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Regulatory Uncertainties of the Sustainability Transition

A qualitative study of the Norwegian shipping industry's response to stricter environmental regulation

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Foreword

Growing up in the former fishing town Haugesund, boats and the maritime industry has been part of my sight. My great-grandfather and grandfather were sailors, and their stories they engaged me from an early age. When I was seven, I got a little motorboat to explore inaccessible places and fish. I have been deeply fascinated by the ocean and maritime activities, ever since. Writing this thesis about the shipping industry have further increased my interest in shipping organization, but also provided me with a more sophisticated understanding of solving climate change-related issues.

Firstly, my mother, Margrethe, my father, Gunnar, and my younger brother, Håvard, deserve all gratitude for always supporting and encouraging me. You are my role models. There are several people I would like to thank for contributing to making my last years as a student adventurous and magnificent. I have met people that I know will be important to me throughout my life in London, Trondheim, Stavanger, and Munich. I want to thank all professors and fellow students that have spiked my interest in sustainability and given me new perspectives on the complex issue of climate change. Thank you to Anette Bærheim, for your friendship and for the great experience of sharing the exchange semester in Munich with you.

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I am now looking forward to new challenges, friendships, adventures, and knowledge in Brussels. The master program Energy, Environment and Society at the University of Stavanger has exceeded all my expectations.

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Abstract

In a paradox, the shipping industry is one of the most heavily regulated industries, without one single authority charged by governing the international industry. There is not one regulative centre, but many, including the International Maritime Organization, the European Union, national governments, organizations, and institutions. The governance complex of several regulators in the sustainability transition leads to regulatory uncertainties, which are further complicated by uncertainties regarding lack of mature zero- and low-carbon technology and a weak financial situation. The regulatory uncertainties serve as a threat to the maritime sustainability transition and might hinder an acceleration. To reach the ambitious emission reduction targets and to overcome the challenges presented, willingness - and capabilities to invest in green technology, stable framework conditions, and cooperation between authorities and industry are required. This thesis investigates the corporate responses strategies to environment regulation of the Norwegian shipping industry, which holds the world's fifth largest fleet measured in value.

The corporate response strategies present two models: the reactive – and proactive models. To overcome the challenges, and despite the future regulatory uncertainties, the Norwegian shipping industry is pursuing a proactive strategy, meaning the industry supports, and even advocates for stricter environmental regulations. The thesis show that the Norwegian shipping industry is highly ambitious, aiming at boosting their competitive advantage and early mover advantage, by beyond compliance measures and move beyond 'business-as-usual'.

This thesis provides in-depth analyses of factors of company-external political responses and company-internal market responses, including challenges and opportunities of the sustainability transition of the shipping industry. The findings are discussed within the proactive response strategy, to which a more transparent understanding of the Norwegian shipping industry in the sustainability transition becomes illuminated.

1. Introduction

International shipping accounts for more than 80% of the total global trade volume (Stalmokaitė & Yliskylä-Peuralahti, 2019, p. 1). The fossil fuel-intensive shipping industry is responsible for approximately 3% of the world carbon dioxide (CO_2) emissions (Skonnord, 2018). The international shipping industry has experienced an increased focus on reducing its carbon footprint. The international shipping community has set the target of reducing emissions by 50% by 2050 from 2008 levels under the International Maritime Organization (IMO) (Norwegian Ministry of Climate and Environment, 2019, p. 27). In the same period, the demand for seaborne transportation is predicted to increase by 50-250% (Corsi, 2018).

The international environmental shipping governance architecture is characterized as polycentric, fragmented, and complex (Stalmokaitė & Yliskylä-Peuralahti, 2019, p. 1). The control of pollution from ships encompasses several different actors with multiple centres of decision making. The IMO is the main international organization for orchestrating measures pertaining safety, security, and pollution prevention in international shipping. However, the 174 IMO member states possess different levels of ambition for environmental standards in shipping (Stalmokaitė & Yliskylä-Peuralahti, 2019, p. 1). For example, Norway's targets for reducing domestic shipping and fisheries emissions are a 50% reduction by 2030 (Norwegian Ministry of Climate and Environment, 2019, p. 27).

Several perspectives prove especially critical to reaching the targets set. First, the zero- and low-carbon technology (e.g., hydrogen, ammonia, offshore wind, battery-electric) necessary to achieve a successful low-carbon transition is currently considered immature and under development (Miljødirektoratet, 2020, p. 159). The IMO consider these alternative fuel technologies realistic only after 2030 (Monios, 2020), and the ships being build today will sail until 2050 (Norwegian Ministry of Climate and Environment, 2015, p. 27). Second, the international shipping industry is heavily and unevenly regulated. Ever stricter environmental regulations and requirements are expected in the next decades, from the international - and regional levels (the European Union (EU)) and national governments. To reach the targets set and overcome obstacles such as immature technology, willingness - and capabilities to invest in green technology, stable framework conditions, and cooperation between authorities, research and businesses are required.

The maritime industry is a knowledge-intensive and globalized industry. Norway has a complete maritime cluster, with leading international players in most business areas (Ringdal,

2019). The Norwegian shipping industry is at the forefront of developing low-carbon technology solutions, which will continue to enable significant emissions cuts at home and abroad. This thesis will focus on the Norwegian shipping industry, mainly shipping company perspectives, reducing emissions from international shipping, and the strategies they pursue in meeting the current and future environmental regulation and advocating for stricter environmental regulation.

Stricter environmental regulations and requirements will change the current business-as-usual and increase the already high competition within the shipping companies. Different shipping companies compete on several grounds, especially on securing long-term contracts. Shipping companies will have to comply with the regulations, and it does not come without costs or uncertainties.

The outlook of the shipping industry is filled with current and upcoming challenges, where uncertainties of regulation from different governance levels make up one of them. An industry which initially should be 'free of regulation', is in fact, heavily regulated. Shipping companies are in a unique position to advocate for stricter regulations or oppose them. By studying Norwegian shipping companies, and where they depart from, this thesis might be able to say something about the degree to which the shipping industry can overcome the challenges they are face in transitioning to alternative fuels.

1.1. Delimitations

International shipping is highly complex and one of the most heavily regulated industries. The number of institutions, organizations, companies, and interest groups within the international shipping regime is enormous, all with different abilities to influence and implement regulation or goals. This thesis primary focus will be on the international organization, the IMO, which will be regarded as the international level, as it is IMO that has the overall responsibility of safety, pollution and security (Waage, 2009). The EU will be referred to as the regional level; despite several regional authorities, the EU is the most relevant regional authority concerning Norway' influence.

This thesis limits its case to the Norwegian shipping industry. The Norwegian shipping industry consists of several segments, e.g., shipyards, shipping companies, manufacturers. This thesis is mostly concerned with shipping companies' interpretations. Hence, the findings of this thesis cannot be generalized to all segments. On the last note, this thesis is not focusing on a specific regulation because the broader picture of attitudes towards regulation is in the loop.

1.2. Research questions

This thesis operationalizes the following research question:

RQ1: *What regulatory challenges and opportunities do the sustainability transition present for the shipping industry?*

RQ2: *What strategies does the Norwegian shipping industry pursue in response to the regulatory challenges involved with the sustainability transition?*

RQ3: *In view of the regulatory uncertainties involved with the sustainability transition, can the chosen strategy deemed to be a success?*

1.3. Structure of this thesis

The objective of this thesis is to identify the response strategy the Norwegian shipping industry pursue in meeting the regulatory uncertainties of environmental regulations from the different governance-levels. Further, the thesis aims to determine whether the pursued strategy can be to deem a success. Henceforth, the thesis is structured as following:

The 2nd chapter will bridge the thesis's introduction with the theoretical starting point of sustainability transitions, including a brief introduction to socio-technical systems. Leaping to the 3rd chapter of unpacking the sustainability transition context: the industry's regulatory regime complexity and the regulatory challenges. The 4th chapter presents the main framework employed within this thesis: corporate response strategies to environmental regulation, namely the *reactive strategy* and the *proactive strategy*.

Chapter 5 presents the research design of the thesis. The research design includes case selection of the case study on the Norwegian shipping industry, and the research strategy. The 6th chapter assesses methodology: the choice methods, data collection, the analysis of data, and evaluates the reliability and validity of this study.

Chapter 7, dealing with empirical findings and analysis, is structured into the elements of *company-external political responses* and *company-internal market responses*. This chapter explores the challenges and opportunities, regulatory uncertainties, and forms the basis of deciding which strategy the Norwegian shipping industry is pursuing. The 8th chapter is the discussion. The chapter assesses the theories of the thesis and applies them to the analysis of the findings.

In chapter 9, the study concludes that the Norwegian shipping industry is supporting, and advocating for, stricter environmental regulations, hence, the Norwegian shipping industry pursue a proactive strategy. The Norwegian shipping industry aim towards 'beyond business-as-usual', advancing their competitive advantages, being technological innovators. If the strategy is deemed to succeed depends on the industry's ability to influence "appropriate" regulations at the IMO-level, and policies and policy-instruments at the EU- and domestic-level.

2. Theoretical departure: Sustainability transitions

This thesis's theoretical starting point is sustainability transitions. To answer the grounding question 'how do we study sustainability transitions?', Geels (2010), Merkard et al. (2012), Köhler et al. (2019), Lachman (2013), and more have reviewed conceptual - and theoretical approaches on how to study sustainability transitions. These reviews will give this study an appropriate point of departure. The contributions to sustainability transitions are many, and four frameworks have gained prominence. The frameworks are Technological Innovation Systems (TIS), Transition Management (TM), Strategic Niche Management (SNM), and the Multi-Level Perspective (MLP). However, valuable insight can be found in management studies, sociology, economic geography, and political science (Merkard, Raven, & Truffer, 2012, p. 956). Before introducing the theoretical starting point of sustainability transitions, it is necessary to provide a conceptual clarification of socio-technical systems and socio-technical transitions.

2.1. Socio-technical systems

In transition studies, the *socio-technical systems* consist of (networks of) actors (individual, firms, organizations, collective actors) and institutions (societal and technical norms, regulations, standards of good practice), as well as material artifacts and knowledge (Merkard, Raven, & Truffer, 2012, p. 956). The socio-technical system of the international shipping industry can be recognized by having such consistency. There is a vast network of actors, ranging from i.e., national governments, shipowners that operate domestically, and internationally, shipowner associations representing small- and large companies and maritime forums that lobby for these networks. Institutions and organizations, such as the international organization, the IMO, regulates activities, technical standards, environmental regulation, etc. These different elements of the socio-technical shipping system interact, and together they provide specific services for society. The variety of elements are tightly interrelated and dependent on each other. The dependency of these elements may have crucial implications for system dynamics, especially for system transformation (Merkard, Raven, & Truffer, 2012).

An important assumption is that socio-technical systems are rigid and inert, making change and innovation incremental and path-dependent (Fuenfschillinga & Binza, 2018, p. 735). A socio-technical system's stability is attributed to the presence of highly institutionalized formal and informal rules that have co-evolved with certain technologies and solidified into practices and routines. Then again, *socio-technical transitions* are "a set of processes that lead to a fundamental shift in socio-technical systems" (Merkard, Raven, & Truffer, 2012, p. 956). A

transition involves far-reaching changes along different dimensions: technological, material, organizational, institutional, political, economic, and socio-cultural (Merkard, Raven, & Truffer, 2012; Geels F. W., 2002). Transitions involve a broad range of actors, and they unfold over considerable timespans, e.g., 50 years or more. New products, services, business models, and organizations emerge during the duration of a transition, partly complementing and partly substituting for existing ones. Historical maritime transitions include moving from sail to steam, and from wooden ships to iron ships. In the maritime transition that is happening as we speak, the transition goal involves moving from fossil fuels to alternative low- and zero-carbon fuel technologies.

Socio-technical transitions differ from technological transitions. Socio-technical transitions include changes in user practices and institutional (e.g., regulatory) structures, and the technical dimension (Merkard, Raven, & Truffer, 2012, p. 956). They typically include complementary technological and non-technological innovations. The emergence of e.g., liquified natural gas (LNG) as a shipping fuel required both a domestic and international fuelling infrastructure, a new regulatory system for gas as a fuel on vessels, supply systems, rules for safety, operation, and user practices, etc. Socio-technical transitions do not just change the structures of existing systems. They also affect related societal domains, such as working, production, trade, planning, and policymaking at all governance levels (Merkard, Raven, & Truffer, 2012, p. 956).

2.2. Sustainability transitions

The interest in, and studies of sustainability transitions, represent a growing and prominent field of research within transition literature. *Sustainability transitions* are defined and contextualized by Merkard, Raven, and Truffer (2012) as "long-term, multi-dimensional, and fundamental transformation processes through which established socio-technical systems shift to more sustainable modes of production and consumption" (p. 956).

Compared to historical transitions, which can be 'opportunity-driven', sustainability transitions (or low-carbon transitions) are mainly 'problem or urgency-driven' (Sovacool & Geels, 2016). The problem involves a collective good: The climate. Sovacool and Geels (2016) argue that: "In evolutionary terms, historical transitions were more about developing 'variations' (technologies), whereas low-carbon transitions will also be about adjusting 'selection environments' (via policies, regulations, and incentives that shape markets)." One of the challenges in sustainability transitions is that the selection environments mentioned by Sovacool and Geels (2016) vary. Policies that should be coordinated may differ among regional,

national, and international levels; regulations may have a short-term timeframe; incentives may not function as they should, thus have a lesser outcome. Guidance and governance often play a particular role, together with long-term goals that inform the direction of the transition (Merkard, Raven, & Truffer, 2012, p. 956). Such long-term perspectives guided by targets are found at the municipality, national, regional, and international levels. Also, within the shipping industry. A sustainability transition is purposeful and intended, and a broad range of actors is expected and required to work together in a coordinated way. Such transitions take decades to unfold (Köhler, et al., 2019, p. 3).

As transitions take off and accelerate the issue of politics and advocating strength remains critical. In transitions towards renewable (or low carbon) fuel or electricity generation, the economic and political struggles of key actors such as utility companies and industry associations are intensifying. The polarization between winners and losers may become more evident.

