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Underwater Noise Pollution: An Evaluation of the Voluntary Guidelines on Reduction of Underwater Noise from Commercial Shipping in the United States

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International Environmental Studies

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Declaration

I, Jessica Kimberley Giannoumis, declare that this thesis is a result of my research investigations and findings. Sources of information other than my own have been acknowledged and a reference list has been appended. This work has not been previously submitted to any other university for award of any type of academic degree.

Signature.....

Date 18.05.2017

This is for the *champion* of underwater noise pollution, the late Lindy Johnson, who I never had the honor to meet, but who I heard many wonderful things about.

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Abstract

The threat of underwater noise pollution was recognized by the International Maritime Organization (IMO) which adopted the voluntary guidelines for the reduction of underwater noise from commercial shipping to address adverse impacts on marine life in 2014. Underwater noise pollution is a transboundary pollutant caused by cavitation of ship propellers which disturbs the behavior of marine mammals. This thesis investigates international and United States national regulations and their demands regarding actions to reduce underwater noise pollution. Additionally, the thesis examines the process of establishing the voluntary guidelines at the IMO and the ways in which political, economic, and civil society actors evaluate the voluntary guidelines. Finally, this research explores the expected outcomes of the voluntary guidelines as evaluated by economic actors and the motivations of economic actors to implement the guidelines.

This thesis draws upon Vatn's environmental governance system framework which aids in understanding the interactions between institutions, actors, and policies. Theories on resource regimes, voluntarism, precautionary principle, and policy entrepreneurship are further used to understand the empirical data on which this thesis is based. Qualitative data from documents and interviews with political, economic, and civil society actors in the United States provides the empirical basis for evaluating the voluntary guidelines.

The results from this thesis show that because of the transboundary nature of sound, international agreements provide a useful basis for addressing the effects of noise pollution. The United Nations Conference on the Law of the Sea (UNCLOS) and the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) define pollution as energy and substance respectively. Therefore, UNCLOS covers noise pollution implicitly. However, neither UNCLOS nor MARPOL 73/78 address noise pollution explicitly.

Several US national regulations address marine pollution. The Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA) regulate the impact that noise may have on marine mammals. Two symposia were in part organized by the National Marine Fisheries Service (NMFS), as a result of these symposia the US delegation to the IMO published an information paper at the IMO on shipping and marine mammals which led to adoption of the voluntary guidelines. This thesis examines the process that led to the adoption from the perspective of political, economic, and civil society actors on a US national level. Furthermore, this thesis explores the format of the guidelines, discussing why the US delegation proposed voluntary guidelines rather than mandatory regulation. The US delegation may have proposed voluntary guidelines because of the lack of scientific knowledge about the effects of noise pollution on marine mammals. Voluntary guidelines could have also been pursued because the US delegation anticipated that pushing for mandatory regulation would require more resources, i.e., time, funding, and research. Proposing voluntary guidelines may have also been a way for the US delegation to build capacity regarding noise pollution. This capacity building may useful in the future, when

further actions regarding noise pollution and its effects are demanded on an international and national level.

This thesis argues that the lack of a noise reduction target in the voluntary guidelines may explain the lack of interest from the shipping industry to implement the guidelines. The lack of scientific knowledge about the effects of noise pollution on marine wildlife may also explain the reservation of economic actors for implementing the guidelines. The economic actors did not seem motivated to implement the voluntary guidelines. This is based on the examination of altruistic motives, potential win-win situations and possible outside pressures economic actors might experience. Altruistic motives would imply that economic actors would have implemented the voluntary guidelines out of concern for the well-being for marine mammals without any benefits for the business. Whereas potential win-win solutions would indicate that by adopting the voluntary guidelines, economic actors would increase energy efficiency while also gaining economic benefits. Possible outside pressures, such as pressures from civil society actors, would influence economic actors by exercising pressure to adopt the voluntary guidelines. This thesis argues that the voluntary guidelines lack mechanisms of compliance which explains economic actors' reluctance to adopt the guidelines. This thesis further reasons that for the voluntary guidelines to be adopted by economic actors, the regime must be strengthened. Possible ways to strengthen the regime would include the amending of the existing agreement; adopting a new agreement with concrete commitments from all Member States; or implementing mandatory regulation without amending an agreement formally.

Keywords: underwater noise pollution, IMO, voluntary guidelines, voluntarism, environmental governance system

Abbreviations:

AIS	Automatic Identification System
ATBA	Area To Be Avoided
C.F.R.	Code of Federal Regulations
CINMS	(United States) Channel Islands National Marine Sanctuary
CLIA	Clinical Laboratory Improvement Amendments
CMSP	Coastal and Marine Spatial Planning
COP	Conference of the Parties
CSA	Chamber of Shipping of America
dB	Decibel
DNV GL	Det norske Veritas and Germanischer Lloyd
EDC	Environmental Defense Center (US-based)
EEZ	Exclusive Economic Zone
EGS	Environmental Governance System
EIA	Environmental Impact Assessment
ESA	Endangered Species Act
FoEI	Friends of the Earth International
Hz	Hertz
IAD	International Analysis Development
ICOMIA	International Council of Marine Industry Associations
ICS	International Chamber of Shipping
IFAW	International Fund for Animal Welfare
IGO	International Governmental Organization
IWC	International Whaling Commission
IMarEST	Institute of Marine Engineering, Science and Technology
IMO	International Maritime Organization
INTERTANKO	International Association of Independent Tanker Owners
ISO	International Organization for Standardisation
ITA	Incidental Take Authorization
IUCN	International Union for Conservation of Nature
MARPOL	International Convention for the Prevention of Pollution from Ships
MEPC	Marine Environment Protection Committee (to the IMO)
MMPA	(US-based) Marine Mammal Protection Act (US-based)
MPA	Marine Protected Area
MPRSA	(United States) Marine Protection, Research and Sanctuaries Act
NEPA	(United States) National Environmental Policy Act
NGO	Non-Governmental Organization
NMFS	(United States) National Marine Fisheries Service
NMSA	(United States) National Marine Sanctuaries Act
NMSP	(United States) National Marine Sanctuaries Program
NOAA	(United States) National Oceanic and Atmospheric Administration
NOP	(United States) National Ocean Policy
NOx	Nitrogen Oxide
NRDC	National Resource Defense Center (US-based)
OCR	Ocean Conservation Research (US-based)

SAR	Stock Assessment Report
SES	Socio-Ecological System
VSR	Vessel Speed Restriction
WWF	World Wildlife Fund
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Programme
UNEP/CMS	United Nations Environmental Programme/Convention on Migratory Species
UNFCCC	United Nations Framework Convention on Climate Change
U.S.C.	United States Code
USCG	United States Coast Guard

Table of Contents

1. Introduction	1
2. Background	5
2.1 Physics of Sounds	5
2.2 Human-induced Sounds	7
2.3 Noise Impacts and Behavioral Changes in Marine Mammals.....	8
2.4 Overview of Legal Frameworks and Agencies regulating the Oceans.....	10
2.4.1 International Legal Frameworks and Agencies	11
2.4.1.1 United Nations Convention on the Law of the Sea.....	12
2.4.1.2 International Maritime Organization	15
2.4.2 US National Legal Frameworks and Agencies.....	16
2.4.2.1 National Oceanic Atmospheric Administration.....	17
2.4.2.2 National Marine Fisheries Service.....	17
3. Conceptual Framework	18
3.1 Environmental Governance System Framework	20
3.2 Problematic Common-Pool Resources	22
3.3 Institutions.....	23
3.3.1 Conflicts and Institutions	23
3.3.2 Resource Regimes.....	24
3.4 Actors and Motivation	25
3.4.1 Political Actors.....	25
3.4.2 Economic Actors.....	28
3.4.3 Civil Society Actors.....	29
3.4.4 Power Imbalances	30
3.4.5 Voluntarism.....	31
3.4.6 Precautionary Principle.....	32
3.5 Policies.....	33
3.5.1 Mandated Solutions and Command and Control.....	33
3.5.2 Self-Regulation and Voluntary Agreements.....	34
3.5.3 Policy Entrepreneurs.....	35
3.5.4 Mechanisms of Compliance for Voluntary Solutions.....	36
3.5.4.1 Altruistic Motives	37
3.5.4.2 Win-Win Solutions	37
3.5.4.3 Outside Pressures	38
3.5.4.4 Public Disclosure Programs	39
3.6 Technical Solutions.....	39
4. Research Methodology	41
4.1 Mixed Methods	41
4.1.1 Data Collection	41

4.1.1.1	Content Collection	42
4.1.1.2	Qualitative Interviews.....	42
4.1.1.3	Case Studies.....	43
4.1.2	Analysis and Coding.....	44
4.1.2.1	Content Analysis.....	44
4.1.2.2	Interview Data Analysis.....	44
4.2	Trustworthiness and Authenticity in Qualitative Research	45
4.3	Research Ethics.....	46
4.4	Limitations	47
5.	Legal Frameworks Addressing Noise Pollution	49
5.1	International Regulations Addressing Noise Pollution.....	49
5.1.1	United Nations Convention on the Law of the Seas.....	49
5.1.2	International Convention on the Prevention of Pollution from Ships..	51
5.1.3	Marine Strategy Framework Directive 2008/56/EC.....	52
5.2	US National Regulations Addressing Noise Pollution	53
5.2.1	National Ocean Policy	53
5.2.2	National Environmental Policy Act.....	54
5.2.3	National Marine Sanctuaries Act.....	55
5.2.4	Marine Mammal Protection Act	55
5.2.5	Endangered Species Act	57
5.2.6	Marine Protection, Research, and Sanctuaries Act.....	59
5.3	Summary of Regulations Addressing Noise Pollution	59
6.	Recognizing the Threat of Underwater Noise Pollution	61
6.1	Raising Awareness and Mobilizing Actors.....	63
6.2	The Process of Establishing Voluntary Guidelines at the International Maritime Organization.....	66
6.3	Presentation of the Voluntary Guidelines.....	70
6.4	Evaluation of the Voluntary Guidelines	72
6.4.1	Evaluation by Political Actors	72
6.4.1.1	General Evaluation of Oceanic Matters.....	72
6.4.1.2	Evaluation of the Voluntary Guidelines	73
6.4.2	Evaluation by Economic Actors	76
6.4.2.1	General Evaluation of Oceanic Matters.....	77
6.4.2.2	Evaluation of the Voluntary Guidelines	78
6.4.3	Evaluation by Civil Society	80
6.4.3.1	General Evaluation of Oceanic Matters.....	80
6.4.3.2	Evaluation of the Voluntary Guidelines	82
7.	Expected Outcomes of the Voluntary Guideline	86
7.1	Costs of Implementing the Voluntary Guidelines	86
7.2	Benefits of Implementing the Voluntary Guidelines	88

7.3 Motivation to Implement the Voluntary Guidelines	89
7.4 Implemented Voluntary Programs	90
7.4.1 Green Flag Incentive Program	91
7.4.2 Vessel Speed Reduction Incentive Trial Program	93
7.4.3 Vessel Speed Restrictions to Reduce the Threat of Vessel Collisions with North Atlantic Right Whales	97
8. Discussion	100
8.1 Perspectives on the Voluntary Guidelines	100
8.2 Effectiveness of the Voluntary Guidelines	104
8.3 Regime Strengthening.....	109
9. Conclusion	112
10. References	117
11. Appendix	126
11.1. Interview Guide	126
11.2. IMO MEPC.1/Circ.833: Guidelines for the Reduction of Underwater Noise from Commercial Shipping to Address Impacts on Marine Life	130

1. Introduction

The oceans have become gradually louder due to increased shipping activities as well as the exploration of the oceans with invasive technologies such as seismic surveys and airguns. Previous studies (Erbe, 2012; Nowacek, Thorne, Johnston, & Tyack, 2007; Weilgart, 2007) have shown that increased anthropogenic sounds change the behavior in ocean's inhabitants tremendously. Water's unique physical characteristics enable sound to travel much further in water than in air. This in turn makes sound a transboundary pollutant as the traveled sound often crosses states' exclusive economic zones (EEZ). Yet the regulations addressing underwater noise pollution are almost non-existent. Although international bodies are in place to regulate different types of transboundary pollution, such as for example toxic waste, no such body oversees underwater noise pollution. Given the rising number of ocean-related activities such as a growing dependency on shipping transport, increase in leisurely activities, i.e., whale watching and fishing and the use of seismic surveys to allocate oil deposits, noise pollution is bound to increase further in the future. Other sound pollutants include pile driving during offshore windfarm constructions which may generate "high sound pressure levels and are relatively broad-band (20 Hz – 20 kHz)" (Thomsen, Lüdemann, Kafemann, & Piper, 2006, p. 12).

Previous research (Madsen, Wahlberg, Tougaard, Lucke, & Tyack, 2006; Southall et al., 2008; Thomsen et al., 2006) suggests that the construction of offshore windfarms, where steel foundation is being driven into the seafloor, may alter behavior in marine mammals. During the construction phase, marine mammals try to avoid the construction area because the sound from pile driving may have "the potential to inflict physical damage to their sensory system" (Brandt, Diederichs, Betke, & Nehls, 2011, p. 205). However, the growing demand for *environmentally friendly* energy led to a growing number of countries exploring the options of offshore windfarms (Brandt et al., 2011). Ocean inhabitants such as whales use their sonar to communicate, forage food, reproduce, and orientate themselves. Natural sound frequencies, such as weather or seismic energy, occur between 1 Hz and 100 kHz (National Research Council of the National Academies, 2003). Vessel traffic noise is a large contributor to low-frequency noise, these sound levels dominate the range between 20 and 300 Hz (Conservation and Development Problem Solving, 2000). These underwater noise levels impact marine mammals' natural behavior and regular activities. Hearing ranges vary greatly in whale species, baleen whales communicate in a frequency range from 10

Hz to 10 kHz whereas, pinnipeds use a frequency range between 50 Hz to 60 kHz (Madsen et al., 2006). Some behavioral changes have been noted in whales, these include masking, changes in migratory patterns, and changes in foraging behavior (Weilgart, 2007). Masking refers to an interference of sounds caused by, but not limited to, background noise. To overcome the masking effect marine mammals may change their vocalization behavior (Weilgart, 2007). Advanced technology in the shipping sector causes for an expansion in ship sizes and shipping fleets which result in an increase in noise especially in the shipping routes. These routes often coincide with the migration paths whales frequently use to migrate between summer and winter habitats. Noise generated in the shipping sector is not equally distributed worldwide but tends to accumulate in major shipping ports such as the Port of Long Beach and the Port of Los Angeles and major shipping routes such as in the North Pacific (McKenna, Wiggins, & Hildebrand, 2013).

Marine pollution, in contrast to much land-based pollution, needs to be regulated internationally “since once a pollutant enters marine waters, it knows no boundary. Thus, a series of regional treaties and conventions pertaining to local marine pollution problems and more comprehensive international conventions providing uniform standards to control worldwide marine pollution” (Copeland, 2010, p. 1/2) are necessary. Yet, underwater noise pollution is not being addressed, neither on a United States national nor international level, with some exceptions, due to “a lack of international attention, particularly as compared to other forms of pollution, such as land-based sources of marine pollution or ballast water pollution” (Firestone & Jarvis, 2007, p. 148). This may be explained through the comparatively recent recognition of underwater noise as pollution. In 2014, the International Maritime Organization (IMO) adapted the voluntary “Guidelines for the Reduction of Underwater Noise from Commercial Shipping to Address Adverse Impacts on Marine Wildlife” (Marine Environment Protection Committee, 2014). The guidelines provide technical recommendations for ship quieting technologies for ship owners and ship designers. The guidelines also include operational suggestions for the maintenance of existing ships to minimize noise pollution.

The aim of this thesis is twofold. This thesis investigates existing US national and international regulations concerning noise pollution as well as the demands that these existing regulations may have on the shipping sector. Thereby also examining the voluntary guidelines as adopted by the IMO. The second aim of this thesis focuses on the expected outcomes these guidelines may have

on economic actors. To address these issues, the following research questions have been formulated:

1. *What do national and international regulations demand regarding actions to reduce underwater noise pollution?*
2. *How did the voluntary guidelines get established at the IMO?*
 - a. *What was the process behind establishing the voluntary guidelines?*
 - b. *How do various actors in the United States evaluate the voluntary guidelines?*
3. *What are the expected outcomes of such proposed guidelines on the shipping sector in the United States?*
 - a. *What are the expected costs and benefits of implementing the voluntary guidelines?*
 - b. *Are economic actors motivated to implement these guidelines?*

This research is divided into nine chapters. After this introduction, a background chapter follows showing the complexities and problems that arise because of underwater noise pollution. Chapter 2 also provides a brief overview over the legal international and US national frameworks and agencies which address ocean-related issues. Chapter 3 presents the conceptual framework whereby focusing on institutions, actors, and policies that influence the governing of environmental resources. Research methodology and the limitations of this research will be presented and discussed in chapter 4. This study uses mixed methods, data collection was performed through the use of content analysis, semi-structured qualitative interviews, and case studies. In chapters 5, 6 and 7 the results of the collected data will be presented. Chapter 5 introduces and explains the existing US national and international frameworks addressing underwater noise pollution. Chapter 6 illustrates the process of establishing voluntary guidelines to reduce underwater noise pollution, which were adopted by the IMO in 2014. Chapter 7 focuses on the expected outcomes of the voluntary guidelines for economic actors, while focusing on the costs and benefits of implementing the guidelines. Chapter 7 also presents motivating factors which help understand the decision-making process of economic actors regarding the implementation of the voluntary guidelines. Additionally, chapter 7 also illustrates three case

studies which all target vessel speed reductions. Two cases are programs with voluntary components while the third case study is an implemented regulation. These case studies may help in evaluating the voluntary guidelines. Chapter 8 provides perspectives on the voluntary guidelines, a discussion on the effectiveness of the voluntary guidelines and ways to strengthen the regime. Chapter 9 presents a summary of the findings of this research and aims to answer the research questions, which were presented in this chapter.

2. Background

The oceans have always been a sound-filled environment. Many of these sounds stem from natural origins such as waves and seismic events or are weather related. Marine mammals depend on the sound landscape to orientate themselves, they too create sounds to communicate and forage for food. Sound may therefore not be categorized as pollution until it becomes noise. Sound is the introduction of energy into the marine environment, which causes substances to vibrate (Conservation and Development Problem Solving, 2000). The difference between sound and noise is that noise harasses and actively disturbs the marine environment and its inhabitants. Sound can be categorized in temporary high frequency, mid frequency, and constant low frequency sound. Temporary high frequency sounds are generated by airguns or the use of seismic sonar, whereas mid frequency sound refers to military sonar between 2 and 10 kHz (McCarthy et al., 2011). Constant low frequency sounds are generated through the propulsion and cavitation of ships while traveling across the seas. These three types of sound impact marine wildlife differently, but upon introduction into the sea, each of them becomes noise in their own ways. Constant low frequency sounds have increased tremendously over the last few decades and therefore pose a serious threat to marine wildlife. This chapter provides background information on the physics of sound, human-induced sounds, and the impacts of noise on marine wildlife.

2.1. Physics of Sounds

Three basic variables determine sound: frequency, wavelength, and amplitude. Frequency is measured in Hertz (Hz) units. The audible frequency for humans, spans from 20 Hz to 20,000 Hz. Through age and exposure, the range might decrease (Conservation and Development Problem Solving, 2000). Wavelength measures the distance a sound travels, usually measured in meters. Amplitude refers to the acoustic power that a sound might generate, in other words amplitude is the “loudness of a sound” (Conservation and Development Problem Solving, 2000, p. 9). Decibel (dB) measure the amplitude of a sound, this differs though between in-air and in-water sound, “this means that a 100 dB in-air sound does not represent the same intensity level as a 100 dB in-water sound. The in-water intensity level is in fact lower than for the equivalent in-air dB value” (Kipple & Gabriele, 2004, p. 173). In air, sound usually travels about 340 meters per second; in ideal water conditions, i.e., ideal temperature and water pressure, sound travels almost at 4.5 times that speed per second. In oceans, due to the temperature and density of water changing with increasing depth,

also referred to as the thermocline, sound first decreases the length of travel (figure 1). However, below the bottom of the thermocline sound is refracted upward, the pressure of the water increases which also leads to an increase in sound (Conservation and Development Problem Solving, 2000).

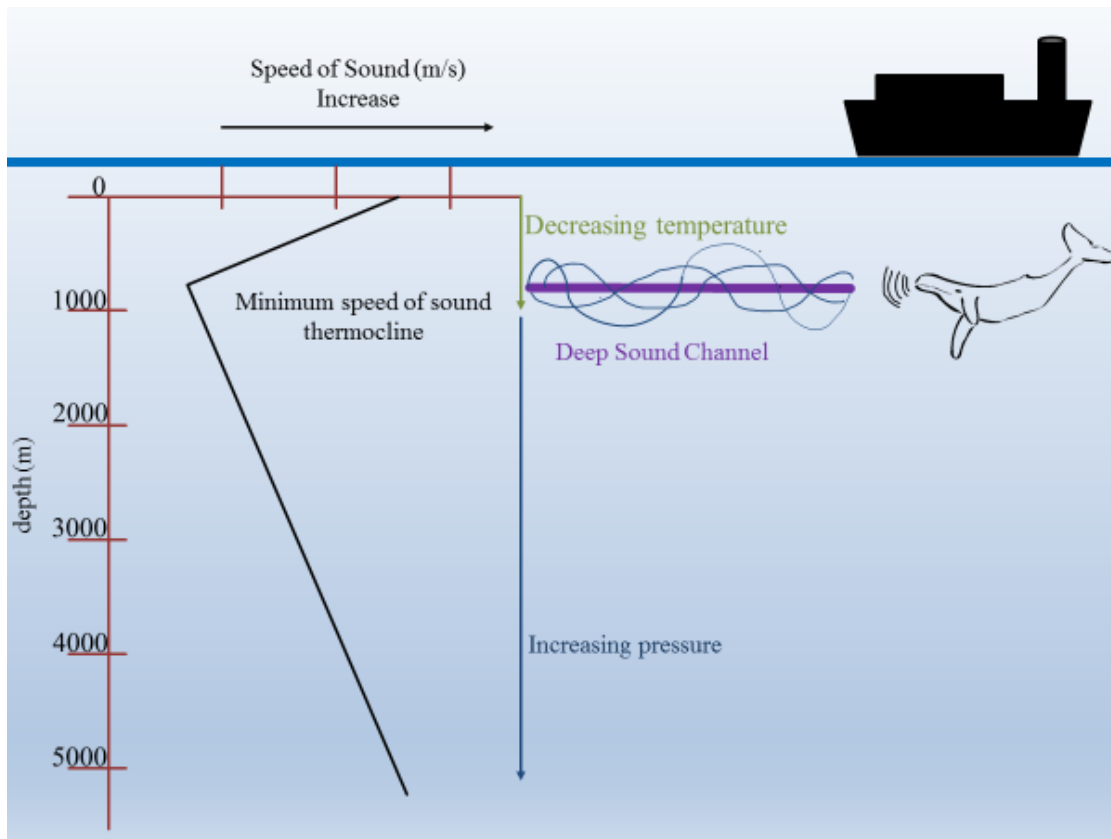


Figure 1: Deep sound channel or SOFAR Channel (Nieukirk, Ocean Explorer, & National Oceanic and Atmospheric Administration (NOAA), n.d.) (modified)

This phenomenon is also known as the *deep sound channel*, where sound may travel “without transmission loss due to geometric spreading” (Conservation and Development Problem Solving, 2000, p. 11). The channel is also called the SOFAR channel and gets its name from the acronym “SOund Fixing And Ranging” channel” (Nieukirk et al., n.d.). Sounds in that channel, especially low frequency sounds, may travel several kilometers and up to 19,000 meters without any signal loss (Nieukirk et al., n.d.; Conservation and Development Problem Solving, 2000). This means, that sound may decrease within the thermocline but given sound’s physics will increase at the bottom of the thermocline. Because of this, low frequency sounds are especially threatening to marine wildlife which depend on the soundscape.

2.2. Human-induced Sounds

Human-induced sounds are causing ambient noise that in turn impact the natural behavior of marine mammals. Whale watching and fishing activities during summer months create seasonal ambient noise, however, the shipping industry generates most constant ambient sound year-round. Commercial shipping dominates ambient sound between 20 Hz and 300 Hz, this sound may travel up to 4000 km (Conservation and Development Problem Solving, 2000). The generated sound comes from the ship's propellers which form cavitation. Cavitation is "the sudden formation and collapse of low-pressure bubbles due to the movement of a vessel's propellers" (Conservation and Development Problem Solving, 2000, p. 14). These cavitation bubbles result in enormous sound activity underneath the water surface (Scheifele & Darre, 2005). A fully loaded ship generates more cavitation than ships that are not fully loaded, as the propeller blades are fully submerged in the water. Empty vessels are usually lighter and the propeller blades tend to break the surface, therefore forming less cavitation underneath the water surface and creating less noise (Scheifele & Darre, 2005). Propeller blades of well-maintained ships may generate sound between 20 and 300 Hz (Conservation and Development Problem Solving, 2000). Older and poorly maintained ships tend to form even more cavitation than well-maintained ships. These propellers may generate noise between 100 and 1000 Hz. Additionally, sound may also be generated from the propulsion machinery, when sound is generated in the hull and further transmitted via the hull into the water (Conservation and Development Problem Solving, 2000). Bigger ships tend to generate more sound than smaller ones. Speed also plays an important role, as "generally, it is possible to avoid cavitation at low speeds, however at high speeds this is not possible" (Renilson, Leaper, & Boisseau, 2013, p. 202). Renilson et al. (2013) further point out that cavitation generates most underwater sound, hence sound reduction methods should target the minimization and prevention of cavitation.

Another source of human-induced disruptions are active sonars. These sonars send out pulses and then wait for a response to "measure water depth (fathometers); to locate schools of fish (fish-finders); to measure currents (acoustic Doppler current profilers); to search for wrecks (side-can sonars); to map the ocean floor (multi-beam sonars); and to detect enemy vessels (military sonars)" (McCarthy, 2007, p. 31). These sonars are widely used, especially for military purposes as well the shipping, oil, and offshore wind industries. Other sound generating sources include the

exploration and extraction of oil through seismic surveys, the use of airguns, offshore wind surveys, sleeve exploders, and gas guns (McCarthy, 2007). The use of active sonar, seismic surveys, and pile driving usually is location specific; their usage may therefore vary greatly between countries. Although these activities may contribute to the overall sound levels within the oceans, their effects often might be temporary.

2.3. Noise Impacts and Behavioral Changes in Marine Mammals

The shipping industry has seen a sharp increase in the last few decades and low-frequency noise generated by this industry travels great distances. This led to an increase in ambient noise which in turn causes stress on marine mammals. Although noise stemming from the shipping industry has yet not been proven to cause lethal damages to marine mammals, shipping noise has been proven to change behavior in marine mammals (Weilgart, 2007). Increased low-frequency noise masks vocalization by marine mammals (Weilgart, 2007). Shipping generates low frequency noise between 10 Hz to 1 kHz, which is also a frequency band baleen whales use. Other marine animals are also impacted by shipping noise, but as figure 2 illustrates, their frequency ranges differ greatly.

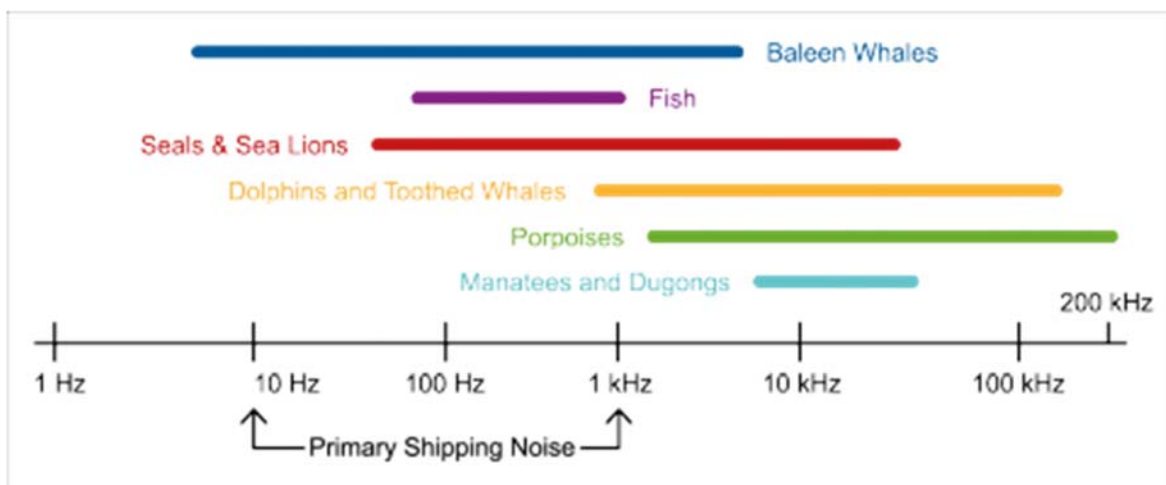


Figure 2: Frequency relationships between marine animal sounds and sounds from shipping. Figure courtesy of B. Southall, NMFS/NOAA (National Marine Fisheries Service & Press, 2013)

Behavioral responses between different species vary greatly, this also depends on the species' hearing and sensitivity frequency (National Research Council of the National Academies, 2005). For instance, "pinnipeds have lower maximum frequency of hearing and maximal sensitivity of hearing than odontocetes (toothed whales)" (National Research Council of the National Academies,

2005, p. 26). Prolonged exposure to high intensity sounds may cause chronic damage in the animals' sensory system, causing hearing damage and loss. There are many anecdotal accounts depicting the behavioral effect that increased ambient noise has on marine mammals, however, research results are limited. Behavioral changes include “shorter surfacings, shorter dives, fewer blows per surfacing, longer intervals between blows, ceasing or increasing vocalizations, shortening or lengthening vocalizations, and changing frequency or intensity of vocalization” (National Research Council of the National Academies, 2005, p. 114). Several studies have been conducted to proof the causal relationship between exposure to noise and changed behavior in marine mammals, for instance, gray whales would change their migration path in order to avoid areas with oil-industry activities (National Research Council of the National Academies, 2005). However, Simmonds et al. (2014) state that “longer-term chronic impacts of noise including disturbance or masking of sources critical for feeding and reproduction have received substantially less attention in management” (p. 71).

Other studies showed that grey whales did not have any behavioral changes when approached by small whale watch boats in few numbers and slow speed (Richardson, Greene Jr, Malme, & Thomson, 1995). Grey whales migrate from the coast of Baja, California to the Bering and Chukchi seas during the summer months, generally these whales migrate along the shore line. Nevertheless, in recent years they were also seen far off the coast, indicating that their migratory behavior changed because of anthropogenic disturbances (Richardson et al., 1995). Additionally, pile driving activities and installations of monopiles during the construction phase of offshore wind farms may cause permanent physical damage to marine mammals and alter their behavior (Brandt et al., 2011). There are indications of behavioral changes in marine mammals due to human-induced disturbances. Although short-term behavioral changes are well-documented, there is little knowledge on the long-term effects on the well-being of marine mammals (Richardson et al., 1995).

In 2000, the US National Research Council addressed anthropogenic sound and the harassment caused to marine mammals in a report as not “biologically significant”. Further research to determine the implications of *biologically significant* impact were thereafter pursued by NOAA Fisheries (National Research Council of the National Academies, 2005), however, no conclusion on the clear parameter of biologically significant were made from that report.

2.4. Overview of Legal Frameworks and Agencies Regulating the Oceans

Figure 3 shows a brief overview of international and US national frameworks and agencies which regulate the ocean and use of oceanic resources. International frameworks include the United Nation Convention on the Law of the Seas (UNCLOS) and specific to maritime pollution, the International Convention for the Prevention of Pollution from Ships signed in 1973 and modified by the Protocol of 1978 (MARPOL 73/78). The agency which ensures cooperation between the Member States is the International Maritime Organization (IMO). The Marine Environment Protection Committee (MEPC) specifically ensures collaboration between the Member States concerning marine pollution. Both, the UNCLOS and MARPOL 73/78, put forward recommendations, conventions, codes, and regulations for and in collaboration with the Member States. However, Member States may also set forward national issues, such as resource use and pollution which they want to discuss on a global level. Any national and international agendas are influenced by economic or civil society actors as well as research, technology, infrastructure, and various other factors.

