption by the Conference of the Parties.¹⁶⁶ In other words, underwater noise could potentially be added to the criteria in the future.

The main advantage of this approach is that it offers the possibility of addressing the issue of noise pollution in combination with other threats to marine biodiversity, offering a unified and holistic solution. There is however a significant limitation. The BBNJ Agreement applies exclusively to ABNJ,¹⁶⁷ meaning that in the Arctic, such MPAs could only be established in the central Arctic Ocean and the three high seas pockets. Nonetheless, as highlighted in Chapter 3, anthropogenic underwater noise has been detected even in the CAO,¹⁶⁸ indicating that such regulations might be necessary. Furthermore, we know that sound travels long distances,

¹⁶⁴ BBNJ Agreement, *supra* note 15.

¹⁶⁵ *Ibid.*, Annex I.

¹⁶⁶ *Ibid.*, Art. 19(5).

¹⁶⁷ *Ibid.*, Art. 3.

¹⁶⁸ PAME (2021), *supra* note 3, p. 10.

meaning that mitigating noise in ABNJ could also benefit areas within national jurisdiction, where the noise would typically spread. Another challenge is the risk of overlap with other ABMTs adopted in the same geographical area, such as those established under the auspices of the IMO, which will be discussed in detail in Section 4.2.7. Lastly, the effectiveness of MPAs remains a significant concern, particularly due to challenges related to compliance and enforcement.¹⁶⁹

4.2.6. Rules of reference

Through its rules of reference, UNCLOS provides a basis for other international agreements to establish specific rules and standards concerning the protection and preservation of the marine environment. This mechanism allows for a continuous evolution of the Convention, without the need for amending its provisions. A suggestion is therefore to regulate underwater noise from shipping as a new form of vessel-source pollution, through these rules of reference. Article 211(2) of the Convention requires States to “adopt laws and regulations for the prevention, reduction and control of pollution of the marine environment from vessels flying their flag or of their registry”, specifying that these laws and regulations shall have at least the same effect as GAIRES established through the “competent international organization”. Furthermore, Article 211(1) imposes a duty on States to develop such laws and regulations through the competent organization, which in this case is the IMO.¹⁷⁰ In essence, flag States therefore have a duty to ensure that vessels flying their flag do not cause pollution, adhering to the regulations adopted by the IMO.

Currently, there is no legally binding IMO instrument that addresses underwater noise, that would determine the threshold for the rules that flag States are obliged to adopt. In other words, there are no GAIRES relating to anthropogenic underwater noise. However, if the IMO were to create legally binding regulations, either by adopting a new instrument or by transforming the IMO Revised Guidelines into mandatory measures, such regulations would become binding

¹⁶⁹ For a discussion of the challenges related to enforcement and compliance in MPAs, see, for instance, De Santo, Elizabeth M. (2018). Implementation challenges of area-based management tools (ABMTs) for biodiversity beyond national jurisdiction (BBNJ). *Marine Policy*, 97, 34–43.

¹⁷⁰ Dotinga and Elferink (2000), *supra* note 53, p. 163.

for UNCLOS States Parties through the rules of reference in Article 211. It is therefore recommended that the IMO takes action in this direction. This approach is likely the most effective, as the IMO is the competent authority for vessel-source pollution and is already actively addressing the issue. Still, the greatest advantage of this solution is that it would not require States Parties to UNCLOS to ratify a new instrument; they would automatically be bound by the regulations through the rules of reference.

Alternatively, some authors have suggested that general acceptance of a specific rule or standard can be achieved if the rules are implemented by a sufficient number of States.¹⁷¹ Consequently, States could potentially choose to adopt rules and standards for vessels flying their flag in accordance with the Revised Guidelines, and over time, these regulations could become widespread enough to become recognized as GAIRAS.¹⁷²

4.2.7. Special areas and PSSAs

A final suggestion involves the designation of special areas or Particularly Sensitive Sea Areas (PSSAs) within which noise mitigation measures can be implemented. Article 211(6) of UNCLOS allows a coastal State to designate special areas, enabling them to adopt stricter rules and standards than the GAIRAS established by the IMO under paragraph 1 of the provision. When a coastal State has reasonable grounds for believing that the GAIRAS are inadequate to meet the special circumstances of a specific area due to its oceanographical and ecological conditions, it may, through the IMO, adopt mandatory laws and regulations to prevent vessel-source pollution.¹⁷³ These laws and regulations can relate to discharges or navigational practices, but shall not impose standards on the CDEM of foreign vessels.¹⁷⁴ Currently, no coastal State appears to have designated special areas on the basis of the powers conferred to it by Article 211(6).¹⁷⁵

¹⁷¹ Rayegani (2021), *supra* note 67, p. 245.