3. Sustainability: A regulatory challenge for the shipping industry

The shipping industry is a significant contributor to the global environmental footprint - approximately 3% of the global CO_2-emissions (Maritimt Forum, 2020, p. 3). The industry has grown continuously over the past decades. It is predicted that shipping activities, hence emissions, are expected to rise between 50% and 250% by 2050 in the absence of significant mitigation policies (Corsi, 2018). This chapter seeks to provide the necessary knowledge of the maritime industry and the operational framework under which the industry operates. This includes the role of shipping in international climate politics. Further, this chapter highlights two pressing challenges for the shipping industry's sustainability transition, namely the complex governance structure, and second, that it is not merely a technological transition.

At the core of international shipping is the fundamental principle of the "freedom-of-the-seas" doctrine (Lister, 2015). It is a principle put forth in the 17th century, inherently limiting national rights and jurisdiction over the oceans to a narrow sea belt surrounding a nation's coastline. The rest of the sea was declared free for all and belonged to none (United Nations, 2020). To uphold this core or norm, shipping has a history of being largely free of any regulation that might hinder trade. With this, states' authority over ship operators have been generally weak (Lister, 2015). By the mid-20th century, there was an impetus to extend national claims over offshore resources, and the doctrine of freedom-of-the-seas partially ceased (United Nations, 2020).

International environmental cooperation is, first and foremost, a phenomenon found in the time after World War II, especially the period after 1970 (Boasson, Andresen, & Hønneland, 2008, p. 24). The foundation of the United Nations contributed to systemize international cooperation in several fields, including environmental issues. In the 1950s, these issues seen as narrow technical challenges. Relevant institutions, such as the UNs specialized agency, the International Maritime Organization, were given the mandate to deal with specific resource management issues rather than a broad mandate covering more fundamental environment- and development challenges (Boasson, Andresen, & Hønneland, 2008, p. 24). Today's international system is institutionalized, with thousands of intergovernmental organizations and way more organizations that are engaged in international politics, and hundreds of international agreements (Alter & Raustiala, 2018, p. 329).

By the very nature, shipping requires cooperation between states and international governance, as nation-states trade goods in international waters. Two or more states must allow exit and

entry for a vessel before engaging in shipping services (Zacher & Sutton, 1996, p. 38). This shared sovereignty can give rise to policy conflict between different national regulatory regimes. States must enter into agreements to regulate various aspects of transactions (Zacher & Sutton, 1996, p. 38). Different regulations and requirements, e.g., environmental regulations regarding emissions to air or technology regulation, might hinder a vessel from entering a port, i.e., if the vessels environmental requirements are lower than the regulatory measures set in the arrival port (Zacher & Sutton, 1996, p. 39).

All these institutions, agreements, treaties, and protocols created concerning, e.g., climate change, can be referred to as regimes. Regimes are defined as:

> "A network of legal instruments and customary rules to govern the interactions of actors in specific issue-areas that emerged as a result of multiple negotiations within several institutional bodies among multiple governance actors, recognizing the respective complexity and scope of a specific environmental issue" (Hackmann, 2011, p. 92).

It is important to understand the current maritime industry is organized and institutionalized to contextualize the ongoing maritime sustainability transition. International shipping is a crucial industry for global trade, as 80% of traded goods travel by ship (Maritimt Forum, 2020, p. 3). The industry is also a driving element of economic globalization (Hackmann, 2011). The international shipping industry has historically been an essential sector of connecting different parts of the world.

3.1. A complex international maritime governance structure

A current challenge for the shipping community is that the governance structure they operate in is complex. Maritime governance has several fundamental characteristics that define its operation and composition, which significantly affect what can be achieved, by whom, and its impact upon shipping characteristics. The governance architecture of international shipping is not charged with one authority governing the international industry (Lister, 2015), but e.g., several actors, nations, organizations, institutions, classification societies, flag-states, different regulatory and operational frameworks. Siddharth Mahajan (2019) presented an overview of some of the many regulatory frameworks implemented from January 1st, 2019, from the three governance-levels of the IMO, the EU, and nation states. Here is a minor excerpt:

- IMO Resolution MEPC.286(71): Designation of the Baltic Sea and the North Sea Emission Control Areas for NOX Tier III control;

- IMO Resolution MEPC 282(70): Ship Energy Efficiency Management Plan (SEEMP Part II);
- IMO resolution MEPC.320(74): A global sulphur (SOx) cap was introduced, reducing SOx to 0.5% from former 3.5%, from January 1st, 2020;
- Domestic emissions control requirements in China, Taiwan and Hong Kong: Limiting the sulphur content to exceed 0.50% prior to entering the state's territorial sea (2019);
- EU MRV shipping Regulation 2015/757: Submission of CO_2 emissions report.

The industry's characteristics can be summarized by nation-based, institutionally defined, stakeholders, shipowners, form, and process (Roe, 2013, p. 170). Shipping is an intensely globalized sector with attributes of ownership, operation, finance, legality, supply, demand, labour, and commodities that emerge from almost anywhere in the world, and changing origin and location with intensity and unpredictability (Roe, 2013, p. 170). It retains its predominant role at the IMO, the EU, and domestic shipping policies.

There are three regulatory regimes in the maritime industry which have distinct, yet overlapping, areas of responsibility, namely classification societies, flag states, and coastal states. Other regulatory bodies include the IMO, the International Court of Justice, International Labour Organization (ILO), the European Maritime Safety Agency (EMSA), and the United Nations Convention on the Law of the Sea (UNCLOS).

The IMO is responsible for regulations on ship safety, pollution, and security (Waage, 2009). IMO is, therefore, the primary regulatory body of focus in this paper. The IMO aims to "facilitate cooperation among governments on technical matters in shipping" (Hackmann, 2011, p. 89). The IMO describes their role as "providing a blueprint for maritime sustainability which governments and industry are called upon to act" (Lister, 2015). As nation-states make up IMO, it is up to the states to develop, ratify, and implement corresponding regulations (Lister, 2015). An IMO convention is considered in force if two-thirds of its member states ratify it. It does not apply to the countries not ratifying it, and enforcement relies on the individual member states (Monios, 2020). IMO might face challenges when regulating the 174 member states, all with different strategic interests and objectives.

At an institutional level, regulating maritime shipping is the IMO's exclusive competency (Corsi, 2018). The IMO has consistently failed to consider GHG emissions from shipping. Already in the 1997 Kyoto Protocol, it was requested that the member states of the IMO should develop a comprehensive strategy to address emissions from shipping. The appeal went

unheard. In 2011, after significant international pressure, the IMO Convention MARPOL approved an amendment to Annex VI and set standards to reducing emissions. During the 2015 Paris Agreement negotiations, which established the current framework of international climate change governance, maritime emissions were once again left out, waiting for IMO to tackle the issue (Corsi, 2018).

As a response to IMO's slow processes, among growing international pressures, the EU has threatened to include shipping emissions under the Emission Trading Scheme (ETS) in 2016. The IMO finally agreed on a 7-year GHG roadmap, which laid the basis for the document approved in 2018: the IMO's GHG Strategy (Corsi, 2018). However, the EU is now aiming to include shipping emissions in the ETS and the European Green Deal. Regional meddling adds a governing complexity and a regulatory threat to the norm freedom-of-the-seas.

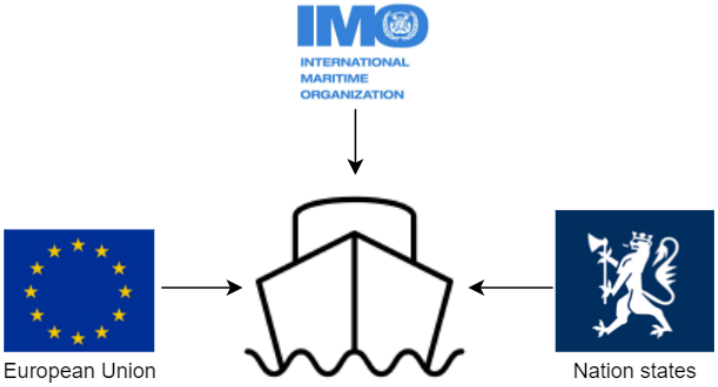

Figure 1: The shipping industry's regime complexity

Figure 2 provides an illustrative example of the three branches of the environmental regulators of the shipping industry: one international regulatory regime (the IMO), one regional authority (the EU), and one nation state (Norway). The three regulatory bodies are only three out of hundreds, considering there are three at the international level, several regional authorities, and 174 IMO member states. The figure shows an industry without one regulative centre, but an industry in-between several regulatory regimes, creating an unpredictable regulatory patchwork for the industry to comply with.

Even though the industry is heavily regulated by several regulatory regimes, the shipping industry are highly significant stakeholders in maritime policy-making (Roe, 2013, p. 171). However, their present influence is so substantial as to overwhelm many other interested parties with genuine stakes. The multitude of tonnage taxation regimes adopted is an example of

relatively profitable shipping companies having gained state subsidies through preferential taxation awarded by nation-states. To remain competitive, one country after another has introduced taxation schemes, like of which is generally unavailable for any other specific industry (Roe, 2013, p. 171)

Steering a maritime low-carbon transition is and will continue to be challenging. Because shipping has a complex international governance structure, it consists of different national policy objectives, goals, interests, and strategies that interfere and contradict other national objectives and global outlooks (Psaraftis, 2018; Hackmann, 2011). The Kyoto Protocol did not regulate GHG emissions from maritime activities. GHG emissions are not included in any legally binding, internationally accepted regulation, including the 2015 Paris Agreement (Psaraftis, 2018; Hackmann, 2011; Skonnord, 2018).

3.2. Not merely a technological transition

In recent years, international shipping has experienced, by governments, the civil society, and the international shipping industry, an increased focus on the significant environmental footprint and GHG emissions emitted from international shipping. The ambitions to reduce emissions are enormous, while the real efforts are lagging due to several industry challenges. The technology needed is considered immature and unavailable until after 2030 (Monios, 2020). The economic situation is unfortunate, and the governance architecture is complex and slow. Massive efforts are needed to mitigate emissions from global shipping activities.

A significant challenge, and maybe the most discussed, of a sustainable transition in the shipping industry, is that the technology needed is not mature yet, or not yet thought of. The current energy regime in maritime activities is marine diesel oil (MDO) and heavy fuel oil (HFO). When talking about a maritime energy transition, it is the transition from fossil fuels like MDO and HFO to alternative fuel types, e.g., hydrogen, ammonia, battery-electric, biogas, and hybrid solutions. But the transition is not merely technological.

Several dimensions are essential to consider when transitioning towards more sustainable fuels. The aspects other than technology is the political context, the economic, social, and environmental dimensions. Especially the political context and economic context are explained in this section as perspectives necessary to include. First, a transitions' political context consists of the hierarchy between policy objectives, choices of instruments and regulations, market conditions for the regime, and niche companies. The instruments influence the practices and outcomes (Kuzemko, Lockwood, Mitchell, & Hoggett, 2016, p. 102).

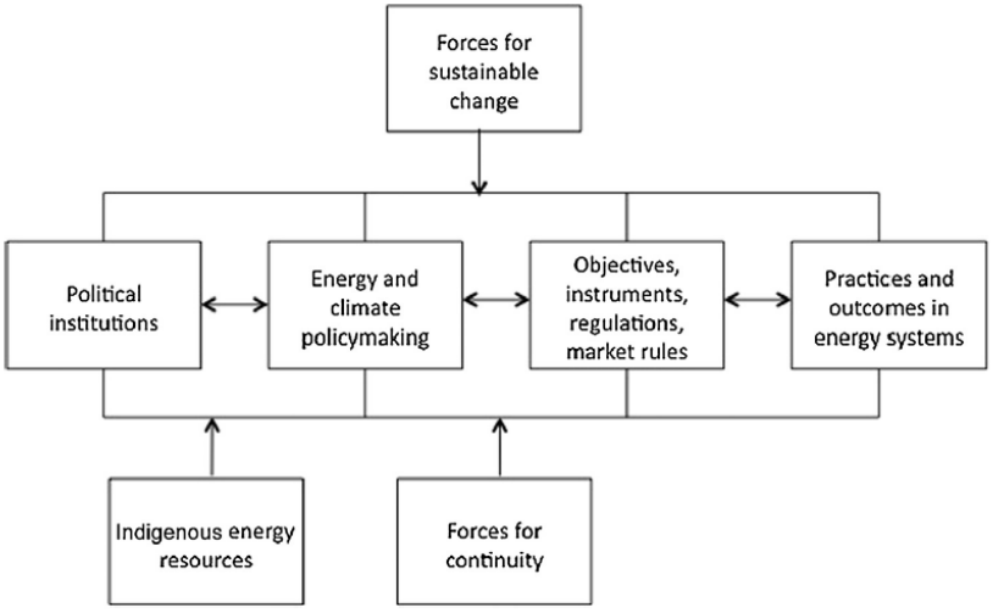

Figure 2: Political context (Kuzemko et al., 2016, p. 102)

Kuzemko, Lockwood, Mitchell and Hoggett (2016) presented the figure above to illustrate the interconnections within governing for sustainable energy system change. The figure presents the 'big picture' (Kuzemko, Lockwood, Mitchell, & Hoggett, 2016, p. 102). As shown in the figure above, political institutions, policy-making, objectives, instruments and regulations are influenced top-down by forces for sustainable change and bottom-up by the well-established energy resources (e.g., oil and gas), and forces for continuity (e.g., industry actors invested in the well-established energy resources).

The economic dimension of the low-carbon transitions is considerable, as an industry's economic capabilities to transition are crucial. The economic situation of the shipping industry has been weak ever since the financial crisis of 2009-2015. The recent COVID-19 pandemic has again stroked the industry with waves of economic uncertainty in times of recovering. Several shipowners have seen it necessary to store their vessels due to the financial situation and the unprofitable environment with low rates.

The challenge of a socio-technical transition in the maritime industry is not merely technological. There are several dimensions that the shipping industry must consider when making decisions. It involves different regulatory regimes, the political environment, the financial situation of an industry, and actors involved. Sustainability transitions are challenged by differing visions (Geels F. W., 2010, p. 500). The shipping industry is exceedingly challenged by these differing visions, due the industry's highly international character, and the significant number of regulatory bodies, nations, organizations, companies, etc., with differing

interpretations of the right balance between the transitional dimensions, and rankings of environmental problems, and different opinions about the solutions. These actors serve as either force for continuity, or forces for sustainable change. The international shipping community is in a difficult position, and staining position, to find common goals and grounds for successfully perform a sustainability transition.