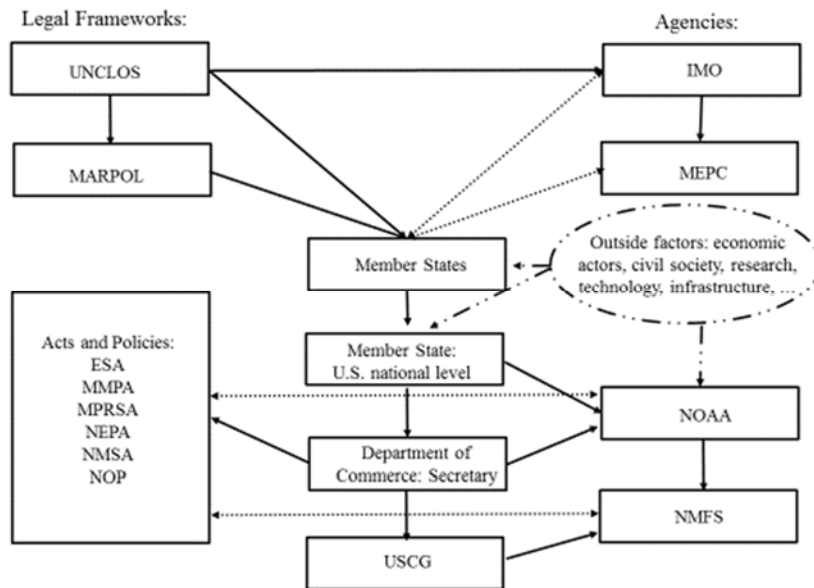


Figure 3: Overview of international maritime and US national frameworks and agencies

On a national level, these factors also play an important role. If Member States decide to sign and ratify conventions, codes, or recommendations from the international frameworks, they are expected to implement these regulations on a national level. In the US, there are several agencies overseeing the regulations and use of ocean resources. Offshore Energy for instance falls under the jurisdiction of Bureau of Ocean Energy Management (BOEM) within the US Department of the Interior, whereas vessel discharges fall under the of jurisdiction of Environmental Protection Agency (EPA). Shipping falls under the jurisdiction of the Department of Commerce. The Secretary may delegate decisions and actions, such as enforcement and monitoring, to other agencies, such as National Oceanic and Atmospheric Administration (NOAA) and the US Coast Guard (USCG). USCG “shall enforce or assist in the enforcement of all applicable Federal laws on, under, and over the high seas and waters subject to the Jurisdiction of the United States” (14 U.S.C. § 2). The duties of the Coast Guard are presented in 14 U.S.C. § 89 (a) and state:

The Coast Guard may make inquires, examinations, inspections, searches, seizures, and arrests upon the high seas and waters over which the United States has jurisdiction, for the prevention, detection, and suppression of violations of laws of the United States. For such purposes, commissioned, warrant, and petty officers may at any time go on board of any vessel subject to the jurisdiction, or to the operation of any law, of the United States, address inquiries to those on board, examine the ship’s documents and papers and examine, inspect, and search the vessel and use all necessary force to compel compliance.

NOAA may also delegate decisions to the National Marine Fisheries Service (NMFS). NOAA and NMFS may recommend actions regarding resource use and protection of the environment, but they are also required to act in accordance to national acts and policies such as the National Environmental Policy Act (NEPA), National Marine Sanctuaries Act (NMSA), the National Oceans Policy (NOP), Marine Mammal Protection Act (MMPA), the Endangered Species Act (ESA), and the Marine Protection, Research, and Sanctuaries Act (MPRSA). These acts and policies will be presented and discussed in chapter 5.

2.4.1. International Legal Frameworks and Agencies

Land-based resources are often governed by a state (country) that has sovereignty over the territory. States can regulate and enforce laws because the land-based resources fall into their jurisdiction. However, making that clear distinction becomes more difficult with marine resources as “more than one state may possess jurisdiction to regulate and enforce” (Kaye, 2016, p. 3). In the following section, legal international frameworks which address marine resources will be presented.

2.4.1.1. United Nations Convention on the Law of the Sea

The 1982 United Nations Convention on the Law of the Sea (UNLCOS) addresses the protection and use of marine resources on an international level. This legal framework has been ratified by 168 States and the European Union and “is considered a model for the evolution of international environmental law” (McCarthy, 2007, p. 124). The UNCLOS describes duties and rights of coastal and flag States while also focusing on the development and protection of natural resources.

Before discussing jurisdiction in the context of oceans, there is a distinction to be made between prescriptive and enforcement jurisdiction. Prescriptive jurisdiction refers to “the ability to regulate an activity – to prescribe the manner in which the activity is undertaken. This prescriptive jurisdiction can exist independent of any ability on the part of the State to enforce its laws, and may extend to activities taking place upon the territory of another State” (Kaye, 2016, p. 3) or simply the ability to write laws governing an activity. Enforcement jurisdiction, on the other hand, refers to a state’s ability to “actively enforce its laws, through the actions of those exercising its authority, such as police or coast guards officials” (Kaye, 2016, p. 3). Even though a state may possess prescriptive jurisdiction, enforcement jurisdiction may not be present. Additionally, enforcement jurisdiction cannot be exercised over another state’s sovereignty, “a coastal State possesses jurisdiction over certain activities in parts of the ocean, proximate to its coast, but a flag State may also possess jurisdiction over the same activities, by virtue of its jurisdiction over ships flying its flag” (Kaye, 2016, p. 3). No state has sovereignty over the vast majority of the world’s oceans and “more than one State may possess enforcement jurisdiction over an activity at the same time” (Kaye, 2016, p. 3).

To understand the rights and obligations of coastal and flag States one must first look at the maritime zones as defined by the UNCLOS (figure 4). The maritime zones consist of internal waters which constitute the waters inside the baseline; territorial waters extending 12 nautical miles from the baseline; the exclusive economic zone (EEZ) extending from 12 to 200 nautical miles from the baseline unless the space between two coastal States is less than 400 nautical miles¹.

¹ With States supporting the compromise of the territorial sea and the EEZ, the contiguous zone, which extends between 12 and 24 nautical miles from the baseline, became outdated (Jagota, 1985; Kaye, 2016).

A state need not claim an EEZ. The high seas extend beyond the 200-nautical mile area of the EEZ, if claimed, otherwise, it begins at 12 nautical miles. Finally, the continental shelf is “that part of the continental margin which is between the shoreline and the shelf break or, where there is no noticeable slope, between the shoreline and the point where the depth of the superjacent water is approximately between 100 and 200 meters” (United Nations Division for Ocean Affairs and the Law of the Sea, n.d.). In juridical terms the continental shelf is a submerged extension of the “land territory of the coastal State - the seabed and subsoil of the submarine areas that extend beyond its territorial sea to the outer edge of the continental margin, or to a distance of 200 nautical miles where the outer edge of the continental margin does not extend up to that distance” (United Nations Division for Ocean Affairs and the Law of the Sea, n.d.). The “seabed, the subsoil of the shelf and the slop and the rise” (United Nations Division for Ocean Affairs and the Law of the Sea, n.d.) are included in the definition of continental margin, not included, however, is the “deep ocean floor with its oceanic ridge or the subsoil thereof” (United Nations Division for Ocean Affairs and the Law of the Sea, n.d.).

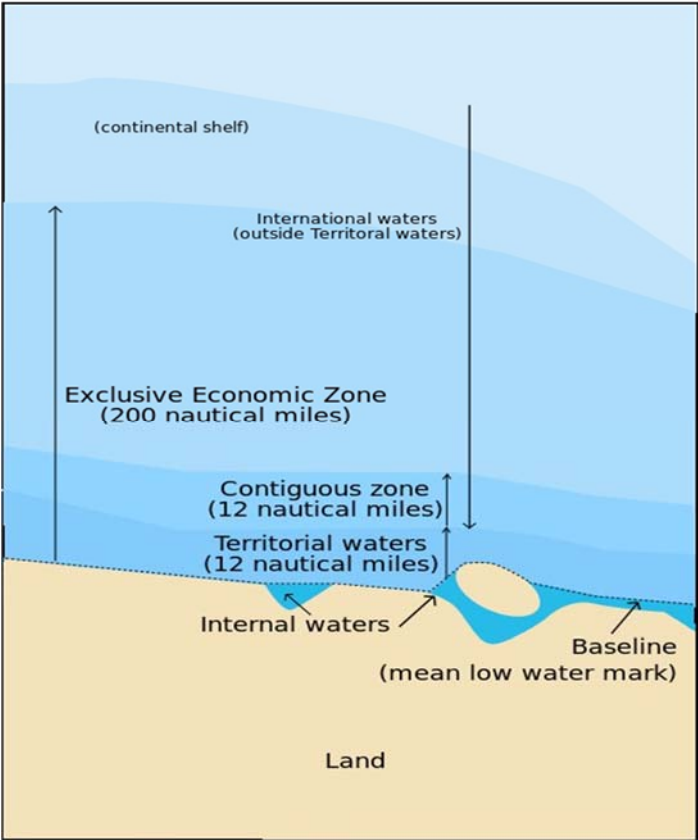


Figure 4: Map of Maritime Zones determined by UNCLOS (Borneman, 2014)

Internal waters of any state are equivalent to land, as such, they “are part of the sovereignty of the coastal State and foreign vessels in these waters have no guaranteed right of navigation” (Kaye, 2016, p. 5/6). Internal waters may include ports, even though they are not strictly internal. Foreign vessels are, unless they have sovereign immunity, subject to the laws of the coastal States within internal waters. Coastal States have the right to protect and allocate the uses of their coasts, which stretch over the coastal State’s land territory, internal waters, and the territorial sea. This right entails the ability to “exercise jurisdiction and to enact legislation and lawfully enforce them in an aspect of sovereignty” (Bautista, 2016, p. 60). Territorial waters extend beyond internal waters and are subject to sovereignty of the coastal State. The sovereignty is “only limited by the obligation on a coastal State to permit innocent passage of vessels through its territorial sea” (Kaye, 2016, p. 6). Beyond the territorial waters extends the contiguous zone in which coastal States “have enhanced jurisdiction over customs, fiscal, immigration and sanitary matters” (Kaye, 2016, p. 8). However, within this zone coastal States are not allowed to enact enforcement upon infringing vessels, even though coastal States are meant to prevent infringement. Many coastal States have not adopted the contiguous zone; however, many states may claim an EEZ beyond the territorial sea. This means, “within the EEZ, the coastal State has jurisdiction over economic activities in the water column and on the seabed, environmental protection and installations and artificial islands” (Kaye, 2016, p. 9). A coastal State therefore has jurisdiction over all marine resources within their EEZ, this also includes conservation and management within this zone. The maritime boundaries in the US “are measured from the official U.S. baseline, recognized as the low-water line along the coast” (NOAA Office of Coast Survey, 2013).

The high seas over which no state may claim sovereignty extend beyond the EEZ. Warner (2016) points out, that “in the absence of any global authority governing the high seas, the flag State model of jurisdiction has become the predominant method of regulating high seas activities” (p.20). By using the flag State model vessels automatically fall into the jurisdiction of national and international law and therefore have the freedom to exercise their national rights as well as have the obligation to follow their national rules. Flag States may exercise “jurisdiction and control over administrative, technical and social matters on ships flying their flags” (Bateman, 2016, p. 43). UNCLOS provides the legal framework under which flag States operate. The flag State is the “principal authority responsible for ensuring that vessels flying its flag are in compliance with international laws and regulations, particularly in areas beyond national jurisdiction” (Bateman,

2016, p. 46). A vessel may still be subject to a flag State's jurisdiction even after leaving the high seas, however, when entering the maritime zones of a coastal States that vessel will then also be subject to the jurisdiction of that particular coastal State (Bateman, 2016).

2.4.1.2. International Maritime Organization

The International Maritime Organization (IMO) was established in 1948, as such is one of the oldest UN bodies and plays an important role in regulating and enforcing maritime activities. IMO's main objectives are to provide mechanisms and tools to states which allow the states to regulate shipping practices as well as control marine pollutions from ships (Roach, 2016). Although the IMO is "only explicitly mentioned once in the LOS Convention, it is generally accepted that the IMO is the primary competent international organization for the regulation of international merchant shipping" (Molenaar, 2016, p. 178/179). IMO promoted and adopted conventions, codes, and recommendations guiding national regulations. Although these codes and recommendations are "not usually binding on the Member States, codes are often implemented through national legislation or regulation" (Silber et al., 2012, p. 1222).

IMO draws most of its financial support from membership fees based on the size of the fleets, this translates to flag States being the main income source for the IMO (Bateman, 2016). Because of this, flag States hold decision power and may influence the IMO, which may lead to conflicts of interest. Due to this power imbalance, flag States are able to push their own agendas and therefore influence the IMO's technical committees (Bateman, 2016). Haren (2007) stresses that "many of the representatives who sit on the IMO from other countries are representatives of the shipping industry" (p. 168). Because of this the IMO might act more favorable to the interests of the shipping industry. However, "this does not mean that the IMO represents a simple case of 'agency capture'" (Pugh, 1994, p. 226). Agency capture refers to an agency's agenda being "driven by industry constituents, leading to counterproductive policy results in natural resource management" (Davidson & Frickel, 2004, p. 474). Although "some shipping interests are politically influential and contribute to domestic political funds" (Pugh, 1994, p. 226), one should not assume that all Member States disregard other interests while favoring the economic interests of their own state's shipping industry.

The IMO further implemented the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78). This Convention addresses marine pollution caused by vessels from accidental and operational causes. MARPOL 73/78 consists of six technical Annexes, which are periodically updated. The Annexes cover “pollution by chemicals, goods in packaged form, sewage, garbage and air pollution” (Roach, 2016, p. 93). Under the Convention there are three obligations to follow, “the sanctioning of violations”, “the issue of certificates”, and “the drafting of a report in case of an incident” (Djadjev, 2015, p. 5). Article 4 of MARPOL 73 states that any ship-owner that does not comply with the MARPOL 73/78 is subject to their flag State’s jurisdiction. Furthermore, “when any violation takes place within the jurisdiction of any Contracting Party, sanctions shall be established under the law of that Party” (Djadjev, 2015, p. 5). Djadjev (2015) stresses that “a ship is required to hold a valid on-board certificate in accordance with the regulations” (p. 5). Ships may be inspected by authorized officers of Port or Coastal states, if during these inspections, the ship owners fail to produce a certificate the ship might be prevented from sailing further if it poses a threat to the marine environment (Djadjev, 2015). In case of an incident which may compromise the operation of the ship and may lead to any type of pollution by the ship, ship owners are urged to report to the “department responsible for the issuance of the respective certificate” (Djadjev, 2015, p. 5).

IMO delegates technical work to various committees, including the Marine Environmental Protection Committee (MEPC), which is a subsidiary body of the IMO overseeing issues of the prevention of pollution from ships (McCarthy, 2007; United States Coast Guard, 2016). MEPC is further “concerned with the adoption and amendment of conventions and other regulations and measures to ensure their enforcement” (International Maritime Organization, n.d.-c).

2.4.2. US National Legal Frameworks and Agencies

UNCLOS and IMO address pollution on an international level with a global perspective. Parties to the Conventions sign and ratify the agreements on their own premises. On a national level, national bodies are responsible for governing and managing resources in their geographical jurisdiction. This section presents relevant US national frameworks and agencies.

2.4.2.1. National Oceanic and Atmospheric Administration

The National Oceanic and Atmospheric Administration (NOAA) is the main agency addressing ocean related issues in the US. NOAA is a branch of the US Department of Commerce and mainly addresses atmospheric issues, including weather related issues, climate change, capture fisheries and mariculture, marine mammals, marine endangered species, coastal management, the conservation and protection of marine habitats, sanctuaries and in general the oceans and coasts. NOAA has the power to regulate and enforce regulations which prohibit certain activities. Hatch et al. (2016) describes NOAA as a “steward of the nation’s oceans, with a variety of statutory mandates for conservation and management of coastal and marine ecosystems and resources of ecological, economic, and cultural significance” (p. 171).

Additionally, NOAA is responsible for the management of Marine Protected Areas (MPAs) within US waters, however, NOAA only manages about 13% of MPAs that lay within US waters, which represent 99% “of the total area contained within US MPAs. This is due mainly to the existence of many large sustainable production fishery MPAs, a few large marine mammal MPAs on the east coast, and 4 large National Marine Monuments in the Pacific” (Hatch et al., 2016, p. 176). Because of the vast geographical and ecological differences between the different sites, NOAA approaches each region context specifically. Depending on the underlying issue, i.e. pollution or activities that are taking place, NOAA delegates responsibilities to various regional agencies, these in turn are then regulate issues specific to the geographic context.

2.4.2.2. National Marine Fisheries Service

The National Marine Fisheries Service (NMFS) is a branch of NOAA and responsible for the protection of the marine resources within the EEZ of the US. As such NMFS has two main functions which include conducting and sponsoring research and regulating environmental resources. The research is used as a base for scientific recommendations in protecting the marine resources (National Marine Fisheries Service, n.d.). NMFS’ regulatory arm “oversees the Office of Sustainable Fisheries, which manages fish stocks for commercial, recreational, and subsistence use” (National Marine Fisheries Service, n.d.). Functions also include “nationwide oversight of law enforcement offices that carry out more than 35 federal statutes and enforce[] U.S. treaties and international laws” (National Marine Fisheries Service, n.d.). NMFS together with the Fish and

Wildlife Service (FWS), is responsible for the enforcement of the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA).

3. Conceptual Framework

Governing environmental resources is a difficult task given the multitude of actors, institutions, and the kind of issues involved. Several conceptual frameworks may be used to address environmental governance, each of which providing a useful angle. These frameworks are not limited to but include the International Analysis and Development (IAD) framework, Ostrom's Social-Ecological Systems (SESs), Agrawal's Common Property Theory, and Vatn's Environmental Governance System (EGS) framework.

The IAD framework was developed by Ostrom and her colleagues at the University of Indiana. The framework's primary objective is to "identify the major types of structural variables that are present to some extent in all institutional arrangements, but whose values differ from one type of institutional arrangement to another" (Ostrom, 2011, p. 9). The framework further assists scholars in realizing important factors to consider when observing a phenomenon which focuses on livelihoods and resources of people (Blomquist & deLeon, 2011). The key of this framework is to identify a problem, either concerning actors, institutions, or resource use and to predict as well as to evaluate "likely behavior of individuals in such a structure" (Ostrom, 2011, p. 11). The IAD framework has further been evolved and integrated into other frameworks such as Ostrom's SES framework.

The SES framework focuses on interactions between resource systems and resource units while also organizing the attributes of resource systems and outcomes between governance systems and users (Ostrom, 2007). Furthermore, through using the SES framework, one could identify the "socioeconomic, political and ecological settings in which [these attributes] are embedded" (Ostrom, 2007, p. 15183). Scholars using this framework are meant to "recognize which combination of variables tends to lead to relatively sustainable and productive use of particular resource systems operating at specific spatial and temporal scales" (Ostrom, 2007, p. 15183). Ostrom (2007) also presents second-tier and third-tier variables which give a more detailed view of environmental governance systems.

Agrawal's Common Property Theory provides an alternative to Ostrom's IAD and SES frameworks. The Common Property Theory framework illustrates four "clusters of variables that are relevant to successful governance of the commons: the characteristics of the resource system,

the user group, the institutional arrangements, and the external environment” (Agrawal, 2007, p. 119). When examining the institutional arrangements, i.e. the way common property is governed, one must consider all other potentially influencing factors, such as the external environments or the characteristics of a resource system. These variables of common property are further supplemented by seven additional requirements, which include “availability of necessary information, ability to deal with conflict, compliance with rules, provision of technical, institutional and physical infrastructure, and ability to adapt and change” (Agrawal, 2007, p. 119). This analytic framework allows a basic view of environmental issues addressing common properties such as forests or the EEZs of states.

Vatn’s framework on Environmental Governance Systems (EGS) is inspired by Ostrom’s IAD framework but emphasizes the importance of “resource regimes, the concept of governance structures and a more explicit treatment of the interaction between the elements of the framework” (Vatn, 2015, p. 150). The EGS framework may be used to analyze resource regimes and institutions as well as processes at various scales. Furthermore, the EGS framework looks at actors on different levels and scales and the way they impact the state of an environmental resource and the ways in which these actors are influenced through and influence technologies and infrastructure. This framework enables a thorough analysis of the interactions between institutions, actors, and policies which alter the state of the environmental resource which in the case of this research is marine wildlife.

3.1. Environmental Governance System Framework

Vatn’s EGS framework (figure 5) explores environmental governance using different angles. The four main pillars of the framework are resource regimes and institutions as well as political and economic actors, which are influenced by civil society actors. The framework identifies the ways in which institutions are formed and their influences on the resource use. Furthermore, the framework addresses political and economic actors which both impact and are impacted by the institutions governing the policy process and the resource regimes which govern the economic process. Changing institutions and their implications on political and economic actors, further influence technologies and infrastructures. However, technologies may also change and improve efficiency, in doing so, the use of these technologies may increase profit for economic actors but this might also lead to increased extraction of natural resources or pollution. The result of this

interaction is a need for regulation and change in policies regarding the resource use. Actors are therefore affected by environmental resources and processes which create certain patterns of interaction. This in turn has implications on the outcomes of the resource use as well as on the state of the resource. The framework may also be used to analyze phenomena on different scales, as actors may interact on different political but also geographical levels. This change of levels may also influence the actors' roles as for instance local actors may change meaning and interaction on a regional or national level.

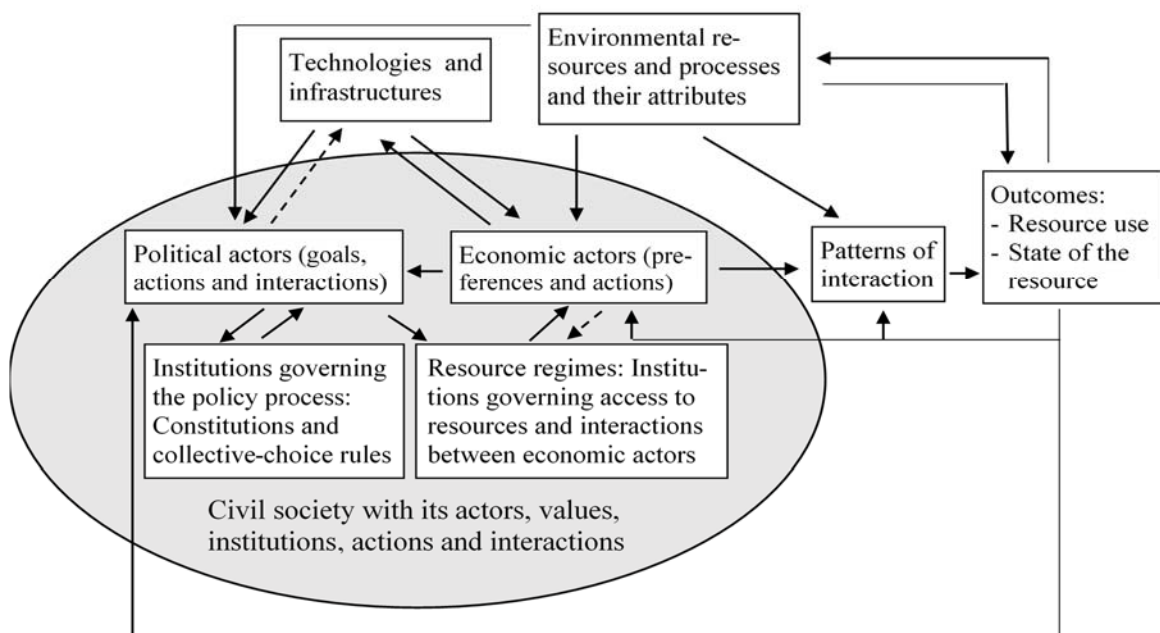


Figure 5: A framework for studying environmental governance systems – the EGS framework (Vatn 2015, p. 154)

To govern environmental resources one needs to consider the involved actors, resource regimes, and institutions concerning the resources. Actors include political, economic, civil society actors, and their agreements. Resource regimes, on the other hand, emphasize various types of policies which influence the pattern of interaction between the resources and the actors. To understand the interaction between actors and resource regimes, and the institutions that govern the policy process, one needs to first identify the characteristics of the resources.

3.2. Problematic Common-Pool Resources

Environmental problems may arise due to various types of degradation or exploitation of environmental goods over prolonged time, however, environmental problems may also arise from the governing of these resources. Environmental goods may be categorized into four types: private goods, public goods, club goods, and common-pool resources. Private goods are goods or services which are consumed by one or several individuals, and therefore not available to others (Ban, Evans, Nenadovic, & Schoon, 2015). Examples of private goods include products such as fishing gear or boats. Public goods refer to goods or services which may be consumed by everyone without reducing availability for anyone else from accessing the good (Ban et al., 2015). Club goods are goods where access may be restricted to some, whereas a common-pool resource is a “natural or man-made resource system that is sufficiently large as to make it costly (but not impossible) to exclude potential beneficiaries from obtaining benefits from its use” (Ostrom, 1990, p. 30). In other words, it is difficult and costly to exclude others from the use of common-pool resources.

Common-pool resources are easily accessible but once consumed, the good is not available to others anymore, as for instance harvesting fish (Ban et al., 2015). Ostrom (1990) argues that policies regarding the use of common-pool resources have often been recommended on the base of *the best available data*, disregarding the *characteristics* of a specific context. Characteristics refer to available decision-making tools when using and/or accessing common resources, such as institutions. Governing common-pool resources is a difficult task as it becomes increasingly complex the more actors, which may use different institutions, are involved. This holds also true in the management of protection of marine mammals, whose behavior may change due to various types of human activities.

Underwater noise pollution poses a challenging issue, as exclusion of economic actors is difficult to achieve and there is *rivalry* between the involved actors using the common-pool resource. Rivalry exists because the increase of noise that each of these economic actors emits, which impacts the common-pool resource negatively, i.e. the marine mammals, for all involved actors. In this case, rivalry translates to polluters, as the increase of polluters, i.e. economic actors/ships, impacts the state of the environmental resource such as marine mammals. Although governing common-pool resources is difficult, it is nonetheless important to protect and avoid exploitation and degradation of environmental resources.

3.3. Institutions

Institutions vary from culture to culture, but are a crucial part of any society as they “influence choices at all levels of society” (Vatn, 2005, p. 6). They might be categorized in three different types of rules: conventions, norms, and formally sanctioned rules (Vatn, 2005). Conventions are ways in which societies coordinate their behavior, for example personal space, which may vary in different societies, or the way people greet each other. Norms, on the other hand are underlying values, representing actions or behavior which are considered right or wrong, as for instance, littering is tolerated in some societies, where in others, it is not. Lastly, “formally sanctioned rules may cover all levels from the constitution of a society, the civil law, to the laws governing business transactions, rights to resources – property rights – formally defined emission rights and so on” (Vatn, 2005, p. 7). Institutions therefore structure and simplify life as they help navigate everyday situations, they also describe rights and duties of common-pool resource users.

In a policy-making process, institutions may be defined as “sets of working rules that are used to determine who is eligible to make decisions in some arena, what actions are allowed or constrained, what aggregation rules will be used, what procedures must be followed, what information must or must not be provided” (Ostrom, 1990, p. 51). In order for policy-processes to function, every actor must be aware of and know the rules, this also means that institutions are stable and constant. Ostrom (1990) further states, that institutions are “working rules [which] may or may not closely resemble the formal laws that are expressed in legislation, administrative regulations, and court decisions” (p. 51). Although institutions often times are tied to formal laws and settings, especially when these may be enforced, monitored, and sanctioned, institutions do not necessarily only apply to formal situations (Ostrom, 1990). Informal settings, as for instance in tribal village councils, also follow certain institutions specific to their situation.

3.3.1. Conflicts and Institutions

Formally sanctioned institutions create order in societies as they “exist where interests are or may be explicitly *conflicting* and the collective finds it necessary to empower the regulation of this conflict by the formalized control of its collective power, like the authority of the court system of a state” (Vatn, 2005, p. 65). Institutions therefore assign rights and duties, as well as privileges, liability, and power to actors in a society, this way they form legal relationships between resource

users and owners. However, conflicts arise where rights and duties are not followed or understood, or simply ignored, either by individuals or collectives.

Defining the works of legal relations is important, as they are applicable wherever there are formally sanctioned institutions. Institutions stem from the want and need to protect interests, however, “in a world of restricted and physically interrelated resources, there will always be conflicts over whose interests are to be protected” (Vatn, 2005, p. 68). This becomes evidently clear, especially in the case of environmental problems. Environmental problems arise due to various types of degradation or exploitation of environmental goods. Degradation of environmental goods may stem from the resource regimes, often also referred to as property regimes, characterizing the use of these environmental resources.

3.3.2. Resource Regimes

Resource regimes define the rights, privileges and duties of individuals, or a group of people, and their access and use of environmental goods. Bromley (1991) makes a distinction between four types of resource regimes which include private property, common property, state (public) property, and open access. Private property might be owned by individuals, or by corporations administering the property. The owners have the ability to exclude and sanction other’s access to the property (Bromley, 1991). The rights and duties of common property might be shared between co-owners which are able to sanction and exclude the use of the property by others. In a state or public property regime, a state may delegate rights and duties to groups or individuals by using leases for a specified period of time (Bromley, 1991). In an open access regime, there are no property rights to a resource (Bromley, 1991; Vatn, 2005).

Resource regimes determine the use of resources for various actors. Typically, the EEZ are state property resource regimes, meaning that regarding the sea “the ownership is in the hands of the state” (Vatn, 2005, p. 256). The high seas, where anyone may use the natural resources, are typically open access property regimes. However, the high seas might also be included in a wider context in different legal frameworks and may be understood as an extension of common property regimes. The wider legal context refers to the UNCLOS, the IMO, or the EU. Defining resource regimes and the access to the resources within the regimes is important, as states may be able to allocate resources to specific economic actors. This might concern the distribution of the total

allowable catch (TAC) of fish onto different actors, but it might also concern the speed-regulations for ships within the EEZ.

3.4. Actors and Motivation

The allocation of rights and duties of environmental resources is determined by institutions and by the actors using the institutions. An actor may be a single individual or a group of people which might operate as corporate actors (Ostrom, 2011). The actors, depending on the type of actor, i.e. political, economic, or civil society and whether they are individuals or collectives, might have varying degrees of access to information. This access to information affects the decision-making process and may lead to opportunistic behavior of the actors. Ostrom (2011) defines opportunistic behavior as an improvement of “one’s own welfare at the expense of others–[which] may take many forms, from inconsequential, perhaps unconscious, shirking to a carefully calculated effort to defraud others with whom one is engaged in ongoing relationships” (p. 14). Vatn (2005) refers to this type of problematic behavior as *free riding* where “if everybody else relinquishes their right to use force, each individual would observe that s/he could gain from not doing so her-/himself” (p. 27). The behavior is affected by the norms and rules of the individual and by “attributes of the decision environment itself” (Ostrom, 2011, p. 14). For example, littering in forests is socially frowned upon which is why many would choose not to litter in forests. However, an individual might decide to litter, despite these social norms, because they believe that others might clean up the litter. These others may clean up the litter due to the social norms being deeply ingrained in them. This behavior might also change due to differing motivation. If a state, or local governments, were to make payments to the individuals which collect the most garbage from the forests, the social norm might not matter as much as the economic incentive.

3.4.1. Political Actors

Political actors may be defined as those which hold the power to decide over resource regimes and rights to determine the use of resources. Political actors have the power to define “resource regimes and the rules for the political process” (Vatn, 2015, p. 142). On a local level, political actors include majors or village elders, whereas on a national level examples of political actors include political leaders, such as a president or ministers. Political actors may also include government spokespeople and party activists. However, political actors do not necessarily have to be tied to

individuals, they could also refer to national political actors, such as states (countries), or international political actors, such as international governmental organizations as for example the IMO.

On a national level, states and their governments have the power to determine rights and duties that concern the citizens of the state. These do not necessarily apply to people that are not citizens of that state. Additionally, states are also interested in advancing policies in their jurisdiction. Policies might address a variety of issues from fiscal policies, to health issues and environmental concerns, such as for example waste management in the oceans. These policies target the state's own governmental entities, such as municipalities or communities. A state might delegate certain decision-making powers to other, often smaller, regional governments, therefore decentralizing the decision-making process, which in turn allows these governments to operate and make regionally specific decisions. However, regional political actors might also depend on national political actors to introduce laws such as for instance the vessel speed restrictions to reduce the ship strike risk of North Atlantic right whales on the east coast of the US. This case will be further discussed in chapter 7.

States may, however, also operate in international settings, where they may take on different roles in negotiations, trying to advance their own political agenda. Such is the case at the IMO or the United Nation Framework Convention of Climate Change (UNFCCC) where states meet at the Conference of the Parties (COP) to discuss alternatives to combat climate change. In these processes states may take on various roles, which Chasek, Downie, and Brown (2016) identify as: lead state, supporting state, swing state or veto, also referred to as blocking, state. Lead states have a “strong commitment to effective international action on the issue, moves the negotiation process forward by proposing options for an agreement, and attempts to win the support of other state actors” (Chasek et al., 2016, See Nation-State Actors: Roles and Interests, para. 1). Lead states may use various tools to persuade other states of the urgency of a problem. These tools include, but are not limited to, funding research, encouraging international organizations to prioritize the issue or committing technical or financial resources (Chasek et al., 2016). Supporting states may advocate “in favor of a lead state's proposal in negotiations” (Chasek et al., 2016, See Nation-State Actors: Roles and Interests, para. 2). Swing states may swing in favor of lead states in exchange of incentives whereas veto states seek to “block a proposed environmental regime outright, tries

to weaken it to the point that it cannot be effective, or refuses to join, thereby severely reducing the global or long-term effectiveness of the regime” (Chasek et al., 2016, See Nation-State Actors: Roles and Interests, para. 2). State’s roles may change, due to for instance administrative changes. States may also be lead states occasionally in environmental negotiations but take on a different role in other negotiations. Chasek et al. (2016) remark that the role a state takes to a global environmental problem depends on “domestic political factors and the relative costs and benefits of the proposed regimes” (See Nation-State Actors: Roles and Interests, para. 7).