¹⁷² *Ibid.*

¹⁷³ UNCLOS, Art. 211(6).

¹⁷⁴ *Ibid.*

¹⁷⁵ Churchill, Lowe, and Sander. (2022), *supra* note 158, p. 645.

The term “special areas” is also found in Annexes I, II, IV and V to MARPOL73/78, where it allows for the adoption of special mandatory measures in areas requiring a higher level of protection due to their oceanographical and ecological conditions.¹⁷⁶ Although the criteria for designating such areas are identical to those in Article 211(6), it is important to distinguish between the two regimes.¹⁷⁷ There are several differences between them, with the greatest one being their geographical scope.¹⁷⁸ While special areas under UNCLOS can only be designated within the EEZ, special areas under MARPOL cover areas within the territorial sea, the EEZ and can even extend to the high seas.¹⁷⁹ Moreover, MARPOL special areas currently only include special discharge standards for vessels, and none of them are applicable to noise emissions, as the Convention only applies to substances and not energy.¹⁸⁰ The likelihood of designating special areas under UNCLOS Article 211(6) seems minimal, given that no coastal State has done so to date. Likewise, designating MARPOL special areas to address the issue of anthropogenic underwater noise is not feasible, as they cannot be applied to sound emissions.

Another closely related tool is the designation of PSSAs by the IMO. These are areas that require special protection due to their vulnerability to shipping activities. IMO Resolution A.982(24), adopted in 2005, contains the Revised Guidelines for the Identification and Designation of PSSAs. The resolution defines a PSSA as “an area that needs special protection through action by IMO because of its significance for recognized ecological, socio-economic, or scientific attributes where such attributes may be vulnerable to damage by international shipping activities.”¹⁸¹ The guidelines establish specific criteria for the identification of PSSAs,

¹⁷⁶ IMO, *Special Areas under MARPOL* (2024), available at <https://www.imo.org/en/OurWork/Environment/Pages/Special-Areas-Marpol.aspx> (accessed 12 August 2024).

¹⁷⁷ Dux, Thomas. *Specially Protected Marine Areas in the Exclusive Economic Zone (EEZ): The Regime for the Protection of Specific Areas of the EEZ for Environmental Reasons under International Law* (Lit Verlag, 2011), p. 275.

¹⁷⁸ Ibid.

¹⁷⁹ Ibid.

¹⁸⁰ Dotinga and Elferink (2000), *supra* note 53, p. 164.

¹⁸¹ Revised Guidelines for the Identification and Designation of PSSAs, IMO Assembly Resolution A.928(24) (1 December 2005), available at [https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/AssemblyDocuments/A.928\(24\).pdf](https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/AssemblyDocuments/A.928(24).pdf) (accessed 12 August 2024), para. 1.2.

such as uniqueness or rarity of an area, the presence of a critical habitat, or vulnerability to degradation by natural events or human activities.¹⁸² It is important to note that the criteria for identifying PSSAs and special areas are not mutually exclusive, and often a PSSA may be located within a special area, and vice versa.¹⁸³

PSSAs can only be established by the IMO, and applications for designation can only be submitted by IMO Member Governments.¹⁸⁴ The designation of a PSSA must be accompanied by so-called protective measures, as the designation alone does not have any legal significance.¹⁸⁵ These protective measures may include discharge restrictions, prohibited activities, or ship routing measures.¹⁸⁶ The ship routing measures can for instance involve the designation of an area to be avoided by all ships or by specific types of vessels.¹⁸⁷ At the time of writing, the IMO has designated eighteen PSSAs globally.¹⁸⁸ Although all current PSSAs are located within the territorial sea or the EEZ, there seems to be no barrier to designating them on the high seas.¹⁸⁹

What is particularly noteworthy is the fact that Resolution A.982(24) expressly identifies noise as a type of pollutant that results from shipping activities.¹⁹⁰ It is therefore clear that the guidelines in theory permit the designation of PSSAs containing protective measures aimed at preventing or reducing underwater noise. This approach appears to be one of the more favorable solutions, as it allows for the adoption of mandatory measures that could even be applied to ABNJ. Furthermore, it is a way of operationalizing Article 194(5) of UNCLOS which requires Parties to take measures to protect and preserve rare or fragile ecosystems. Yet, a significant limitation lies in the fact that the effectiveness of a PSSA will depend on the protective measures

¹⁸² *Ibid.*, Section 4.