3.3. Businesses and industries in sustainability transitions

Firms and industry actors play critical roles in sustainability transitions (Köhler, et al., 2019, p. 11). They function as innovators, developers of new products and services and business models, contribute to market creation for novel technologies, or work toward the formation of new industries (Köhler, et al., 2019, p. 11). Firms and industry associations engage in broader institutional work as they shape societal discourses and problem framing, lobby for specific policies and regulations, develop industry standards, legitimate new technologies, or shape collective expectations on behalf of their members. Consequently, new industries emerge, and existing industries transform, or even decline.

When transition scholars study businesses and industries, they are typically interested in how firms and other organizations contribute to (or slow down) transitions and how organizational and business dimension changes affect transformation more broadly (Köhler, et al., 2019). Köhler et al., (2019) argue that there is significant potential to intensify research at the intersection of businesses and industries. One way to do it is to include organizational strategies, resources, and institutional entrepreneurship.

The shipping industry is exposed to external environments such as new regulations, policies, technological developments, shifts in public opinion, or consumer preferences (Vormedal I. , 2011, p. 2). Changes in the external environment can alter the limits and possibilities of business conduct. Therefore, companies must continuously consider expectations, demands, and future trends in the external environment and how that environment likely is to affect their business (Vormedal I. , 2011, p. 2). Shipowners have the last decades experienced a changing external environment, as emission targets are ambitious, alternative technology is rapidly developing, new requirements to environmental standards are implemented by national governments, the EU, the IMO, as well as consumers (or charterers).

The new and stricter environmental regulation may limit a company's ability to conduct business as usual, as new regulations that require emission reductions may induce high compliance and adjustment costs. The challenge of not having technology that is mature and

commercially viable, and the shipping industry's financial situation adds further uncertainty and financial capacity to adjust.

Shipowners are operating in a high fossil fuel-intensive industry, and current systems are under alteration. When proposals of new environmental regulation first emerge on the policy agenda, affected industries are likely to pursue a strategy of opposition. However, uncertain conditions that may emerge as an issue area of environmental governance measures, business opposition is likely to decrease, become more fragmented, and shift towards regulatory support. Vormedal (2011) identified three conditions that may cause corporations and business lobbies to begin support and/or push for the adoption of new environmental regulations: (i) the emergence of uneven playing fields, (ii) the increase of regulatory threats and uncertainties, and (iii) the proliferation of new market opportunities.

How firms react to new environmental regulations may threaten the business models of the shipping industry. The anticipation of new regulation and/or de-facto regulatory developments represents an important determinant of the company's strategy. Two models of response strategies of the shipping industry will be described in the following chapter. By presenting two response models, this study aims to identify what strategies the Norwegian shipping industry is pursuing in response to the regulatory challenges involved with the sustainability transition, by identifying regulatory challenges and opportunities, and identify whether the chosen strategy can be deemed a success.

4. Corporate response strategies to meet the challenges

The previous section has outlined the role of businesses in sustainability transitions. Corporations have different ways to respond to environmental regulation. This thesis will incorporate the framework of corporate responses strategies to environmental regulation by using the two models: The r*eactive response model* and the *proactive response model* to investigate the Norwegian shipping industry's responses to environmental regulation, to form an understanding of the strategy pursued by the industry.

Regulatory strategies with environmental policies may vary significantly according to a broad range of conditions, from company-level variables like managerial perceptions or the ability to produce technological innovations to industry type, distributional effects, and the firm's socio-political context (Vormedal & Skjærseth, 2019, p. 1). It is less known about the roots of heterogeneous firm preferences within industries that face common regulatory pressures. Studies, therefore, distinguish between ideal-typical corporate strategies as either reactive or proactive. The reactive strategy is depicting business opposition when regulation threatens profitability and competitiveness. The proactive strategy is points to support or advocacy when firms can seize opportunities that strengthen their competitive advantage (Vormedal & Skjærseth, 2019, p. 3).

Essential elements of the models are the company-external *political responses* and company-internal *market responses.* The elements are important to confirm the industry's strategic position, or response model. Political responses refer to strategic company support or opposition to new regulation, and market responses concerns compliance and problem-solving measures, such as innovations in production technology (Vormedal & Skjærseth, 2019, p. 4). Which political responses and market responses that are assumed associated with the models are presented in relation to the models below. Market responses should correlate with the political responses to identify whether strategic positions conform the actual behaviour of an industry.

In studies of relationships between business and environmental regulation, a distinction can be made between those based on a neoclassical economics inspired assumption of company behaviour as "perfectly rational", which suggests a negative relationship between regulation and competitiveness (Vormedal & Skjærseth, 2019). Studies in behavioural economics-inspired assumption of company actions as "boundly rational" suggest a positive relationship between regulation and competitiveness. These two competing views underpin the two models for expected strategic responses, as either reactive or proactive. The view of company behaviour

as “perfectly rational” fits into the reactive response model, whereas company actions as “boundly rational” fits the proactive response model. The corporate response models, which will be presented in the following sections, are ideal type, representing opposite poles of the same analytical continuum (Vormedal & Skjærseth, 2019). They can be utilized as heuristic tools for analysing variations in corporate responses to environmental regulation.

4.1. The reactive corporate response model

The reactive corporate response model is grounded in firm’s traditional economics views as unitary rational, profit-maximizing agents that develop strategies based on full information of the relative costs of various alternatives. Before regulation, companies will have adapted optimally in output and input markets at levels reflecting the marginal income equal to marginal costs. Since new environmental regulations change companies for previous free by-products and impose sizable compliance costs that can erode profits, regulation is seen as diverting capital away from innovation and other investments, thereby threatening the firm’s competitiveness.

In this view, environmental regulation can be assumed to represent a threat to corporations. We expect *political responses* that seek to minimize new regulatory costs by opposing increasingly strict regulations. As to *market responses*, companies would like to choose compliance options based on cost-ranking, adopting only low-cost, incremental, and business-as-usual options. Based on the assumption that profit-maximization firms with full information had already discovered all the “low-hanging fruits” and taken advantage of such opportunities before the regulation was implemented. We would expect business-as-usual activities and compliance measures focused on incremental improvements to existing production and mitigation options, with no strong focus on radical innovations.

4.2. The proactive corporate response model

The proactive response model assumes that the firm is “boundedly rational”, suggesting a positive relationship between regulation and competitiveness (Vormedal & Skjærseth, 2019). While striving to maximize profits, strategic managerial choices are assumed to be influenced by other, company-internal and external factors, including design of regulations or market failures, organizational practices and operating procedures, perceptions of risks and opportunities, and information constraints, habits or routines.

According to these assumptions, environmental regulation will not necessarily represent a threat to profits and competitiveness: Indeed, it may contribute to innovation, improved

performance, and competitive advantages. “Appropriately” designed environmental regulation is particularly likely to create new opportunities, spur learning about resource inefficiencies and technological improvements, reduce uncertainty about future investment, and stimulate innovations that can offset compliance costs. Appropriate regulation should focus on outcomes, not specific technologies. Best-available-technology regulation will hinder innovation, as companies will lack incentives to progress beyond the technology required. Second, regulation must be strict enough to spur radical innovation, as companies are likely to respond to lax regulation with short-term adjustments and incremental improvements to existing practices. Third, regulation should incentivize continuous improvements and be based on market incentives. Finally, uncertainty should be reduced by coordinating relevant regulations, ensuring predictability, and providing phase-in periods to avoid expensive solutions.

In this view, environmental regulation can represent an opportunity for corporations. We would expect *political responses* that support or advocate stricter regulation that enables firms to exploit new business opportunities and strengthen competitive advantages in environmental management and technology. Support to government proposals or a preference for regulation expresses in interviews, consultations, and other lobby papers would be in line with this expectation. Concerning *market responses*, companies can be assumed to start searching for new innovative solutions beyond business-as-usual, to create early-mover advantages. We expect beyond-compliance measures and investments in long-term, radical innovation projects since corporate management would direct attention toward new entrepreneurial opportunities. Documentation of technology innovation and demonstration projects, or participation in private certification schemes requiring stricter environmental management than government regulation would be in line with this expectation.

4.3. Why different response models matter

The reactive and proactive models capture how regulation can be represented as a threat and an opportunity to company profitability and competitiveness. How new regulations are perceived depends on several factors, including the industry’s economic capabilities, the regulatory regime, challenges, and opportunities the industry is facing. The reactive and proactive models for corporative strategies can only partly explain the diverging responses from the firms. The international maritime community is faced with an asymmetrical distribution of regulatory burdens. The competitive advantages vary between companies in different flag-states, providing a plausible complementary explanation for the marked discrepancy in the response strategies. Predatory motives behind corporate support or advocacy for stricter regulation are

plausible (Vormedal & Skjærseth, 2019, p. 2). A company's size might matter concerning to a firm's ability to capitalize on opportunities and competitive advantages under strict environmental regulation. Size is also relevant to consider in studying the Norwegian fleet, as it also varies in size.

There are a variety of policies, measures, instruments, and approaches are available to limit GHG emissions, including regulations, standards, taxes and charges, tradable permits, voluntary agreements, informational instruments, subsidies and incentives, research and development and development assistance (Gupta, et al., 2007, p. 750). Most governments' policy-making process consists of complex choices involving many stakeholders, including the potential regulated industry, suppliers, producers, labour organizations and environmental organizations (Gupta, et al., 2007, p. 753). Moreover, the strategy pursued by an industry may tell us about what the industry sees as opportunities and challenges in the future and outline the capabilities of the industry to succeed and achieve the targets set. Regarding capability, the industry is faced with opportunities and challenges in influencing the implementation processes of regulation at the different governance levels, e.g., the international level (the IMO), the regional level (EU), and the national level (Norway). The industry is of a variable degree capable of influencing the choice of policy instruments and regulations.

International regimes can incorporate goals for the short, medium – and long-term. Goals provide a common vision about the future and, therefore, the design of the international regime (Gupta, et al., 2007, p. 769). The primary advantage of a regulatory standard, is that it may be tailored to the industry, considering the industry's specific circumstances (Gupta, et al., 2007, p. 754). The industry has less influencing impact at the international level, due to the other 174 nations aiming to influence the IMO. The fact that there are many opinions regarding the regulatory regime also makes it harder for the IMO to introduce coercive (or "hard") policy instruments, such as emission trading schemes or taxes. Regulations and standards are by the shipping industry important, as shipping is of international character, hence similar "rules of the game" are important for equal competitive conditions. At the EU-level, the influence of the industry varies. The EU can set specific goals, but the goals will be conquered if adopted internationally. For the EU, regulation is vital. The EU has its own tools for mitigation available, coercive, and non-coercive (or "soft") instruments, such as the EU ETS and taxes. The industry's influence over the goals and instruments vary. The industry is naturally more capable of influencing national policy instruments to reduce GHG emissions (Gupta, et al., 2007, p. 750).

5. Research design: Case study on the Norwegian shipping industry

The thesis's case under investigation is the Norwegian shipping industry. The shipping industry is defined as "all businesses that own, operate, design, build, supply equipment or specialized services for all types of ships and other floating units" (Jakobsen, Mellbye, & Holmen, 2013, p. 4). The industry's definition is quite broad; therefore, the primary focus is on shipowners/shipping companies who own, operate, build vessels, and specialized their services for different kinds of operations, and the shipping industry's interest organizations. The shipping companies make up 60% of Norway's value creation, before the service providers, shipyards and equipment manufacturers (Miljødirektoratet, 2020).

Norway is a consensus-seeking, oil and gas dominated, small-state, with a social investment political economy and forward-looking foreign policy based on norm-setting and multilateralism (Ćetković & Skjærseth, 2019, p. 1039). Norway is the second wealthiest OECD country in GDP per capita, and most of the wealth comes from the production and export of carbon-intensive fuels (Ćetković & Skjærseth, 2019, p. 1040). Norway has been argued to hold historical responsibility for driving climate change and is also expressing its commitment to mitigating climate change, domestically and internationally. Sustainable development and environmental protection have constituted important elements of Norway's foreign policy ever since Gro Harlem Brundtland, the first female prime minister in Norway, and 'Our Common Future' in 1987 (Ćetković & Skjærseth, 2019, p. 1039).

Norway is recognized globally as one of the world's leading maritime nations. The Norwegian fleet is the 5th largest globally, measured in value (Maritimt Forum, 2020, p. 27). Not only does this give Norway influence in the IMO, but it also gives Norway weight at a regional level, as a partner to the EU and in the preparation of European frameworks (Maritimt Forum, 2020).

5.1. Single case study

This thesis is a case study of the Norwegian shipping industry, exploring the Norwegian shipping industry's responses to regulatory environmental uncertainties of sustainability transitions, and whether their chosen strategy is deemed a success. Doing a case study, and a single case study, allows the thesis the opportunity to go in-depth on a case and retain a holistic and real-world perspective on a contemporary issue and understand the context surrounding the case (Yin, 2018, p. 5). Case studies are preferred when the relevant behaviours cannot be manipulated, and when the desire to study contemporary events. Case studies rely on many of the same techniques as in history. But case studies also rely heavily on two sources of evidence

not usually available as part of the conventional historian's repertoire, direct observation of the events being studies and interviews of persons who may still be involved in these events (Yin, 2018, p. 12).

The choice of doing a single case study is embedded rooted in the fact that the Norwegian shipping industry, as a unit, is a unique and unusual case (Yin, 2018, p. 50). This will be accounted for in the next section which justifies the case selection.

5.2. Case selection

The shipping industry is the second largest industry in Norway. The historical importance, the level of ambition, and the Norwegian shipping industry's international influence makes Norway an interesting case. Norway is a historically shipping nation. Norwegians have lived by the sea and of the sea throughout times. The opportunities that lie in the oceans are vital for Norway's value creation and have proven to be so from the time of the Norwegian Vikings who were first to explore the world by ships and sail. Fish has been a substantial resource base along the coast of Norway. In more recent time, the export of petroleum and fish has become the two biggest exports. Ships are central in this picture. And with-it expertise, a robust knowledge base, innovative potential, and a competitive edge (Norwegian Ministry of Climate and Environment, 2015, p. 27). How small-state Norway, today, makes up the 5th largest fleet is an extraordinary story.