On a broader scale, political actors also include international governmental organizations (IGO) which are part of an international regime structure where a multitude of Parties collaborate on various global issues such as the United Nations Environment Programme (UNEP) or IMO (Chasek et al., 2016; Vatn, 2015). Traditionally, “IGOs are formed by member states in order to achieve general and multiple purposes” (Chasek et al., 2016, See Intergovernmental Organizations, para. 1). IGOs are therefore important actors in global environmental politics as they facilitate “the development of common norms or standards for government behavior” (Chasek et al., 2016, See Developing Nonbinding Norms and Codes of Conduct, para. 1). These norms and standards are nonbinding agreements between different states. This is also referred to as soft law and includes voluntary guidelines. Ahmed and Mustofa (2016) state that “soft law provides for agreement of states, general commitments and measures to accomplish besieged objectives in global standpoint” (p.1). These agreements “are usually developed or negotiated by groups of experts representing their governments, usually through processes convened by IGOs” (Chasek et al., 2016, See Developing Nonbinding Norms and Codes of Conduct, para. 2). IGOs may choose the route of nonbinding agreements rather than mandates to “avoid the lengthy process of negotiating, signing and ratifying binding agreements while also seeking to change international behavior” (Chasek et al., 2016, See Developing Nonbinding Norms and Codes of Conduct, para. 5). Involved parties may also choose nonbinding agreements because they are unwilling or unable to negotiate binding agreements, which means that compliance with these agreements may be uneven among states (Chasek et al., 2016). Nonbinding agreements might also be negotiated favoring terms of economic actors.

3.4.2. Economic Actors

Economic actors are individuals or a collective group of people, i.e. a firm or organization, making economic decisions. In organizational theory, which explores the characteristics that influence organizational behavior, “firms are seen as rational machines, acting to secure their main interest and to maximize economic outcome by rationalizing the use of the working force, techniques and resources” (Mac, 2002, p. 261). Making rational economic decisions implies that “firms make decisions, make plans and take strategic actions according to rational and stable criteria” (Mac, 2002, p. 260). Rational behavior may be explained as an individual always preferring one good over another, implying that the criteria they base their decision on are stable and given (Vatn, 2005). This view of economic actors and firms is heavily critiqued, as it only allows a simplistic understanding of economic actor’s preferences and attitudes while disregarding social norms, routines, or changing interests within a firm as well as external factors that might impact a firm’s agenda (Mac, 2002). External factors include social values, power structures, or leadership within firms. A firm might decide to de-invest into nonrenewable energy, even though this might not be profitable to the organization, but because of altruistic motivation to find cleaner energy or outside pressures from other actors.

Economic actors play a vital role in national and international negotiations. Because of the core activities of economic actors, which often include consuming resources and producing pollution, their economic interests are often directly impacted by environmental negotiations (Chasek et al., 2016). Chasek et al. (2016) also point out that economic actors operate in a network of decision makers and often contribute to the decision-making process with technical expertise. In providing this expertise, economic actors also reason their opposing to national and international policies that might “impose significant costs on them or otherwise reduce expected profits” (Chasek et al., 2016, See Business and Industry, para. 2). Although economic actors may at times support policies that lead to weak regulations, these same actors may in other instances support strong policies. For example, if national regulations are strong, but international regulations are weak, these actors may support the strengthening of international regulations. Economic actors might choose to do so, to minimize their loss, or minimize the gain of other international actors regarding the use of resources or technologies. Stronger international regulations would then lead to a *status quo* of resource use and access between the various international economic actors (Chasek et al., 2016).

However, “in most global environmental issues, corporations have relied on their domestic political clout to ensure that governments do not adopt strong policies adversely affecting their interest” (Chasek et al., 2016, See Influence on Regime Formation, para. 3). Additionally, Lemos and Agrawal (2006, p. 306) argue, economic actors favor voluntary agreements “as a strategy to preempt legal regulations”. In doing so, economic actors ensure the appliance of nonbinding agreements with minimal economic impact on their operation.

3.4.3. Civil Society Actors

Civil society actors or Nongovernmental Organizations (NGO) are typically organizations representing concerned citizens whose primary goals often include raising awareness and informing the public about a vast variety of issues, i.e. social, environmental, or economic issues, to name a few. The role of civil society actors varies and “may cover everything from rather loose relationships in a neighbourhood to quite formalized common property agreements, organizations and working communities” (Vatn, 2005, p. 128). Although civil societies represent citizens on many different issues and levels, the number of civil society actors and NGOs concerned with environmental issues as well as the supporters of these organizations have been increasing (Betsill & Corell, 2001). Additionally, campaigns led by these organizations may reach more people than ever before due to affordable and easily accessible communication channels and platforms.

Chasek et al. (2016) divide civil society actors into three different categories: 1) international NGOs with national branches, 2) national organizations focusing on domestic issues and 3) think tanks or research institutes. International NGOs with national branches include organizations such as Green Peace or the World Wildlife Fund (WWF) which often run international campaigns with additional regional foci. National organizations, focusing on domestic issues, include organizations such as the National Research Defense Council (NRDC) which “use legal, economic, and regulatory processes to affect national policy” (Chasek et al., 2016, See Nongovernmental Organizations, para. 7). The final category, environmental think tanks, “rely primarily on their technical expertise and research programs to influence global environmental policy” (Chasek et al., 2016, See Nongovernmental Organizations, para. 8), as for instance the World Resources Institute.

The way civil society actors participate in any types of negotiations depend on the national or international regime structure of the arena. On a national level, NGOs may “lobby state decision-makers hoping to affect domestic and foreign policies related to the environment” (Betsill & Corell, 2001, p. 67). NGOs could also target specific activities of various economic and/or political actors, where “they coordinate boycotts in efforts to alter corporate practices harmful to nature” (Betsill & Corell, 2001, p. 67). However, on an international level, civil society participation takes on a different form as international agreements are exclusively the domain of states (Betsill & Corell, 2001). Betsill and Corell (2001) further point out that “as UN members, only states have formal decision-making power during international negotiations. They establish rules for who may participate and the nature of that participation” (p. 68). This structure makes it difficult for civil society actors to engage and influence international negotiations.

However, on an international scale, the power of environmental civil society actors derives from “expert knowledge and innovative thinking about global environmental issues acquired from years of focused specialization on the issues” (Chasek et al., 2016, See Nongovernmental Organizations, para. 2). Civil society actors therefore “influence international regimes in a more specialized way by circulating ideas for inclusion in a convention or amendment and circulating it in advance of the negotiations in the hope that a national delegation will include it among their proposals” (Chasek et al., 2016, See Influencing Environmental Regime Formation, para. 6). In addition, NGOs partake in international negotiations where they “represent substantial constituencies within their own countries and thus command attention from policymakers because of their potential ability to mobilize people to influence policies and even tight elections” (Chasek et al., 2016, See Nongovernmental Organizations, para. 2). Civil society actors provide scientific and technical information for decision-makers and economic actors, and are vital to a healthy balance of governance on local, national, and international levels.

3.4.4. Power Imbalances

Power imbalances between the various actors impact the decision-making of policies. To understand the power relations and the interactions between all involved actors, a structural view of power first needs to be considered. The structural view of power is defined by “the practices and rituals of groups and institutions” (Raik, Wilson, & Decker, 2008, p. 735). Individuals are formed by these practices and rituals and because of this, strengthen the system of power (Raik et

al., 2008). The idea behind this structural view of power is the “production of consent and norms” (Raik et al., 2008, p. 735). Barnett and Duvall (2004) point out that “structural power generates resistance as attempts by those in subordinate structural positions to reduce the inequality that inheres in that relationship, as well as potentially to transform the structures that sustain it” (p. 23). The opposition, which usually is led by actors in subordinate structural positions, often takes place in solidary action (Barnett & Duvall, 2004).

Power imbalances occur because of knowledge being unevenly distributed across all involved actors. Hurrell (2004) points out that the actors who lack power are “increasingly ‘rule-takers’ over a whole range of issues that affect all aspects of social, economic, and political life” (p. 48/49). This becomes especially problematic in terms of environmental policies, when various actors impose rules on other actors, based on the knowledge that they have gathered. In some cases, economic actors carry out their own environmental impact assessments (EIA), showing that their operations had little to no effect on the environment and therefore did not need regulations. However, EIAs carried out by the state or research facilities may show different results, which would favor regulations concerning operational procedures of economic actors.

3.4.5. Voluntarism

Values play an important role when identifying and exploring certain behaviors, such as voluntarism. Voluntarism refers to actors freely choosing to undertake a social activity, such as donating blood, because the actors want to, and are not legally obligated or economically incentivized to do so (Husted & Allen, 2007). Economic actors might engage in social activities voluntarily, due to the underlying values of the firm. Identifying these values becomes even more important, when political actors consider implementing voluntary guidelines, rather than mandates. Underlying values play a crucial role when contemplating environmental policies.

For environmental policies, especially voluntary ones, to be successful, the motivations and values of targeted actors need to be considered. Steg (2016) emphasizes that policymakers must reflect on “the extent to which different strategies are effective in encouraging proenvironmental actions, but also to what extent and why such strategies are acceptable to the public” (p. 286). If policies fail to ensure public support, policies are less likely to be implemented. Steg (2016) also points out that “generally, policies are evaluated as more acceptable when people expect that the relevant

policies have more positive consequences and less negative consequences for themselves or the collective” (p. 286). Therefore, if policies reflect the values and norms of a society, they have a higher chance to be accepted and implemented. Nevertheless, it is believed that pro-environmental actions are costly, as for instance using public transportation may be less convenient and may take more time than using a personal car for transportation (Steg, 2016). Pro-environmental actions are therefore inherently less likely to be applied, which means that the motivation to implement pro-environmental policies may link back to the underlying values of involved actors (Steg, 2016).

3.4.6. Precautionary Principle

Essentially, the precautionary principle refers to actors changing their behavior because an identified phenomenon might impact their interests and operations. There are two types of extremes when a phenomenon is identified: on one end of the scale, actors lack scientific evidence to fully understand the characteristics of the phenomenon and therefore act precautionous. On the other end of the scale, actors will not act precautionous until they have enough scientific evidence to fully understand all characteristics of a specific phenomenon. This might be due to changing behavior leading to extra costs but maybe not benefits. The first extreme of the precautionary principle plays an interesting role in environmental law, as it has achieved a soft form of customary law and therefore is and, in areas where it has yet not been, should be applied (Gillespie, 2007).

The main goal of the precautionary approach is the protection of the environment and “entails taking preventative action in response to threats of environmental harm at an early stage, including in situations of scientific uncertainty” (Trouwborst, 2009, p. 27). Because of scientific uncertainty, a weak version of the precautionary principle may be attempted, in which the harm caused in the environment would be serious or irreversible (Gillespie, 2007; Trouwborst, 2009). However, scientific uncertainty, Trouwborst (2009) argues should not prevent decision-makers from taking action to minimize harm to the environment. Furthermore, the precautionary principle should be used “when the best information available indicates there are reasonable grounds for concern that unacceptable environmental harm may be caused, the presence of any remaining uncertainty is not a valid reason for failing to take preventive action” (Trouwborst, 2009, p. 34).

Gillespie (2007) points out five underlying principles that must be considered before using the precautionary approach. The principles include the (1) consideration of costs and benefits, (2)

identify who would benefit and who would carry the costs, (3) identifying alternative methods which would lead to the same outcome, (4) the action taken should be proportionate to the threat and finally (5) the precautionary approach should not be contradicting other policy measures taken in comparable cases (Gillespie, 2007). These principles may be understood as an aid for decision-makers when implementing environmental policies.

3.5. Policies

Resolving conflicts between resources and users might in some cases be easily reached, if all actors agree on the same solution. In other cases, third-party involvement, as for instance a state or city council, are necessary to resolve a conflict. A company may pollute by dumping water they used for their operations into a river. If there are no regulations for water waste, the company does *nothing illegal*. Further down the river villages rely on the water for irrigation and sanitation, however, due to the pollution they cannot use the river anymore. Their livelihoods are in danger. The company will insist, that it is their right to use the river in whatever way they feel necessary, meanwhile the villages suffer, because there are no regulations in place protecting their interests. Cases, like the one just described, are of “physical interrelationships where the choice of one by necessity influences the situation for and the well-being of others” (Vatn, 2005, p. 76/77). Here, it is unavoidable to involve an authority, which possesses the power to define but also to enforce actors’ rights, usually this means the government (Vatn, 2005). Governments may choose between two alternatives to resolve these issues: mandated solutions or voluntary agreements. When governments choose mandated statutory to regulate the access and use of a resource, they strictly define the rules and sanctions, which apply if actors do not abide by the rules. On the other hand, when governments choose voluntary agreements to regulate actions, they rely on actors to act voluntarily to resolve the issue. In the field of environmental regulation, these two alternatives equate to command and control and self-regulation.

3.5.1. Mandated Solutions and Command and Control

Mandated solutions, such as policies or regulations, may be defined as rules that are sanctioned through available tools to a state (Harrison, 2001). Mandatory regulation works on the principle of theory of deterrence “under which compliance is treated as a function of the probability of an offender being punished and the severity of the penalty” (Sinclair, 1997, p. 534). Therefore, actors

are incentivized to act in compliance with the mandates, as their non-compliance will be punished. In terms of actors' access to and use of resources, policymakers have several options. Policymakers could make formal requirements, where companies would have to *ask for permission* to operate, by formally filing applications. Once filed, a committee or civil servant will evaluate the project and ensure that certain requirements are met before operation starts. Other actors may formally complain in case the company does not comply with the rules. Alternatively, decision-makers could also institute a system, "whereby people who do not want to follow the rules are taxed according to the nuisance they create" (Vatn, 2005, p. 77). The result will be the same, actors having to abide by rules created by policymakers using formally sanctioned institutions to protect the interests of actors as well as resources.

Traditionally in environmental policies is the regulatory approach *command and control* "where a group of actors or facilities is subjected to uniform process or performance standards" (Harrison, 2001, p. 209/210). Sinclair (1997) elaborates that a "government literally *commands* industry to meet specific environmental standards, either directly through legislation or indirectly through delegated authority, and *controls* its behavior through the threat of negative sanctions" (p. 534). Industries therefore are "subject to a complex web of legislation, agency rules, permit procedures, standards, judicial decisions, and other enforceable environmental policies, underpinned by a variety of sanctions" (Sinclair, 1997, p. 529). Companies are obligated to follow the rules and face sanctions if they do not comply.

However, command and control has been subject to criticism as this type of regulation is "accused of being costly and inefficient, of stifling innovation, inviting enforcement difficulties and focusing on 'end-of-pipe' solution" (Sinclair, 1997, p. 530). This is partly due to governments imposing regulations on industry, which might stiffen the need and want of innovation of better, more efficient, and even more environmentally friendly ways to operate. The move towards self-regulation has in recent times, as Sinclair (1997) notes, "enjoyed serious consideration as a viable alternative to traditional command and control regulation" (p. 530).

3.5.2. Self-Regulation and Voluntary Agreements

Self-regulation is another approach to governance which in contrast to mandated solutions relies "substantially on the goodwill and cooperation of individual firms for their compliance" (Sinclair,

1997, p. 534). Firms and companies would morally commit to the self-regulation by “using information, education, technology sharing, and perhaps peer group pressure, as means to achieve this end” (Sinclair, 1997, p. 534). Self-regulation therefore is not limited to individual companies but includes collaboration between political, economic, and civil society actors, wanting to achieve a common goal. The ability to self-regulate is an attractive alternative to industries, because they may act on their own free will to comply but also because there are no strict sanctions, if they do not comply (Sinclair, 1997). Governments which lack resources to monitor compliance of industries, may choose self-regulation as an alternative form of “social control that [is] less resource-intensive” (Sinclair, 1997, p. 530).

Voluntary agreements between involved parties are a form of self-regulation, but may only be achieved when all involved parties “perceive benefits to participation” (Harrison, 2001, p. 214). The agreements are meant to “improve environmental performance” (Blackman, 2010, p. 24) and have become increasingly more popular in most industrialized countries. Increased popularity is driven by industries, which try to preempt regulations. In addition to that, industries might also over-comply to these regulations to attract *green* consumers (Blackman, 2010). These agreements rely on “the willingness of non-governmental actors, including industry associations, environmental groups, and individual consumers to resist the temptation to exploit common-pool resources” (Harrison, 2001, p. 208). However, Blackman (2010) also notes that voluntary agreements often “lack clear baselines, environmental performance targets, and monitoring” (p. 42). In combination with industries self-electing whether they want to comply, the impact of voluntary regulation is difficult to measure (Blackman, 2010).

From a government perspective, Harrison (2001) argues, that the appeal to use voluntary approaches stems from the business expertise, of which governments take advantage. By doing so, governments “can incorporate better solutions to environmental problems” (Harrison, 2001, p. 215). This, Harrison (2001) stresses, may further strengthen and improve the relations between political and economic actors and therefore, a sense of shared responsibility will grow in businesses.

3.5.3. Policy Entrepreneurs

Policy entrepreneurs have long been recognized as crucial to the process of policy making (Hopkins, 2016; Roberts & King, 1991). Böcher (2012) defines policy entrepreneurs as actors which “develop policy ideas and try to convince other actors of the viability of these ideas” (p. 17). In contrast to lead states, which commit technical and financial resources, policy entrepreneurs help “introducing innovation – the generation, translation and implementation of new ideas – into the public sectors” (Roberts & King, 1991, p. 147). They operate on micro-, meso-, and macrolevels. Policy entrepreneurs are any type of actors, i.e. political, economic, or civil society, individuals, or collectives, and may come from within the government or from outside of the government. They interact between different actors as well as different levels and their aims and goals may differ from situation to situation (Böcher, 2012). The role of the policy entrepreneurs is advocating and developing ideas and proposals to existing or emerging problems by specifying policy alternatives and present the ideas to policymakers, in addition to mobilizing public opinion and putting the identified issues and policies on the public agenda (Böcher, 2012; Hopkins, 2016; Roberts & King, 1991). To set agendas, “argumentation, persuasion, and marshaling evidence and information are [] important” (Kingdon, 1993, p. 44). Timing and persistence are crucial to agenda setting, because the window of opportunity to present ideas to policymakers is short (Kingdon, 1993).

3.5.4. Mechanisms of Compliance for Voluntary Solutions

Institutions are necessary as they protect interests (Vatn, 2005), yet interests between actors differ and therefore institutions may not always protect the interests of every actor. Industries may not always support or agree with policies as they prioritize the interests of their business. Industries and actors are complex and multidimensional, taking on various roles which prioritize various interests. This section may provide some insight on mechanisms which may motivate economic actors to comply with voluntary guidelines. The mechanisms include altruistic motives, win-win solutions, outside pressures, and public disclosure programs. Altruistic motives explore the idea of firms implementing voluntary action on their own, whereas win-win solutions emphasize the benefits for economic actors to implement the voluntary guidelines. Businesses may experience outside pressures either from publicly naming and shaming strategies or shippers, i.e., the companies that own cargo, the public or civil society actors demanding changes in businesses

practices. Finally, public disclosure programs are legally mandated programs where firms are required to disclose (sensitive) information about their operations. As a reaction to these programs, civil society and political actors may pressure economic actors in demanding changes in their operational behavior.

3.5.4.1. Altruistic Motives

Businesses may claim that they have altruistic motives, on which they base their decision-making. Practicing voluntary actions allows the firms more freedom and flexibility regarding their own adoption of voluntary guidelines. As a result of altruistic motives, economic actors could counteract regulatory decisions by political actors. Firms may then use their voluntary achievements as *proof* showing that regulation is unnecessary as they are already performing to the best of their ability. Providing this proof could also show that regulation is time and resource intensive for political actors, and based on that, regulation may simply not be practical.

Whether altruistic motives are underlying in decision-making is difficult to say. Nevertheless, Harrison (2001) argues that firms would need to be incentivized to voluntarily self-regulate by governments “in the form of credible threat of regulation” (p. 216). The author further notes that “therein lies the paradox of a voluntary approach: coercive government is often a necessary prerequisite for cooperation” (Harrison, 2001, p. 216). In this sense, self-regulation would not necessarily be tied to firms being altruistically motivated to adopt voluntary measures, but rather to firms wanting to avoid regulation. This in turn then raises the question whether economic actors comply with voluntary agreements because of altruistic motives, or if other factors, such as economic activities, play a larger role in the decision-making process.

3.5.4.2. Win-Win Solutions

The concept of win-win solutions stems from the discourse of ecological modernization, which Bäckstrand and Lövbrand (2006) define as, “the compatibility of economic growth and environmental protection, a liberal market order and sustainable development” (p. 52). In other words, all involved actors win from implementing or complying to voluntary agreements. Win-wins, within ecological modernization, build on “innovative technologies for integrated pollution control, market-driven strategies to internalize environmental costs and changing role of government towards more flexible, decentralized, cost-effective and collaborative policy-making”

(Bäckstrand & Lövbrand, 2006, p. 53). Successful governance therefore requires “a consensual and interventionist policy style consistent with corporatism” (Dryzek, 2013, p. 181), especially when political actors consider the realization of voluntary agreements.

From a business perspective, win-win solutions may be based on businesses being able to draw immediate financial benefit when complying to voluntary agreements. In ideal win-win solutions, a firm’s compliance may result in more efficient business practices, therefore saving money, and in addition to that perform better than the competition. Complying with a voluntary agreement could then, for example, lead to lower fuel consumption and therefore more financial benefit for the business and in addition lessen greenhouse gas emissions (Lyon & Maxwell, 2000). Businesses may also increase their competitiveness in the market, by adopting voluntary guidelines, which may again lead to an increase in income as well as positive environmental effects. It is noteworthy that a firm might comply with voluntary agreements regardless of environmental benefits or the government’s demands, prioritizing their own interest rather than the gained environmental benefits when complying (Harrison, 2001).

3.5.4.3. Outside Pressures

Outside pressures to comply with voluntary guidelines may come in various forms. Naming and shaming firms is a proven mechanism used by civil society and political actors. Naming firms, which comply with voluntary agreements or self-regulate and shaming firms, which do not comply with regulations, “has proved to be positively contagious” (Pawson, 2002, p. 212). Furthermore, Pawson (2002) states that publicly “[naming and shaming] initiatives are often regarded as ‘pure communication’ in that they work as a chain of reactions to what is said about whom, to whom, by whom” (p. 216). Naming companies therefore increases their positive reputation in the media and among customers, whereas publicly shaming may lead to financial backlash or changed management styles (Pawson, 2002). Harrison (2001) also notes that “government recognition of industry’s voluntary efforts may enhance the credibility of a firm’s own environmental claims with consumers” (p. 215). Positive reinforcement by the government, publicly naming the company in regards of their environmental efforts for instance, may add to the company wanting to self-regulate and/or comply with voluntary agreements.

Concerned citizens may demand changes in operations directly from the individual shippers. For instance, civil society pressure initiatives may lead to boycotting individual shippers and their cargo, these shippers may in turn demand changes in the carrier's, i.e. shipping line, operational behavior. To counteract these outside pressures, a shipper may adopt voluntary agreements in their business practices. In doing so, carriers may appeal to their shippers whose customers in turn prefer 'greener' businesses (Harrison, 2001).

3.5.4.4. Public Disclosure Programs

Negotiated voluntary agreements often fall short, as they lack monitoring and "may depend on strong formal regulation to be effective" (Blackman, 2010, p. 2). Harrison (2001) agrees that recent environmental policies "represent more flexible forms of regulation, such as negotiated compliance agreements, and less demanding regulatory requirements" (p. 207). One such alternative is public disclosure programs. These programs, Blackman (2010) argues, work more efficiently than voluntary agreements because public disclosure "initiatives in industrialized countries frequently suggest that they can have a significant impact on environmental performance" (p. 42/43). Bennear and Olmstead (2008) state that "many information disclosure programs have been developed to inform consumers about the *public* benefits of particular actions" (p. 119). These programs require firms to disclose information about their operations, these may include their economics as well as air pollution emissions or chemicals they use during operation and ways in which they dispose the chemicals. Carriers are therefore not required to change their operational procedures, but rather provide the public with information about their operations. This way, consumers are free to support a company that shares their customer's values (Bennear & Olmstead, 2008).

3.6. Technical solutions

Technical solutions play an important role within the EGS framework as leaps in technology change the way economic actors operate. A move from non-industrialized tools to industrialized tools increased productivity globally. In many cases, technological changes have increased productivity and changed societal landscapes time and time again, as exemplified by the industrial revolution, faster transportation systems, and smart communication technologies. Nevertheless,

technological solutions have also, in many instances, led to environmental issues such as greenhouse gases or oil spills by tankers (Renner, 2015).

Technologies impact governance in various ways. A firm may recognize a need for advanced and new technology and therefore invests into researching and developing technology that in turn may have the potential to change the industry and in an extension of that policy-making. Innovative firms may increase their economic gain and enhancing competitiveness over other companies by adopting technical solutions. Alternatively, policymakers recognize an issue and invest into research in a field, to then base their decision-making on these findings and thereby driving changes in technology. In this case, policymakers would implement policies to which firms would then be obligated to abide, as for instance changes in resource use or resource regimes (Vatn, 2015).

In a technocratic approach “sustainability is presented as an apolitical problem amenable of technical fixes” (Gómez-Baggethun & Naredo, 2015, p. 392). This translates to actors relying on technical solutions to solve any problems they might face on various scales such as environmental or economic. Approaching problems with this technocratic discourse means that “politics have been reduced to the search for technocratic solutions to pre-framed problems instead of a genuinely antagonistic struggle between alternative visions” (Kallis, 2014, p. 9). On the one hand, technical solutions help fix problems and may enhance operations tremendously. On the other hand, relying solely on technical solutions to fix all types of problems is a simplistic approach to complex and multi-layered issues. Therefore, technical solutions should always work in a collaboration between political, economic, and civil society actors. This holds also true for the implementation of voluntary guidelines, which should not only address behavioral changes, but also technical and operational advances.

4. Research Methodology

The aim of this research is three-fold: first, to investigate the demands in action of national and international regulations in the field of underwater noise pollution caused by the shipping industry in the United States. Second, to reconstruct the process of establishing voluntary guidelines on an international level as well as the evaluation of these guidelines. Third, to showcase the expected outcomes of implementing the voluntary guidelines and in addition to that uncover the motivation for economic actors to apply the voluntary guidelines. To achieve these aims, mixed methods were used to cross-reference and verify the collected data. I will also discuss issues related to trustworthiness and authenticity. Furthermore, this chapter will also deliberate research ethics as well as the limitations of data collection, such as access to economic actors.

4.1. Mixed Methods

In order to investigate the matter of underwater noise pollution, mixed methods were used. Mixed methods are “increasingly employed to describe research that combines the use of both quantitative and qualitative research” (Bryman, 2012, p. 713). However, the term also describes the combination of different qualitative research methods. This triangulation of methods refers to “the use of more than one method or source of data in the study of a social phenomenon so that findings may be cross-checked” (Bryman, 2012, p. 717). Mixed methods are “inclusive, pluralistic, and complementary, and it suggests that researchers take an eclectic approach to method selection and the thinking about and conduct of research” (Johnson & Onwuegbuzie, 2004, p. 17). Furthermore, mixed methods enable the exploration of a social phenomenon using multiple approaches, thereby providing a deeper understanding of the phenomenon. Using a combination of content analysis, qualitative interviews and case studies allowed a thorough investigation of the process of underwater noise pollution from the perspective of various actors.

4.1.1. Data Collection

Data collection took place in two phases: content collection and qualitative interviews with political, economic, and civil society actors. Additionally, information on case studies was collected. This section illustrates in which ways these different data collection methods were used to help answer the research questions.

4.1.1.1. Content Collection

Initially, a comprehensive search of peer-reviewed journals was conducted. Relevant keywords and in an extension of that, also key actors in the field of noise pollution in the US were identified. These included but were not limited to, Underwater Noise Pollution, Marine Pollution, Vessel Speed Reduction, IMO voluntary guidelines, UNCLOS, Sonar, Seismic Survey, Shipping. Two data bases were used, these included Google Scholar, which was the primary data base as well as Oria. Thereafter, the reference section of every article was thoroughly searched for further articles relevant to the research topic. The result of this research was 160 peer-reviewed articles and book chapters published between 1987 and 2017. Additionally, official government documents, which include, but are not limited to the Final Report of the NOAA International Symposium: “Shipping Noise and Marine Mammals: A Forum for Science, Management, and Technology” (Southall, 2005), and a Report of the Correspondence Group of IMO MEPC (2007) titled “Noise from Commercial Shipping and its Adverse Impacts on Marine Life” were collected and analyzed.

4.1.1.2. Qualitative Interviews

Qualitative interviews consisted of in-depth, semi-structured interviews which refer to qualitative forms of investigation where “the researcher has a list of questions of fairly specific topics to be covered, often referred to as an interview guide, but the interviewee has a great deal of leeway in how to reply” (Bryman, 2012, p. 471). This allowed flexibility in the interview process and enabled the participants to elaborate on topics and issues that they considered important while also focusing on overall topics pre-defined in the interview guide (Bryman, 2012). Furthermore, using semi-structured interviews also enabled the adjustment “the emphases in the research as a result of significant issues that emerge in the course of the interview” (Bryman, 2012, p. 470).

The selection of participants was based on a non-probability sampling, which implies that “some units in the population are more likely to be selected than others” (Bryman, 2012, p. 187). Having a non-probability sampling was necessary for this research, as only some persons within the US population have expertise and knowledge needed to help answer the research questions. Convenience sampling is a form of non-probability sampling which is “simply available to the researcher by virtue of its accessibility” (Bryman, 2012, p. 201). Two forms of convenience sampling were used. Based on the content analysis, key actors in the academic field of underwater

noise pollution in the US were identified, this was a strategic choice of participants, the first form of convenience sampling. Based on several criteria 20 actors were chosen for contact. The criteria included: 1) the year of the publication, priority was given to those actors which produced articles relevant to this thesis after 2004 (when the first discussions of underwater noise pollution took place); 2) feasibility of arranging meetings in person on the East Coast of the US; 3) which actors these participants represented (i.e. political, economic, or civil society). The second form of convenience sampling used, was snowball sampling where “the researcher makes initial contact with a small group of people who are relevant to the research topic and then uses these to establish contacts with others” (Bryman, 2012, p. 202). After conducting the interviews, the participants were asked for recommendations for further people to interview in the field of underwater noise pollution. Altogether, 65 participants were invited for interviews in November and December 2016, 38 of which were economic actors. All in all, 15 qualitative interviews were conducted, five interviews with political actors, seven interviews with civil society actors and three interviews with economic actors. On average, each interview lasted about one hour, with some exceptions.

The fieldwork was scheduled for January 11-28th, 2017 along the East Coast of the US. Several interviews were organized before the fieldwork had started. Once in the field, further interviews were secured through the snowball technique. This proved especially useful with economic actors. Some interviews took place via Skype, as some participants were located on the West Coast of the US and traveling across the country was not feasible. Two interviews with a political and a civil society actor from the US took place in Norway via Skype after the fieldwork has been completed.

4.1.1.3. Case Studies

To further the understanding of the effectiveness and the motivation for economic actors to implement the voluntary guidelines, an analysis of three case studies was performed. A case study “entails the detailed and intensive analysis of a single case” (Bryman, 2012, p. 66), thereby allowing researchers to analyze the characteristics of the case. Bryman (2012) employs the term of *representative cases*, which imply “that cases are often chosen not because they are extreme or unusual in some way but because either they epitomize a broader category of cases or they will provide suitable context for certain research questions to be answered” (p. 70). The cases chosen, exemplify the way in which voluntary programs may operate in US waters. The case studies include the Green Flag Incentive Program, the Vessel Speed Reduction Incentive Trial Program,

and vessel speed restrictions to reduce the threat of vessel collisions with North Atlantic right whales. The first two programs include voluntary compliance mechanisms for carriers whereas the third case study exemplifies the way in which policy entrepreneurs may operate within the US national legal frameworks.

4.1.2. Analysis and Coding

The analysis of the collected data took place in two phases. In the initial phase a content analysis was performed to identify the gaps in literature, important key actors in the field of noise pollution and conceptualize an interview guide. The second phase of analysis started after the qualitative interviews were completed and main themes were identified.