¹⁸³ IMO, *Particularly Sensitive Sea Areas* (2024), available at <https://www.imo.org/en/OurWork/Environment/Pages/PSSAs.aspx> (accessed 12 August 2024).

¹⁸⁴ Revised Guidelines for the Identification and Designation of PSSAs, *supra* note 181, para. 3.1.

¹⁸⁵ Churchill, Robin, Vaughan Lowe and Amy Sander. "Protection of the marine environment: conserving marine biodiversity." Chapter in *The law of the sea*, 718–778. (Manchester University Press, 2022), p. 753.

¹⁸⁶ IMO, *Particularly Sensitive Sea Areas* (2024), *supra* note 183.

¹⁸⁷ *Ibid.*

¹⁸⁸ *Ibid.*

¹⁸⁹ Churchill, Lowe, and Sander. (2022), *supra* note 185.

¹⁹⁰ Revised Guidelines for the Identification and Designation of PSSAs, *supra* note 181, para. 2.2.

contained within it. The key question is therefore how effective these measures are in mitigating the impacts of anthropogenic underwater noise. For instance, while it is feasible to use ship routing measures to direct vessels away from sensitive areas, it may not be effective in practice. In the Arctic, separating ships from wildlife is challenging, as both vessels and marine mammals will tend to navigate through ice-free routes.¹⁹¹ Additionally, enforcing and ensuring compliance with these measures can be particularly difficult in the remote regions of the Arctic, and this may further undermine their effectiveness.

¹⁹¹ Lancaster, Melanie L., Peter Winsor and Andrew Dumbrille. "Underwater Noise from Shipping: A Special Case for the Arctic." Chapter in: Carpenter, A., Johansson, T.M. and Skinner, J.A. (eds) *Sustainability in the Maritime Domain*, 271–289. (Springer, Cham, 2021), p. 284.

Chapter 5: Conclusion

The aim of this thesis has been to critically assess the current international regulation governing underwater noise from shipping activity in the Arctic, with a focus on determining its adequacy. The analysis reveals significant regulatory gaps, as the current instruments largely fail to adequately address the issue. Notably, the relevant legally binding instruments make no mention of anthropogenic underwater noise, and while soft law guidelines and instruments attempt to address the issue, their legal impact is rather limited. The findings of this study indicate that the regulation remains largely sectoral and fragmented, as there is no comprehensive multilateral instrument that applies to all geographical areas and relevant activities. Moreover, despite the obligation imposed on States under the UNCLOS/IMO framework to prevent and reduce noise pollution, the problem lies in its operationalization, as there is no international instrument to specify the necessary tools and mitigation measures or to establish common international standards.

Addressing these regulatory gaps requires a more coordinated international response, particularly in light of the transboundary nature of underwater noise pollution resulting from international shipping. In other words, there is a need for a more unified and holistic approach to addressing the issue. The thesis has proposed and explored various approaches to remedy the shortcomings of the current international regulation. While the adoption of a new implementing agreement to UNCLOS, an amendment of the Convention, or the creation of a new separate treaty focused on underwater noise remains unlikely, these possibilities should not be entirely dismissed, especially given the increased attention underwater noise has received at the UN level in recent years.

Nonetheless, the IMO appears to be the most suitable forum to address this issue, in light of its role as the competent authority to address vessel-source pollution. Regulating underwater noise through the IMO may thus prove more feasible than amending existing treaties or creating new legally binding instruments. This could be achieved by transforming the Revised Guidelines for the Reduction of Underwater Noise from Commercial Shipping into mandatory measures, thereby making them binding through the rules of reference, or by designating PSSAs that contain measures aimed specifically at preventing and controlling underwater noise in the vulnerable areas of the Arctic.

Predicting future developments in international law is inherently difficult, as progress largely depends on the political will of States and the level of public awareness surrounding a specific issue. Nevertheless, recent trends indicate that underwater noise pollution is gaining attention at the global level, signaling a potential shift in the international discourse. International commercial shipping in the Arctic is expected to increase in the coming years, and as demonstrated in this thesis, it may have adverse effects on the marine environment of this fragile region. It is therefore crucial that further action is taken to strengthen the international regulation of underwater noise from shipping activity in the Arctic, before irreversible damage occurs.

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