The target is to reduce domestic shipping and fisheries emissions by 50% by 2030 (Norwegian Ministry of Climate and Environment, 2019, p. 7). The target has been widely discussed among several central actors in the maritime landscape. The former minister of Climate and Environment, Ola Elvestuen, and technology expert Marius Gjerseth from Zero argued that the target will be "extremely difficult to achieve", and limited time remains until 2030 (Stensvold T. , 2019). The CEO of the cluster NCE Maritime CleanTech, Hege Økland, believes the targets could have been more ambitious, but points to the problem of competing interests within the Norwegian government (Stensvold T. , 2019). The IMO's target by 2050 is a 50% reduction of emissions. The Norwegian government and the Norwegian shipowners' association were important driving forces to set a high ambition level (Skonnord, 2018). While other countries' delegations may seem divisive and less well-considered in the IMO, Norwegian administration and shipping companies achieve great impact by joining together and knowledge-based negotiations (Jakobsen, Mellbye, & Holmen, 2013, p. 28).

There are reasons to assume that the Norwegian shipping industry is likely to pursue a proactive strategy, rather than oppose stricter regulations. First, Norway has a complete maritime cluster with leading international players in most business areas such as shipping companies (i.e., shipowners), classification companies, financial institutions, shipyards, and equipment suppliers (Ringdal, 2019). The core of the cluster is the shipping companies – which also ensure access to experience-based expertise from the sea. Second, the Norwegian shipping industry is a leader in developing environmental technology. Stricter environmental regulation could, therefore, strengthen the industry's competitive advantage. Third, the Norwegian shipping industry has positioned itself as a high-cost industry with a valuable and specialized fleet. Therefore, it can be assumed that part of the Norwegian strategy is to potentially export environmentally friendly technology, therefore pushing for/supporting stricter environmental regulation.

The shipping industry is operating in a highly complex and multi-layered environment. In the context of the complexity the industry faces in terms of governance and operation, looking at whether the Norwegian shipping industry pursues a proactive or reactive strategy, Norway's capabilities to achieve the targets in reducing emissions from the shipping industry will be discovered. Shipping companies that have positioned themselves correctly in anticipation of rigorous future environmental requirements may have a competitive advantage in the future, and a chance to live up to the international ambitions agreed upon. By studying the shipping companies and interest organizations in the frame of regulations and requirements in such a complex governance structure, the industry's challenges and opportunities are a subject of interest. Opportunities and challenges are part of the transition and identifying these is of interest. Considering the targets set, the position of Norway in the IMO and the industry's regulatory regime, the Norwegian government's ambition level for what the shipping industry should achieve by 2030, the strategy pursued by the industry will be of great importance to whether the goals are reached.

5.3. Research strategy

This thesis is concerned with creating a further understanding of the shipping industry's strategies and motives towards meeting ever stricter environmental regulations from different governance levels. In the broader phenomenon of sustainability transitions, the role of businesses and industries will be highlighted. As environmental regulation is considered to become stricter, why companies respond as they do is interesting in the light of the broader success of transitions and the shipping industry. Not meeting regulation will limit a company's

operational, and for the shipping sector, the oceans have no borders. The nature of the research topic of the responses to environmental regulation, and the phenomena of strategies and motives that lie within actors in the shipping industry, directs the thesis towards an abductive research strategy. The abductive research task is to re-contextualize and discuss the strategies and motives of shipping actors from the theoretical perspectives.

There are four different modes of inference: deduction, induction, abduction, and retroduction (Danermark, Ekström, Jakobsen, & Karlsson, 2002, p. 75). They constitute central parts of structure and preconditions of scientific reasoning, and thus the core of the scientific method. 'Inference' is descriptions of various procedures, reasoning and arguing applied when we in science relate to the in general. The abductive principles are based on trying to explain and understand a (social) phenomenon through conceptual frameworks (Danermark, Ekström, Jakobsen, & Karlsson, 2002). The strategy guides the interpretative processes by which we ascribe meaning to events concerning a broader context (Danermark, Ekström, Jakobsen, & Karlsson, 2002, p. 80).

The strategy of abduction is concerned with the structures of social phenomena that are not directly observable, but analysis cases of individual phenomena to imply something about general structures (Danermark, Ekström, Jakobsen, & Karlsson, 2002, p. 88). An abductive research strategy can be used to answer both 'why' and 'what' questions, to produce understanding and provide reasons for the phenomenon (Blaikie & Priest, 2019, p. 99).

The limitation is there are no fixed criteria from which it is possible to assess in a definite way the validity of an abductive conclusion (Danermark, Ekström, Jakobsen, & Karlsson, 2002, p. 81).

6. Methodology

The thesis's empirical analysis is based on the principles from the theoretical starting point of sustainability transition, and the response models/strategies to stricter environmental regulation. The Norwegian shipping industry's motives and opinions regarding the sustainability transition are under investigation. Given the bounded context of shipping activities, and its highly globalized and international nature, Norway represents the main spatial context in examining the actors concerned with stricter environmental regulation. Making use of the right tools is crucial to satisfy the purpose of this thesis. When conducting social science research, one can use a wide range of tools for generating data. Before embarking on the empirical findings and analysis, the methods for acquiring the knowledge needed to answer the research questions must be established.

6.1. Empirical methodology

This thesis applies a qualitative research approach. Qualitative and quantitative methods concern different aspects. The qualitative method is concerned with producing discursive descriptions and exploring social actor's meanings and interpretations, whereas quantitative methods are concerned with counting and measuring aspects of social life (Blaikie & Priest, 2019, p. 200). Qualitative research methods provide a systematic way to collect, analyse, and present non-numeric data about a particular subject (Frattaroli, 2012, p. 222). Interviews are one of the most frequently used methods to generate data. Still, data may also be collected through observation, diaries, or other forms of text, such as reports, communications, and scientific publications (King & Horrocks, 2010, p. 6). The choice of methods should be justified in relation to the research in question.

Given that this thesis explores the Norwegian shipping industry's strategies in responding to stricter environmental regulation in view of regulatory uncertainties with the sustainability transition, and what regulatory challenges and opportunities they face in the transition, it fits a qualitative research approach, as these methods have a record of explaining social actors meanings and interpretations.

A narrative explanation will be used to capture the complex interactions between the shipping industry and the governance-levels and the regulatory uncertainties. According to Griffin, in Grin, Rotmans, and Schot (2010):

> "Narrative explanation takes the form of an unfolding, open-ended story fraught with conjunctures and contingency, where what happens, an action in fact happens because of its order and position in the story" (p. 97).

Narratives are always about something or someone, who has certain aims, undertakes an action, learns, and adjusts (Grin, Rotmans, & Schot, 2010, p. 97). In this sense, events are not single properties, but complex conjectures in which complex actors encounter complex structures. There are no independent causes since no cause ever acts except in complex conjunctures with others. Narrative explanations always involve pattern recognition, which to some degree, entails interpretation.

The timeframe of the research is set to focus on the period from 2000 until 2020. This period marks the acceleration of the climate – and environmental focus of the shipping companies. The year 2000 also launched the development and regulatory process of LNG. As narratives are open-ended, the time frame goes beyond 2020, as expectations of future developments will be included.

6.2. Data collection

The qualitative data are collected through documents and interviews with central actors in the Norwegian shipping sustainability transition. Six semi-structured interviews with informants from four shipping companies, with fleets ranging from 15 vessels to 130 vessels, and two shipowners' associations have been conducted.

The study draws on multiple data sources. The paper will triangulate the interview data against key documentation resembling legal documents, industry position papers, and written comments by individual companies and industry interest associations to new regulatory proposals in government consultations. Shipping companies tend to align behind interest organizations mandated to protect their interests, associations are therefore a subject of interest. I will also draw on written inputs from the most extensive industry organizations and other submissions towards regulation. This documentation will provide abundant material about corporate responses and show the correlation between corporations' domestic and international focus.

Interviews with key informants from four shipping companies and two shipowners' – and interest associations are conducted. Representatives of the companies Solstad Offshore ASA, Eidesvik Offshore ASA, Knutsen OAS Shipping, and Østensjø Rederi are interviewed, and representatives from the Norwegian Shipowners' Association and Kystrederiene.

By interviewing four different shipping companies and two highly relevant interest organisations, who also represent the industry in meeting with the government at the state level, the EU at the regional level, and the IMO at the international level, the case study will have the strength of grasping a holistic view and connect the shipping companies' data to the broader context of the sustainability transition. Hence, the information can contribute to describing better, explain, and predict the various political – and market responses and outcomes.

The interviews are to be supplemented by documents. The documents will be collected through secondary sources, such as reports from the industry, articles with statements from the industry (e.g., Teknisk Ukeblad), public debates (mainly newspapers) and official strategy documents. The documents can provide the information necessary to understand the actors' history, and former opinions, positions, and statements.

6.2.1. Semi-structured interviews

Interviews may be carried out in various ways, ranging from group interviews, individual interviews, and from face-to-face to interviews over technological mediums, such as video. The length of the interview is important to reflect upon prior to the conversation. For this thesis, decisions were based on the situational conditions regarding the COVID-19 situation and the Government's lock-down of Norway. This put some constrains on the preferred face-to-face meetings. As a result of offices not welcoming guests, four of the interviews were conducted on the Microsoft 365 tool Teams, and two interviews were able to be carried out face-to-face at the informants' office. A positive effect associated with remote interviews is that it is argued that informants are given a greater sense of anonymity (Given, 2008, p. 16).

In contrast to unstructured interviews, semi-structured interviews put the researcher in greater control over the topics in question while stimulating reflective responses rather than fixed (Given, 2008). Semi-structured interviews can be viewed more like a directed conversation in this sense. Semi-structured interviews usually have explicit research goals and generally serve comparative and representative purposes – comparing responses and putting them in the context of common group beliefs and themes (Given, 2008, p. 290). In the case of using a semi-structured interview, the interview guide typically contains a general framework for the interview. Still, the interviewer can pursue the questions in different orders and allocate more time to certain questions, depending on what is most appropriate for each informant (Given, 2008, p. 469).

Open-ended questions were formed, as it was assumed that several perceptions or understandings of reality existed. The interviews were carried out in Norwegian, as all informants were Norwegian speaking. A translated version of the interview guide is attached in the appendix of the thesis.

6.2.2. Choice of informants

The informants' recruitment rested based on acquiring persons with a close relationship or position within the Norwegian shipping community. I chose to pick shipping companies from the Haugesund-region. I have prior knowledge of the chosen shipping companies, from being from this region, and the media. Also, because of the close distance if face-to-face interviews would be possible. The shipowners' associations were chosen based on their representation of the shipping industry in the IMO, the EU, and Norway. To find the right person to interview at the shipping companies chosen, I got valuable help from a key person in Maritimt Forum, who has comprehensive knowledge about Haugesund's shipping community. The informants interviewed hold key positions regarding the environment – and environmental technology in the respective shipping companies, many of whom have been working with climate- and environmental matters since it arrived at the company's agenda.

The potential interview objectives were contacted via email. The email briefly presented the project, the approximated duration of the interview (45 minutes to 1 hour), and what was implied by participating in the project. Attached in the email was the information sheet from the Norwegian Centre for Research Data (NSD), which delineated the more formal aspects by participating.

6.3. Data analysis

Narrative explanations always involve pattern recognition, which to some degree, entails interpretation. Narratives were formed by using the qualitative data analysis computer software Nvivo was used. Nvivo was used to transcribe the interviews and to code the interview - and documents accordingly. In line with the narrative approach, the source types are ideal for describing and mapping narratives. The data has been compared and put in the context of the relevant topics covered. Dey (2004, p. 88) argues that comparison is a vital tool in identifying, classifying, and ordering data. The analysis can then compare the challenges and opportunities presented by the informants from the different shipping companies. Several nodes of codes are created, with under-categories. The most important nodes developed for creating the narratives are "alternative fuel types", "ambitions", "sustainability", "levels of governance", "the green

shift", "competition", "regulation and requirements", "market responses", "opportunities", "challenges", "strategy", "mitigation measures" and "economy". The nodes were set up in advance, but additional nodes were created as I was coding as I saw the need to expand the reach.

An important note regarding the usage of the words 'policy' and 'regulation', is that they are often used in an overlapping manner. There is a difference. Regulation are rules or directives made and maintained by an authority that the industry will have to comply with. In contrast, policies are fundamental decisions of the elected people, as the government and the European Parliament. Regulations need to be stable and are not affected by a change in the political majority after an election, whereas policies may change. Without stable regulations, there will be great confusion and uncertainty for the parties involved. And as the shipping industry is one of the most heavily regulated industries, the regulation is preferred at the international level. In this regard, policies can be seen to be "bi-effects" of regulation. Regulation comes with requirements. Policies and policy instruments, adopted by organisations, businesses, or governments, can help steer the industries towards compliance. Policy instruments may also be regulative (Rogge & Reichardt, 2016, p. 1623), as will be shown later. The industry will have a greater impact on influencing the national-level policies than influence change in, or stricter, regulations at the IMO-level.

As this thesis is mostly concerned with regulation, and the fact that requirements and policies are bi-effect of regulations, policies and policy instruments will also be important in this study because the industry's influence of the different governance levels is under investigation.

6.4. Evaluation of validity and reliability

Science has traditionally emphasized objectivity, so qualitative inquiry emphasizes procedures for minimizing investigator bias and rigorous data collection procedures (Given, 2008, p. 302). Validity and reliability are two factors researchers are concerned about while designing a study, analysing results, and judging the study's quality (Tjora, 2013, p. 202). Reliability concerns the internal criticism of the data (Given, 2008, p. 398), and is demonstrating that the operations of the study, such as data collection procedures, can be repeated (or replicated), with the same results (Yin, 2018, p. 42). Validity is concerned with the external critique of the data (Given, 2008, p. 398). It is understood as whether the means of measurement are accurate and whether they measure what they measure (Tjora, 2013, p. 206).

A common strategy for testing validity is through triangulation. The informants were recruited based on qualifications and hands-on-experience with climate – and related environmental regulations, by the assistance of an 'insider' from the industry. To ensure credibility of data, accuracy and to control potential bias, the informants' claims were compared and cross-checked with secondary sources. From the interview data with the different companies and interest organisations, a general pattern emerged, which adds support to the findings' validity.