4.1.2.1. Content Analysis

A content analysis was performed, which is “an approach to the analysis of documents and texts that seeks to quantify content in terms of predetermined categories and in a systematic and replicable manner” (Bryman, 2012, p. 710). An extensive high quality analysis of documents, including official documents from governments and political organizations, on underwater noise pollution was performed. The content analysis was used to further identify interview subjects as well as key actors within the field of underwater noise pollution in the US. Once the content analysis was finished, gaps in literature were identified, which formed the base for the qualitative interviews. Having identified the gaps, an interview guide (Appendix 11.1) was conceptualized to answer the research questions and fill in the identified gaps.

4.1.2.2. Interview Data Analysis

Data was collected with the informed consent of the participants, and recorded on hand-held devices. All data was made anonymous upon transferring the audio files from the hand-held devices to password protected folders on a personal computer, accessible only by the author. Data was then transcribed with the use of an online transcription program called “Transcribe”, a program produced by Wreally Studios (n.d.). Once transcribed, recursive abstractions were produced which is “a simple method that is mainly based on summarizing the data in steps” (Oun & Bach, 2014, p. 256). Each interview was summarized into a maximum of two paragraphs, to capture the most important points discussed during the interviews. Grounded theory, where the

aim is to “generate theory out of research data by achieving a close fit between the two” (Bryman, 2012, p. 712), is another potential approach to better understand the voluntary guidelines. The focus of this research, however, was to examine the ways in which voluntary guidelines work in depth, which could help confirm and extend existing theories.

After the completion of the interviewing stage, main themes were identified, these included: 1) the involvement in the process of establishing the voluntary guidelines and the position of the actor, 2) alternatives that were discussed during the establishment of the voluntary guidelines, 3) effectiveness of the voluntary guidelines and finally, 4) the motivation to implement the voluntary guidelines. The collected data was then categorized into these themes.

4.2. Trustworthiness and Authenticity in Qualitative Research

Validity and reliability usually refer to quantitative research. Whereas validity measures “whether an indicator (or set of indicators) that is devised to gauge a concept really measures that concept” (Bryman, 2012, p. 171), reliability “is fundamentally concerned with issues of consistency of measures” (Bryman, 2012, p. 168). However, in qualitative research the concepts of trustworthiness and authenticity are often used instead (Bryman, 2012).

Trustworthiness includes four criteria, credibility, transferability, dependability, and confirmability. Credibility of qualitative research describes a researcher’s ability to understand the social reality of the interviewed participants. Furthermore, credibility also entails “that research is carried out according to the canons of good practices and submitting research findings to the members of the social world who were studied for confirmation that the investigator has correctly understood the social world” (Bryman, 2012, p. 390). This was achieved through the practice of respondent validation, which is a process “whereby a researcher provides the people on whom he or she has conducted research with an account of his or her findings and requests feedback on that account” (Bryman, 2012, p. 715). During the interviews, participants were asked to confirm or restate information that was collected from previous interviews, this strengthened the credibility of the research.

Transferability, dependability, and confirmability refer to research conduct. To ensure trustworthiness researchers should act in good faith by giving thick descriptions of their accounts. Additionally, researchers should keep a complete record of all the data collected as well as the

entire research process from the formulation of research questions to data analysis decisions, so that others could, given the information, arrive at the same conclusions as the researcher. Finally, personal values and background of the researcher should have not overtly interfered with the “conduct of the research and findings deriving from it” (Bryman, 2012, p. 393).

Authenticity is a thought-provoking concept, which presents several criteria which have “not been influential and their emphasis on the wider impact of research is controversial” (Bryman, 2012, p. 393). Nevertheless, this criterion includes fairness; ontological, educative, catalytical and tactical authenticity. Fairness asks whether the research “fairly represent different viewpoints among members of social settings” (Bryman, 2012, p. 393). This research included all actors equally, while trying to present a holistic approach of the actors involved. Ontological and educative authenticity refers to a researcher’s ability to showcase various actors in a social setting so that the actors may be able to gain a better understanding of their positions. The research further aims to illustrate standpoints of the various actors fairly in the hopes, that involved actors better understand the underlying motivation to implement voluntary guidelines and therefore achieving ontological and educative authenticity. Catalytic and tactical authenticity are indicators of change, and investigate whether the researcher enabled the actors to change their actions. Whether involved actors feel empowered to engage in change regarding noise pollution in the shipping industry remains to be seen and is beyond the scope of this research.

4.3. Research Ethics

Informed consent is a “key principle in social research ethics. It implies that prospective research participants should be given as much information as might be needed to make an informed decision about whether or not they wish to participate in a study” (Bryman, 2012, p. 712). Basic information, regarding the project was therefore given to the respondents, when reaching out to them and upon request, further information was distributed before the interview. Interviews started with a briefing restating the aims of the project, and then respondents were asked whether they understood the aims of the project and if the wish to participate. Additionally, participants were asked whether the interviews could be recorded for transcription purposes, to which all participants consented. Some information was provided *off the record*. This information was provided for background reasons only, and will not be included in this research.

Although personal information of the respondents is not sensitive in this case, all participants were anonymized and any personal information was excluded except for a respondent's affiliation, as this is important for the analysis of this research. Providing this information helps to understand the position of the respondents considering their affiliation. The data collection and analysis was therefore performed in unison with ethical principles which state that there should be no harm done to participants, all participants should have informed consent, there be no breach of trust which could invade the privacy of the respondents and finally, following the principles of trustworthiness and authenticity, there be no deception involved in this research project (Bryman, 2012).

4.4. Limitations

Conducting research in the field of underwater noise pollution caused by the shipping industry in the United States came with its own set of difficulties. These include access to actors in the field of noise pollution coupled with time and geographical constraints and the timing of the research in general. Due to time constraints and availability of participants, fifteen interviews were conducted, including only three interviews with economic actors. Altogether, 38 economic actors were invited for interviews in November and December 2016. A second attempt, which included several friendly reminders, was initiated in early January 2017, with still no response from economic actors. Some economic actors eventually agreed to be interviewed, however, their view on the motivation and the implementation of voluntary guidelines may not represent all other economic actors active in this industry. Furthermore, Maersk Line, the carrier that agreed to an interview is known for their pro-environmental initiatives, compared to other carriers. Therefore, the information that this carrier provided, may also skew the results. Although some information about the costs and benefits of implementing the voluntary guidelines was gathered, this information is minimal and might again, not represent actual benefits and costs to economic actors. Interview requests "attract a certain amount of non-response" (Bryman, 2012, p. 199). Having gatekeepers through which a researcher may gain access to a setting or organization might have been helpful during the research process (Bryman, 2012). Nevertheless, the snowball technique proved to be helpful in connecting with other interview participants.

Although many of the answers given by various participants were overlapping, therefore indicating a saturation point in research, more data might have strengthened the findings. Additional interviews with economic actors might have provided a better understanding of the evaluation and

motivation to implement the voluntary guidelines. Some limitations in the research were also due to the timing of the data collection. The governmental administration change in the US took place mid-January 2017. This led to government offices being closed, therefore political individuals and offices were not available for interviews. Furthermore, the change in administration led to reorientation and confusion among the respondents regarding the new administration and its environmental governance. In the interviews that took place after the inauguration there was a shift in focus, with the change in administration becoming a definite conversation point in the interviews, as the participants voiced their concerns for and opinions about the future of environmental governance in the US. This was not observed during the interviews before the inauguration, although the change in administration was touched upon by almost all participants, as all interviews were conducted after the Presidential election in early November 2016.

5. Legal Frameworks Addressing Noise Pollution

The demands for actions to reduce underwater noise pollution targeting the shipping industry vary depending on the various legal frameworks. There is a distinction to be made between sound and noise, sound is noise which harasses and annoys marine wildlife. Sound travels much farther in water than in air, therefore impacting more than the State in which the sound originates and because of this noise pollution is a transboundary pollutant. Due to the transboundary nature of sound it is necessary to address noise pollution on an international and national level.

5.1. International Regulations Addressing Underwater Noise Pollution

International frameworks which address underwater noise pollution includes the United Nations Convention on the Law of the Sea (UNCLOS), which although the US has not ratified is still understood as customary international law (Valencia, 2004). The International Convention on the Prevention of Pollution from Ships (MARPOL 73/78) represents another international legal framework which consists of six Annexes of which the US has ratified all except Annex IV on sewage. Lastly, the Marine Strategy Framework Directive 2008/56/EC will be presented, even though it is a EU framework and thus does not apply to the US. However, the Marine Directive was included because the framework presents an alternative view on protection of marine wildlife and ecosystems.

5.1.1. United Nations Convention on the Law of the Sea

The UNCLOS agreement is a result of the third Conference on the Law of the Sea (UNCLOS III). The conference convened in New York in 1973, after a lengthy negotiation process, the agreement was finalized in 1982 and has since then been ratified by 168 States. The US has signed but not ratified the agreement, however, they comply with the UNCLOS provisions and consider it as customary international law (Brisman, 2011; Valencia, 2004). The agreement “provides the first global framework on all aspects of the law of the sea - with broad rules to guide general behavior that necessitate issue-specific agreements to give its provisions concrete meaning” (Brisman, 2011, p. 1104). The agreement is considered a “key document in terms of environmental protection and some of its major achievements in this regard lie in its treatment of jurisdictional authority” (Brisman, 2011, p. 1104), whereby the agreement established jurisdictional zones such as the EEZ or high seas. Furthermore, the agreement established “obligations to protect and preserve the

marine environment (e.g., by creating duties to regulate ocean pollution, although no detailed pollution standards)” (Brisman, 2011, p. 1104). Part XII of the agreement addresses the protection and preservation of the marine environment and includes several articles on States’ obligation to prevent pollution from land-based and seabed activities. Pollution under UNCLOS is defined as followed (Part I. Article 1 (4)):

The introduction by man, directly or indirectly, of substances or **energy** into the marine environment, including estuaries, 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 [emphasis added].

The introduction of sound into the marine environment is not explicitly mentioned as a form of pollution. However, sound may be characterized as ‘energy’ and should therefore be implicitly addressed under UNCLOS. Part XII. Article 192 states a general obligation of all States to “protect and preserve the marine environment”. Part XII. Article 194 (1) of the agreement further asserts an obligation of all States to prevent pollution from any source:

States shall take, individually or jointly as appropriate, all measures consistent with this Convention that are necessary to prevent, reduce and control pollution of the marine environment from any source, using for this purpose the best practicable means at their disposal and in accordance with their capabilities, and they shall endeavor to harmonize their policies in this connection.

Because noise is a transboundary pollutant, management of noise requires a joint cooperation between all States, regardless of their borders or territorial sovereignty, to prevent and reduce further degradation of natural resources (McCarthy, 2007). Part XII. Article 194 (2) in the agreement emphasizes the importance of coordination between States:

States shall take all measures necessary to ensure that activities under their jurisdiction or control are so conducted as not to cause damage by pollution to other States and their environment, and that pollution arising from incidents or activities under their jurisdiction or control does not spread beyond the areas where they exercise sovereign rights in accordance with this Convention.

The agreement does not specify sanctions for non-complying States. It is up to each State individually to enforce regulation and specify sanctions and settle disagreements with other States *peacefully*. Part XV. Section 1. Article 280 states that the parties to a dispute have the right to “settle a dispute between them concerning the interpretation or application of this Convention by any peaceful means of their own choice”. Yet, if no agreement between the States is reached, the States may submit a request to the court or tribunal having jurisdiction for binding dispute resolution (Part XV. Section 2. Article 286). The disputes among the parties shall then be settled

by the court or tribunal. However, because the US has not ratified the agreement, this does not apply to the US. Regional differences make State specific sanctions necessary, as not every State and therefore the environment of every State is impacted the same way by various sorts of pollutions. The agreement does not include a global target for pollution reduction, neither does the agreement specifically address noise pollution. The lack thereof in an international agreement, such as the UNCLOS, makes it difficult for individual States to specify their regulations.

5.1.2. International Convention on the Prevention of Pollution from Ships

The IMO regulates shipping with focus on safety, environmental concerns, and the prevention of pollution from ships. The International Convention on the Prevention of Pollution from Ships (MARPOL 73/78) is IMO's most important tool addressing vessel-source pollution (McCarthy, 2007). MARPOL has six Annexes, which on the prevention of pollution by oil, noxious liquid substances, harmful substances carried by sea in packaged form, sewage from ships, garbage from ships and air pollution from ships (McCarthy, 2007). The US has signed all Annexes of MARPOL except Annex IV on sewage and ratified the Annexes on oil and noxious liquid substances, garbage and air (United States Coast Guard, 2017). MARPOL 73/78 was adopted at the IMO in 1973 and specifically addresses the prevention of pollution from ships. The Convention regulates both, accidental pollution and pollution from routine operations (International Maritime Organization, n.d.-b). MARPOL 73/78 defines pollution as "consisting of harmful *substances*; unlike the 1982 Convention on the Law of the Sea, there is no mention of *energy*" (McCarthy, 2007, p. 146). Pollution, per Article 2 (2) of the Convention are defined as:

Any substance which, if introduced into the sea, is liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea, and includes any substance subject to control by the present Convention.

McCarthy (2007) explains, that introducing substances into a setting would entail introducing physical foreign objects into the marine environment, such as oil or plastic, whereas the introduction of energy, i.e. noise, does not entail an introduction of actual objects. By this definition, noise is not included in the Convention and furthermore, noise pollution is not addressed elsewhere in the Convention. Scott (2007) argues that noise, because of the way it impacts marine wildlife, should be "subject to control as a result of biodiversity conservation obligation" (p. 179). MARPOL 73/78 has been successful in implementing regulations regarding the prevention from ships and therefore could be used as a tool to minimize and prevent noise

pollution. An Annex to the Convention specifically targeting noise caused by ships could be a leap forward in the prevention of this type of pollution (Firestone & Jarvis, 2007).

5.1.3. Marine Strategy Framework Directive 2008/56/EC

In 2008, the European Parliament adopted the “Establishment of the Marine Framework Directive 2008/56/EC” (Official Journal of the European Union, 2008), which was due to be translated into national law by 2010. The Marine Directive recognizes the need to protect and conserve marine habitats and urges all its Member States to limit their resource exploitation and act to *good environmental status* which is defined as (Article 3 (5)):

Environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations.

Furthermore, acting in good environmental status includes the limitation of polluting the marine environment. The Marine Directive defines pollution as (Article 3 (8)):

‘Pollution’ means the direct or indirect introduction into the marine environment, as a result of human activity, of **substances or energy**, including human-induced marine underwater noise, which results or is likely to result in deleterious effects such as harm to living resources and marine ecosystems, including loss of biodiversity, hazards to human health, the hindering of marine activities, including fishing, tourism and recreation and other legitimate uses of the sea, impairment of the quality for use of sea water and reduction of amenities or, in general impairment of the sustainable use of marine goods and services [emphasis added].

The Marine Directive recognizes human-induced substances and energies as a source of pollution including the introduction of noise. Annex 1 of the Marine Directive also provides qualitative descriptors for determining the characteristics of good environmental status while explicitly addressing underwater noise pollution. Article (11) of Annex 1 of the Marine Directive states that qualitatively good environmental status is achieved if “introduction of energy, including underwater noise is at levels that do not adversely affect the marine environment”. The Marine Directive is the first step to achieving “Good Environmental Status (GES) of the EU’s marine waters by 2020 and to protect the resource base upon which marine-related economic and social activities depend” (European Commission, 2016). Member States are requested to implement long-term strategies for the protection of marine resources and biodiversity, which will be reviewed every six years.

5.2. US National Regulations Addressing Underwater Noise Pollution

The US recognized the negative impacts of noise pollution as early as the 1970s and classified noise pollution as an “environmental pollutant that necessitated regulation to protect human health (Noise Control Act 1972)” (Hatch et al., 2016, p. 183). However, underwater noise pollution regulation to protect marine animals are practically non-existent (Hatch et al., 2016). In contrast to the EU Directive which addresses noise pollution from the concept of good environmental status, the US approaches the protection of marine wildlife from an angle which focuses on specific species and individual mammals. Additionally, because of the wide variety of geographic differences, the US adopted a regional management approach, which emphasizes the importance of site-specific protection. The National Ocean Policy is an overarching policy which defines the US governments’ objectives regarding the management of oceanic resources. Overarching acts addressing environmental and ocean resources are the National Environmental Policy Act and the National Marine Sanctuaries Act, which are binding laws. US national acts, which specifically address the effects noise pollution may have on the marine environment, include the Marine Mammal Protection Act, the Endangered Species Act, and the Marine Protection, Research, and Sanctuaries Act also referred to as the Ocean Dumping Act.

5.2.1. National Ocean Policy

In 2010, an Executive Order (13547) was signed followed by the National Ocean Policy (NOP) Implementation Plan, which was produced by the National Ocean Council in 2013. NOP “sets forth a vision of an America whose stewardship ensures that the ocean, our coasts, and the Great Lakes are healthy and resilient, safe and productive, and understood and treasured so as to promote the well-being, prosperity, and security of present and future generations” (Bureau of Ocean Energy Management, n.d.-b). Furthermore, NOP “directs federal agencies to implement ecosystem-based approaches to management” (Hatch et al., 2016, p. 175). Ecosystem-based management approaches enable the federal agencies to address the regional and local challenges caused by natural exploitation and degradation (Hatch et al., 2016). NOP uses coastal and marine spatial planning (CMSP) which is an ecosystem-based tool which analyzes and “support[s] regional actions and decision-making and address[es] regionally determined priorities, based on the needs, interest, and capacity of a given region” (National Ocean Council, 2013, p. 2). Furthermore, the use of CMSP helps identify and designate ecologically rich areas and “provides

a public policy process for society to better determine how the ocean, coasts, and Great Lakes are sustainably used and protected” (Bureau of Ocean Energy Management, n.d.-a). NOP serves as a reminder of important aspects to consider in policy-making by providing an overview over involved actors and the ways in which they rely and are impacted by the oceanic resources and occurring changes. However, the plan does not provide a concrete action plan to combat any type of pollution.

5.2.2. National Environmental Policy Act

The National Environmental Policy Act (NEPA) was established in 1969, and was “one of the first laws ever written that establishes the broad national framework for protecting our environment” (United States Environmental Protection Agency, 1969). NEPA’s purpose is:

The purposes of the Act are: To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality (42 U.S.C. § 4321).

NEPA aims “to assure that all branches of government give proper consideration to the environment prior to undertaking any major federal action that significantly affects the environment” (United States Environmental Protection Agency, 1969). NEPA does not explicitly mention ocean resources, however, given the common pool resource regime, NEPA applies to the EEZ. Furthermore, NEPA requires that prior to any action taken, an environmental impact statement (EIS) shall be provided:

Include in every recommendation or report on proposals for legislation and other major Federal action significantly affecting the quality of the human environment, a detailed statement by the responsible official on—

- (i) the environmental impact of the proposed action,
- (ii) any adverse environmental affects which cannot be avoided should the proposal be implemented
- (iii) alternatives to the proposed action
- (iv) the relationship between local short-term uses of man’s environment and the maintenance and enhancement of long-term productivity, and
- (v) any irreversible and irretreivable commitments of resources which would be involved in the proposed action should it be implemented.

Prior to making any detailed statement, the responsible Federal official shall consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact Involved [sic]. Copies of such statement and the comments and views of the appropriate Federal, State, and local agencies, which are authorized to develop and enforce environmental standards, shall be made available to the President, the Council on Environment Quality and to the public as provided by section 552 of title 5, United States Code, and shall accompany the proposal through the existing agency review process (42 U.S.C. 4332 (C)) [emphasis added].

NEPA emphasizes the importance of collaboration between different Federal agencies and experts when commencing EIS. The Council on Environmental Quality (CEQ) put forward Title 40 Code of Federal Regulations (C. F.R.) Parts 1500-1508 which “provide regulations applicable to and binding on all federal agencies for implementing the procedural provisions of [NEPA]” (40 C.F.R. Part 1500.3). The document defines the type of information that shall be included in the EIS which also “serves as an action-forcing device to insure that the policies and goals defined in the Act are infused into the ongoing programs and actions of the federal government” (40 C.F.R. Part 1502.1).

5.2.3. National Marine Sanctuaries Act

The National Marine Sanctuaries Act (NMSA) was passed by the US Congress in 1972 and it is the primary legislation to add “areas of the marine environment with special national significance due to their conservation, recreational, ecological, historical, scientific, cultural, archeological, educational or esthetic qualities” (National Marine Sanctuaries Act, n.d.) to the National Marine Sanctuary System. As such NMSA is quite limited in practice. The Secretary of Commerce is responsible for the NMSA and may as such, design marine sanctuaries, enforce regulation, and punish non-compliance. USCG also enforces regulations put forward under NMSA. NMSA does not explicitly address pollution of any sort or recommend actions to minimize or prevent pollution. However, the National Marine Sanctuary Program (NMSP), which is a division of NOAA carries out NMSA and is tasked with the creation of sanctuaries within US waters. It is noteworthy that some sanctuaries have been added as national marine monuments in which NOAA has “no formal role in the establishment” (National Marine Sanctuaries, 2016). Under the Antiquities Act of 1906 Presidents may assign marine monuments with “historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest” (National Marine Sanctuaries, 2016). Sanctuary status may be assigned to areas where endangered and threatened species reside. The Secretary of State may also engage with the Secretary in international negotiations to promote the purposes of the sanctuaries and inform other nationalities about the importance of national marine sanctuaries (National Marine Sanctuaries Act, n.d.).

5.2.4. Marine Mammal Protection Act

The US Congress passed the Marine Mammal Protection Act (MMPA) in 1972, “effectively giving the National Marine Fisheries Service (NMFS) of the National Oceanic and Atmospheric

Administration (NOAA) responsibility for conserving and managing all species of cetaceans and pinnipeds” (Daly & Harrison, 2012, p. 537). The conservation of other animals, such as polar bears, sea otters and manatees, to name a few, falls under the jurisdiction of the Fish and Wildlife Service (Fish & Wildlife Service, n.d.). Under MMPA of 1972 as amended, it is prohibited for anyone subjected to the jurisdiction of the US to *take* marine mammals within US waters or in the high seas. Article 13 of the MMPA defines the term *take* as “to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal”. The term harassment is further defined in Section 2, Article 18 (A) of the MMPA as,

Any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the world, or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to migration, breathing, nursing, breeding, feeding or sheltering.

Paragraph (i) refers to level A harassment and (ii) refers to level B harassment. The MMPA also recognizes in Section 9, Article 5 that noise pollution may change and affect whale habitats and populations. Although no definition of noise pollution is given in the MMPA. US citizens may be authorized with *incidental take authorizations* (ITA), issued by NMFS. ITAs focus on “sound-generating activities such as naval training (e.g. utilizing sonar or explosives), seismic surveys or marine construction, because they have the potential to result in marine mammal harassment” (Daly & Harrison, 2012, p. 537). However, ITAs do not apply to regular shipping operations and sound generated by them.

It is noteworthy, that MMPA provides a different definition of harassment regarding military readiness. According to Section 3, Article 18 (B) (i) harassment is defined as

- (i) any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild; or
- (ii) any act that disturbs or is likely to disturb marine mammal or a marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, **to a point where such behavioral patterns are abandoned or significantly altered** (16 U.S.C. 1362) [emphasis added].

This definition of harassment compared to the level A and level B harassments, is much more extreme, as in case of military readiness the well-being and protection of marine mammals are completely disregarded.

In contrast to the international legal frameworks, the MMPA puts forward clear penalties, in case of non-compliance or violation of the regulations. The Secretary and subsequently the USCG may

enforce the penalties. Violations will be fined and if failed to pay, taken to court, as stated in Title I, Section 105 (a)(1):

Any person who violates any provision of this title or of any permit or regulation issued thereunder, except as provided in section 118, may be assessed a civil penalty by the Secretary of not more than \$10,000 for each such violation. No penalty shall be assessed unless such person is given notice and opportunity for hearing with respect to such violation. Each unlawful taking or importation shall be a separate offense. Any such civil penalty may be remitted or mitigated by the Secretary for good cause shown. Upon any failure to pay a penalty assessed under this subsection, the Secretary may request the Attorney General to institute a civil action in a district court of the United States for any district in which such person is found, resides, or transacts business to collect the penalty and such court shall have jurisdiction to hear and decide any such action.

MMPA does not directly address pollution and its effects, but MMPA assesses the marine wildlife and the ways in which they are impacted by pollution and human activities in the marine environment. The Act focuses on stocks of animals and species which might be more prone to harassment than other species. NMFS conducts EIAs and prepares annual marine mammal stock assessment reports (SARs), which assist in the decision-making process when granting ITAs and other permits. Moreover, these reports are powerful tools which enable policymakers to make sound and evidence-based decisions regarding the protection of the marine environment.

5.2.5. Endangered Species Act

The Endangered Species Act (ESA) initially passed in 1966 “providing a means for listing native animal species as endangered and giving them limited protection” (Fish & Wildlife Service, 2016). Congress amended ESA in 1969 to “provide additional protection to species in danger of “worldwide extinction” by prohibiting their importation and subsequent sale in the United States” (Fish & Wildlife Service, 2016). The Act called for an international conference to “adopt a convention to conserve endangered species” (Fish & Wildlife Service, 2016), this led to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1973. CITES aims to “ensure that international trade in specimens of wild animals and plants does not threaten their survival” (Convention on International Trade in Endangered Species of Wild Fauna and Flora, n.d.). Congress passed ESA 1973 with the purpose to conserve and protect endangered and threatened species under the treaties to which the US pledged. ESA falls under the jurisdiction of FWS except for ocean fish which fall under the Jurisdiction of NOAA. ESA is one of the “primary statutes by which NOAA requires mitigation strategies and monitoring action

designed to reduce or eliminate and better understand the impacts that specific types of noise have” (Hatch et al., 2016, p. 175). ESA has several purposes as stated in Section 2 (b):

The purposes of this Act are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions set forth in subsection (a) of this section.

ESA is tasked to designate critical habitat and consults “with the States concerned before acquiring any land or water, or interest therein, for the purpose of conserving any endangered species or threatened species” (ESA, Section 6 (a)). The Act prohibits any person subject to the jurisdiction of the US as stated in Section (9 (a) (1)) to “(B) take any such [endangered species of fish or wildlife] within the United States or the territorial sea of the United States; (C) take any such species upon the high seas”. Any violation of the Act will be penalized, this is enforced by the Secretary and subsequently the USCG. Under ESA, “the term ‘take’ means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct” (Section 3, 19). In contrast to MMPA, ESA’s definition of take includes *harm*, which also means harm to critical habitat. Harm is by regulation defined as “significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering” (National Marine Fisheries Service/NOAA). Any violation of the Act will be penalized, this is enforced by the Secretary and subsequently the USCG. However, ESA includes a citizen suit provision under which any person may file a lawsuit:

(A) **to enjoin** any person, including the United States and any other governmental instrumentality or agency (to the extent permitted by the eleventh amendment to the Constitution), who is alleged to be in violation of any provision of this chapter or regulation issued under the authority thereof; or
(B) **to compel** the Secretary to apply, pursuant to section 1535(g) (2) (B) (ii) of this title, the prohibitions set forth in or authorized pursuant to section 1533(d) or 1538(a) (1) (B) of this title with respect to the **taking of any resident endangered species or threatened species** within any State (16 USC 1540 (g)) [emphasis added].

This means that the “ESA may be enforced by both the federal government and the public via citizen suit. In practice, citizen suits are the primary mechanism by which the ESA is enforced against government agencies and private entities” (Nathanson, Lundquist, & Bodelon, 2014, p. 2). ESA allows a 60-day window after the alleged violator has been informed, thereby providing a chance to resolve disputes before the commencement of the suit (Nathanson et al., 2014).

5.2.6. Marine Protection, Research, and Sanctuaries Act

The 1972 Marine Protection, Research, and Sanctuaries Act (MPRSA), also known as Ocean Dumping Act, implements the London Convention requirements on the US national base. The MPRSA is carried out by the NMSP and much like NMSA it's limited in practice. The US signed and ratified the London Convention which is "one of the first international agreements for the protection of the marine environment from human activities" (United States Environmental Protection Agency, n.d.). Human activities refer to the dumping of wastes and other matters into the oceans. In 1996, the London Protocol was negotiated, which was meant to eventually replace the London Convention. The London Protocol entered force in 2006 and has although signed, not been ratified by the US. Title II of MPRSA contains research provisions whereas Title III "authorizes the establishment of marine sanctuaries" (Copeland, 2010, p. 1). MPRSA has two intentions: "to regulate intentional ocean disposal of materials, and to authorize related research" (Copeland, 2010). The second aim is of interest as NOAA is "responsible for long-range research on the effects of human-induced changes to the marine environment" (Copeland, 2010, p. 2). Research carried out by NOAA builds the basis for further regulation.

5.3. Summary of Regulations Addressing Underwater Noise Pollution

UNCLOS defines pollution as substances or energy introduced into the environment, this means that under the Convention noise pollution is implicitly addressed, although not explicitly mentioned. Furthermore, UNCLOS does not include pollution reduction targets. This becomes especially troublesome because noise is a transboundary pollutant and therefore its regulation needs to be addressed holistically and internationally. Without a pollution reduction target Member States may not be motivated to prevent or mitigate noise pollution. Although not signed, the US accepts UNCLOS as customary international law. MARPOL 73/78 defines pollution as substance introduced into the environment which means that noise pollution under this agreement is not addressed due to sound being energy. MARPOL 73/78 has six Annexes addressing several types of pollution. The US signed five and ratified four Annexes of MARPOL. An Annex to the Convention targeting noise could be one way of addressing the effects of noise pollution. In contrast to MARPOL, the EU Marine Directive recognizes both, substances and energy as pollution and asks all Member States to act to good environmental status. Furthermore, the Marine Directive explicitly addresses noise pollution, although no noise pollution reduction targets have

been set. The Marine Directive is scheduled to reconvene in 2020, until then Member States are asked to implement long-term pollution mitigation and prevention management plans. The Marine Directive does not apply to the US, yet provides another international perspective on noise pollution and its management.

There are several US national regulations addressing marine pollution. NOP is a policy providing agencies with ecosystem management approaches and CMSP tools to identify and designate ecologically rich areas. NEPA on the other hand provides clear regulations on EIS which build the basis for policymaking for environmental protection. NMSA may designate marine sanctuaries but it is limited in practice. MPRSA has two foci, research of ocean dumping and the designation of marine sanctuaries, however, like NMSA it is limited in practice. The two most significant acts regarding noise pollution are the MMPA and ESA, which both are concerned with the *taking* of marine mammals. Under MMPA noise pollution qualifies as level B harassment, which is harassment that disturbs the natural behavior of marine mammal. However, in the event of military readiness level B harassment is disregarded and the military may employ any action which could significantly disturb marine mammals. In contrast to MMPA, under ESA the taking of animals also includes the destruction and degradation of habitats of critically endangered species. Although these policies and acts do not address noise pollution directly, they address the effects of noise pollution on marine mammals and their habitat.

6. Recognizing the Threat of Underwater Noise Pollution

In 2000, 17 cetaceans from five different species, stranded in the Bahamas within a 36-hour period. Among them were several beaked whales, known as the world's deepest divers. The stranding took place only hours after the US Navy conducted routine sonar exercises in the area. This incident gained media attention quickly and the US Navy's exercises were attacked by environmental protection groups and academics (Nevala, 2008). Shortly after the Bahamas incident, noise pollution became a talking point among many. In an office far removed from sandy beaches, a NOAA lawyer, Lindy Johnson, and a registered lobbyist came together and discussed the incident, a Chamber of Shipping of America representative recalled. This marks the beginning of agendizing underwater noise pollution in international and national fora. Several years later, the issue is still current. Figure 6 provides a brief overview over the steps taken between 2000, when the problem of noise pollution was first recognized until 2014, when the voluntary guidelines at the IMO were adopted.

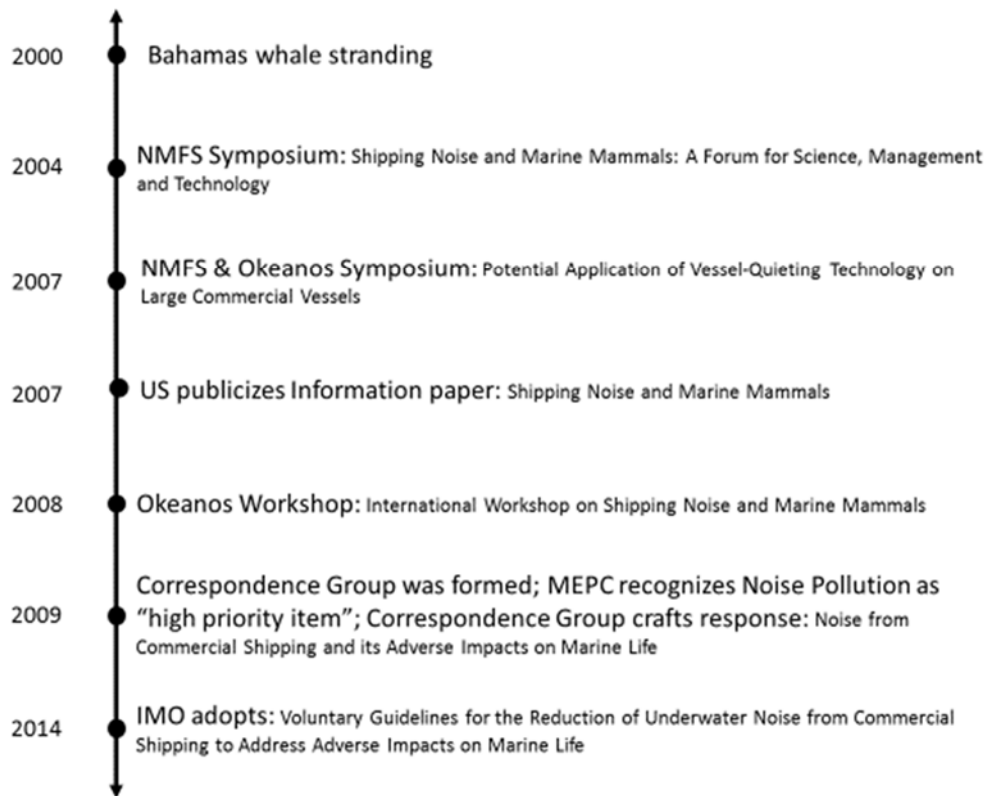


Figure 6: Timeline from recognizing the issue of noise pollution until adoption of the voluntary guidelines at the IMO-level

A multitude of political, economic, and civil society actors have shown interest in participating in this project. Some political and economic actors have participated in the two symposia and the workshop and may therefore provide valuable insight in the process of establishing the voluntary guidelines. Altogether 15 actors agreed to an interview, their affiliations will be presented in the following section.

Most the political actors are or have been representatives of the National Oceanic and Atmospheric Administration (NOAA). The interviewed actors were involved in different branches of NOAA and showed expertise in an array of various issues, these actors will hereafter be referred to as NOAA 1, NOAA 2, NOAA 3, and NOAA 4. A scientific advisor, hereafter referred to as Advisor 1, was also included as a political actor, given that the advisor had shown expertise in the international and US national regulations.

Economic actors' participants came from three different areas of the shipping industry. There is a distinction to be made between the economic actors in the shipping industry, shipping lines are generally referred to as carriers whereas the cargo will be provided by shippers (Talley & Ng, 2013). A representative from Maersk Line, referred to as Maersk 1, agreed to an interview and provided important information regarding Maersk Line's environmental management. Maersk Line is one of the world's largest carriers with a strong commitment to sustainability (Maersk Line, n.d.). Maersk Line's view on environmental issues may therefore not be representative of all carriers, yet provides valuable insight. A representative from Det norske Veritas and Germanischer Lloyd (DNV GL) also participated in this project and provided insight in the role of classification societies for the shipping industry, hereafter referred to as DNV GL 1. DNV GL was founded in Oslo, Norway in 1864 and has since then become an important global actor within maritime (Det norske Veritas and Germanischer Lloyd, n.d.). Lastly, a representative from the Chamber of Shipping of America (CSA), a US based organization representing the interest of the shipping industry agreed to an interview, hereafter referred to as CSA 1. CSA represents a vast array of actors, such as the public at large, US national and international charterers and ship owners (Chamber of Shipping of America, n.d.). CSA's role is to pursue and represent the member's interests before US and international entities, such as IMO.

Several civil society actors from various organizations agreed to partake in this project. Some of the interviewed actors may have moved on to other organizations, but because of their previous

engagement in these NGOs, they were included in this section. Organizations include the Environmental Defense Center (EDC), National Resources Defense Council (NRDC), and Ocean Conservation Research (OCR). EDC is a nonprofit corporation which provides legal counsel to other nonprofit organizations (Environmental Defense Center, n.d.). Their work focuses on the protection of the local environment in California, US, through advocacy, education, and legal action. Three representatives of EDC, referred to as EDC 1, EDC 2 and EDC 3 have agreed to participate in this study. NRDC is a not-for-profit organization with an array of national and international environmental protection programs. More than two million members support this NGO which relies on the expertise of 500 scientists, lawyers, and policy advocates (National Resources Defense Council, n.d.). Three NRDC representatives have agreed to an interview, hereafter referred to as NRDC 1, NRDC 2, and NRDC 3. Finally, OCR is a non-profit organization promoting and supporting ocean conservation. Their focus is researching and deepening the understanding of noise pollution and the effects noise pollution has on marine wildlife. They use this research to inform the public, political, and economic actors as well as other civil society organizations (Ocean Conservation Research, n.d.). The participant from OCR will hereafter be referred to as ORC 1.

6.1. Raising Awareness and Mobilizing Actors

After Lindy Johnson and CSA 1 recognized the threat that underwater noise pollution poses to marine wildlife, they started to inform national and international as well as economic, political, and civil society actors and raised awareness about this issue. NMFS, NOAA Fisheries Acoustics Program, Office of Protected Resources and NOAA sponsored and organized a symposium in 2004 in Arlington, Virginia. The symposium was titled “Shipping Noise and Marine Mammals: A Forum for Science, Management, and Technology” and was open to the public. Among the attendees were political actors from NOAA, US Department of Commerce, and a magnitude of researchers from various universities as well as economic actors from the CSA, and civil society actors from NRDC. Advisor 1, NOAA 1, and CSA 1 were present at the symposium.

Dr. Southall (2005) produced a final report of the NOAA international symposium. At the symposium, various aspects of underwater noise pollution were discussed in five different technical sessions. These were titled: 1) Trends in the Shipping Industry and Shipping Noise, 2) Effects of Noise on Marine Life, 3) National and International Response to the Marine Noise Issue,

4) Developing Technologies for Monitoring Marine Noise, and 5) Vessel Quieting Technology: Application and Benefits (Southall, 2005). Each session came to an individual conclusion that further research in their focus areas was needed. Nevertheless, each session provided ‘needed research and possible future actions’ (Southall, 2005). For instance, the National and International Response to the Marine Noise Issue session remarked:

Consider the potential conflicts/trade-offs between quieting vessels to mitigate communication masking and the potential that quieter vessels may be more difficult for marine mammals to detect and thus avoid. Consider effects of speed restrictions enacted to prevent ship strikes in the context of noise pollution (slower ships take longer to transit through a specific area emitting noise for a longer period of time within it; however slower transit speeds may reduce cavitation noise) (Southall, 2005, p. 20).

In this session two areas of conflicts were acknowledged: trade-offs between vessel quieting and marine mammals’ ability to detect the vessel and reduction of ship-speed increases the whale strike risks, as ships would stay longer in whale aggregation areas. Addressing noise pollution effectively is inherently complex, because of the multitude of factors that need to be considered. Nevertheless, the participants of the symposium recognized that the biggest contributor to underwater noise pollution were large shipping vessels. To conclude the symposium a panel consisting of representatives from NOAA, CSA, and NRDC in addition to others were invited to discuss issues related to underwater noise pollution. The panel was moderated by Dr. Southall.

Some of the representatives of NOAA, CSA and NRDC, which were partaking in the panel discussion agreed to participate in this study. CSA 1 and NOAA 1 characterized the discussion as a healthy debate among the involved actors. Some of the issues that were discussed at the panel was the uncertainty around the effects of underwater noise pollution and the regulation of shipping noise. These representatives did not recall the specific actors which were discussing shipping regulations, yet the final report of the symposium indicated that the shipping industry was opposed to the idea of regulating shipping noise:

Regulation of shipping noise was discussed extensively throughout the panel discussion. Some individuals indicated that regulation was needed immediately. **Others, including representatives of the shipping industry, felt that proactive collaboration would be more likely to provide both short and long-term results.** Guidance in terms of implementing cost-effective quieting technologies rather than developing standards or regulations may be more effective approach in engaging the shipping industry. A regulatory structure may be counter-productive to developing a collaborative working relationship between the industry, regulators, and scientists on this environmental issue. Those either in favor or opposition of future regulations on commercial shipping concur that this would be a process that would take many years (Southall, 2005, p. 32) [emphasis added].

During the panel discussion, it was pointed out that “if the shipping industry is provided information regarding how to minimize noise from vessels, they may devise engineering solutions that have acceptable associated costs” (Southall, 2005, p. 32). This indicates, that the panel and various other actors recognized the need to motivate the shipping industry to implement the changes and in order to achieve this, they would have to provide the shipping industry with practical considerations (Southall, 2005).

In May 2007, NMFS and Okeanos – Foundation of the Sea, a non-profit organization, hosted another symposium, titled, “Potential Application of Vessel-Quieting Technology on Large Commercial Vessels”, which was held in Silver Spring, Maryland. Present at the symposium were political actors from NOAA and US Environmental Protection Agency, economic actors from various representatives of shipping lines and CSA, and representatives from several universities. The focus of the symposium was narrower than the first symposium and included three sessions: 1) Introduction: Meeting Objectives, Vessel Acoustics, Ambient Noise, and Biology, 2) Feasibility and Estimated Cost/Benefits of Applying Existing and Future Quieting Technologies to Large Commercial Vessels and, 3) Non-Regulatory Incentives to Reduce Sound Emission from Large Commercial Vessels (Southall & Scholik-Schlomer, 2007). A report on the symposium was written by Dr. Southall and Dr. Scholik-Schlomer (2007).

A plenary session was facilitated which concluded the symposium, in which “possible treatment options for vessel-quieting (new design, retrofit, and operational measures), the relative advantages/disadvantages and qualitative estimates of costs and anticipated efficiency were discussed” (Southall & Scholik-Schlomer, 2007, p. 29). Due to high uncertainty and case-specific differences of various vessels, no consensus on *the best way forward* was reached. However, several options were presented and discussed by the participants of the symposium (Southall & Scholik-Schlomer, 2007). The participants identified ship design as a major cause in creating underwater noise, which had not been considered previously. They further realized that awareness needed to be raised among shipbuilders and operators (Southall & Scholik-Schlomer, 2007).

Although some of the interview participants which were also present at the second symposium (CSA 1, Advisor 1, and NOAA 1) again recalled a healthy debate between the involved actors as part of the panel discussions, the participants were not able to recall any specifics. The symposium

report, however, points out that the connection between noise and efficiency was an important discussion point:

An important issue that was discussed extensively was the potential connection between noise and efficiency. There were mixed views within the technical experts present regarding whether there is an explicit connection between quieting vessels and the efficiency of motion. It is expected that more efficient vessels may generally be quieter, but it is unclear as to whether explicit efforts to quiet vessels will necessarily result in greater operational efficiency. This is not an easy relationship to establish, but empirical case studies are clearly needed in order to either support or refute conclusions that efficacy of transporting goods and vessel-quieting efforts are mutually inclusive (Southall & Scholik-Schlomer, 2007, p. 28).

Unaware of the noise-generating effects that ship design causes, the participants recognized the importance of addressing the issue of noise pollution on an international level. The symposium participants decided that the next step forward should be an “information paper on the subject submitted to the International Maritime Organization” (Southall & Scholik-Schlomer, 2007, p. 5).

A quick glance at the literature cited in both the final report of 2005 and the final report of 2007 shows that more scientific articles on the effects of noise pollution on marine mammals and shipping noise have become available (Southall, 2005; Southall & Scholik-Schlomer, 2007). This indicates that more scientific data has become readily available between the initial symposium and the second symposium.

6.2. The Process of Establishing Voluntary Guidelines at the International Maritime Organization

To agendaize noise pollution at the IMO, delegations from Member States first must provide an information paper about the issue (Silber et al., 2012). Actors not affiliated with Member States or delegations are not able to bring forward any types of request to discuss during the IMO meetings. Following this procedure, the US delegation publicized an information paper on “Shipping noise and marine mammals” under the section of “any other business” at the 57th session of MEPC in December 2007. The information paper recognizes the limitations of research and knowledge about the impact of noise on marine mammals, but stresses the importance to address this issue, as shipping noise was only to increase over the next few decades due to trade and globalization. The US delegation asked of all member states to “inform all interested entities, in particular those from the shipping industry, shipyards, and ship builders, of this issue and invite them to participate in the ongoing dialogue” (Marine Environment Protection Committee, 2007, p. 1). Furthermore, the US delegation requested of all Member States “to provide any relevant information to the U.S.

Department of Commerce, NOAA's Ocean Acoustics Program" (Marine Environment Protection Committee, 2007, p. 6).

After the information paper was published, Okeanos held an "International Workshop on Shipping Noise and Marine Mammals" in Hamburg, Germany in May 2008. Okeanos convened the workshop which "concentrated on engaging members of the international maritime transport industry, particularly ship builders and architects" (Wright, 2008, p. iii). Okeanos made a strategic decision to convene the workshop in Hamburg as it "is a globally important supplier of ship equipment and the world's 4th leading shipbuilding nation, with Hamburg a capital of ship owners and operators (representing 36% of the world's containership fleet)" (Wright, 2008, p. iii). The symposium collaboration with Okeanos in addition to the workshop could be seen as an intentional decision by NOAA to engage German policymakers as well as the German delegation at the IMO in the issue of noise pollution thereby emphasizing the importance of this issue but also possibly exercising more power at the IMO.

The workshop provided an opportunity for economic and political actors to discuss various issues of noise pollution, based on the workshop a report was written by Dr. Wright (2008). In contrast to the symposia, there was a broader international attendance, including a variety of economic actors such as ship engineers as well as political actors from MEPC. The main goal of the workshop was to get all stakeholders, i.e. ship industry, including ship owners and builders, and the IMO, engaged in the issue of noise pollution created by the shipping industry (Wright, 2008).

The most notable outcome of the workshop was a call for "a 3 dB reduction in the band of 10-300 Hz in 10 years, ultimately leading to a 10 dB reduction within the next 30 years relative to current levels" (Wright, 2008, p. 1). The band of 10-300 Hz was chosen because noise from shipping vessels dominates this range. Applying the suggested measures "on an individual ship basis would lead to the 3 dB reduction in ambient noise within a decade and would result in an overall increase in potential communication/hearing ranges for marine mammals" (Wright, 2008, p. 1). This target was chosen because of the advances in modern shipping "ocean noise in the low-frequency range (10-300 Hz) has been doubling approximately every decade" (Wright, 2008, p. 1). This increase in noise means that "in sound level terms, a doubling in the power of sound is measured as 3 dB, while a ten-fold increase is measured as 10 dB" (Wright, 2008, p. 1). Therefore targeting 3 dB in 10 years over three decades would ultimately counteract the increase of noise levels caused by

modern shipping. The workshop indicated a clear achievable target over the next three decades which was later also endorsed by the International Whaling Commission (IWC) (Wright, Simmonds, & Galletti Vernazzani, 2016).

At the 58th session of MEPC in 2008, the US delegation urged MEPC to recognize noise pollution as a *high priority item* and a Correspondence Group overseen by the chairmanship of the US was formed. Several “Member States, observer organizations and entities” (Marine Environment Protection Committee, 2009, p. 2) were on an email-list organized by the Correspondence Group, even though “not all participated in the discussions” (Marine Environment Protection Committee, 2009, p. 2). Member States included (in alphabetical order): Argentina, Australia, Bahamas, Canada, China, Germany, Italy, Japan, Liberia, Marshall Islands, Panama, Republic of Korea, Singapore, Sweden, The Netherlands, United Kingdom, and United States. Observer organizations and entities included: Clinical Laboratory Improvement Amendments (CLIA), United Nations Environmental Programme/Convention on Migratory Species (UNEP/CMS), Friends of the Earth International (FoEI), International Council of Marine Industry Associations (ICOMIA), International Chamber of Shipping (ICS), International Welfare for Animal Welfare (IFAW), Institute of Marine Engineering, Science and Technology (IMarEST), International Association of Independent Tanker Owners (INTERTANKO), International Organization for Standardisation (ISO), International Union for Conservation of Nature (IUCN), International Whaling Commission (IWC) and WWF (Marine Environment Protection Committee, 2009, p. 2). MEPC assigned the Correspondence Group with two objectives (Marine Environment Protection Committee, 2009, p. 2):

Identify and address ways to minimize the introduction of incidental noise into the marine environment from commercial shipping to reduce the potential adverse impact on marine life, in particular develop **non-mandatory technical guidelines for ship-quieting technologies** as well as potential navigation and operational practices; and Provide reports to the Committee [emphasis added].

The first objective stated that the Correspondence Group shall produce a report which then shall be used for non-mandatory technical guidelines. Already in 2008, at the 58th MEPC session, the US delegation proposed nonbinding technical guidelines for ship owners, operators, and builders. The Correspondence Group produced a report titled, “Noise from Commercial Shipping and its Adverse Impacts on Marine Life” (Marine Environment Protection Committee, 2009) which was publicized in April of 2009. The report developed “practical, effective guidance on solutions that

can reduce the incidental introduction of underwater noise from commercial shipping in turn reducing potential adverse impacts to marine life” (Marine Environment Protection Committee, 2009, p. 3). Moreover, the report included a specific target of a 3 dB reduction in the band of 10-300 Hz in 10 years, ultimately leading to a 10 dB reduction within the next 30 years relative to current levels (Marine Environment Protection Committee, 2009). Applying the suggested measures “on an individual ship basis would lead to the 3 dB reduction in ambient noise within a decade and would result in an overall increase in potential communication/hearing ranges for marine mammals” (Wright, 2008, p. 1). The Correspondence Group recognized a need of measurement and classification of vessel noise, which could be achieved by linking noise data to Automatic Identification Systems (AIS). AIS sends out transit information such as speed and size of the ship, entry port and final destinations. In other words, AIS is a type of black box for vessels, its information is easily accessible for the Coast Guards. This data could then help monitor and identify the vessels that contribute most to the ambient shipping noise.

IMO adopted the Guidelines for the Reduction of Underwater Noise from Commercial Shipping to Address Adverse Impacts on Marine Life in 2014 (Marine Environment Protection Committee, 2014). The opening statement reads,

The Marine Environment Protection Committee, at its sixty-sixth session (31 March to 4 April 2014), with a view to providing guidance on the reduction of underwater noise from commercial shipping, and following the recommendation made by the Sub-Committee on Ship Design and Equipment, at its fifty-seventh session, approved the annexed Guidelines for the reduction of underwater noise from commercial shipping to address adverse impacts on marine life (Marine Environment Protection Committee, 2014, Article 1).

The guidelines emphasize that this document is a non-mandatory guideline, which in addition to that may not form the basis of a mandatory document (Marine Environment Protection Committee, 2014). The document outlines technologies and designs to be used in new ships as well as recommendations for limiting noise in existing ships. Furthermore, the document includes operational tasks to limit noise pollution. Most notably, the guidelines do not target any dB reduction goals, although these were stressed as important during the 2008 workshop and by the Correspondence Group. The voluntary guidelines have been in force since 2014, a move towards a mandate reducing the noise pollution from commercial shipping has not yet been initiated.

Although Germany participated in the Correspondence Group and the Okeanos workshop report was later used as background information in the report produced by the Group, it seems that the

German delegation did not play a big role in the process of establishing the voluntary guidelines at the IMO. NOAA 1 recalls that the idea of getting the German delegation involved into the issue of noise pollution caused by the shipping industry was based on Germany's economy. The representative elaborated that because most of the shipping industry is owned by the Germans, they hold decision power. Nevertheless, it seems that Germany's interest in this issue might have seized to exist.

6.3. Presentation of Voluntary Guidelines

The final version of the voluntary guidelines is titled IMO MEPC.1/Circ.833: Guidelines for the Reduction of Underwater Noise from Commercial Shipping to Address Adverse Impacts on Marine Life (Appendix 11.2). The document addresses the application of the guidelines, the purpose of the guidelines, and design considerations for ship builders. Section (2) specifies that the guidelines do not address naval and war ships and/or the use of sonar and seismic activities, yet the guidelines apply to all commercial ships. Section (3.1) declares that the non-mandatory guidelines are "intended to provide general advice about reduction of underwater noise to designers, shipbuilders and ship operators. They are not intended to form the basis of a mandatory document". Section (3) of the guidelines states:

3.2 Given the complexities associated with ship design and construction, the Guidelines focus on primary sources of underwater noise. These are associated with propellers, hull form, onboard machinery, and operational aspects. Much, if not most, of the underwater noise is caused by propeller cavitation, but onboard machinery and operational modification issues are also relevant. The optimal underwater noise mitigation strategy for any ship should at least consider all relevant noise sources.

3.3 These Guidelines consider common technologies and measures that may be relevant for most sectors of the commercial shipping industry. Designers, shipbuilders, and ship operators are encouraged to also consider technologies and operational measures not included in these Guidelines, which may be more appropriate for specific applications.

The guidelines encourage further research and development in technologies and operational measure which could lead to a reduction of underwater noise pollution. Most underwater noise stems from cavitation which may be minimized through design considerations of the ship, during the initial designing process of ships. These considerations are deemed impractical and expensive for existing ships, because of this, the guidelines are meant to support and guide new ship designs. The guidelines address various considerations regarding ship design in paragraph (7) which include propellers and hull design. These considerations are general in their nature and leave leeway for special circumstances such as mentioned in section (7.2.5):

Noise-reducing propeller design options are available for many applications and should be considered. However, it is acknowledged that the optimal propeller with regard to underwater noise reduction cannot always be employed due to technical or geometrical constraints (e.g. icestrengthening of the propeller). It is also acknowledged that design principles for cavitation reduction (i.e. reduce pitch at the blade tips) can cause decrease of efficiency.

In addition to the design considerations, the guidelines recommend reflections concerning the onboard machinery. Section (8.1) states,

Consideration should be given to the selection of onboard machinery along with appropriate vibration control measures, proper location of equipment in the hull, and optimization of foundation structures that may contribute to reducing underwater radiated and onboard noise affecting passengers and crew.

The guidelines encourage an open dialogue between ship designers and ship builders, in order to provide information about “airborne sound levels and vibration produced by the machinery to allow analysis” (Section 8.2). Further suggestions include the use of vibration isolators and the use of resilient mounting of the machinery, which would help reduce underwater noise. The guidelines also include additional technologies for existing ships in paragraph (9) which states,

In addition to their use for new ships, the following technologies are known to contribute to noise reduction for existing ships:

- .1 design and installation of new state-of-the-art propellers;
- .2 installation of wake conditioning devices; and
- .3 installation of air injection to propeller (e.g. in ballast condition).

The guidelines also provide considerations for operational and maintenance measures, which are applicable to both existing and new ships. These include general advice on propeller cleaning, underwater hull surface and the selection of ship speed in paragraph (10.4-10.4.3).

10.4.1 In general, for ships equipped with fixed pitch propellers, reducing ship speed can be a very effective operational measure for reducing underwater noise, especially when it becomes lower than the cavitation inception speed.

10.4.2 For ships equipped with controllable pitch propellers, there may be no reduction in noise with reduced speed. Therefore, consideration should be given to optimum combinations of shaft speed and propeller pitch.

10.4.3 However, there may be other, overriding reasons for a particular speed to be maintained, such as safety, operation and energy efficiency. Consideration should be given in general to any critical speeds of an individual ship with respect to cavitation and resulting increases in radiated noise.

The speed measures are generic and superficial, as they fail to address speed reduction targets for the benefit and health of marine wildlife. The initial reduction target of 3 dB/10 year over the next

three decades, which was included in the Correspondence Group report, was not included in the final version of the voluntary guidelines.

6.4. Evaluation of the Voluntary Guidelines

Although the adoption of the voluntary guidelines by the IMO is an achievement, involved actors had mixed perceptions on the adoption. This section illustrates the evaluations by political, economic, and civil society actors regarding the process of establishing the voluntary guidelines and the adoption of the voluntary guidelines.

6.4.1. Evaluation by Political actors

Interviewed political actors either are currently or have previously been NOAA representatives. NOAA 1 worked previously at NOAA's Ocean Acoustics Program, NOAA 2 and NOAA 4 both work at the Channel Islands National Marine Sanctuary (CINMS), which is administered by NOAA. NOAA 3 conducted their Master studies at CINMS and has since then become a Doctor of Jurisprudence. Advisor 1 provides scientific advice on marine mammals to NOAA.

6.4.1.1. General Evaluation of Oceanic Matters

There are differences in approaches between the EU and US regarding marine mammal protection. Advisor 1 explained that the US approach focuses on one activity and the ways in which a stock's behavior may change due to the exposure of the activity. In other words, the US looks at the noise that is emitted by the shipping industry and then identifies the ways in which a stock of marine wildlife experiences the exposure. The EU on the other hand investigates all types of noises that are generated in an area and then tries to limit the noise cumulatively. This becomes difficult in areas where there is more than one type of noise pollutant, as for instance high-frequency sounds are much louder and intensive than low-frequency sounds. The advisor acknowledged that neither of these approaches are ideal, but that a combination of these two approaches may lead to quieter oceans. Voluntary guidelines, which target the international shipping industry, are the first step towards an adaptive approach of quieting human-induced noise into the oceans.

NOAA 4 thoroughly discussed the shipping traffic scheme which is the main cause of noise in the US marine sanctuaries. More specifically, the representative pointed towards the shipping lanes in California, which are near the regional sanctuaries. The shipping industry is not forced to use these

shipping lanes, however, generally the industry does comply with the traffic lanes. NOAA 4 mentioned that historically the shipping lane came before the implementation of the sanctuary. Nevertheless, NOAA brought forward evidence to the IMO documenting the historic aggregation of whales in the sanctuaries and in part in the shipping lanes. Based on the data, the IMO approved a move of the shipping lanes closer to the edge of the sanctuary, to reduce the risk of whale strike. NOAA 4 explained that the shipping industry was collaborative and agreed to move traffic further outside the shipping lane. However, pushback on the move of the shipping lane came from the US military, which uses the area outside the shipping lane and the sanctuary. Because of their pushback, the shipping lane could not be re-assigned to be entirely outside of the sanctuary. Conflicts regarding the use of ocean and ocean resources stems therefore not only from various political scales, but comes also from within national levels.

Another point brought up by NOAA 1 is the lack of political will to act on behalf of marine mammals. Because marine mammals often display migratory behavior, they fall into everyone's and no-one's jurisdiction, making it difficult to regulate around the *environmental resource*. Negative effects on the resource are often not experienced first-hand by humans, which makes advocacy difficult, because the issue has to appeal to actors on a deeper level. NOAA 2 explained that the shipping industry has no economic gains from implementing voluntary guidelines. NOAA 2 further elaborated that the only way they could see more progress in the field of noise pollution, would be through extensive national-wide campaigns which could engage citizens. Without this public engagement, NOAA 2 feared, the political will to implement and enforce rules is practically nonexistent.

6.4.1.2. Evaluation of the Voluntary Guidelines

The US delegation initiated the process of establishing the voluntary guidelines at the IMO in 2007. Seven years after the information paper was published, the voluntary guidelines were adopted. Although the political actors have worked tirelessly to get the guidelines adopted, there is still one lingering question, unanswered: *Are the voluntary guidelines enough?*

Most remarkably, Advisor 1 mentioned the need for an *inside champion* to further an issue at the IMO. Many of the interviewed political actors agreed, that this role was taken by the late Lindy Johnson, a General Counsel for International Law at NOAA. Lindy Johnson worked tirelessly for

the protection of environmental resources. Among her professional accomplishments were the adoption of the International Ballast Water Treaty, International Air Pollution Standards (MARPOL 73/78 Annex VI) and the implementation of IMO guidelines to several Particularly Sensitive Sea Areas (PSSA) around the world. She was among the key actors that put noise pollution on the agenda at the IMO (NOAA Office of General Counsel, 2017). Advisor 1 added that her passing left a void in the political community, especially because Lindy Johnson was an active advocate, advancing many environmental issues by connecting with political and economic actors. Lindy Johnson was a person who understood the importance of networking, NOAA 1 recalled. The absence of a policy entrepreneur, as Lindy Johnson was, slows down the process of progressing agenda items at the IMO, NOAA 1 said, as other issues may be prioritized by other policy entrepreneurs or lead states.

Initially, NOAA considered addressing noise pollution on a national level. Civil society actors suggested a carrot and stick approach to incentivize good behavior, however, approaching noise pollution on a national level was not practical. The reasoning behind this was threefold: 1) Noise pollution was a newly identified phenomenon and no enforcement mechanisms on noise had been implemented before. Enforcement mechanisms for the multitude of ships entering US waters were not in place to address the issue on a national level. 2) Implementing national 'entry requirements', i.e. noise thresholds for ships entering US waters, could negatively impact US trade, because ship owners may resort to choosing ports outside of US waters for docking. 3) NOAA is part of the Department of Commerce, because of this, conflicts between interests of trade and environmental protection are predetermined. Because of these issues, internal discussions concluded, that approaching IMO about the issue of noise pollution would be most beneficial.

NOAA 1 stated that prior to the first symposium in 2004, underwater noise pollution was not an issue political or economic actors discussed. The far-reaching effects were unknown and therefore, awareness regarding the issue was relatively small. Recognizing noise pollution as an issue and subsequently adopting the voluntary guidelines was therefore a great achievement. However, NOAA 1 also mentioned that they were disappointed with the outcome of the voluntary guidelines, although the guidelines clearly represent a good starting point. Most notably, the guidelines lacked a clear target, as was first proposed by the Correspondence Group. Including the 3 dB per decade target over the next 30 years, would have set a manageable goal for the shipping industry. This

target was deemed premature and therefore was not included in the voluntary guidelines. NOAA 1 mentioned that the lack of said target would de-incentivize the industry to actively research, develop as well as implement technologies and designs that would contribute to the minimization of noise pollution.

Alternatives to ship-design, such as speed reductions and isolation mechanisms and dampening for on-board machinery, were discussed in the early stages of the first symposium. The participants of the symposium identified that 80% of noise energy is created by the ship propeller, therefore targeting speed design was prioritized. Advisor 1, who was also present at the first symposium said that although there is scientific evidence of propellers being the biggest noise contributors and the effects noise has on marine wildlife, some parts of the shipping industry still continued to be skeptical towards the evidence. NOAA 1 recalled that there was some discussion about the effects of noise pollution and whether regulation would be the best way to proceed. Advisor 1 and NOAA 1 both agreed that the debates regarding regulation were healthy, yet neither of these representatives would characterize the debates as strong opposition from the shipping industry.

The Executive Summary of the second symposium states that “a starting point [regarding noise pollution] could be an information paper on the subject submitted to the International Maritime Organization” (Southall & Scholik-Schlomer, 2007, p. 5). Furthermore, in one of the working groups of the second symposium it was agreed that any proposed changes to existing ships and new ships should be voluntary (Southall & Scholik-Schlomer, 2007). This was due to two reasons: expected push-back from the industry and the timeframe. NOAA 1 said that they expected opposition from the shipping industry and Member States if they were to suggest mandatory regulation on noise pollution. As noise pollution was a new and unexplored area and little was known about the effects that noise pollution had on marine wildlife. NOAA 1 pointed out that to convince the Member States to not veto the mandatory regulation, would have needed more scientific knowledge about the effects on marine wildlife. The timeframe was another consideration the political actors made. NOAA 1 remarked that the IMO was slow-moving. From experience, they gathered, voluntary guidelines were easier to present and subsequently implement than mandatory regulation, because the guidelines required less resources. Additionally, the involved actors expected less push-back from other political and economic actors on voluntary guidelines and therefore anticipated fast implementation.

NOAA 3 stressed that, because of the nature of the voluntary guidelines, no pressure is exercised on the shipping industry to implement them. The guidelines make recommendations for new ship design as well as operational suggestions for existing ships. Additionally, the ship owners, builders and designers should invest into researching and developing ship designs that would minimize cavitation. Yet, there has been little investment into research and development of noise-quieting technology. NOAA 1 believed that this is due to the multi-tiered organization of the shipping industry. There are many links between the ship builders, ship owners, the carriers, shippers which own the cargo, and the end-consumer. The one carrying the burden of costs of applying the voluntary guidelines may not benefit from having implemented these. The shippers could market their product as *green products* by informing the consumers, using labels, that their products have been shipped on quiet ships. However, carriers would not benefit from this labelling. The motivation to realize the guidelines, NOAA 1 argued, is practically non-existent as the shipping industry may not see a quantifiable gain from the implementation of the guidelines.

When asked about the future the political actors imagined for the prevention of underwater noise pollution, the political actors reacted skeptically. The change of administration in the US is a contributing factor, as the political actors imagine a roll-back of environmental policies and a disengagement from international agreements. Additionally, NOAA 4 stated, that there is a lack of research funding dedicated to the effects of noise pollution, which could be used to deepen the understanding of noise pollution and push for regulations on various levels. Yet, NOAA 1 remained hopeful, as civil society actors and media engagement has increased, raising awareness about underwater noise pollution.