As the research is of a contemporary issue and abductive inquiry, it might be hard for researchers to replicate the findings of several reasons. It might prove hard for others to reach the same conclusions for the industry as a whole. The shipping companies interviewed are four out of approximately 300 shipping companies in Norway. The data collected in this study is based on these companies. The information given is compared and contextualized by the more general opinion given by the shipowners' associations, which is concerning the whole Norwegian shipping industry. As it is a contemporary issue, the strategy pursued might also change accordingly with new regulatory developments, regulatory changes, changes in regimes, and as technology is developing. If the study is to be replicated successfully, the same companies should be interviewed or similar in structure and operating segments. The case study database (Nvivo) is enhancing the probability of replicating the study.

Overall, this research's trustworthiness is believed to hold high standards due to the variety and quality of the sources used. The findings and the conclusion do not diverge from the nature of the data accumulated; the interviews represent a reliable form to gather solid facts and infer general patterns.

7. Empirical findings and analysis

This chapter presents the study's empirical data. The interview – and document data is coded and analysed to map narratives of the regulatory challenges and opportunities of the sustainability transiting, to identify the strategy pursued of the industry towards responding to environmental regulation, and to be able to deem if the shipping industry's chosen strategy can be deemed a success. The empirical findings are structured in close consideration of the corporate response models and its elements, company-external *political responses,* and the company-internal *market responses.* The former refers to strategic company support or opposition to new regulation, and the latter concerns compliance and problem-solving measures, such as innovations in production technology (Vormedal & Skjærseth, 2019).

Insights from this thesis informants are brought forth in this chapter. The informants are given different codes to distinguish them from one another. The codes are labelled by an 'I', for informant, accompanied by a number, I1, I2, I3, I4, I5, and I6. I1 and I2 represent the shipping associations. And I3, I4, I5, and I6 are informants from the shipping companies.

7.1. Company-external political responses I: Challenges and opportunities

The shipping industry must consider a variety of elements when conducting business and planning for the future. The shipping industry's external *political responses* consists of new legislation, regulations, requirements, policies, and strategies that outline the direction the industry is heading towards (Vormedal & Skjærseth, 2019). It also include economic factors, technological developments and shifts in consumer preferences (Vormedal I. , 2011, p. 2).

The challenges and opportunities found in the shipping industry's external environment are affecting the shipping companies' political responses towards regulation. As changes in the external environment can alter the limits and possibilities of business conduct, companies must continuously consider expectations, demands, and future trends in the external environment and how that environment likely is to affect their business (Vormedal I. , 2011, p. 2). The challenges and opportunities raised by the informants are relevant to answer the research question as it helps gain a holistic view over the company-external operating environment. Therefore, this section explores the challenges and opportunities of technology, the financial situation, and the investment capacity of shipping companies and how they view environmental regulations. The data used in this section is mainly based on the interview data, and supplemented by secondary media articles, to aim for triangulation.

7.1.1. Technological

Even though the transition towards sustainable fuels in the shipping industry is not merely technological, technology is crucial for this transition. The shipping industry is dependent on alternative technology to reduce emissions. The topic of technology was unavoidable during the interviews.

IMO believes technology will be ready after 2030. Informants from the shipping companies' views on this are that IMO's perspective may be true. However, the technology might be developed already in 2023 or 2025 and spread subsequently (I5). How long it will take for the technology to be commercial on a large scale depends on several factors, including economical, which regulations and requirements that will come, and how the market responds to the new technological solutions. As mentioned, there is no viable commercial, technological alternative that will reduce emissions on a full scale. Today, vessels are still built to be powered by conventional fuels such as MDO and MGO. "We have to. We don't want to" (I3). Now, several shipping companies are implementing battery-hybrid packages to supplement fossil fuels. The battery capacity is not significant enough to run even close to emission-free, but battery packages can be used as a secondary fuel, for example when the vessel is standing still in calm water.

One issue that arises when talking about environmentally friendly fuel technologies is energy density. Energy density is a symbol of how far you can go on a litre of fuel. Diesel has the highest density. LNG has about 20% less density. LNG then requires a 20% larger tank to go the same distance. Hydrogen has less than LNG and must have an even larger tank to go as far as a diesel vessel (I2).

One main challenge, which proved to be relevant for all the shipping company representatives interviewed, was the issue of committing to a specific fuel technology of the future. As the technology-of-the-future is not existing yet, shipping companies have no way of knowing what the "popular" fuel is in 5, 10, or 15 years ahead (I5). Now, the shipping companies focus on flexible solutions to meet future technology demands (I3 & I4). Therefore, the engine is fuelled with MDO or oil, but by adding the flexibility, there is room for alteration and implementing a future fuel, whether this proves to be ammonia or hydrogen. Despite not having sufficient technology, the shipping companies are focusing on alternative ways to reduce emissions, e.g., to focus on energy efficiency (I3).

In terms of the ambition level, some informants did not believe the technology would serve as an obstacle to achieving the shipping community's ambitions (I6, I5, & I3). Instead, other elements are hindering the transition. Among them is the lack of strict enough regulations and enough incentives to find technological solutions for new fuels (I1). I6 stated: "In terms of technology maturity, it is not very much of a challenge. And I do not think it is so difficult technically to reach the finish line". The main issue, stated by the informants, is the financing of projects. This bridges well to the next section, which aims to explain the industry's main challenge: The challenging financial situation of the industry.

7.1.2. Financial situation and investment capacity

The shipping industry's economic challenges are maybe the most pressing challenge and the one that proves most challenging to overcome for the shipping companies. The Norwegian shipping industry and the petroleum sector are closely linked (Norwegian Ministry of Climate and Environment, 2019, p. 14). Maritime operations play a key role in the entire oil- and gas industry's value chain. Vessels are required to map the seabed and find where to drill for oil; when developing the oil fields, construction vessels are needed; in the operational phase, supply ships are necessary to maintain daily production; and by the end of life of the oil fields, the vessels remove the platforms (Jakobsen, Mellbye, & Holmen, 2013, p. 6). Most domestic cargo activities are commissioned by the oil and gas industry (Norwegian Ministry of Climate and Environment, 2019, p. 14). If we turn the coin, the oil business creates a large market for maritime service providers. When the oil price is high, it means that the maritime industry benefits from profitability and growth (Jakobsen, Mellbye, & Holmen, 2013, p. 41). This links these two sectors very tightly, and changes in one sector might lead to changes in the other.

All the shipping representatives interviewed stated that the economy is the driver of a shipping company (I1, I2, I3, I4, I5 & I6 (Stensvold T. , 2010)). Projects where there is little to no financial prospects, will not be followed through. Retrofitting and new buildings of vessels are incredibly expensive. Therefore, financial support from the NOx-fund, funding agencies, governmental incentives, and EU programs (e.g., Horizon Europe) are necessary to move forward (I5, I6 & I2). Financial support has proven to be even more important, as the financial situation among shipping companies has since 2014 and onwards been "economically challenging" (I1, I2, I3, I4, I5 & I6). First, in 2014, in the context of the financial crisis, which also hit the petroleum industry hard. Secondly, the current COVID-19 situation has prolonged the challenging financial situation and has led to several projects are put on indefinite hold, and uncertainties in the markets have, once again, aroused.

The shipping companies are also aiming at long-term contracts (2.5-15 years) to be able to pay down the loans, especially if the shipping company commit to a design. Building a new vessel costs between 200 million to 1.5 billion NOK, depending on the technology used, segment, purpose, design, etc. As per today, low-carbon technology is costly. Since 2014, shipping companies have not been able to afford to build new vessels and invest in new low-carbon technology projects (I5 & I6). To a large extent, the last 6-5 years, shipping companies financial situation has been characterized by focusing on the renegotiation of payment obligations, less profitable short to medium-term contracts, vessels laid in storage, a wish to sell or get rid of old tonnage, high competition, and charterers looking for as cheap as possible transportation (I3, I4, I5 & I6). Companies or instances (e.g., municipalities and government) chartering vessels are not yet willing to pay the extra cost for low-carbon technology (I2).

The informants pointed out areas where support is needed. Generally, framework conditions which enables companies to newbuild are needed and existing frameworks must be strengthened. The main issue to newbuild is lack of equity, which regularly varies from 35-45% of the total costs (I2). A second issue is top financing and the term of loans. Even though environmentally friendly technology is costly to implement, and in an operating environment where the investment capacity is low, the informants still stated that "sustainability sells" (I5). For shipping companies that did move early on sustainability-focused operation and environmentally friendly innovation and technology development saw it as a profitable investment just before 2014-15 hit the industry hard (I6). Moving early on, implementing the concept of sustainability and low-carbon vessels, both in terms of design (energy efficiency) and technology, facilitates future business opportunities (I3, I5 & I6).

7.1.3. Environmental regulations

The challenges with regulations are not the regulation itself. But the regulations that do not apply to all (e.g., national legislation, regional regulation), are considered a challenge and a further complexity to the already heavily regulated industry (I2 & I4).

There is a fear among the shipping companies that the regulatory complexity will increase further. One of the main concerns is the fuel they use today. I4 said: "We try to get an overview over how clean, or how pollutive, out fuel is, the amount we use, and how we emit". From mapping the emissions, the shipping companies calculate and report their emissions to the IMO and the EU (I4). Measures and reporting to achieve compliance with regulations and requirements are important, but also time-consuming, and tiresome for shipping companies.

This trend of emission reporting is expected to rise, as it is predicted an increase in regional authorities requiring it and 'new' emissions might be subject to emission reporting.

7.1.3.1. Mindset towards environmental regulations

Being environmentally friendly comes with high financial costs. Even if the environment is a priority of the industry, all shipping companies' principal goal is to earn money. The informants are under the impression that the environment will not be prioritized by the industry before the industry is required to comply with regulation. The informants in this thesis support stricter environmental regulations and requirements. Jan Fredrik Meling, CEO at Eidesvik, said in an interview:

> *"The requirements will come, therefore demand, and we are prepared. We will earn money by being early movers with environmental ships and technology. We acquire advantages, knowledge, and competence by doing so"* (Stensvold T. , 2010).

The informants were asked: *the industry is international, and actors play differently. Do you think it is a prerequisite that requirements and regulations must become stricter for the industry to follow suit? And why?* On which I6 answered:

> *«Yes. The IMO is slow, and it takes an unbelievably long time before regulations and requirements are in place. There have been new rules and requirements at the steps for an infinite number of years. But then members cannot agree, because some hold back – therefore, it is quite conservative and incredibly difficult to keep the required pace because the IMO processes are so slow"* (I6).

I6 would wish that the new regulations would come into force at a faster speed and that they would be stricter. "Partly because it would have given us an even greater competitive advantage. Also, because we have worked with a climate and environment focus for so many years" (I6).

I3 answered: "Yes, regulations and requirements are what it takes for everyone to have environmentally friendly technology". I3 also expressed concerns regarding the slow processes in IMO and that from a climate perspective, the slow processes are worrying. This relationship between regulations and environmental technology is exemplified with a new domestic regulation for NOx and SOx emissions, initially emission-free operations, for cruise ships in Norway's world heritage fjords. "It is great that these requirements are set. The solutions are not there now, but when the requirements are set, the solutions will follow. It starts there, with setting requirements" (I5).

I4 also supports stricter environmental requirements and standards at the international level: "The stricter the requirements, the easier it is to bring out competitors. Given that Norway is actually at the forefront in developing low- and zero-emission technology" (I4). Important for I4 in this regard, is that the requirements should become stricter, but not more complicated.

I5 answered: "Yes, but I struggle with the fact that there are 'no' requirements". I5 wishes the environmental requirements and regulations were stricter, because: "When requirements such as the NOx-tax and IMO Tier III comes, we have to comply". I5 also believes the IMO processes are slow and that particular flag-states aim to block regulatory processes. Eventually, the regulation is implemented, and shipping companies comply. When the company started with LNG, the shipping community only spoke about the GHG CO_2, and not methane. Methane emissions are now regulated. I5's shipping company is already thinking about "what's next" because, in 15 years, the focus on CO_2 might be replaced with a different GHG emission or something else. And then they "want to be ahead".

7.1.3.2. Shipping companies' opinions on domestic mitigation measures

The Norwegian government has several tax systems, and as mentioned, the economic policy instruments are the most important for Norway's efforts in reducing emissions. According to I2: "All taxes weigh on the shipping industry. The industry is exposed to 28 different taxes, whereas the car is exposed to 8. All the sea taxes on sea transport have financed almost the entire infrastructure". Different from road transport, the entire toll system in maritime transport is organized around gross tonnes. When a shipping company installs an environmentally – and climate-friendly propulsion system – the boat increases in gross tonnes, which causes the taxes to increase, this way, shipping companies are 'punished' in the operational situation with higher fees. The companies will also get higher capital costs because they must pay more to get the climate-friendly propulsion system. These things work against an acceleration (I2 & I5).

The government has announced a 5% increase in the CO_2-tax each year. The tax-increase contributes to stimulating that older vessels are retrofitted with battery-package to reduce the CO_2 emissions. This contributes to stimulate that older vessels are retrofitted with a battery-package to reduce the CO_2 emissions (I2). But the income from these environmental taxes goes straight into the government budget. Shipping companies have advocated for the establishment of a CO_2-fund, like the NOx-fund. If some of the costs would be transferred into the actions of reducing emissions from shipping, the shipping industry believes the transition will be more cost-efficient for the companies (I5).

7.1.4. Summary: Uncertainties

The dimensions of technology, economy, regulations, and ambitions are all connected. Changes in an external environment lead to developments in another. The picture that was pained by the informants was that lesson could be drawn from the aquaculture industry, an industry that generally has a lot of funds:

> *"No one wants to have diesel-fuelled vessels if they do not have to. Having a green profile means extremely much. The money that finances them, they see the same [green profile]. Financers want to invest in new and cool projects. Not the old and polluting projects. That is just how it is"* (I5).