6.4.2. Evaluation by Economic actors

The interviewed economic actors provide different perspectives on the evaluation of the voluntary guidelines, this is partly due to their affiliations. CSA 1 represents US based commercial shipping interests in national and international fora. Maersk 1's works for the Environment, Health, Safety and Sustainability division of Maersk Line in North America. DNV GL 1 works for the group government and public affairs for the US.

6.4.2.1. General Evaluation on Oceanic Matters

The role that the shipping industry plays in today's global trade is essential, as they deliver products daily over great distances. Yet, CSA 1 remarked that little attention is paid to the industry, as shipping is *the invisible industry*. Several actors recalled instances of great disaster caused by ships, such as oil spills. In those instances, the media searches for a villain which they tend to find in the shipping industry. This media coverage influences the way shipping is perceived by the public, DNV GL 1 stressed. Maersk 1 further elaborated that the public usually does not understand the importance of the shipping industry. Consumers prioritize, receiving products on time, cost efficiently. Consumers might buy environmentally friendly products, but they do generally not consider the travel distances and means between the production of a product and the delivery of the product to one's doorsteps.

Regarding the structure and operation of the shipping industry, a distinction must be made between small and big carriers, Maersk 1 explained. Big carriers are financially able to hire their own naval architects and are therefore able to design ships in an environmentally friendly and energy efficient, whereas smaller carriers do not have these resources and rely on the selection shipyards had to offer. Much like when buying a car, small companies can choose the color of the ship or the engine, but the basic design of the ship is determined by the shipyard. The shipyards may build their ships in accordance to classification societies concerning energy efficiency, but in the end, the shipyards hold almost all decision power regarding the production of the vessels and may decide to build the ships according to their own preferences. These preferences may include cheap, readily available materials or designs that make economic sense for the shipyards.

The shipping industry relies on classification societies to provide notations and classifications for their vessels, which are regulated by states (countries). DNV GL 1 explained that they play an important role in the maritime safety regime. Their tasks are to develop rules and standards for building ships and ensure that the ships comply with the rules. Furthermore, classification societies supervise the construction of new ships and periodically survey the vessel to ensure compliance. DNV GL 1 further elaborated that vessels must be categorized into classes due to insurance reasons on top of mandatory requirements and commercial pressures. The classification society also collects data regarding ship operations, and although some of the data is classified, other documents could be used for scientific purposes.

6.4.2.2. Evaluation on the Voluntary Guidelines

CSA 1 was, much like Lindy Johnson, a key actor in the implementation of the voluntary guidelines. The representative explained that Lindy Johnson approached them after the Bahamas stranding incident in 2000 and they discussed the issue of noise pollution thoroughly. Prior to that conversation, CSA 1 had not recognized noise as an issue for marine wildlife. Shortly after this meeting, CSA 1 approached several other key actors and put together, in collaboration with NOAA, the first symposium, where the effects of noise pollution were presented and discussed. The shipping industry viewed the issue of noise pollution and the guidelines ambivalently, whereas some participants were highly aware of the issue and its effects on marine wildlife, others did not see the need to prioritize this issue. Maersk 1 stressed that other environmental issues, such as whale strikes and greenhouse gas emissions were more pressing than noise pollution. The final report of the second symposium states that regulation regarding noise pollution was not desired by the shipping industry (Southall & Scholik-Schlomer, 2007). CSA 1 agreed with that notion, as the voluntary guidelines were in their eyes the *best-case scenario* for the industry, because the shipping industry could avoid regulation. Furthermore, CSA 1 stressed that the shipping industry in general wants to avoid regulation on any level. Neither DNV GL 1 nor Maersk 1 were directly involved in the establishment of the voluntary guidelines, yet both agreed that voluntary guidelines were a good starting point. DNV GL 1 also elaborated that their company was working on voluntary noise classifications which they saw a need for, as some carriers had approached about this issue.

During the process of establishing the guidelines, speed reductions were discussed, as this would minimize noise pollution and limit greenhouse gas emissions due to less fuel being burnt in transit. This would, according to CSA 1, also translate to more energy efficiency, although this is highly debated among representatives of the shipping industry. Reducing speed does not necessarily equate to energy-efficiency, as ships are designed to operate best at certain speeds, DNV GL 1 explained. Operating below a certain speed might in turn have the opposite effect and be even less energy efficient, and therefore not desirable for carriers. When asked about speed reductions, Maersk 1 remarked that slowing down, was not an option, as they would still have to meet deadlines and have little flexibility in their schedules.

CSA 1 explained that the shipping industry would benefit greatly from applying the guidelines as they *had nothing to lose* from implementation. In CSA 1's eyes, the realization of the guidelines would benefit the industry, as the costs of implementing the voluntary guidelines were minimal in comparison to the overall costs of building new ships. Furthermore, carriers would benefit from the implementation because the energy emitted through cavitation could instead be redirected into the propulsion system. Minimizing cavitation therefore would make ships more energy efficient and would in the long run lead to economic savings due to less fuel being burnt. Yet, little resources are going into the development and research of new technology or the implementation of the suggested technical changes by the IMO. This is partly due to the current state of the shipping market, Maersk 1 explained. There are exceptions though. Maersk Line, for instance, invested \$125 million to upgrade and 'radically retrofit' 12 Maersk Line container ships. The retrofit program ensures a significant reduction in fuel consumption, which benefits air quality. Maersk Line also practices slow-steaming, where container ships run below maximum speed, which also reduces fuel consumption. Both these initiatives have great environmental and economic benefits for Maersk Line, yet noise pollution has not been prioritized in these programs. Although, one could speculate that slow-steaming may lead to less noise pollution, because of the speed reduction, however, these findings could not be quantified yet.

The costs of implementing the changes in ship design suggested in the voluntary guidelines are quite low, according to DNV GL 1. However, the representative mentioned that companies are more concerned about other factors such as energy efficiency, and minimizing travel time between two destinations. Nevertheless, Maersk 1 noted that at the current time, companies do not have the resources to invest into researching and developing new technologies or designs. Although Maersk 1 agreed that developing new technologies could help a carrier to gain a competitive advantage over other carriers. This comes at a high risk of not being economically stable in the future, because the expenses for implementation the technical solutions of the voluntary guidelines and investment into developing and research technical solutions would probably be bigger than the economic benefits. Additionally, companies would not be able to hold on to the hard-earned advantage for a long time, as other companies might follow, but at a fraction of the cost. This does not incentivize companies to develop noise limiting technology and ship-designs that prevent noise pollution. However, DNV GL 1 mentioned that the lifespan of ships has decreased over the last few years, the average lifespan of ships now is about 20 years, where previously it was more than 30 years.

This suggests an increased need in constructing and building ships, which would invite ship builders to adapt quicker than before to newly implemented regulations and voluntary guidelines.

In the eyes of economic actors, the role of civil society concerning noise pollution, is ambivalent. Some actors insisted that civil society has little to no impact in the decision-making process within the shipping industry. Typically, the public is not aware of the effects that noise pollution caused by the shipping industry has on marine wildlife and therefore NGOs struggle with mobilizing enough citizens to address this issue on a national and international level. Other actors argued that NGOs are the backbone of any social change that the shipping industry has experienced. However, whether NGOs could impact further regulations on underwater noise pollution as well as behavior of economic actors remains to be seen. DNV GL 1 stated that port states hold more power in contrast to NGOs. Port states could exercise their power and demand changes regarding noise pollution. Some port states have already started experimenting with some changes in regulations, one such case study will be described and analyzed in chapter 7.

6.4.3. Evaluation by Civil Society Actors

The interviewed civil society actors provide different insights on oceanic matters and the evaluation of the voluntary guidelines. NRDC 1, 2 and 3 work currently at NRDC although at different divisions, each of them having a different expertise. NRDC 1 is a main actor in the marine mammal protection project and land and wildlife program. NRDC 2 is an attorney also working on the marine mammal protection project and land and wildlife program. NRDC 3 works on NRDC's marine mammal protection project. Representatives from EDC include EDC 1 who previously worked on the Vessel Speed Reduction (VSR) 2014 trial, EDC 2 who helped facilitate the VSR 2016 program and EDC 3 who previously worked as an analyst for the Coast and Ocean program at EDC. OCR 1 is an expert on ocean noise and advised and informed political actors as well as other NGOs about noise pollution and its effects.

6.4.3.1. General Evaluation on Oceanic Matters

The civil society actors of the various NGOs agreed that their role was to educate the public and raise awareness about ocean-related issues, including but not limited to noise pollution. NRDC 1 remarked that civil society's role is also to create a kind of checks and balance for political and economic actors. NGOs might not be able to pressure the decision-making process, but attending

public hearings and voicing their concerns shows governmental agencies that they are being closely watched, NDRC 2 remarked. However, during the interview-process, it became evident that ocean-related issues are not prioritized in the public eye. EDC 2 summarized the underlying issue about ocean-related concerns: *“We just don’t see anything about it. We don’t hear anything about it. We just don’t know anything about it. Unless it’s bad.”*

NDRC 2 pointed out that to generate momentum, issues need to be presented in a way that relates to the public. To gain momentum from the public, the effects need to be far-reaching and easily accessible to the public. Underwater noise pollution is one of these issues, that are difficult to present to the public, because humans do not suffer the immediate effects of the pollution. EDC 1 pointed out that ocean related matters generally only tend to be discussed in the media when disasters strike, such as oil spills and whale strandings. Keeping noise pollution on the media agenda is difficult, as the media is fast-changing and climate change and its effects is often prioritized over other issues. Therefore, it is difficult to gain enough public momentum to demand changes in regulation from the government and in operation from the shipping industry. OCR 1 remarked that consumerism is of high priority, whereas environmental issues, especially ones that have no direct impact on human behavior, tend to be ignored.

The interviewed participants explained that they had, for the most part, close and positive relationships with both political and economic actors. EDC 2 stated that the collaboration is important because of the differences in knowledge and power each of the actors may have. NDRC 2 also stated that positive relationships, especially with economic actors, are important because issues concerning the ocean needed to be addressed holistically with the help of all actors. EDC 2 explained that publicly naming companies, rather than shaming them, shows appreciation towards the economic actors and because of this, economic actors are also more inclined to participate in workshops for regional programs.

EDC 1 and EDC 2 drew on their personal experiences, to recall successful programs they spearheaded and helped to implement in collaboration with political and economic actors. When asked whether they considered a program regarding minimizing noise pollution, both EDC 1 and EDC 2 claimed that noise pollution was always implicitly part of the programs they chose to follow-through. However, noise pollution has not been the primary objective of these programs. These programs, the Vessel Speed Reduction Program and Green Flag Incentive Program, will be

further discussed in chapter 7. In contrast to EDC, NRDC has been explicitly addressing anthropogenic noise for years and continues to raise awareness. In collaboration with the International Fund for Animal Welfare (IFAW), NRDC produced the documentary “Sonic Sea” (National Resources Defense Council & International Fund for Animal Welfare, n.d.), which has won several awards and contributed to informing the public about noise pollution caused by the shipping industry.

6.4.3.2. Evaluation on the Voluntary Guidelines

NRDC 1 explained that a representative from NRDC was present at the creation of the voluntary guidelines, who advised NOAA and Okeanos at the symposia and the workshop in Germany. NRDC 1 recalled that the issue of noise pollution had gained some real momentum in the US during these years and that they were involved in the process from the beginning to the adoption of the voluntary guidelines. Several other NGOs were also involved in the process of establishing the voluntary guidelines at the IMO. NRDC 1 mentioned that during the establishment of the voluntary guidelines there was a focus on the practical reality of noise reductions. There was evidence that noise created by ships could be prevented and limited, exemplified by classes of vessels, such as warships.

One of the main issues that had come up during the implementation was the establishment of a noise threshold or target. NRDC 1 informed that representatives of the shipping industry questioned the suggested noise targets. During the Okeanos workshop, the participants emphasized a 3 dB per decade reduction to reverse the increasing noise trend that had been taking place over the latter half of the 20th century. This goal was subsequently endorsed by the scientific community and therefore included in the Correspondence Group report. However, MEPC felt that including the 3 dB target over 10 years was premature and therefore was not included in the voluntary guidelines. Based on the interview data, it is difficult to say which actors were involved in this decision. However, the lack of including the target indicates that there must have been some push-back regarding the threshold. The civil society actors were not aware of the details that transpired before the decision was made to not include the target.

Regarding the process of adopting the voluntary guidelines, NRDC 1 remarked that the IMO moves glacially to a point where it becomes inevitable that one might consider the slow-moving

of the IMO as intentional. This is partly due to the structural complexities of the IMO. Nonetheless, the voluntary guidelines are a great starting point, NRDC 1 remarked, but they also recognized that specific action from coastal and port states was required. The representative believed that policymakers could strategically implement policies that would incentivize the shipping industry to comply with the voluntary guidelines. OCR 1 believed that applying the voluntary guidelines would be a win-win solution for the shipping industry. Adopting the technological suggestions could extend the lifespan of a vessel and noise generation could be prevented, therefore self-regulation from the shipping industry would be beneficial, OCR 1 elaborated. Alternatives to the technical suggestions were discussed during the two symposia and in the Okeanos workshop, such as whale pingers, NRDC 1 mentioned. These pingers would be attached to a ship and would send out a signal in the water to *warn* whales that ships are in the area. However, the idea was quickly dismissed, because one could not assume that whales understood the signal, which could mean that marine mammals would remain in the area. Additionally, the sound may have the opposite effect and attract whales rather than warn them.

NRDC 2 mentioned that currently raising awareness and informing the public is among the most important actions of civil societies regarding noise pollution. Documentaries, like the Sonic Sea, go a long way in informing and mobilizing the public. Yet, civil society actors recognized several problems in regard to the prevention of noise pollution. These include: 1) the behavior of consumers, 2) lack of political will to act, and 3) lack of research in regard to the effects of noise pollution on marine mammals. OCR 1 also explained, that the issue was not the industries generating noise, but society, i.e. the public, not wanting to change their behavior. Societies drive a fast-moving economy and want new products quickly, this behavior affects economic actors. Economic actors are trying to maximize profit by delivering products to the end-consumers quickly to gain profits faster. In the eyes of OCR 1, disgruntled citizens blame industries and demand changes from the industry, even though these are consumer-driven issues. NRDC 3 also pointed out that most consumers are unaware of the origin of the products they buy and in which ways the product was delivered to local stores. Furthermore, even if the consumers were aware of the noise emissions a carrier may produce, consumers do generally not know which carrier delivered their products. To counteract this issue, EDC 2 stated, influential international department stores could take the lead and inform their consumers by labeling their products. In the label, they could include the travel distance as well as the carrier that delivered the product. This could be a form of public

shaming which would pressure carriers to comply with regulations. The lack of knowledge and information in this regard, makes it difficult to mobilize and engage the public, NRDC 1 said.

To demand change of political and economic actors, NRDC 1 said, “enough critical mass”, i.e. mobilizing the public, needed to be generated. Having this kind of public pressure, would make it easier to push the agenda forward. EDC 3 believed that citizens generally do not worry about the happiness and wellbeing of marine species, especially in regard to noise pollution. However, if other issues were brought up, such as air pollution or climate change, citizens are more likely to be engaged, because they experience the health effects first hand. EDC 2 remarked that these kind of issues also impact the economics of a state. Bad air quality leads to respiratory health issues, impacted people will rely on health care, which the state provides. By improving air quality everyone in a state, especially coastal communities, benefits. Making this claim regarding noise pollution is difficult, because the beneficiaries are not citizens of a state. In addition, there is no political will to act, because the state also does not benefit from the prevention of noise. Yet, EDC 2 explained that states and economic actors would carry the burden of costs, which they do not want. Therefore it is important, according to EDC 1, to actively include the community, especially coastal communities, in the decision-making process. Appealing to these communities, may generate more citizen power, because they may have a closer connection to marine wildlife, than citizens that live in landlocked communities.

Furthermore, EDC 2 explained that the public as well as stakeholders of shippers hold a power over the shippers. Both, the public and the stakeholders could exercise power not only on the cargo, but also over the way in which the cargo is delivered. The representative explained that shippers such as Amazon, Apple or Walmart, because of the volume of cargo that they deliver to consumers, could further exercise pressure on the carriers. However, this kind of pressure regarding noise pollution has not been exercised on the shippers and because of this has also not been exercised on the carriers.

OCR 1 explained that one of the biggest issues regarding noise pollution was the lack of resources. Funding to undertake research on noise pollution and its effects on marine wildlife are scarce, which explains the slow-moving change. To gain political will, technological change has to come first, EDC 1 believed. Yet, there seems to be few resources invested into the development of and research in technologies to minimize noise pollution. NRDC 3 expressed concern regarding marine

mammals' health. At the current state, findings are preliminary, however, evidence suggests that stressors negatively impact the reproductive health of marine mammals for years to come. Stressors include whale strike but could also extend to noise pollution generated by the shipping industry. The risk of lethal injury when ship strike occurs is reduced, when ships slow down. However, NRDC 3 pointed out, there is also a risk that with slower and quieter ships, marine mammals may be less aware of the risk the ships pose and may then be more likely to be hit by the ships. Yet, reduced speed would minimize the risk of lethal impact on marine mammals upon whale strike.

7. Expected Outcomes of Implementing the Voluntary Guidelines

The expected outcomes of implementing the voluntary guidelines will be examined from the point of view of economic actors. It is noteworthy that only three economic actors out of 38 contacted have agreed to be interviewed regarding this issue. To supplement this, information given by political and civil society actors will be presented as this helps to explain and deepen the understanding of the expected outcomes. The foci of this section are the costs and benefits of implementing the voluntary guidelines for economic actors and the motivation of economic actors to apply the guidelines. To illustrate the effectiveness of voluntary programs two case studies will be analyzed. These include the Green Flag Incentive Program and the Vessel Speed Reduction Incentive Trial Program, which both provide excellent examples of successful voluntary programs. Thereafter follows a case study presentation of the Vessel Speed Restrictions to Reduce the Threat of Vessel Collisions with North Atlantic Right Whales. This is a seasonal management rule where ships are required to reduce their speeds during various times and locations along the east coast of the US.

7.1. Costs of Implementing the Voluntary Guidelines

The Correspondence Group report acknowledges that the implementation of the voluntary guidelines may lead to added costs during the initial construction of the ships as well as during operation (Marine Environment Protection Committee, 2009). However, little research has been done concerning the actual costs of implementing the voluntary guidelines into ship design. CSA 1 recalled a conversation with a naval architect in which they discussed the costs of applying the voluntary guidelines. If the voluntary guidelines were to be considered during construction, i.e. during the designing of the hull and propeller, the costs would be much lower than if the hull and propeller had to be modified after construction. CSA 1 also explained that the costs to realize the voluntary guidelines, in comparison to the costs of the construction of a ship would be minimal, although the implementation could potentially decrease noise pollution.

The technological recommendations of the voluntary guidelines mostly target new ships, whereas the operational recommendations target existing ships. DNV GL 1 explained that it is the shipyards which hold the deciding-power to implement technical recommendations. Nevertheless, some of the big carriers have decision power in developing ship designs that adhere to technical

recommendations made by the IMO. These companies have their own research and development teams that together with naval architects design ships according to various targets, such as energy efficiency targets. Once these designs are finalized, the design plans are sent to shipyards where the ships are built to the specification of the companies. Most of the smaller carriers, however, do not operate in this way. These companies do not have the same resources as the big carriers and therefore resort to a different strategy.

CSA 1 and DNV GL 1 further explained the way in which smaller carriers strategize. Smaller carriers rely on shipyards to buy vessels. Shipyards design ships according to mandatory code but beyond that have decision-making power over the design. The shipyards produce one or two ships out of their newly designed carriers and use the time it takes to produce the ships to promote and advertise these new ships. Carriers may then show their interest and may even reserve one or two ships, depending on their company's needs. Once reserved, the carrier has limited choices regarding their order. The carrier might be able to decide on the color of the ship, they might be able to choose which engine they want and they might have the option to decide on the interior, but the carriers are not able to make further changes to the basic framework of the ships. Between the ordering of a ship and the delivery of a ship years may pass, before the carrier may receive their order. At this point, the carrier will not be able to demand changes in the design of propellers or other factors that may limit noise pollution. Shipyards are highly competitive; they produce with materials that are cheaply and readily available to them and try to maximize their profits. DNV GL 1 pointed out that smaller carriers exercise little pressure on shipyards. Voluntary guidelines are therefore widely disregarded, unless it makes economic sense for the shipyards to follow these guidelines.

When asked about alternatives, such as implementing speed reductions as also suggested by the Correspondence Group (Marine Environment Protection Committee, 2009), economic actors had two concerns: energy efficiency and shipping schedules. DNV GL 1 pointed out, reducing the ship speed by a few knots, may not lead to an increase in energy efficiency, even if noise might be reduced. This is due to ships running most efficiently at a certain speed, reducing the speed would ultimately mean that ships would operate at a financial loss, even if reducing the speed would lead to burning less fuel while operating.

NOAA 2 mentioned that speed reductions would extend shipping time tremendously. Most of the bigger ships operate at speeds between 18 and 24 knots, asking them to reduce speeds to between 10 to 12 knots would double the travel time. By increasing the travel time, personal costs for the crew will also grow. In addition to that, ships may, because of the speed reduction, spend much more time in whale aggregating areas, which would increase whale encounters. Yet, reduced speed would reduce the risk of ship strike. Furthermore, the reduction of speed needs to be calculated in shipping schedules, as many cargos are time-sensitive, such as food and health products. This change in speed would need to be adjusted in the schedules months in advance, when the shipping schedules are finalized.

7.2. Benefits of Implementing the Voluntary Guidelines

Implementing the voluntary guidelines allows the shipping industry to self-regulate, thereby avoiding regulation. CSA 1 exclaimed that by applying the voluntary guidelines, the shipping industry would benefit greatly as they would be able to make adjustments to their ships at their convenience. This way the shipping industry could also demonstrate to their political constituencies that they have adjusted their operations. In doing so, carriers could appeal to political actors as well as to their consumers.

Additionally, by realizing the guidelines, the carriers would limit noise generation and therefore would not have to reduce speed, which the representative saw as another great benefactor. Because of tight shipping schedules, avoiding speed reductions is important to the shipping industry. The implementation of the voluntary guidelines could also help re-direct the energy, that is being emitted through noise, into energy into the propulsion system. This would then increase energy-efficiency, which would translate to economic benefits. However, Maersk 1 pointed out, this potential energy-efficiency increase could not be quantified yet.

Marine wildlife safety was mentioned several times during the interviews. CSA 1 pointed out that no shipping crew actively wants to hurt marine wildlife. If possible, ships will go out of their way to avoid whale strikes. In the same sentiment, shipping crews do not want to expose whales to noise pollution and if possible, they would avoid having any negative impacts on wildlife. But the costs to implement the voluntary guidelines seem to be outweighing the benefits for the shipping industry in regard of whale safety.

NRDC 3 stated that there is a scientific gap understanding the effects and impacts of noise caused by cavitation on marine mammals. Preliminary research shows that various stressors, such as whale strike and entanglement, may impact whales' reproductive behavior. Although NRDC 3 imagines that ship noise may have some effect on whales, scientific knowledge is lacking to support this claim. Exploring the benefits of the voluntary guidelines on marine mammals would be an interesting area of research, but is beyond the scope of this research.

7.3. Motivation to Implement the Voluntary Guidelines

An analysis of the costs and benefits of implementing the voluntary guidelines indicate that the costs outweigh the benefits of the realization of the guidelines. Nevertheless, economic actors considered the implementation of the voluntary guidelines. These considerations are driven by internal and external drivers. Internal drivers are motivators that may come from societal norms amplified in a company's structure, whereas external drivers are motivators that stem from external origins, such as financial motivators or outside pressure.

CSA 1 stressed that the industry should apply the guidelines, simply because *it's the right thing to do*. Maersk 1 elaborated that Maersk Line dedicated resources to research and development to ensure that the carrier operated in an environmentally friendly manner. The representative stated that the company is concerned about environmental threats and tries to prevent and mitigate the effects. However, it is noteworthy that noise pollution has been prioritized by Maersk Line. To show its commitment to environmentally friendly operations, Maersk Line dedicates resources to the funding and researching of environmental phenomena. In some regards, Maersk Line also takes on an advocacy role, to push for stricter regulation regarding the use of fuel. Furthermore, upon request, the company shares collected data with governmental agencies, which may help the decision-making process of the agencies. The company also engages in environmental programs led by the national government. Maersk 1 mentioned that they recently overhauled and retrofitted many of their existing ships as well as designed an energy efficient shipping fleet. In doing so, the representative imagined, the ships would run quieter as well, although, Maersk 1 stressed that they do not have any scientific proof for that. DNV GL 1 pointed out that gathering this kind of information should not be difficult, as all vessels use AIS which track various vessel services. However, noise has not yet been incorporated in AIS data.

Applying the voluntary guidelines should improve energy efficiency of the ships, which would translate to economic savings for carriers, as emitted noise energy would be re-directed into propulsion energy. In addition to energy-efficiency, by implementing voluntary guidelines, the shipping industry could avoid regulation in the long-run and should therefore be motivated to apply the guidelines. CSA 1 stated that by realizing the guidelines all involved actors would benefit. Economic actors could operate according to the guidelines and would increase energy efficiency and would gain economic benefits. Political actors would not have to invest in monitoring mechanisms, but could invest in research to assist the economic actors. Civil society actors could continue their work in raising awareness and acting as a monitoring mechanism off economic actors, and marine wildlife would not have to suffer the effects of noise pollution. Although this might be a simplified version showcasing the motivation to apply the voluntary guidelines, in general, CSA 1 explained, implementing the voluntary guidelines would result in a win-win situation for all involved actors.

Maersk 1 mentioned that company employees take any information they might gather from academia or political actors seriously and try to ensure that their company acts in the most sustainable way possible. In addition to that they conduct their own research as well as follow any mandates from the government. However, the representative pointed out that interactions with civil society actors are minimal, if they exist at all. This is partly due to the public not being aware of the role that carriers play in the global economy. Yet, carriers experience pressure from the media, especially when human-induced actions have negative outcomes, such as for instance oil spills. EDC 2 explained that the shipping industry does not want to be vilified by the media. When the shipping industry experiences negative public relations from the media, they tend to avoid collaboration with political and civil society actors. However, carriers value positive public relationships highly and are more inclined to collaborate with political and civil society actors. NOAA 4 believed that the shipping industry values positive public relations even more than financial incentives.

7.4. Implemented Voluntary and Mandatory Programs

During the interviews, the participants drew on their personal experiences elaborating on successful programs with voluntary components, partly run by the government. Two such programs will be presented in this section. The third selected case which will be described in this

section is a mandatory regulation for speed reductions to protect the endangered North Atlantic right whales on the East Coast of the US. It is noteworthy, that none of these programs require technical changes of the shipping industry, meaning that carriers do not have to invest into research and development to make technical adjustments to their ships. Yet, the programs require the shipping industry to reduce speed significantly in various areas and during certain times of the year, indicating that the industry might not be opposed to speed reductions.

The first program presented is the Green Flag Program in the Port of Long Beach. The port takes initiative in incentivizing ships to reduce their speed as they enter the bay area. If carriers comply, they receive a tax reduction for their annual dockage fees. Thereafter follows a presentation of the Vessel Speed Reduction Program, a collaboration between the Channel Islands National Marine Sanctuary, Santa Barbara County Air Pollution Control District, EDC, and National Marine Sanctuary Foundation, spearheaded by NOAA. The program is an incentivized voluntary program where carriers receives financial incentives to reduce speed in certain whale-habituated areas. This program was in part copied from the Green Flag Incentive Program. In contrast to these two voluntary programs, the vessel speed restrictions to reduce the threat of vessel collisions with North Atlantic right whales is a mandatory rule that requires vessels to reduce speed between October and May on the East Coast of the US.

7.4.1. Green Flag Incentive Program

The Green Flag Incentive Program provides a perfect example of collaboration between the ports and the shipping industry, NOAA 4 explained. Many of the defining elements of both programs (the Green Flag Incentive and Vessel Speed Reduction Program) are alike, such as incentivized voluntary compliance as well as publicly recognizing companies for their pro-environmental behavior. The Green Flag Incentive Program was first introduced as part of the Clean Air Action Plan (CAAP) and “can be seen as an attempt by the ports to get ahead of state-mandates environmental mitigation” (Hall, O'Brien, & Woudsma, 2013, p. 94). The Program “involves container ships slowing speed from an average 18-25 knots to 12 knots within 20 nautical miles from Point Fermin” (Gibbs, Rigot-Muller, Mangan, & Lalwani, 2014, p. 343). This program introduced incentives for vessel speed reductions (figure 7), “vessel operators that participate in this programme earn port fee reductions, up to 25% if they slow speed down to 12 knots from 40 nautical miles to the port, and 15% if they slow from 20 nautical miles to the port” (Gibbs et al.,

2014, p. 343). Ship operators receive reductions in their dockage fees at the Los Angeles and Long Beach port, while they also minimize greenhouse gases and smog-creating air pollution by reducing speed.



Figure 7: Map of the Green Flag Program (Port of Long Beach, n.d.-a)

McKenna, Katz, Condit, and Walbridge (2012) point out that “compliance with the measure has increased steadily, particularly since 2010 when the Port committed \$2.5 million to reward vessel operators with lower dockage fees and recognition for participating in the program” (p. 647). To receive these reduced fees, “an annual 90% compliance rate must be achieved” (Gibbs et al., 2014, p. 343). This program provides an excellent example of a successful paid voluntary program recognized by the industry (McKenna et al., 2012). Gibbs et al. (2014) elaborate that “90% of vessels comply with the 20 nautical Miles slow speed limit and 70% with the 40 nautical Miles limit” (p. 343). The Marine Exchange of Southern California measures compliance and “provide[s] extensive reports of ship activities for the Ports of Los Angeles and Long Beach” (Marine Exchange of Southern California, n.d.). Furthermore, “the port anticipates awarding US\$4 million in fee savings in 2011 and calculates that 40% of the vessel emissions’ reductions are due to the Green Flag Program” (Gibbs et al., 2014, p. 343). NOAA 4 elaborated that the program provides recognition for the participating vessels in addition to the dockage fee savings. Additionally, NOAA 4 added that the ports struggle with air pollution, if they exceed the emissions target, they will be severely fined and regulated by CAAP. For the port, awarding US\$4 million into fee

savings, thereby incentivizing ships to slow down and emit less, might be less costly than being penalized and regulated through CAAP.

Part of the Green Flag Program success was, EDC 2 believed, the willingness of the port to pay the polluter. Because air quality in the ports has decreased over years, decision-makers recognized that they had to take action. Introducing the program led to improvement of air quality and the shipping industry's willingness to comply, which could have also been triggered by the direct economic incentive that the port provided.

7.4.2. Vessel Speed Reduction Incentive Trial Program

NOAA 4 introduced the environmental issue at the Channel Islands National Marine Sanctuary (CINMS; figure 8). Biodiversity in the sanctuary is plentiful and varies among seasons. In the summer months during May and October marine mammals migrate along the West Coast of the US (Channel Islands National Marine Sanctuary, 2014). Further up the West Coast of the US are also two of the busiest ports in the world, the Port of Los Angeles, and the Port of Long Beach. Ship traffic in the channel is heavy, subsequently air quality is bad due to the ships' air emissions and heavy traffic poses a serious threat to the marine wildlife because of ship strike risk. To reduce the risk of ship strike, NOAA attempted various ways to inform ship operators. NOAA 4 explained that once the first whale of the seasons was sighted, they would send out radio warning messages, informing ship operators that whales were in the area. NOAA's CINMS also produced brochures and fact sheets which showed ways in which operators could easily identify whales. Additionally, NOAA 4 mentioned that they encouraged operators to inform NOAA's CINMS when they detected whales. Yet, this work seemed for the most part fruitless.

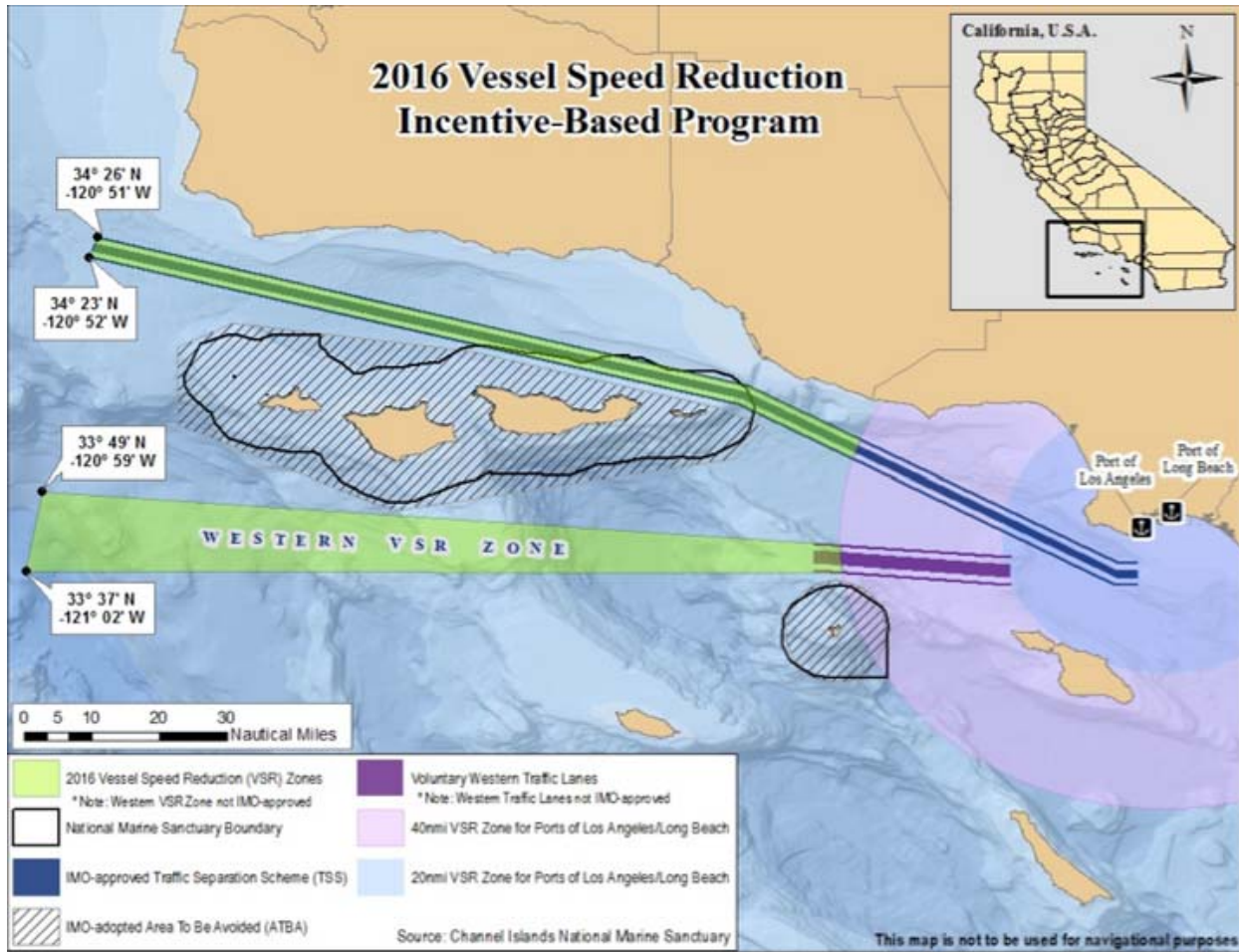


Figure 8: Channel Islands Region Incentive-Based Vessel Speed Reduction Programs 2016 (Channel Islands National Marine Sanctuary, 2016)

The Santa Barbara County Air Pollution Control District, NOAA’s CINMS and EDC launched the Vessel Speed Reduction (VSR) Incentive Trial Program in the Santa Barbara Channel in 2014. The aim of VSR was to incentivize “container ships to slow down to speeds at or below 12 knots, thereby reducing air pollution and enhancing protection of endangered whales” (Santa Barbara County Air Pollution Control District, National Oceanic and Atmospheric Administration, & Environmental Defense Center, 2014). EDC 1 elaborated that the 12 knot-speed was chosen because research suggested, that a whale hit at this speed was less likely to be lethally injured. Coincidentally, EDC 1 further elaborated, at this speed, ships were emitting far less nitrogen oxides (NOx), therefore minimizing air pollution, than at higher speeds. This was also confirmed by other participants, which helped facilitate the VSR program. NOAA 4 explained, months before the launch of the program, the facilitators, i.e. NOAA’s CINMS, informed the shipping industry of

the program and invited them to participate. The funding of the program came in large from the Santa Barbara County Air Pollution Control District, although EDC 1 elaborated that they were successful in generating funding from other areas as well. NOAA 4 explained that they were aware of the shipping schedules and knew that in order for this program to be successful, the program had to be advertised to carriers in advance. They received 89 applications and were able to fund 27 transits with the money they received from the Control District.

The industry showed tremendous interest in the program, an EDC 2 said. However, they only had limited funding available and therefore NOAA's CINMS and EDC had to carefully select a handful of applicants which typically travelled between 14-18 knots between Point Conception and the Ports of Los Angeles and Long Beach. The speeds were measured and monitored using AIS. By slowing down, participants of the VSR would receive 2,500 USD per transit, which CSA 1 classified as *peanuts compared to the fuel costs*. In addition to the paid incentives, NOAA's CINMS and EDC publicly recognized the enrolled transits because of their efforts to reduce NOx and reduce the risk of whale strikes in the Santa Barbara Channel. According to a EDC 2, the shipping industry valued the recognition more than the payment incentives. When asked whether the facilitators attempted *publicly shaming* non-complying carriers, EDC 2 expressed that their aim was to collaborate with the shipping industry. Setting a positive tone was therefore crucial for collaboration. NOAA 3 stated that this program was promising and showed measurable success, as less NOx was emitted and carriers were willing to partake in a voluntary, non-regulatory program.

In 2016, EDC in collaboration with NOAA's CINMS initiated a new voluntary incentive program, largely based of the 2014 VSR program. In this program, the incentives ranged from 1,500 to 2,500 USD, "depending on historical speeds in the program area" (National Marine Sanctuary Foundation, NOAA's Channel Islands National Marine Sanctuary, Santa Barbara County Air Pollution Control District, Ventura County Air Pollution Control District, & Volgenau Foundation, 2017, p. 3). Transits were eligible for an additional 1,250 USD if they fulfilled three requirements: 1) travelled at a speed of 10 knots or less; 2) reported whale sightings, and 3) "demonstrate that schedules were adjusted so that the ships did not need to speed up elsewhere along the route" (National Marine Sanctuary Foundation et al., 2017, p. 3). The facilitators provided a summarized

comparison between the 2014 and 2016 trials, which illustrates an increased interest and success in the program:

Highlights of the 2016 program as compared with the 2014 program included the following:

- The 2016 Program provided financial incentives for 50 slow speed transits, nearly double the 27 transits incentivized [sic] in 2014;
- 10 shipping lines participated in 2016, seven shipping lines participated in the 2014;
- The 2016 program received applications for 367 transits; the 2014 program received 89 applications.
- The 2016 program more than doubled the emission reductions as compared with the 2014 program.
- Many ship crews provided whale sightings information during their transits (National Marine Sanctuary Foundation et al., 2017, p. 3).

EDC 1 and NOAA 4 pointed out that the program was a collaborative initiative between civil society, political, and economic actors. The Santa Barbara and Ventura County Air Pollution Control Districts largely funded the program. EDC 1 remarked, that because research had proven that ships travelling at 12 knots or less would emit less NO_x, air quality would improve significantly. Improved air quality in turn would benefit coastal communities, which suffer directly from air pollution. NOAA 4 stated that they were not aware whether ships that partook in the program kept the speed reductions when not incentivized by the program. Furthermore, the representative said that ships may increase speed outside the designated areas to maintain their schedule. NOAA 4 further elaborated that carriers were asked to provide schedule reports to NOAA's CINMS where they show that speeding up in other areas was not necessary, in doing so they would receive further financial incentives. Positive effects that come with reducing speed, such as reducing NO_x emissions, would be nullified, through the added speed outside the protected areas, as NO_x would be emitted in other areas and other communities might suffer the consequences. NOAA 4 stressed that the preventative measures taken in one location, should not come at a cost for other locations or communities. Therefore, it was important that the participants in the second trial of the VSR provided proof that the reduction of speed was included in their schedules. Although this program has the potential to eventually change the behavior of the shipping industry, NOAA 4 suspected that this has not happened yet.

Voluntary programs which incentivize speed reductions of carriers also work in favor of noise reduction, because less cavitation is produced, EDC 1 imagined. If carriers would permanently slow down, thereby emitting less noise, they may not need to implement the voluntary guidelines on noise reduction. However, CSA 1 and NOAA 4 stated that the economic actors do not want to slow down, because of their delivery schedules. A combination of financial incentives and

recognition may incentivize industries to reduce speeds short-term, but this might not be sustainable long-term, as programs would have to generate funding. The Port of Long Beach handles approximately 2,000 vessels each year (Port of Long Beach, n.d.-b), in 2016 VSR was able to fund ca. 4% of these transits. To make a conclusive remark about the effectiveness of the program, more data needs to be collected. Whether carriers would slow down for only receiving recognition poses an interesting question, but is beyond the scope of this research.

7.4.3. Vessel Speed Restrictions to Reduce the Threat of Vessel Collisions with North Atlantic Right Whales

The case of vessel speed restrictions to reduce the threat of vessel collisions with North Atlantic right whales is a remarkable example of collaboration between regional, national, and international political actors. Many of the interviewed participants agreed that this initiative in part was successful due to the tireless work of Gregory Silber, a marine mammal biologist and “NOAA’s National Coordinator for Recovery Actions, particularly for endangered large whales” (National Marine Fisheries Service, 2011). CSA 1 stated that Silber was the *inside champion* of the policy and because of his efforts, he achieved tremendous success in the policy implementation. EDC 1 stated that Silber was involved with *everything* on the East Coast regarding the protection of the North Atlantic right whales. Furthermore, EDC 1 elaborated that because Silber was working at NOAA, “*they had someone on the inside*”, that could push the issue of the right whales. Having a policy entrepreneur, such as Silber, made the implementation of the speed restrictions possible. According to several interview participants, Silber provided both the IMO and national decision-makers with historic data on the status of the North Atlantic right whales and the devastating effects that ship strike had on the species. This endeavor was challenging as there is a “lack of information on right whale distribution [which] makes it difficult to characterize how and when right whales use this area. This information gap, in turn, greatly complicates the creation of effective mitigation measures in this area” (Firestone, Lyons, Wang, & Corbett, 2008, p. 230). To the advantage of the speed restriction rule came the geographically narrow area that is affected by the restriction as well as the seasonal differences. Figure 9 illustrates the times and location in which speed restrictions are enforced.

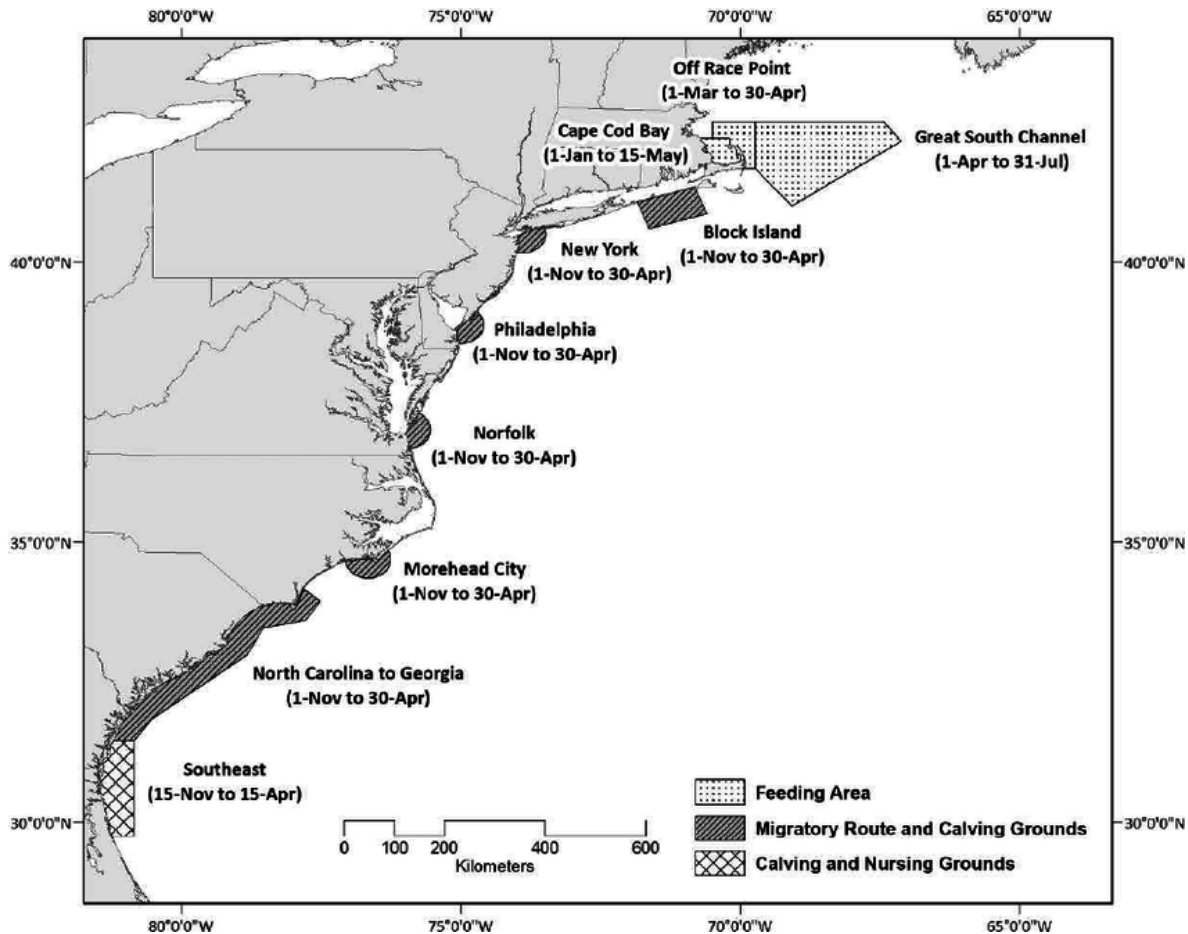


Figure 9: Times and locations of vessel speed restriction seasonal management areas for North Atlantic right whales along the U.S. east coast (Conn & Silber, 2013, p. 3)

In 1997, the US delegation brought forward an information paper regarding vessel strikes to right whales to the MEPC. The information paper was “developed collaboratively by the US Marine Mammal Commission, [NOAA,] and the USCG, the paper identified and detailed the threat of vessel strikes to right whales” (Silber et al., 2012, p. 1225). The paper requested of the IMO to distribute the information paper and ask all Member States to share information about vessel strike with NMFS (Silber et al., 2012). After a lengthy process, which included data collection and research, as well as proposals brought forward by the US delegation to the IMO, NMFS issued the Right Whale Ship Strike Reduction Rule. The rule states that “vessels 65 feet and greater in length travel at 10 knots or less near key port entrances and in certain areas of right whale aggregation along the US eastern seaboard, known as ‘Seasonal Management Areas’ (SMAs)” (Silber & Bettridge, 2012, p. iii). In addition, ships weighing 300 gross tons or more are requested to avoid

certain areas which were categorized as Areas To Be Avoided (ATBA) between April 1st and July 31st. Reducing speed to 10 knots or less has shown a decrease in risk of vessel strike (Wiley, Thompson, Pace, & Levenson, 2011). However, Vanderlaan et al. (2009) point out that “from a right whale conservation perspective, decreasing the probability of a strike by re-routing large vessels may be preferable to reducing speed” (p. 283), this would limit the chance to encounter whales altogether.

The rule was revisited in 2013 and reinstated. EDC 2 explained that the rule was partly successful because of the endangered species status of the Northern Atlantic right whale. In 2011, the numbers of this species were estimated to be less than 500 whales, their status remains endangered (National Marine Fisheries Service, 2016). When asked if a similar rule could be implemented along the West Coast, EDC 2 said that this was not likely, due to complexity of the issue. Many species migrate along the West Coast of the US, the species arrive at and leave various areas during various times, EDC 2 elaborated. The US also focuses on the taking of animals, adding to the difficulty of implementing strategies that could benefit all marine wildlife equally. Additionally, there is a lack of research regarding the behavior of marine mammals, which makes regulation and justification of regulation challenging. Nonetheless, NOAA 3 stated that the vessel speed reduction rule proved that the government could institute speed regulations and that, with enough notice, the shipping industry would comply. NOAA ensures compliance through enforcement and penalties (Silber, Adams, & Fannesbeck, 2014), they monitor compliance using AIS. Maersk 1 explained that they see and understand the value in the speed restrictions and therefore are happy to comply.

8. Discussion

This chapter aims to link the results to the conceptual framework while discussing three focus areas: why the US delegation proposed voluntary guidelines rather than mandatory code; the effectiveness of the voluntary guidelines and finally, regime strengthening alternatives which could help the voluntary guidelines succeed in a better way.

8.1. Perspectives on the Voluntary Guidelines

In the 1970s and 1980s environmental degradation was typically addressed with the command and control approach, where governments dictated regulatory standards and practices to businesses (Sinclair, 1997). Only within the last two decades a move towards self-regulation has started and the ‘voluntary approach’ to environmental regulation grew in popularity (Lyon & Maxwell, 2000). Within the EGS framework, this means that the move towards self-regulation altered the resource regimes, i.e., the institutions that govern the access to the resources as well as the interactions between the economic actors and the resource. As a result, States experience that “firms make commitments to improve their environmental performance above and beyond the level required by law” (Lyon & Maxwell, 2000, p. 1). The implementation of the voluntary guidelines to reduce noise from commercial shipping should have motivated the shipping industry to self-regulate and commit to minimizing and preventing noise emissions. Yet, the results show that this has not been the case as civil society actors have, ever since the adoption of the voluntary guidelines, seen a need to continue pursuing policymakers regarding this issue. As recently as April 2017, NGOs submitted a statement to the Canadian government requesting action regarding noise pollution in the Salish Sea to protect the local marine wildlife (National Resources Defense Council, 2017). This suggests that economic actors have taken little action to enact the voluntary guidelines. Nonetheless, the question arises why the US delegation insisted on voluntary guidelines in the first place rather than demanding mandatory regulation.

The voluntary guidelines symbolize the first step in the recognition and prevention of noise pollution and its effects. Both the US delegation and the IMO could have chosen to not pursue the voluntary guidelines thereby “gambling on doing nothing in the hope that things will not be as bad as all that” (Johnson & Levin, 2009, p. 1598). By not taking action, the political actors could have done damage, “simply by choosing not to take a stand, nations can accentuate prevailing

environmental problems; thus, the costs of not participating in evolving environmental accords will be equivalent to over opposition” (Choucri, 2001, p. xii). Not taking action is often “characterized by uncertainty, irreversibility, and complexity” (Choucri, 2001, p. xi). The political actors’ uncertainty of the issue relates to the interaction of the political actors with the environmental resources, and the outcomes within the EGS framework. Although uncertainty and complexity of the situation (effects of irreversibility are not yet known) characterize the threat of noise pollution, the US still proposed nonbinding technical solutions which ultimately were adopted at the IMO. By proposing and adopting the voluntary guidelines, the US delegation and the IMO chose to act, even though the threat of noise pollution was not fully understood.

The IMO may have implemented the voluntary guidelines because of the precautionary principle. The Rio Declaration (1992) stipulates the application of the precautionary principle on “all activities potentially having an adverse impact on the environment” (Lentz, 1995, p. 667). This also applies to the activities the IMO regulates. There is a misconception that the precautionary principle “would prohibit most, if not all, industrial activity—and in the case of the IMO, would largely prohibit shipping activities” (Lentz, 1995, p. 668). In contrast to this misconception, the application of the precautionary principle should provide progressive action preventing the pollution of the marine environment (Lentz, 1995). Conceptualizing this interaction within the EGS framework, the US delegation recognized the deteriorating state of the resource and understood that in order to address this issue, they could target technological changes to influence economic actors’ operations. From the US delegation perspective, addressing noise pollution and its effects would benefit whales, some of which have endangered species status. The costs of applying the technical suggestions would burden economic actors, such as ship owners, builders, and operators. Yet, the economic actors would also benefit from the technical suggestions, as they would potentially increase energy efficiency. In the eyes of the US delegation, the implementation of the voluntary guidelines was proportionate to the threat that noise pollution poses.

The US delegation may have also proposed the implementation of voluntary guidelines as a way to build capacity regarding noise pollution. Jänicke (1997) points out that by building capacity one may “improve informational and communicative capacities” (p. 12) which may help to educate and mobilize the public. Furthermore, building capacity helps to inform policymakers which “will help reduce uncertainty/ambiguity and may help reduce negative peer and status quo effects”

(Adamowicz, 2007, p. 9). Given that the effects on marine wildlife are largely unknown, there is a need for more research to fully understand the issue and its implications. Implementing voluntary guidelines might help to generate funding from the individual Member States to research the issue. MEPC recognized noise pollution as a high priority issue, thereby emphasizing the urgency of noise pollution, which could motivate Member States to invest into more research. If research results were to show that noise generation has increased or remained at the same level, while also providing a better understanding of the effects of noise pollution on marine wildlife, the US delegation could demand further steps on an international level in the regulation of noise pollution. This relates to the interactions of political actors within the EGS framework. Political actors identified institutions that govern the policy process and the resource regimes, furthermore the political actors tried to motivate economic actors by understanding their patterns of interaction with the environmental resource and the outcomes. The US delegation may have attempted to build capacity and furthering scientific knowledge by using the available tools to them. Proposing voluntary guidelines may have helped the US delegation to emphasize the need for more research. Additionally, the US delegation could by proposing voluntary guidelines show that they tried to initiate change in economic actors' behavior. This way, the US delegation could showcase their collaboration with industries in an attempt to prevent and mitigate noise pollution and its effects. Industries could also use the voluntary guidelines to research and develop technology that could prevent noise pollution.

Furthermore, the US delegation might have also pushed for the voluntary guidelines, rather than mandatory regulation because they expected that the process of establishing the voluntary guidelines would take significantly less time than the adopting of mandatory regulation. Additionally, the US delegation was also concerned that other environmental issues may arise which may lead to Member States losing interest in supporting the voluntary guidelines for noise reduction. Using the EGS framework as a multi-level framework shows that political actors have different interests on various political spheres. Political actors may operate on several levels and their interests and goals may change depending on the political sphere in which they operate. The initial aim of NOAA, and in an extension also of the US delegation, was to fill the scientific knowledge gap and collaboratively, with the international community, investigate possible solutions to minimize and prevent noise pollution. Several symposia and workshops were held to inform and generate interest among civil society actors, political actors, and the industry. The

participants of the symposia and workshops reached a consensus and agreed that further steps on an international scale had to be taken. Based on previous experiences that the participants of the US delegation had on working with IMO, they were aware of the process of initiating further steps at the IMO. The results show that the US delegation used the tools that were readily available to them and did not demand an array of resources such as capacity, funding, and time. Proposing mandatory regulation could have led to a veto from some Member States, based on the costs of implementing the voluntary guidelines. Yet, these Member States might have argued that the gap of scientific knowledge does not justify mandatory regulation, which could have meant that the US delegation would have had to invest more resources into the issue. Not having the support from other Member States could have stalled the process of mandatory regulation. Pursuing voluntary guidelines could therefore have been a calculated consideration made by the US delegation. The US delegation could also have calculated the differing costs and benefits between establishing voluntary guidelines and mandatory regulation and based their decision on this calculation.

The interest of Member States delegations and industries also played an important role when the US delegation decided to pursue voluntary guidelines. Assuming, that the delegations would have not vetoed mandatory regulation on noise pollution, the results show that the participants feared disinterest of Member States if no immediate action was taken. Disinterest may have arisen because of changes in national administration, which might follow a different political agenda than the administration which was interested in mandatory regulation. Disinterest might have also come from a sense of lack of urgency. Environmental pollutions are plentiful, but it seems that other types of pollutions such as air and ballast water are of greater concern for Member States. This may be due to the direct effects that these types of pollutions have on coastal communities. Noise pollution indirectly affects coastal communities, whereas greenhouse gas emissions impact the health of persons living in coastal communities directly. Therefore, other types of pollution may be prioritized. Regarding the protection of marine wildlife, other threats, such as entanglement, ship strike, and loss of habitat may give precedence to noise pollution. Member States may focus on these *visible* threats, rather than on noise pollution, as addressing these issues may help during election seasons. By pursuing national issues on an international level, Member States may be able to show their constituencies and their voters that they have pursued the prevention and mitigation of environmental degradation. This in turn may help their political election.

The results suggest that a policy entrepreneur was beneficial to the process of establishing the voluntary guidelines. Policy entrepreneurs “can be crucial to agenda setting and the emergence of new, radical policy concepts or instruments” (Böcher, 2012, p. 18). Hopkins (2016) points out that “policy entrepreneurs are utility maximizers who work in institutions where imperfect information and disequilibria prevail. They watch for information gaps and look to fill them, in order to profit from the new equilibrium” (p. 336). Noise pollution had a policy entrepreneur early on, which managed to generate interest and mobilize political and economic actors on a national scale. Many of the interview participants recalled Gregory Silber as the champion of the North Atlantic right whale case, in the same way, many recalled Lindy Johnson as the champion of noise pollution as she managed to convince Member States of the importance of preventing noise pollution. The achieved progress in the field of noise pollution may have been due to Lindy Johnson’s personal engagement and interest in the field. However, acting as a policy entrepreneur may also have been part of her official role as a NOAA representative. Lindy Johnson had a network she relied on to prioritize her agenda item. Although policy entrepreneurship can also consist of a collective, it seems that within the structure of the IMO, it is important to have policy entrepreneurs which have well-established networks they can rely on to push forward their agenda item. Since her passing in 2010, progress has been made in the field of noise pollution and its regulation, but it seems that little has changed since the adoption of the voluntary guidelines and the feeling of urgency might have seized. The results suggest that lacking a policy entrepreneur could mean that there is no further policy development to follow.

8.2. Effectiveness of the Voluntary Guidelines

Evaluating the effectiveness of voluntary guidelines is challenging as “participation is voluntary, claims of benefits beyond ‘business as usual’ can be viewed with less confidence since firms may be selectively signing on only to do what they would have done anyway” (Harrison, 2001, p. 233). This would suggest that businesses may comply with voluntary agreements because it is convenient to their intentions to change their operations, regardless of the agreement. Yet, the results suggest that the voluntary guidelines are weak as there is no compliance from economic actors with the voluntary guidelines. This relates to the interaction between the economic actors and resource regimes within the EGS framework. The ineffectiveness of the voluntary guidelines may be due to the lack of mechanisms for compliance for voluntary solutions, such as the lack of

a noise reduction target. The ineffectiveness may also arise from economic actors' differing motivations to enact voluntary guidelines. However, evaluating the effectiveness of the voluntary guidelines is challenging as the voluntary guidelines were adopted in April 2014. This provides a limited timeframe for the evaluation of their effectiveness and might therefore be premature.

The voluntary guidelines did not include a noise reduction target of 3 dB per decade over the next thirty years, as initially suggested by the Correspondence Group. The lack of the target meant there was no pressure-exercising mechanism. Harrison (2001) states that voluntary approaches work when the government incentivizes businesses to implement voluntary guidelines by creating a "credible threat of regulation" (p. 216). Including a preliminary noise reduction target would have initiated a sense of urgency regarding the threat of noise pollution, thereby motivating economic actors to act. The target could have exerted pressure on the Member States to invest into research to understand the effects of noise pollution and develop mechanisms to use when carriers are not complying. This relates to the interaction between the political and economic actors, the resource regimes, patterns of interaction, and the outcomes within the EGS framework. Including the target in the guidelines would have therefore altered the interaction of the economic actors regarding the resource regime. However, the target was deemed *premature* by the Member States and therefore was not included in the voluntary guidelines. Harrison (2001) points out that voluntary policies are effective, when clear targets are included as well as effective mechanisms for public reporting.

In the case of the voluntary guidelines, public reporting mechanisms were not initiated. Public disclosure programs could help monitor noise emissions of ships. Dixon, Mousa, and Woodhead (2005) point out that the lack of reporting mechanisms could be due to the lack of access to resources to produce environmental reports. Yet, all ships are required to use AIS which regularly send out information about the transit, such as speed, entry port and final destinations. This information is easily accessible for coasts guards, to help track the individual transits, in case of an emergency. Although noise information is not yet available on AIS, these systems could be modified to include information about noise emission, meaning that making reports on noise emissions should not need many resources. This relates to the interaction between the political and economic actors and technologies and infrastructure within the EGS framework. Ships could include this information in AIS, which is readily available for all ships, with minimum effort and thereby help estimate the environmental impact that one ship may have (Dixon et al., 2005). One

key issue of environmental public disclosure programs is the lack of public awareness about the environmental issues. Dixon et al. (2005) point out that “people need to become aware of many issues on how to protect the environment and its impact on business. Environmental awareness is challenging companies to re-examine their operational processes and products” (p. 712). If the public was aware of the impact that one individual business may have on the environment, they might be able to exercise pressure on political and economic actors and demand public disclosure programs regarding noise pollution.

Before the implementation of voluntary guidelines, policymakers first needed to understand the motivations of economic actors to comply with voluntary guidelines, “since the effectiveness of government environmental policies depends in large on how corporations will respond to them” (Lyon & Maxwell, 2000, p. 5). For voluntary guidelines to be successful, policymakers need to consider the values of the targeted actors. Voluntary action should on one hand encourage pro-environmental behavior of economic actors while simultaneously reflect the public’s values and norms (Steg, 2016). The interaction between the actors dictates the outcome and effectiveness and willingness of economic actors to comply with the voluntary guidelines. However, if the public is not aware of noise pollution and its effects, the shipping industry might not be inclined to act pro-environmentally to appease the public. The interests of economic actors might not align with pro-environmental behavior.

The results suggest that altruistic motives were at best minimal as the issue of noise pollution did not seem like an issue of great concern for the economic actors. Karp and Gaulding (1995) argue that “voluntarism works best in an atmosphere of trust. Unless people are motivated completely by altruism, in which case they usually cooperate without regard to what others are doing” (p. 456). Compared to other carriers, Maersk Line has the financial capital to invest and develop new technologies. In this regard, Maersk Line could out-compete other carriers, by introducing new technologies, thereby reducing their impact on the environment. Yet, it seems that the initiative to retrofit Maersk ships and the Maersk slow steaming initiative came out of an economic need, rather than altruistic motives. However, these initiatives have positive environmental effects and may very well come from a societal value to act environmentally friendly. In regard of noise pollution, it seems that the industry is not altruistically inclined to voluntarily act and implement the guidelines. The results show that this could be partly due to the global economy, i.e. industries

lacking financial means to comply. Still, lower oil prices over the last year would indicate that the shipping industry should be operating at a financial win, and therefore may be financially able to implement the voluntary guidelines. Yet, carriers may argue that lower oil prices may have resulted in lower freight rates for shippers as well, which would indicate that there is no increase in financial win for the carriers, however, the implications of freight rates on the economy is beyond the scope of this thesis. Nevertheless, the results suggest that the industry might not be altruistically motivated to comply with the voluntary guidelines.

Compliance of voluntary action would be best achieved when there are win-win solutions for all involved actors. From the ecological modernization perspective, win-win situations are achieved when environmental costs are internalized by the market and the government takes on a decentralized, more flexible role (Bäckstrand & Lövbrand, 2006). Voluntary guidelines are the first step towards that direction. Businesses would be able to self-regulate rather than the government commanding and controlling the implementation of the guidelines. CSA 1 pointed out that the industry does not want to be regulated. Self-regulation, as is the case with the voluntary guidelines, should motivate economic actors to proactively take initiative to implement the technical suggestions made. This would indicate a win-win solution for the industry as they would not experience any regulatory pressure from political actors and self-regulation would enable economic actors to use their own available resources to develop effective technologies. The results show that civil society actors and political actors believe that the implementation of the voluntary guidelines would result in a win-win solution to all economic actors, as energy efficiency would be increased and negative environmental impacts on marine mammals would be decreased. Despite that there is little research to support these arguments. As a result, economic actors do not see the economic value in implementing the voluntary guidelines. The cost and benefit analysis of economic actors indicates that they would carry most of the costs, with minimal benefits, although no data was available to quantify that claim. Nonetheless, the results suggest that by implementing the voluntary guidelines, economic actors could ensure less wear of the propellers and that in turn would minimize cavitation. This would indicate a win-win solution for the economic actors. The win for the economic actors would be a long-term win, as propellers would be able to last longer, and the lifespan of ships would be prolonged, which would delay the need to invest into new ships. The results suggest that the costs to implement the voluntary guidelines on new ships may be minimal compared to the costs of new ships, however, the implementation

costs are still costs for the carriers, which may not gain any economic benefit from the adoption of the guidelines. From a business perspective, environmental issues may not be part of the cost and benefit analysis, especially if the business does not benefit directly, yet would have to carry the burden of the costs.

The EGS framework indicates that the general public could also exercise pressure on economic actors to follow the voluntary guidelines. Lyon and Maxwell (2000) point out that especially in rich countries, there has been a shift towards environmentally-friendly products. Because “companies want to appeal to these “green” consumers, and to do so are willing to go above and beyond the levels of care required by environmental regulations” (Lyon & Maxwell, 2000). However, the results show, that all interview participants believe that the public has little knowledge about any ocean-related issues, unless there are immediate visible consequences, such as oil spills. Because of this, there is no critical mass, i.e., several NGOs and their supporters, mobilized which could demand change of political and economic actors regarding noise pollution.