The financial situation for the shipping companies is not similar to the aquaculture industry where there are funds. However, making decisions today, and for the future, is a matter of uncertainty. I4 put it like this:

> "*We have made up some thoughts about what the future looks like, but it is all very uncertain. We have some design drawings on our drawing board. And we have our opinions about different fuel alternatives, but for now, we must think flexibility. Because no one knows which direction the green shift is taking"* (I4).

But flexible solutions also costs, and that raises the much-asked questions: who is going to pay? If the investment is put into a project now, will it prove to be the right investment decision in 5-10 years? The shipping industry's operating environment is filled with uncertainty. "Going all-in on a project is not an easy decision to make" (I4). The financial uncertainty, especially considering the COVID-19 situation, is a long-term worry for shipping companies. This uncertainty might hinder Norwegian shipping companies from newbuild, experiment, and innovate new technological solutions.

Thus, conditions related to climate risk do not contribute to the banks being more willing to finance more green technology in shipping companies with too little equity and too low a level of profitability. Climate risk considerations might increase the likelihood that loan lenders will reject an application from a shipping company with equity that wishes to invest in a technology that might lose part of its value due to future regulations (Fjose, Basso, Aamo, Pedersen, & Jakobsen, 2020, p. 43).

The uncertainty regarding regulations is less apparent, as Norwegian shipping companies aim to be ahead of, and advocating for, international regulations. Complying with international

regulation posed by IMO is not a concern. The concern regarding regulation is mainly the fear of regional regulation trending. Regional regulation, e.g., from Brazil or China, will add further complexity to the regulatory regime the shipping industry is exposed to. Despite these challenges, opportunities are found in the company-external political responses. The Norwegian shipping companies interviewed, and the evidence found in media-articles all point to support for stricter environmental regulation, rather than opposition. The company-external political responses support stricter regulation. Hence, the company-external political responses point to a proactive strategy pursued by the Norwegian shipping industry.

7.2 Company-external political responses II: Strategies

An additional element the shipping industry must consider when conducting business and plan for the future is the different governance levels' strategies. The strategies outline the direction of the external environment, and which the industry must relate to and possibly comply with in the future. Due to the shipping industry's complex operating environment, the Norwegian shipping industry is affected by several organs when conducting business. The most relevant governance bodies related to the Norwegian shipping industry's political external environment, regarding environmental issues, are the IMO, the EU, and the Norwegian government. This section explores the official GHG mitigating strategies of the three governance bodies. And aim to differentiate them in terms of ambition level. The newly launched strategy of the Norwegian Shipowners' Association is also included in this section. To some degree, it might be categorized as 'internal' rather than 'external'. Still, as it is a strong signal to the shipping community of the Norwegian shipping industry's direction and action, I will include it under this chapter.

7.2.1. IMO's GHG Strategy

The IMO's ever-first greenhouse gas strategy was approved in 2018 and aimed at reducing emissions for international maritime shipping (Corsi, 2018). Over one hundred IMO member-states signed the strategy. Hence, it represents a milestone in controlling international shipping emissions, which puts an end the IMO's long-standing reluctance to regulate GHG emissions (Corsi, 2018). The IMO has established quantitative GHG emission reduction targets for shipping up to 2050 and proposes a set of policy measures that should be evaluated to achieve these goals. The targets are structured as follows (Corsi, 2018):

> 1. The carbon intensity of new ships should decline by implementing further phases of the energy efficiency design index (EEDI), first approved in 2011. This measure is subject to the review of the MEPC;

2. The CO_2 intensity of international maritime shipping should decline on average by at least 40% by 2030, pursuing efforts towards 70% compared to 2008 levels;

3. GHG emissions from international shipping should peak and decline as soon as possible. Total annual GHG emissions should decline by at least 50% by 2050 compared to 2008 levels, while pursuing efforts to phase them out, in line with the Paris Agreement CO_2 emissions reduction targets and temperature goals.

These emission reduction targets represent a compromise between the IMO member states (Corsi, 2018). For example, on the one hand, Saudi Arabia, Brazil, and the United States strongly opposed the targets and claimed that the IMO should await significant technological developments before establishing mandatory targets. On the other hand, small island developing states (SIDS) demanded emission reduction targets between 70% and 100%, in line with their ambition to fight climate change. A 50% target by 2050 is seen as a compromise.

The strategy includes short-term (2018-2023), medium-term (2023-2030), and long-term (2030-onwards) measures that should be evaluated to reduce the emissions. In 2023 the GHG Strategy is scheduled for revision (Corsi, 2018). The short-term is focus on improving the efficiency of shipping, including research in improving energy-efficient performances and the use of low-carbon fuels. Necessary for this phase is also the suggestion of the development of national action plans to address GHG emissions. Medium-term proposes innovative emission reduction mechanisms, which may include market-based measures (MBMs). If such a measure is to be implemented, it is significant due to IMO's historical reluctance to be subject to such an emission reduction scheme. The scheme would have a global effect, and its implementation would be extremely difficult (Corsi, 2018). What defines the long-term measures is that the alternatives are less defined but includes the pursuit of zero-carbon fuels.

Agreeing on the GHG Strategy is a milestone for international shipping. There is still a long way to go. The ambitions are high, especially in light of the different IMO's member states' interests and national ambitions.

7.2.2. EU's strategy to reduce shipping emissions

EU regulations and requirements for shipping in EU-waters are highly relevant to study when looking at the Norwegian shipping industry. Norway is an EEA-member, and the EU is Norway's most important trading partner and makes up 70% of the total trade (Rolsdorph & Austnes, 2007). Ships are the primary source of transportation of these goods. The EU's regulations and requirements will also be adopted in Norway, and hence have an impact on

Norwegian industries. It is important to note that the EU is not representing its member states in the IMO. The European Commission works towards achieving this, arguing that it is important that all members speak with one voice (Roe, 2007, p. 98)

The EU does not have a single strategy to reduce shipping emissions (however, a strategy aimed at maritime security) from shipping. Still, shipping emissions have been rising on the agenda since 2018. Therefore, it is a strategic manoeuvre. But the EU has several systems, tools, and mechanisms to reduce emissions from activities and industries.

The European Union Emission Trading Scheme (EU ETS) is a cornerstone of the EU's policy to combat climate change. It is a key tool for reducing greenhouse gas emissions cost-effectively (European Commission, 2020). The EU established the EU ETS as early as 2004, as the world's first and (still is) the largest international carbon emission-trading market. The scheme operates in all EU countries plus Iceland, Liechtenstein, and Norway. It limits emissions from more than 11.000 substantial energy-using installations and airlines operating between the countries (European Commission, 2020). Altogether, it covers approximately 45% of the EU's greenhouse gas emissions. In 2030, the emissions covered by the EU ETS will be cut by 43% from 2005 levels, as part of the EU's current '2030 climate and energy framework'. The idea is that trading emissions bring flexibility that ensures that emissions are cut where it costs least to do so, and where a robust carbon price will promote investment in clean, low-carbon technologies. Shipping is not (yet) included in the scheme. As the European Commissions is proposing to include shipping in the EU ETS as part of the European Green Deal (European Commission, 2020), this might change.

However, the shipping industry has not been included earlier in the EU ETS because the shipping community believes that the IMO is a recognized international entity to act. This argument is supported by national governments, shipping companies, and interest groups (I1 & I3). Regional shipping regulations do, according to the International Chamber of Shipping (ICS), "create chaos" (World Maritime News, 2020). Moreover, the EU "supports ambitious international action to address climate change". Still, the EU has uttered frustration over the slow progress in IMO to achieve international commitments. The EU was determined to act on its own first. The European Parliament voted to include shipping into the EU ETS as of 2023 if no IMO agreement is reached by 2021. The EU vote raised strong protests from industry circles, from actors such as the European Community Shipowners' Association (ECSA) and the ICS. The argument was by including shipping in the EU ETS might create obstacles for efficient trade, a fear that it might not be a good instrument for reducing GHG emissions, and that it

could be incompatible with the IMO roadmap (Psaraftis, 2018). The decision to force an ETS system on regional EU waters can add further complexity for the shipping industry and higher compliance costs.

7.2.3. Norway's strategies, objectives, and toolbox to facilitate the transition

Norway has developed several strategies, action plans, and targets for reducing emissions for most industries, including shipping. This section will explore Norway's strategies, and the objectives and instruments included in the strategies. Objectives and instruments will be accounted for because it contributes to contextualizing the frameworks and framework-conditions shipping companies adhere within. The national level differs from the international IMO-level and EU-level because the shipping industry directly influences the choices of policy instruments at the national level.

The EU ETS, as Norway is a part of, does not include all sectors. However, Norway is committed to reducing emissions from the sectors included and set domestic targets for emission reduction in non-ETS compliance sectors (Norwegian Ministry of Climate and Environment, 2015). Shipping is a sector that has been included. Norway's shipping target is to reduce emissions with 50% in domestic shipping and fisheries by 2030 (Norwegian Ministry of Climate and Environment, 2019), as stated in the Granavolden-platform. The long-term aim is a zero-emission maritime sector.

The white paper document, *New Emission commitments for Norway for 2030 - towards joint fulfilment with the EU,* sums up the most important objectives of the maritime sustainability transition in Norway to promote green shipping. The objectives are:

1. Add a competitive edge to the Norwegian maritime industry and fleet in the future;
2. To promote the development of green technology and industries;
3. Ensure active participation in policy-making at international (in the IMO and the EU) level; and
4. To promote employment along the coast (Norwegian Ministry of Climate and Environment, 2015).

The principal plans to achieve the objectives are laid out in the maritime strategy *'Maritime Opportunities – Blue Growth for a Green Future: The Government's Maritime Strategy'* from 2015. The strategy document contains reviews of the efforts and the instruments necessary for further development and value creation in the maritime industry, and the specific measures to

steer the low-carbon transition (Norwegian Ministry of Trade, Industry and Fisheries, 2015). The Norwegian government has an action plan leading up to 2030: '*The Government's Action Plan for Green Shipping'* from 2019. The action plan considers possible measures, policy instruments and regulations (Norwegian Ministry of Climate and Environment, 2019, p. 7)

7.2.3.1. Policy instruments to reach the objectives of the Norwegian maritime strategies

Policy instruments are the concrete tools to achieve the policy objectives (Rogge & Reichardt, 2016, p. 1623), and they can take different forms and serve different purposes. As shown in the following table:

	PRIMARY PURPOSE		
PRIMARY TYPE	Technology push	Demand pull	Systemic
Economic instruments	RD&D* grants and loans, tax incentives, state equity assistance	Subsidies, feed-in tariffs, trading systems, taxes, levies, deposit-refund-systems, public procurement, export credit guarantees	Tax and subsidy reforms, infrastructure provision, cooperative RD&D grants
Regulation	Patent law, intellectual property rights	Technology/performance standards, prohibition of products/practices, application constraints	Market design, grid access guarantee, priority feed-in, environmental liability law
Information	Professional training and qualification, entrepreneurship training, scientific workshops	Training on new technologies, rating and labelling programs, public information campaigns	Education system, thematic meetings, public debates, cooperative RD&D* programs, clusters

Table 1: Type and purpose of instrument typology with examples (Rogge and Reichardt, 2016, p. 1624).

Norway has five main policy instruments to promote green shipping: (i) Regulation measures and requirements, (ii) taxation, (iii) funding agencies, (iv) the NOx agreement and the NOx Fund, and (v) cooperation between the authorities and the business sector (Norwegian Ministry of Climate and Environment, 2019, p. 53). The instruments have been developed in close cooperation with the industry to increase the demand for climate and environmental technology (Norwegian Ministry of Climate and Environment, 2019, p. 57).

The *economic* instrument of emission pricing, through taxations, is one of Norway's main climate policy instruments (Norwegian Ministry of Climate and Environment, 2019, p. 57), as over 80% of Norwegian GHG emissions are a subject to a carbon tax. The carbon tax, first introduced in 1991, provides incentives to achieve emission cuts at the lowest possible cost to society. In the years leading up to 2025, the government will increase the carbon tax rate by 5% for all sectors. The revenue will reduce taxation of groups affected by the increase to ease the transition. The stepwise increase gives shipowners the advantage to take future carbon prices into account when making investment decisions (Norwegian Ministry of Climate and Environment, 2019, p. 61).

The Norwegian government has established several funding agencies. The main agencies are Enova, Innovation Norway, and the Research Council of Norway. The funding agencies aim to

reduce emissions by supporting technology development, restructure Norwegian businesses and industries, boost competitiveness, and offer tax incentives (Norwegian Ministry of Climate and Environment, 2019, pp. 61-64). The agencies provide grants, contract schemes, innovation risk-loans.

An economical instrument that has received a lot of praise from the industry is the NOx agreement and the NOx-fund (Norwegian Ministry of Climate and Environment, 2019, p. 68). NOx-emissions were taxed as of 2008, and tax exemptions can be given for emissions covered by the state and business organizations' environmental agreement on measures to reduce NOx emissions. The business organizations that are parties to the environmental agreement have established the NOx-fund. The fund's purpose is to encourage companies in Norway to carry out measures to reduce NOx emissions (Norwegian Ministry of Climate and Environment, 2019, p. 68). Enterprises make payments to the fund based on the per unit of their NOx emissions, and the fund provides support for the enterprises that carry our measures to reduce their NOx emissions. The shipping industry has granted most of the support. Projects included have accounted for about 60% of the emission reductions that have been achieved.

The *regulatory* measures and requirements for shipping have grown a lot in the last decade, on both international level and in Norway, with rules restricting emissions to air and water. There are regulatory instruments such as the 'Shipping Safety and Security Act' and the 'Pollution Control Act' (Norwegian Ministry of Climate and Environment, 2019, p. 57).

The *information* type of instruments is in Norway closely developed in cooperation with businesses, which is regarded as crucial to accelerate the transition (Norwegian Ministry of Climate and Environment, 2019, p. 69). The Norwegian governments' green shipping policy instruments of information are the *Shortsea Promotion Centre* and the '*Green Shipping Programme'*. The former aim to share expertise, knowledge, and act as a forum for contact between government and stakeholders. The latter is developing studies and pilot-projects to identify and develop zero- and low emission solutions that can rapidly be put into action (Norwegian Ministry of Climate and Environment, 2019, p. 69).