Naming and shaming techniques is a popular tool used by civil society actors to raise awareness (Pawson, 2002). Naming and shaming is often “regarded as ‘pure communication’ in that they work as a chain of reactions to what is said about whom, to whom, by whom” (Pawson, 2002, p. 216). Pawson (2002) argues that publicly shaming will motivate actors if they get a chance to change their behavior. Yet, the findings from the VSR program indicate otherwise, as they show that the industry does not want to be vilified. This suggests that the shipping industry might be more inclined to implement voluntary guidelines as their role and action receive public recognition from political and civil society actors. Publicly naming the industry would increase the willingness of economic actors to collaborate. Nevertheless, this finding has to be treated carefully, as the civil society actors have not attempted shaming the industry, because they sought after collaboration with them. Naming and shaming businesses also ties back to public disclosure programs which would “enhance[] pressure from external agents” (Blackman, 2010, p. 23). Another form of outside pressure could also be exercised by other economic actors, such as the shippers. International companies such as Apple, Walmart or Amazon could be influenced by their consumers and shareholders. These companies, or shippers, could then exercise pressure on the carriers to change their behavior. However, to which extend the shippers could influence the carriers is beyond the scope of this paper.

8.3. Regime Strengthening

Explanations why the US delegation insisted on voluntary guidelines may be found within the resource regimes of the EGS framework. Analyzing these regimes may explain the weakness of the voluntary guidelines. This does not mean that the voluntary guidelines are obsolete, but rather that in order for the guidelines to succeed the regime would have to be strengthened. Strengthening of a regime implies that Member States negotiate the terms of the agreement, to make it more stringent and clearer (Chasek et al., 2016). This strengthening could occur for various reasons, such as scientific knowledge or new technologies become available, which could prevent and mitigate pollution, political shifts in administrations or the current regime not being capable of reducing the environmental threat (Chasek et al., 2016). Strengthening a regime could take place through scientific knowledge about the effects of noise pollution becoming available (Chasek et al., 2016), this relates to the interaction of technologies and infrastructures and economic and political actors within the EGS framework. To jumpstart this process, the IMO could partner with national and regional organizations to further research the area of noise pollution and its effects. Furthermore, the IMO could support this research by providing financial and in-kind support (International Maritime Organization, n.d.-a). Such a fund could be beneficial to the researching and development of technology in the field of noise pollution, which could then build the basis to further the strengthening of the regime. However, as scientific knowledge or new technologies have not yet become available, attention has to be turned to the political shifts in administration and the regime not being capable of reducing the threat. Although there was a change of administration in the US in November 2016 which may have potential implications on the evaluation of the voluntary guidelines, examining these effects are beyond the scope of this research. Focus needs to be turned towards strengthening regimes within the political sphere, where Member States negotiate provisions to the current agreement (Chasek et al., 2016).

Chasek et al. (2016) identify three ways in which regime strengthening may occur: a) amending the existing agreement to binding annex; b) adopting a new agreement with concrete commitments from the Member States; or c) implementation of mandatory regulation without amending an agreement formally. Implementing mandatory regulation without amending an agreement formally may be applicable to other UN family agencies, such as the COP to the UNFCCC, however, this may not be applicable to the IMO. The COP has features that make it both like the IMO

but also like a treaty. In the latter case the COP may have certain powers that would enable the COP to strengthen an agreement “without a formal amendment or protocol procedure. These mechanisms exist to allow parties to change regime terms or technical details rapidly in response to new information and without the delays produced by ratification requirements” (Chasek et al., 2016, See *The Development of Environmental Regimes*, para. 14). In contrast to this, IMO essentially oversees treaties, such as MARPOL 73/78 and does not have features or powers that would allow the IMO to bypass mandatory regulation without following formal procedures. Therefore, this form of regime strengthening is not applicable to the IMO. In any case, it is not clear that MARPOL 73/78 could adopt an annex regarding noise because of MARPOL’s limited definition of pollution. This means in order for noise pollution to be addressed, an amendment to MARPOL 73/78 would first be required.

To strengthen the regime, IMO could amend the existing agreement to binding annex. The results show that this option is most feasible, as the IMO has amended other voluntary agreements to binding agreements in the past, such as the Ballast Water Convention. In the 1970s, it was brought to the IMO’s attention that non-indigenous organisms were transported in ballast water of ships. These organisms were harming local environments by spreading non-native diseases. The IMO adopted voluntary guidelines to minimize the biological invasion of organisms through ballast water, but realized that in order to protect local environments, they needed to minimize transfer of ballast water through a legally-binding mandatory code (Gollasch et al., 2007). The Convention was finally adopted in 2004. Yet, it is noteworthy that ballast water characterizes as a substance and therefore may be addressed under MARPOL 73/78. The same is not applicable for noise pollution, because of MARPOL 73/78 definition of pollution. However, MARPOL 73/78 enables amendments to existing agreements, through the use of tacit amendment procedures. In contrast to an “explicit procedure, where parties to a convention had formally to ratify amendments, under the tacit procedure, they become international law by a vote in the Maritime Safety Committee or the [MEPC]” (Mukherjee & Brownrigg, 2013, p. 244/245). This simplifies the procedure while enabling IMO to “change regulations quickly, and with minimum formality” (Mukherjee & Brownrigg, 2013, p. 245). Nevertheless, because MARPOL 73/78 does not have an existing voluntary agreement addressing noise pollution, it is not possible to strengthen the regime by amending the agreement to a binding annex.

Adopting a new agreement with concrete commitments from the Member States would be a possible option by which the Member States could oblige to reduce noise pollution (Chasek et al., 2016). Yet, given that there has been little progress in understanding the effects of noise pollution since the adoption of the voluntary guidelines, this option does not seem probable. Member States may be inclined to make concrete commitments in order to prevent and minimize noise pollution if they were to experience pressure from either economic actors or the public and in an extension of that civil society actors. However, because noise pollution has not been a priority of civil society actors adopting a new agreement with concrete commitments from Member States is not to be expected in the near future.

In order for MARPOL 73/78 to address noise pollution, it would first have to amend an annex recognizing noise as pollution and then further address the effects of noise pollution. This annex could include specific pollution targets such as the 3 dB noise reduction target per decade over the next 30 years. Having a target like this in a binding agreement would exercise pressure on Member States to include the target in their national regulations which would further exercise pressure on carriers to comply with the noise reduction target.

9. Conclusion

Underwater noise pollution is a complex issue and requires more scientific knowledge in order to fully understand the effects of noise on marine wildlife. The aim of this research was the evaluation of the voluntary guidelines to reduce underwater noise pollution caused by commercial shipping, which were adopted by the International Maritime Organization (IMO) in 2014. Three overarching research questions have driven this research and will be answered in this chapter. The first research question addresses the US national and international regulations and their demands regarding noise pollution and was formulated as followed:

1. *What do national and international regulations demand regarding actions to reduce underwater noise pollution?*

Three international frameworks address marine pollution: UNCLOS, MARPOL 73/78 and the EU Marine Strategy Framework Directive. UNCLOS defines both energy and substances as pollution. Because the physics of sound classify it as energy, noise pollution should technically be addressed under UNCLOS, although noise and its effects are not specifically mentioned in UNCLOS nor its amendments. In contrast to UNCLOS, MARPOL 73/78 limits the definition of pollution to substances, under which noise is not included. In contrast to these global frameworks, the EU Marine Directive explicitly defines noise as pollution and requires all Member States to act in accordance with good environmental status. To ensure this behavior, the Directive provides qualitative criteria of good environmental status, which gives Member States clear indicators of the requirements and obligations of them (Official Journal of the European Union, 2008). Although the EU is investing in noise pollution research – the results are preliminary – concrete targets to minimize or avoid pollution are not expected before 2020, when the European Commission will reconvene and review the Marine Directive.

The US has several acts and policies addressing marine pollution. While National Ocean Policy (NOP), National Environmental Policy Act (NEPA) and National Marine Sanctuaries Act (NMSA) address various types of marine pollution, Marine Mammal Protection Act (MMPA), Endangered Species Act (ESA) and Marine Protection, Research and Sanctuaries Act (MPRSA) address the effects of noise pollution on marine mammals. The former ones are concerned with the protection of marine ecosystems and the ecosystem-based approach to management, whereas the later ones

focus on the *taking* of marine wildlife. Taking marine wildlife refers to the harassing, hunting or capturing of marine mammals. The effects of noise pollution fall under level B harassments, which are types of harassments that potentially disturb the behavior of marine mammals. Under MMPA it is prohibited to take marine mammals within US waters and violators may be penalized by the Secretary and United States Coast Guard (USCG). These rules also apply to ESA. In contrast to MMPA and ESA, MPRSA aims to research the effects that human-induced changes have on marine ecosystems and marine wildlife.

Neither the international nor the US national regulations address noise pollution directly, although all frameworks provide guidance on the regulation *of the effects* of noise pollution. Because sound is a transboundary pollutant, it needs to be addressed on an international scale. An annex to MARPOL 73/78 which needs to first recognize noise as a pollutant would be a way forward in addressing noise pollution caused by the shipping industry on an international level.

The second research question that has driven this thesis was focusing on the process of adopting the voluntary guidelines at the IMO. Furthermore, this research question examined the ways in which political, economic, and civil society actors evaluated the voluntary guidelines. Since access to economic actors was limited and only included one carrier, the results may not be representative of the entire shipping industry.

2. *How did the voluntary guidelines get established at the IMO?*

a. *What was the process behind establishing the voluntary guidelines?*

b. *How do various actors in the United States evaluate the voluntary guidelines?*

The effects of noise pollution caused by the shipping industry were first discussed on a broad scale at the National Marine Fisheries Service (NMFS) symposium 2004 focusing on shipping noise and marine mammals. Following this symposium, NMFS held another symposium in 2007 focusing on the potential application of vessel-quieting technology on large commercial vessels. During both symposia, political actors had *healthy debates* with economic actors regarding the effects of noise pollution on marine mammals and various ways in which economic actors could minimize their noise impact. At the second symposium, it was decided that the US delegation shall put forward an information paper at the IMO. The US delegation publicized an information paper

addressing the adverse effects of noise pollution on marine mammals under other businesses, titled “Shipping Noise and Marine Mammals” at MEPC later in 2007. In 2008, a workshop hosted by Okeanos was held discussing Shipping Noise and Marine Mammals where a noise reduction target of 3 dB per decade over the next three decades was emphasized. In 2009, MEPC recognized noise pollution as a high priority item and tasked a Correspondence Group with crafting a response to noise pollution. The US delegation chaired the Correspondence Group consisting of other Member States, observer organizations and entities. As a result, the voluntary guidelines for the reduction of underwater noise from commercial shipping to address adverse impacts on marine life were adopted in 2014 at the IMO, however, the noise reduction target of 3 dB/decade was deemed premature and not included in the voluntary guidelines.

Generally, all interviewed political actors which included representatives from National Oceanic and Atmospheric (NOAA) and an advisor to NOAA, economic representatives from Maersk Line, the Chamber of Shipping of America (CSA) and Det norske Veritas and Germanischer Lloyd (DNV GL) and civil society representatives from the Natural Resources Defense Council (NRDC), the Environmental Defense Center (EDC) and the Ocean Conservation Research (OCR) viewed the voluntary guidelines as the first step in recognizing noise pollution as a threat to marine wildlife. Yet, there were mixed evaluations of the voluntary guidelines between the various actors. Political actors saw the adoption of the voluntary guidelines as a significant achievement, however, some NOAA representatives recognized the limitations of the guidelines as they lacked a noise reduction target. Including this target would have strengthened the voluntary guidelines and would have possibly resulted in more voluntary compliance from economic actors. Economic actors, on the other hand, evaluated the voluntary guidelines as a way for the shipping industry to self-regulate and thereby avoid mandatory regulation from international and national policymakers. However, there are also some disparities between the economic actors, as CSA saw the implementation of the voluntary guidelines as a win-win situation for carriers and marine mammals. Maersk Line did not view the implementation of the voluntary guidelines as high priority. Civil society actors evaluated the voluntary guidelines as a starting point in addressing noise pollution, yet some NRDC representatives recognized that the voluntary guidelines are weak without any further follow-up. Several issues were mentioned by the civil society actors, which could strengthen the regime, including raising awareness, and mobilizing the public to demand action from political actors and change in behavior from economic actors. Furthermore, these actors pointed out that,

based on other successful voluntary programs, collaboration between all involved actors is necessary, to understand the involved actors' motivation to enact voluntary guidelines.

The final research question that has driven this thesis focused on the expected outcomes of the voluntary guidelines through the perspective of economic actors. Special attention was given to the expected costs and benefits for the economic actors as well as the motivation for economic actors to implement the voluntary guidelines. It is noteworthy that the access to economic actors was limited and therefore the results of this research question might be skewed.

3. *What are the expected outcomes of such proposed guidelines on the shipping sector in the United States?*
 - a. *What are the expected costs and benefits of implementing the voluntary guidelines?*
 - b. *Are economic actors motivated to implement these guidelines?*

Limited access to economic actors makes it difficult to answer research question 3 with tangible numbers. However, the results suggest that the costs of implementing the voluntary guidelines outweigh the benefits for the shipping industry, even though the implementation of the technical suggestions to reduce noise could increase energy efficiency for the ships. The energy that causes cavitation and therefore emits noise could be redirected into the propulsion system, thereby decreasing energy loss. Additionally, minimizing cavitation could increase the longevity of ships as the wear of the propellers would be reduced and therefore the lifespan of the propellers would increase. However, these benefits have not yet been quantified. It is noteworthy that because of the unknown effects of noise pollution on marine mammals caused through cavitation, the costs of implementing the technical suggestion could outweigh the benefits that marine mammals could gain from the implementation. Further scientific knowledge is necessary to understand the benefits of the implementation of the voluntary guidelines on marine wildlife.

The results suggest that the economic actors are not motivated to implement the voluntary guidelines. The underlying question remains, what could motivate economic actors to implement the voluntary guidelines. Altruistic motives would suggest that economic actors would act voluntarily regardless of outside influences, yet, it seems that economic actors were primarily motivated by maximizing profit. Noise pollution did not seem to be a primary objective, but rather

an issue that was addressed as a side-effect through other initiatives. The findings suggest that both economic and civil society actors did not address noise pollution directly in their initiatives and programs. Although the Maersk Line representative imagined retrofitting ships could have some positive effect on minimalizing noise emissions. In the same way, EDC representatives believed that the Vessel Speed Reduction (VSR) program would aid in minimizing noise pollution. The results also suggest that economic actors did not see the implementation of the voluntary guidelines as a win-win solution as they would have to carry the burden of the costs without increasing tangible benefits for themselves. Outside pressures, such as naming and shaming techniques have proven efficient in other voluntary programs, yet no such activity has been initiated to address noise pollution. Shippers could extend the pressure they may experience from the public regarding their cargo onto the carriers, yet in regard of noise pollution, this has not been experienced.

Other factors which may impact underwater noise regulation and are important to consider include political shifts in administration and raising awareness among the public. However, the evaluation of these impacts on the regulation of noise pollution are beyond the scope of this research. Regulating noise pollution is complex and challenging due to noises' physics and transboundary nature. Although the voluntary guidelines provide a starting point, they are merely the first step towards regulating noise and its effects on marine wildlife. In order to address this issue, more scientific knowledge, and in an extension of that, strengthening of the regime is required to minimize and prevent noise pollution.

10. References

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11. Appendix

11.1. Interview Guide

	Introduction	Category	Actors
	- Brief summary of aims of the study plus general questions about participant		
	Part 2: Voluntary Guidelines		
	RQ2: What explains the format of the present sound regulations?		
1	Could you tell me about your involvement in the process of establishing the VG?		
2	What was your/organization's role?		
3	To what extent were you part of establishing the VG?		
4	Did you have any concerns about the VG?		
5	If so, were you able to voice your concerns?		
6	Was there any discussion about what format these guidelines should take?		
7	Was there any consideration on making the VG mandatory?		
8	What was the reason to make the VG voluntary?		
9	Was there any discussion from other actors?		
10	What was your/organization's position on the VG?		
11	Did you encounter other positions?		
12	Was there any influences from outside? I.e. political/civil society/economic?		
13	What were some active steps that you/r organization took in this process?		
14	Were you a proactive part of the establishment of the guidelines?		
15	During the process of establishing the VG where there debates regarding the VG?		
16	The US took a leading role in this process followed by governments such as Germany, Australia, Spain, the UK, to name a few. Why do you think the US took a leading role?		
17	The US is currently the protégée of noise pollution minimization in the world and their fight against noise pollution could change the impact across the globe. On a global scale, what do you predict for the future in the field of noise pollution?		
18	Do you think that the minimization of noise pollution/establishing a sound baseline is something that could happen within the next few years?		
19	Were issues raised about in which ways to limit noise pollution?		

20	Did you encounter debates with the member states/different actors?		
21	Could you describe other positions of other actors?		
22	Why do you think these guidelines are not mandatory?		
23	The VG mainly address design changes in new ships as well as additional technologies that are known to minimize noise in existing ships. Why do you think there was a focus on technology?		
24	Are you aware of any influences that might have had an impact on the VGs?		
25	What were the main reasons to make this a voluntary guidelines rather than mandatory?		
26	What effects would a mandatory document have on the shipping sector?		
27	Why do you think there was comparatively little focus on other incentives to minimize noise pollution such as speed limits or weight requirements for ships?		
28	VGs did not establish a dB-noise baseline, (a noise limit for commercial shipping). Reports said that this is partly due to not having enough research and not knowing the extends of effects of noise pollution within the marine wildlife. In your opinion, why was there no establishment of a dB-noise baseline?		
29	If national/global regulations were put in place that would determine your speed limits/weight limits/design of your fishing/shipping fleet, what would that mean for your organization? What effects do you think any of these limitations would have on your fleet? What would be the long-term/short-term consequences? Would you be able to sustain your business as you do now?		
30	Did the establishment of the VG meet any resistance from various actors? Why not speed limits or weight limits or other ways to regulate noise pollution?		
31	What effects would have the establishment of dB-noise baseline have?		
32	What is your certification by the US Coast Guard?		
33	It seems that many of the requirements are crew-based with lesser focus on requirements for your ship/fleet?		
34	US Coast Guard: Are you aware of the VG? What is the procedure? Do you have to inform? Enforce? What do the VG mean for your operations?		
35	Would the Coast Guard be able to demand changes in your shipping fleet?		
36	Have you been made aware of the VG? If so, how? Do you have any concerns about them? If so, what?		

37	Would you follow the VG? If so, why? Why not?		
38	If the VG were to be made mandatory, what effects would this have on the shipping sector?		
39	How high would the costs to implement be on your shipping sector?		
40	What would be alternative costs if you for instance had a speed requirement?		
41	What do you believe the long-term effects would be give that the ship's lifetime is about 30-50 years? In terms of costs? - With respect to what?		
42	Is there anything you would want to include or exclude within the VGs?		
43	Do you have any concerns regarding the implementation of the VGs?		
	Part 3: Expected Outcomes of VG/Motivation		
	RQ3: What are the expected outcomes by such proposed guidelines on the shipping sector in the United States?		
	RQ3a: What are the expected costs and benefits of these voluntary guidelines?		
	RQ3b: Are economic actors motivated to implement such guidelines?		
45	What are the benefits of implementing the VG?		
46	In your opinion do the benefits of the implementation outweigh the costs?		
47	How would you describe a success/failure of implementing the VG?		
48	What do you believe is the next step forward within this process?		
49	Does your company follow any ISO standards concerning underwater noise pollution?		
50	Are these determined by the Coast Guard?		
51	If so, did these standards have any impact on your operation? Costs/benefits?		
52	Are there any standards (ISO or other) that you follow? If so, why/why not?		
53	Are there any external influences that are a deciding factor in implementing various standards?		
54	Have you felt any pressure from others to implement certain standards?		
55	Have you noticed a change of attitudes towards noise pollution from different actors?		

56	Has there been a notion to make the VG a mandatory document?		
57	In your opinion, would stricter regulations in the context of the LOS or MARPOL (International Convention for the Prevention of Pollution from Ships) address noise pollution be the way to go forward?		
58	Could you tell me more about your role in the IMO delegation?		
59	Could you describe the position you are in now? And the responsibilities?		
60	What is the process of the IMO?		

11.2. IMO MEPC.1/Circ.833: Guidelines for the Reduction of Underwater Noise from Commercial Shipping to Address Impacts on Marine Life

GUIDELINES FOR THE REDUCTION OF UNDERWATER NOISE FROM COMMERCIAL SHIPPING TO ADDRESS ADVERSE IMPACTS ON MARINE LIFE

1 The Marine Environment Protection Committee, at its sixty-sixth session (31 March to 4 April 2014), with a view to providing guidance on the reduction of underwater noise from commercial shipping, and following a recommendation made by the Sub-Committee on Ship Design and Equipment, at its fifty-seventh session, approved the annexed *Guidelines for the reduction of underwater noise from commercial shipping to address adverse impacts on marine life*.

2 Member Governments are invited to use the annexed Guidelines from 7 April 2014 and to bring them to the attention of all parties concerned.

ANNEX

GUIDELINES FOR THE REDUCTION OF UNDERWATER NOISE FROM COMMERCIAL SHIPPING TO ADDRESS ADVERSE IMPACTS ON MARINE LIFE

1 Preamble

1.1 Concern has been raised that a significant portion of the underwater noise generated by human activity may be related to commercial shipping. The international community recognizes that underwater-radiated noise from commercial ships may have both short and long-term negative consequences on marine life, especially marine mammals.

1.2 It is important to recognize that both the technical and cost-effectiveness of measures considered, either individually or in combination, will be strongly dependent on the design, operational parameters, and mandatory requirements relevant for a particular ship. A successful strategy to reduce radiated noise should consider interactions and contributions from measures provided to achieve other objectives such as reduction of onboard noise and improvements in energy efficiency.

1.3 When efforts have been made to mitigate underwater noise, as far as reasonable and practical, evaluation should be undertaken to determine the success or otherwise of ship noise reduction efforts and to guide and enhance future activities at noise reduction. Such evaluation can include forms of radiated-noise measurements, simulations or other ways of data gathering.

2 Application

2.1 These Guidelines can be applied to any commercial ship.

2.2 These Guidelines do not address the introduction of noise from naval and war ships and the deliberate introduction of noise for other purposes such as sonar or seismic activities.

3 Purpose

3.1 These non-mandatory Guidelines are intended to provide general advice about reduction of underwater noise to designers, shipbuilders and ship operators. They are not intended to form the basis of a mandatory document.

3.2 Given the complexities associated with ship design and construction, the Guidelines focus on primary sources of underwater noise. These are associated with propellers, hull form, onboard machinery, and operational aspects. Much, if not most, of the underwater noise is caused by propeller cavitation, but onboard machinery and operational modification issues are also relevant. The optimal underwater noise mitigation strategy for any ship should at least consider all relevant noise sources.

3.3 These Guidelines consider common technologies and measures that may be relevant for most sectors of the commercial shipping industry. Designers, shipbuilders, and ship operators are encouraged to also consider technologies and operational measures not included in these Guidelines, which may be more appropriate for specific applications.

4 Definitions

4.1 Cavitation inception speed is the lowest ship speed at which cavitation occurs.

4.2 Propeller cavitation is the formation and implosion of water vapour cavities caused by the decrease and increase in pressure as water moves across a propeller blade. Cavitation causes broadband noise and discrete peaks at harmonics of the blade passage frequency in the underwater noise spectrum. The broadband noise is caused by growth and collapse of a vast amount of individual cavitation bubbles in water. The discrete noise peaks are caused by the volume fluctuations of the sheet and tip vortex cavities.

4.3 Underwater noise, or the underwater-radiated noise level, for the purposes of these Guidelines refers to noise from commercial ships².

5 Predicting underwater noise levels

5.1 Underwater noise computational models may be useful for both new and existing ships in understanding what reductions might be achievable for certain changes in design or operational behaviour. Such models may be used to analyse the noise sources on the ship, the noise transmission paths through the ship and estimate the total predicted noise levels. This analysis can

² Underwater-radiated noise level is reported in sound pressure levels in decibels and expressed as 10 times the logarithm of the square of the ratio of the rms sound pressure to a reference pressure of 1 micro Pascal. When it is a ship source level, the sound pressure level is adjusted to a level at 1 m from the source.

help shipowners, shipbuilders and designers, to identify noise control measures that could be considered for the specific application, taking into account expected operational conditions. Such measures may include amongst others: vibration isolation mounts (i.e. resilient mounts) for machinery and other equipment, dynamic balancing, structural damping, acoustical absorption and insulation, hull appendages and propeller design for noise reduction.

5.2 Types of computational models that may assist in reducing underwater noise include:

.1 Computational Fluid Dynamics (CFD) can be used to predict and visualize flow characteristics around the hull and appendages, generating the wake field in which the propeller operates;

.2 Propeller analysis methods such as lifting surface methods or CFD can be used for predicting cavitation;

.3 Statistical Energy Analysis (SEA) can be used to estimate high-frequency transmitted noise and vibration levels from machinery; and

.4 Finite Element Analysis (FEA) and Boundary Element Method (BEM) may contribute to estimate low-frequency noise and vibration levels from the structure of the ship excited by the fluctuating pressure of propeller and machinery excitation.

5.3 The value of a modelling exercise is enhanced if its predictive capabilities are assessed in case studies under various operational conditions.

6 Standards and references

6.1 Underwater noise should be measured to an objective standard for any meaningful improvements.

.1 The International Organization for Standardization (ISO) has developed the (ISO/PAS) 17208-1 – Acoustics – Quantities and procedures for description and measurement of underwater sound from ships – Part 1: General requirements for measurements in deep water. This measurement standard is for deep water which implies that the water depth should be larger than 150 m or 1.5 times overall ship length (engineering method), whichever is greater. This is a temporary publicly available standard. This standard is based on the American National Standards Institute and the Acoustical Society of America (ANSI/ASA) S12.64-2009 "Quantities and Procedures for Description and Measurement of Underwater Sound from Ships, Part 1: General Requirements".

.2 ISO is also developing ISO/DIS 16554 – Ship and marine technology – Measurement and reporting of underwater sound radiated from merchant ships – deep-water measurement, which is expected to be published in 2013. The standard would provide shipyards, shipowners and ship surveyors with a well-established measurement method for underwater sound radiated from merchant ships for use at the final delivery stage of ships.

6.2 Several research ships have been designed using the noise specification proposed by the International Council for the Exploration of the Sea (ICES) Cooperative Research Report No.209 (CRR 209). It should be noted that the ICES CRR 209 noise specification was designed for fishery research ships so that marine life would not be startled during biomass surveys; it was not intended to be used as a commercial ship design standard to prevent potential harm of marine life. However, certain design arrangements used to meet ICES CRR 209 may still be useful for new commercial ships to reduce underwater noise.

6.3 Other underwater noise rating criteria are available and may prove useful as guidance.

7 Design considerations

7.1 The largest opportunities for reduction of underwater noise will be during the initial design of the ship. For existing ships, it is unlikely to be practical to meet the underwater noise performance achievable by new designs. The following design issues are therefore primarily intended for consideration for new ships. However, consideration can also be given to existing ships if reasonable and practicable. While flow noise around the hull has a negligible influence on radiated noise, the hull form has influence on the inflow of water to the propeller. For effective reduction of underwater noise, hull and propeller design should be adapted to each other. These design issues should be considered holistically as part of the overall consideration of ship safety and energy efficiency.

7.2 Propellers

7.2.1 Propellers should be designed and selected in order to reduce cavitation. Cavitation will be the dominant radiated noise source and may increase underwater noise significantly. Cavitation can be reduced under normal operating conditions through good design, such as optimizing propeller load, ensuring as uniform water flow as possible into propellers (which can be influenced by hull design), and careful selection of the propeller characteristics such as: diameter, blade number, pitch, skew and sections.

7.2.2 Ships with a controllable pitch propeller could have some variability on shaft speed to reduce operation at pitch settings too far away from the optimum design pitch which may lead to unfavourable cavitation behaviour (some designs may be able to operate down to a shaft speed of two thirds of full).

7.2.3 The ship and its propeller could be model tested in a cavitation test facility such as a cavitation tunnel for optimizing the propeller design with respect to cavitation induced pressure pulses and radiated noise.

7.2.4 If predicted peak fluctuating pressure at the hull above the propeller in design draft is below 3 kPa (1st harmonic of blade rate) and 2 kPa (2nd harmonic) for ships with a block coefficient below 0.65 and 5 kPa (1st harmonic) and 3 kPa (2nd harmonic) for ships with a block coefficient above 0.65, this could indicate a potentially lower noise propeller. Comparable values are likely to be 1 kPa higher in ballast condition.

7.2.5 Noise-reducing propeller design options are available for many applications and should be considered. However, it is acknowledged that the optimal propeller with regard to underwater noise reduction cannot always be employed due to technical or geometrical constraints (e.g. icestrengthening of the propeller). It is also acknowledged that design principles for cavitation reduction (i.e. reduce pitch at the blade tips) can cause decrease of efficiency.

7.3 Hull design

7.3.1 Uneven or non-homogeneous wake fields are known to increase cavitation. Therefore, the ship hull form with its appendages should be designed such that the wake field is as homogeneous as possible. This will reduce cavitation as the propeller operates in the wake field generated by the ship hull.

7.3.2 Consideration can be given to the investigation of structural optimization to reduce the excitation response and the transmission of structure-borne noise to the hull.

8 Onboard machinery

8.1 Consideration should be given to the selection of onboard machinery along with appropriate vibration control measures, proper location of equipment in the hull, and optimization of foundation structures that may contribute to reducing underwater radiated and onboard noise affecting passengers and crew.

8.2 Designers, shipowners and shipbuilders should request that manufacturers supply information on the airborne sound levels and vibration produced by their machinery to allow analysis by methods described in section 5.2 and recommend methods of installation that may help reduce underwater noise.

8.3 Diesel-electric propulsion has been identified as an effective propulsion-train configuration option for reducing underwater noise. In some cases, the adoption of a diesel-electric system should be considered as it may facilitate effective vibration isolation of the diesel generators which is not usually possible with large direct drive configurations. The use of high-quality electric motors may also help to reduce vibration being induced into the hull.

8.4 The most common means of propulsion on board ships is the diesel engine. The large two-stroke engines used for most ships' main propulsion are not suitable for consideration of resilient mounting. However, for suitable four-stroke engines, flexible couplings and resilient mountings should be considered, and where appropriate, may significantly reduce underwater noise levels. Four-stroke engines are often used in combination with a gear box and controllable pitch propeller. For effective noise reduction, consideration should be given to mounting engines on resilient mounts, possibly with some form of elastic coupling between the engine and the gear box. Vibration isolators are more readily used for mounting of diesel generators to foundations.

8.5 Consideration should be given for the appropriate use of vibration isolation mounts as well as improved dynamic balancing for reciprocating machinery such as refrigeration plants, air compressors, and pumps. Vibration isolation of other items and equipment such as hydraulics,

electrical pumps, piping, large fans, vent and AC ducting may be beneficial for some applications, particularly as a mitigating measure where more direct techniques are not appropriate for the specific application under consideration.

9 Additional technologies for existing ships

In addition to their use for new ships, the following technologies are known to contribute to noise reduction for existing ships:

- .1 design and installation of new state-of-the-art propellers;
- .2 installation of wake conditioning devices; and
- .3 installation of air injection to propeller (e.g. in ballast condition).

10 Operational and maintenance considerations

10.1 Although the main components of underwater noise are generated from the ship design (i.e. hull form, propeller, the interaction of the hull and propeller, and machinery configuration), operational modifications and maintenance measures should be considered as ways of reducing noise for both new and existing ships. These include, among others:

10.2 *Propeller cleaning*

Propeller polishing done properly removes marine fouling and vastly reduces surface roughness, helping to reduce propeller cavitation.

10.3 *Underwater hull surface*

Maintaining a smooth underwater hull surface and smooth paintwork may also improve a ship's energy efficiency by reducing the ship's resistance and propeller load. Hence, it will help to reduce underwater noise emanating from the ship. Effective hull coatings that reduce drag on the hull, and reduce turbulence, can facilitate the reduction of underwater noise as well as improving fuel efficiency.

10.4 *Selection of ship speed*

10.4.1 In general, for ships equipped with fixed pitch propellers, reducing ship speed can be a very effective operational measure for reducing underwater noise, especially when it becomes lower than the cavitation inception speed.

10.4.2 For ships equipped with controllable pitch propellers, there may be no reduction in noise with reduced speed. Therefore, consideration should be given to optimum combinations of shaft speed and propeller pitch.

10.4.3 However, there may be other, overriding reasons for a particular speed to be maintained, such as safety, operation and energy efficiency. Consideration should be given in general to any critical speeds of an individual ship with respect to cavitation and resulting increases in radiated noise.

10.5 *Rerouteing and operational decisions to reduce adverse impacts on marine life*

Speed reductions or routing decisions to avoid sensitive marine areas including well-known habitats or migratory pathways when in transit will help to reduce adverse impacts on marine life.



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