The government's action plan states that "the shipping policy is designed to promote market change that allows zero- and low-emission solutions to become profitable" (Norwegian Ministry of Climate and Environment, 2019, p. 7). These instruments make the Norwegian shipping industry less pollutive and hazardous and make the Norwegian shipping industry more competitive in developing low- and zero-emission technology. Norway have a forward-looking

foreign policy based on norm-setting and multilateralism (Ćetković & Skjærseth, 2019, p. 1039). And is expressing its commitment to mitigating climate change, both domestically and internationally. Norway have facilitated stable and long-term environmental policies and prevented radical and disruptive policy solutions (Ćetković & Skjærseth, 2019). Leading up to the strategies and elements of the policy, industries and businesses have been encouraged to participate and come with recommendations to the government's expert committees.

The industry often influences agenda setting in government, and both parties value learning processes and consider cooperation necessary to achieve the overall objectives. Reducing emissions from maritime shipping is a common target for industry and government. The industry's impact on the Norwegian government differs from the industry's impact on the EU. In the case of the EU, this would seem to be the case only indirectly. Many EU policies need to be implemented at the national level, where in many cases the member states can choose the specific instruments to reach the EU's goals.

Building on industry influence, the Norwegian shipping industry has recently launched its strategy to reduce emissions by 2050. The next section will introduce the Norwegian Shipowners' Association, and the Norwegian shipping industry's GHG mitigating strategy.

7.2.4. Norwegian Shipowners' Association's strategy: Zero-emission in 2050

The Norwegian Shipowners' Association (NSA) is a trade, employment, and interest organization for Norwegian controlled companies within the shipping and offshore industry (Norwegian Shipowners' Association, 2014a). NSA's primary fields are e.g., national, and international industry policies, employer issues, competence, environmental issues, and innovation. The NSA term its members as "the core and driving force in the Norwegian maritime cluster" (Norwegian Shipowners' Association, 2014a).

According to the NSA, Norwegian shipowners create tremendous value and possess a unique competency and innovation capacity. The global competition is intense. But as Norway is a leading maritime nation, Norway advocate for high international standards in the global industry. NSA believes that "those companies that lead the way on quality will also be commercial winners in the future" (Norwegian Shipowners' Association, 2014b).

NSA launched a strategy 18th May 2020, named *'Zero emission in 2050'*, which aims for the title; the Norwegian shipping is to be climate neutral by 2050 (Norwegian Shipowners' Association, 2020a). The strategy is a response from the Norwegian shipping industry to the Paris Agreement's targets and the UN Intergovernmental Panel on Climate Change's (IPCC)

utterance that we have ten years to halve GHG emissions (Norwegian Shipowners' Association, 2020b, p. 4). Further, the emissions must drop to zero by 2050.

According to NSA, the strategy includes four proactive climate goals (Norwegian Shipowners' Association, 2020a). Norwegian shipping industry have under the umbrella of NSA, acted and adopted these goals:

1. *NSA members will cut their GHG emissions by 50% per transported unit by 2030, compared to 2008 levels*. Measures to ensure lower emissions through efficient operation and retrofits to the existing fleet are important, as they cut emissions immediately.

2. *From 2030, NSA members will only order vessels with zero-emission technology*. In their role as buyers, shipping companies can specify the technology and machinery solutions for their ships and therefore have a responsibility to give clear indications of what they expect supply companies to develop in the years to come. This is an expression of an expectation that significant resources should be devoted to technology development of solutions that can be commercialized and scaled up as quickly as possible. It is also an invitation to actors within the industry to think outside the box and challenge widely accepted restrictions and conventions.

3. *From 2050, the NSA's member's fleet will be climate neutral*. Ships normally operate for about 20-30 years before taken out of service. To reach the target of zero-emission shipping in 2050, ships with zero-emission technology must be phased in as quickly as possible, and on a large scale from 2030. New fuels are required to realize such cuts.

4. *International ban from 2050 on fuel types that are not climate neutral*. Such a ban will be an important driver for developing new technology and alternative fuels and ensure a level playing field.

Six intentions, as part of a roadmap, is developed to reach these goals:

1. To upgrade the existing fleet to reduce emissions.

2. To use sustainable low and zero-emission fuels from an early stage and contribute to infrastructure development for these fuels.

3. To phase in ships with zero-emission technology as quickly as possible, and no later than 2030, ensure that the fleet sails without emissions from 2050.

4. To operate ships as energy efficient as possible without using voyage planning, low friction anti-fouling paint, and optimised speed.

5. To minimise the enterprise's environmental impact in a lifecycle perspective, using the best overall solutions.

6. To measure, analyse, and publish our environmental and climate accounting consistently, relevant, and transparently.

The strategy is a signal to the Norwegian government, and the international shipping community that Norwegian shipping companies will now take the lead in the fight against climate challenges (Norwegian Shipowners' Association, 2020a). The strategy has the strength of direct and concrete targets, not only stating the target but includes time-based measures and mechanisms. The CEO of the NSA, Harald Solberg, said:

> *"Norwegian shipping is taking a leading role by setting ambitious goals to develop new and profitable green technology. We have high ambitions, even in areas that today do not have commercially available technological solutions. We believe ambitious goals will help accelerate the necessary development. This means that the entire industry, in collaboration with the authorities, both nationally and internationally, must engage in developing new solutions".*

According to NSA, a transition is "good for the climate, good for business": "Norwegian shipping sees great business opportunities in taking leadership in the development of innovative technology that the maritime industry and the world need*"* (Norwegian Shipowners' Association, 2020a). NSA believes that this is the way to go, both for the environment and for the industry. Because the technology is developing, and Norway has a complete maritime cluster with established competency, which makes the industry positioned to take the lead in developing green solutions (Norwegian Shipowners' Association, 2020b, p. 4).

NSA's strategy gives weight to the argument that international, regional, and national authorities have a crucial role to play in facilitating the development that is both desirable and necessary.

7.2.4.1. NSAs stand on international, regional, and national climate mitigation ambitions

The NSA will work to implement ambitious climate goals and the necessary incentives in national and international arenas. The strategy has a strong international focus. The IMO and the EU are mentioned for their efforts in mitigating emissions. The NSA believes that new

regulations should be developed through the IMO to ensure global support and enforcement. The argument is that differential treatment of vessels from different flag states and loopholes in regulation are avoided while ensuring fair competition (Norwegian Shipowners' Association, 2020b). IMO's efforts to make global shipping more environmentally friendly and is supported by the NSA, where the organization will take an active part in the negotiations and implementation of the IMO's climate strategy.

The strategy deals with the EU's 'European Green Deal', where the target is similar to the one of NSA: Reach the goal of climate neutrality by 2050. The NSA welcomes the EU's ambition and anticipates that several measures that will impact shipping will be implemented in the coming years. NSA believes that "EU can play a particularly important role in facilitating a modal shift from road and air to sea and railways" and that "the EU can assume a leading role in international regulatory processes in the IMO" (Norwegian Shipowners' Association, 2020b, p. 9)

The association members will, on their part, contribute to green innovation and inventions and reduce emissions through several technical and operational measures. National authorities are important to support the acceleration of the NSA strategy. The NSA has called on the authorities to help speed up the transition with these requirements:

1. Target research and development resources related to the development and testing of zero-emission solutions;

2. Establish a maritime research and development fund for zero-emission technology under the auspices of the IMO;

3. Establish market regulations that make it profitable in order zero-emission technology on ships as quickly possible and by 2030 at the latest;

4. Establish an international ban from 2050 on fuel that is not climate neutral.

NSA supports the Norwegian climate targets and commits doing their part to meet the goals through its own industry. But to succeed, the NSA points to that authorities at all governance levels take a holistic approach and regard the transportation sector as a whole (Norwegian Shipowners' Association, 2020b). A level playing field and promotion of transportation alternatives based on their environmental performance will reduce emissions.

7.3. Company-internal market responses

This section explores the Norwegian shipping companies' company-internal market responses, the second element of the response models. Market responses focus on the drivers, the threats and opportunities, and the actions taken by companies to address certain challenges. The assumptions of company-internal market responses for companies pursuing a proactive strategy are searching for new innovative solutions beyond business-as-usual, to create early-mover advantages. They will also aim beyond-compliance measures and investments in long-term, and radical innovation projects due to new entrepreneurial projects' opportunities.

Regulator uncertainties might create business opportunities. Environmental regulations, or the credible threat of future regulations, signal a future market shift towards greener operation or technology patterns. Hence, it may spur investments in clean technologies and operation methods (Vormedal I. , 2011, p. 4). Early movers in the development of technological solutions may find their strategic positioning improved vis-à-vis competitors. Market opportunities related to new regulation may impel emerging technological frontrunners to begin to pursue a strategy of regulatory entrepreneurship.

While the financial situation has been challenging since 2014, so has the market (I6). This line can be drawn to the close relationship and interconnectedness between the petroleum-industry and the shipping industry in Norway. The market is steered by demand and supply. When the oil price is low, there is little demand, or chartering, from the petroleum industry. The market serves great importance for driving technology development, and I4 put it like this:

> *"As of today, we do not take the climate into account. We look at the market. We can mean what we want about the climate and oppose climate challenges if we want to. We follow the market trends and deliver what the market demands. If we say that much more needs to be done to reach the Paris goals, ergo we contract costly boats. Then we lose a lot of money"* (I4).

The market has a tremendous effect on the shipping industry's choices today and in the future. Supply and demand have a significant impact on the market. As long as environmentally friendly technology is not requested from the charterers or required by regulation, the market will be steered by whoever pays.

7.3.1. Norwegian Shipowners' Association: Signalling willingness

The NSA represents all shipping companies interviewed in this thesis in the EU and the IMO. Norway has been a strong driving force in enforcing environmental regulations in the IMO (I1).

Working towards the EU, NSA is grouped with 19 other shipping shipowners' associations from European countries in the NCSA. When working together with other associations, huge efforts are geared towards internal negotiations due to different cultures, fleets, interests, and ambition levels. Then "anchoring positions internally is a difficult procedure" (I1). Norway and the NSA have some adopted positions that go beyond other countries' position and issue levels (I1): "It is obvious that some members [of the NSA] who want to take the lead on climate and environmental issues" (I1). This might be because Norwegian shipping companies have specialized their fleet in some segments, including offshore, advanced chemicals, LNG, etc., which gives Norway some prerequisites for competing on innovation (I1). There is a dividing line, which gives Norway a basis for being more in the direction of competitive advantage and innovation. Because of Norway's relatively young fleet, compared to other countries with old and large oil-tankers, and who often work in small companies (I1). Norway also has small companies, but not compared, for example, Greece. The NSA has 140 members and approximately 1500 ships. The Greeks have 4000 ships, but 1000 members of the shipowners' association (I1). The Greeks have four ships in average per company, whereas Norway has ten ships average per company. "The distinction provides a different capacity to think about a sustainability transition and lifting the company by investing in new technology" (I1).

The NSA's recently launched *Zero emission in 2050* goes much further than the targets for international shipping. The NSA believes "the strategy is rational for the members, because they want to compete on climate- and environmental areas, and because they believe it is the right thing to do" (I1) (Norwegian Shipowners' Association, 2020a). The NSA also believe it is financial rational, because:

> *"The NSA, as a business organization, should try to develop new financial opportunities for the industry in the long run. Thus, challenge the members to look in the direction it goes [stricter regulations], and encourage them to think differently early enough so they can get something in return for the efforts"* (I1).

The NSA strategy has one overarching purpose: "To send signals to others around us, shipping companies in Norway cannot solve this alone" (I1). As the NSA believes that signalling a willingness to achieve a sustainability transition, and perhaps by going a little forward than what is economically rational, they believe those who chose to go in the direction of transitioning will be awarded (I1).

7.3.2. Industry innovation and regulative involvement: Eidesvik Offshore ASA

Several Norwegian shipping companies have shown great willingness to create early mover advantages by developing low-carbon technology and driving the regulatory processes. Eidesvik Offshore ASA is a Norwegian shipping company based on the West Coast in Bømlo. Eidesvik known for its forward-looking vision of using as little fossil fuels as possible to minimize their emissions. This vision has resulted in Eidesviks' strong reputation as a pioneer in implementing new environmental technologies, in both newbuilds and the existing fleet (Eidesvik Offshore ASA, 2020a). Eidesvik owns and operates a worldwide fleet of purpose-built vessels. Eidesvik has experimented with new technology also the last 6-7 years, despite a "terrible" market and an industry in a demanding financial situation (I6). Eidesvik has been rewarded by its climate and environmental commitment over the years (I1). Partnerships with Equinor have paid off, and they are continually installing new technologies, and have received 100 million in EU support to develop this new phase (I1). "They are rewarded for their commitment" (I1).

Eidesvik is not significant in size. The fleet consists of 15 vessels. The company offers services to the offshore supply, seismic, subsea, and offshore wind markets (Eidesvik Offshore ASA, 2020a). Out of the 15 vessels of the Eidesvik fleet, one vessel stands out: Viking Energy.

Picture 1: Viking Energy (NCE Maritime CleanTech, 2020)

Eidesvik's success story of climate and environment focused innovation started as early the year 2000 when the first plans for liquified natural gas (LNG) operation of a PSV were formed (Eidesvik Offshore ASA, 2020b; Stensvold & Jensen, 2020). Viking Energy was delivered in 2003, and Eidesvik became the first to introduce LNG as a fuel for offshore vessels. In 2016, Viking Energy was given the world's first Battery Power notation (Eidesvik Offshore ASA, 2020b). In 2020, Eidesvik entered a joint development project where Viking Energy shall

operate with a fuel cell that can run on green ammonia by the start of 2024 and significantly reduce the vessel's emissions. DNV GL has predicted that ammonia will make up 25% of the shipping fuel in 2050 (Stensvold & Jensen, 2020). The introduction of ammonia will become another world's first for Viking Energy, Eidesvik and Norway. Hence, Viking Energy is one of the key players of the Eidesvik success story, and an important part of Norway's reputation as a leading shipping nation. Eidesvik's innovative work has led the way to several ground-breaking technology development projects and LNG proliferation internationally.

The history of LNG is quite comprehensive and includes several actors, as Eidesvik, the Norwegian Maritime Authority, Norwegian government, and the IMO, as well as elements of regulation, influence, and different narratives of perception.

7.3.2.1. LNG: Industry driving-forces and international take-off

LNG is a fossil fuel-based energy technology. However, it is regarded as environmentally friendly compared to conventional fuels, as CO_2 emissions are reduced with approximately 20%, NOx is reduced by 85%, and a 100% reduction of sulphur (SOx) (Steen, 2018, p. 50). Whether LNG should, or could, serve as a 'transition fuel' is well discussed, where the supporting argument is that LNG is a mature technology. In contrast, the other alternatives are not, with a (now) well-developed infrastructure. Arguments against LNG is that LNG could contribute to extending the fossil fuel pathway (Steen, 2018, p. 51). In 2019, DVN-GL conducted a study of the energy mediums that would be important in the mix up to 2050, and what fuel would be dominant internationally to reach the IMO's requirements in 2050. The results showed that LNG would be the fuel dominant at the international level to reach the targets set by IMO (I2).

How LNG has evolved in Norway versus the international market includes factors such as finances, regulation, governance levels, and shipping companies as mediators in the governance levels. The story of LNG starts with Eidesvik. In the late 1990s, regulations for gas-fuelled vessels was not existing. Eidesvik proposed to implement a regulation for gas-fuelled vessels. The Norwegian Maritime Authority turned down the proposal directly (Stensvold T. , 2010) (I6). After massive efforts, Eidesvik was a significant contributor to writing the legislation, together with the Norwegian Maritime Authority, which eventually gave in (I6), the shipyard Kleven and DNV GL (Stensvold T. , 2010).

Norway, with industry support, took it the next step and extended to process and "sold" LNG for the IMO (Stensvold T. , 2009). After several years with tax exemptions, building

infrastructure, etc., in Norway to promote LNG, LNG 'takes off' internationally and stagnated in Norway, despite huge efforts both domestically (I2). The picture painted in the media is that LNG is now considered dirty in Norway: "Because it is a fossil fuel" (I2 & I5). But there are two important perspectives of how the story of LNG evolved in Norway, with two actors regarded as facilitating actors in the maritime transition in Norway: Equinor (former and back then Statoil) and the Norwegian government.

The first perspective is concerning Equinor and charterers (mainly petroleum companies) in general. Charterers have received praise for setting high environmental standards in their tenders, and that the requirements set by charterers in the procurement processes drive technology development (Stensvold & Jensen, 2020). Shipping companies compete in a procurement process to win contracts. The winner of the procurement, or tender, must offer the cheapest options on the wanted technology and design. In 2012, Equinor set out a tender, with the requirement of reducing emissions. Several shipping companies changed their engines accordingly to LNG. Equinor chose six diesel vessels, and at the end of the process, only one LNG vessel (I4). Diesel-vessels was the cheapest option. Adding the LNG engine would have cost 50 million NOK extra for the charterers (I3). This procurement process signalled that the charterers were unwilling to pay the extra cost for LNG, making LNG a less attractive fuel alternative for Norwegian shipping companies.

In 2009, the Norwegian government introduced a CO_2 tax exemption on LNG to signal Norway's commitment to LNG as a 'transition fuel', and technology Norway could diffuse (Steen, 2018). By the introduction of the exemption, shipowners changed their engines to LNG. And the number of LNG fuelled vessels increased. January 1st, 2018, the Norwegian government repealed the tax exemption and introduced CO_2-tax on LNG. The fee was also increased to NOK 500 per tonne of CO_2, making LNG 25% more expensive. The drastic change in the price of LNG left MDO as the cheapest fuel option. As a response to the change of price, shipping companies still operating on LNG saw no other opportunity then to change their engines back to MDO (Hove, Meling Jr., Solbakken, & Ingjerd, 2018). The government argued that the expensive tax exemption was not leading to significant emission reductions, and shipping companies used a lot of resources to change their operations, which ended in a disruptive turnaround. In this regard, LNG diffusion in Norway is an example of a learning process, and not having a long enough perspective on policy instruments.

Another factor related to the removal of the CO_2-tax exemption, is that the shipping companies that invested in LNG, due to heavy signalling from government and charterers, are that only for

5-8 years ago they were premiered to choose LNG. In contrast, they are now punished for it (Hove, Meling Jr., Solbakken, & Ingjerd, 2018) (I1). The removal of the CO_2 tax exemption and the procurement process by Equinor in Norway, in contrast to LNG trending on the international market, led I1 to raise the issue of Norway "jumping over technologies" because "we did LNG, now we go green" (I1).

The example of LNG shows that the Norwegian shipping industry is driving technological development, and vulnerable to drastic changes in price, signals of direction from government and charterers, and stable framework conditions. The industry showed strength in writing the regulation, despite a lack of support from the Norwegian Maritime Authority. The fact that LNG soon was "outdated" (I6) in Norway, the competitive advantage struggled for was simply weakened, given LNG now trending internationally, and is considered a transition fuel leading up to 2050.

LNG is also an example of how regulation is important for developing zero- and low-carbon technology. The informants are under the impression that the market for low and zero-emission technology will come when regulation and requirements are in place. After writing the regulation on LNG, the fuel has been commercialized and internationally diffused. With the global sulphur cap from January 1st, 2020, LNG diffusion is expected to increase. Because the SOx emissions from LNG are close to zero, LNG complies to the global sulphur cap.

7.3.3. Beyond compliance measures

Company-internal market responses for company's pursuing proactive strategies are characterized by beyond compliance measures. Solstad Offshore ASA, a Karmøy based shipping company, is forward-looking and has recent years focused on beyond compliance measures. For Solstad, it has been essential to look forward by thinking in the direction of what regulations and requirements that might come, and what the customers will request in the coming years. Informant 3 provided two examples where Solstad has sought beyond compliance measures. In 2009, when the regulation on reporting NOx emissions came into force, the company investigated all emissions they polluted (I5). Although there was not a requirement to report CO_2 emissions, Solstad started to report CO_2 already in 2009, "because it was a huge environmental impact, even though it was not a requirement" (I3). The requirement to report CO_2 emissions came years later (I3). Secondly, Solstad is one of the very few shipping companies in the world that have got the ISO501001 certificate in energy management (I3). ISO501001 is not yet part of any regulation or a certificate required by customers. The

certificate is an example of "something Solstad see is becoming more important, so we see that when we market ourselves, there will be an advantage to have" (I3).

> *"There are things today that we as a company can do voluntarily, which you can flex with, and we do so because we believe it will be smart next year or in the future. And it can contribute to differentiate us from our competition"* (I3).

Eidesvik has, as mentioned, been in the front of developing technology and aimed at being early movers. Regarding beyond compliance measures, I6 stated that:

> *"There are only two things that work, that is carrot and stick. Where the carrot is funding, and the stick is regulations. You get a reward; directly or indirectly is you do the little extra beyond what you have to do"* (I6).

The company-internal market responses point to the Norwegian shipping industry' pursuing early mover advantages, beyond compliance measures, and new innovative projects. The example of Eidesvik's LNG has also shown an industry able to make the regulations at the domestic level and implement them internationally, not only complying with regulation.

8. Discussion

In this chapter, I will revisit both the background, the theory, and key points of the analysis findings. This thesis has the theoretical starting point of sustainability transitions and has employed corporate response strategies to environmental regulation to answer the research questions. Throughout this chapter, the research questions of this thesis are considered:

> RQ1: *What regulatory challenges and opportunities does the sustainability transition present for the shipping industry?*
>
> RQ2: *What strategies does the Norwegian shipping industry pursue in response to the regulatory challenges involved with the sustainability transition?*
>
> RQ3: *In view of the regulatory uncertainties involved with the sustainability transition, can the chosen strategy deemed to be a success?*

The shipping industry is one of the most heavily regulated industries, despite the doctrine 'freedom-of-the-seas', to avoid obstacles to shipping activities. Based on the findings mapped out in the chapter above, several regulatory uncertainties exist as a threat to the shipping industry's sustainability transition. Likewise, several opportunities are found that give the uncertainties an opponent.

To understand the shipping industry's pursued strategy, this discussion aims to align the findings more explicitly regarding the expected corporate response model, the *proactive strategy*, so that the conclusion may take form. This discussion will attempt to contextualize the narratives of the Norwegian shipping industry with the strategy pursued regarding the regulatory uncertainties and if it can be deemed successful.

8.1. The challenges and opportunities of the sustainability transition

First, let us return to the sustainability transition challenges, to contrast the challenges to the industry's opportunities in the sustainability transition regarding environmental regulation. The shipping industry's sustainability transition experiences a significant focus on the technological challenges associated with reducing emissions. Technology development of zero-emission technology is important to reach the international targets set. Still, the transition is not merely technological, and contextual factors such as the political, economic, social, and environment must be considered. These additional challenges have been addressed in section 7.1 political responses I, and further in 7.3. market responses, which affect the shipping industry's strategies towards environmental regulation.

The lack of mature fully-fledged technology, a weak financial situation, a reduced investment capacity, and environmental regulations that do not apply to all are viewed as the main challenges of the sustainability transition. These challenges of the company-external political responses are well connected and are summarized as regulatory uncertainties. The regulatory regime posed on the international shipping community is complex, and there is a fear that regional regulations would further complicate the operating regime of global shipping activities. The slow processes at the IMO-level is also a concern for the Norwegian shipping industry. The challenge can be considered as regulatory uncertainties as it forces a dilemma for the shipping industry in "picking" the future technology, investing in the right projects and technology, and prepare for future regional or international regulation they will have to comply with.

Despite the challenges associated with the transition, the Norwegian shipping industry has identified several opportunities with regulation. Concerning the lack of mature technology, stricter environmental regulation is viewed as an opportunity to drive technological development and innovation. If more, and stricter, environmental regulation is implemented, the shipping industry will have to comply. Thus, develop, and invest in environmentally friendly technology. If the industry is to comply with international legislation, they must invest in technology, whereas the national government will have to facilitate more stable and direct instruments.

The Norwegian shipping industry supports stricter environmental regulations because the international shipping community will not prioritize the environment before they are required to. The technical solutions will not come before the requirements are set. The Norwegian shipping industry supports and advocates for stricter environmental regulations because it might exploit their early-mover capabilities and give the Norwegian shipping industry a greater competitive advantage. The Norwegian shipping industry is "ahead of" the community in developing technology. The industry has acquired the necessary knowledge and competence and is already thinking about "what's next". This gives the Norwegian shipping industry the edge necessary to exploit the regulatory opportunities and eventually enter new markets. Regulation is an essential driver in the sustainability transition for the shipping industry. To this end, I will argue that willingness to transition is not lacking but rather a lack of financial capacity to speed up the transition.

8.2. Pursuing a proactive strategy

The conditions to support stricter environmental regulation proposed by Vormedal (2011) comprise three elements: (i) emergence of uneven playing fields; (ii) increase of regulatory threats and uncertainty; and (iii) proliferation of new market opportunities. Several governance trends have heightened perceptions of looming regulation: the emergence of domestic emission regulations in e.g., the Norwegian fjords, the entering of regional emission trading schemes in the EU, but also a fear of other significant shipping nations to do the same and hence complicate the regulatory regime even further. The perception of risk or inevitability of GHG regulation has generated significant uncertainty about the future rules of the game. The possible cost of uncertainty can be considerable because regulatory ambiguity can affect the shipping companies' ability to make investment decisions now and in the future. The emergence of a patchwork of regulations and standards for different coastal lines or oceans creates an uneven playing field shipping companies operating worldwide. The Norwegian shipping industry prefers IMO-legislation over regional or national regulations. Because of shipping's globalized nature, different compliance measures for different waters hinder equal competitive playing fields.

As a reminder, the reactive strategy depicted company opposition when regulation threatens profitability and competitiveness. In contrast, the proactive strategy points to support or advocacy when companies can seize opportunities that strengthen their competitive advantages. The reactive strategy's assumption of company behaviour as "perfectly rational" suggests a negative relationship between regulation and competitiveness. The proactive strategy assumptions of company actions as "boundedly rational" suggest a positive relationship between regulation and competitiveness.

Overall, the industry's market responses correlate with political responses. Consequently, the strategic positions conform to the actual behaviour of the industry. The study's findings of opportunities found in the sustainability transitions point to the company-external political responses and company-internal market responses align with the proactive response strategy. The Norwegian shipping industry pursues a proactive strategy as it supports and advocates for stricter environmental regulations, and do not in any way oppose environmental regulation as an industry pursing a reactive strategy assume. The Norwegian shipping industry hold a "boundedly rational" approach to the relationship between regulation and competitiveness, as in contrast to the reactive strategy's "perfectly rational" approach suggesting a negative relationship between regulation and competitiveness. New market opportunities related to

stricter and new environmental regulations impel the Norwegian shipping industry's technological frontrunner advantage to pursue a proactive strategy. The regulatory challenges involved in the sustainability transition is not seen as a reason to oppose regulation, but rather as opportunities to enhance the competitive – and early-mover advantages the shipping industry holds.

Since 2000, the strategic choices of the Norwegian shipping industry, ranging from writing the legislation on LNG, participating in pilot projects, developing the NOx fund, the wish to establish a CO_2 fund, the regulatory presence of the NSA in the EU and IMO, has led to a high-cost industry with specialized assets. In this regard, the Norwegian shipping industry's strategic choices have steered a to strong international recognition, with a foothold in environmental – and climate matters.

8.3. The industry's ambition level and influence

This thesis has in section 7.2., concerning the company-external political responses, explored the governance-levels strategies and the Norwegian shipping industry's *Zero-emission 2050*-strategy. The IMO's GHG-strategy is considered a milestone because the shipping community agreed and implemented the strategy, which marked the end of IMO's reluctance to regulate emissions from shipping. Whether the short-, medium – and long-term measures will serve as a facilitating factor is unclear. The ambition level of the IMO has been considered extremely high. The EU's inclusion of shipping in the EU ETS adds further complexity to the already heavily regulated industry. The measure signals ambition and willingness from the EU, but whether the instrument might create an obstacle for efficient activities are a concern of the Norwegian shipping industry, as IMO is the preferred regulator. Norway's inclusion of non-ETS industries, including shipping, has increased the Norwegian shipping industry's focus on environmental – and climate issues due to the obstacles and opportunities that the policy instruments bring about. The policy instruments both facilitate technological development and funding for newbuilds and serve as an additional cost for companies to pay in terms of taxes.

The Norwegian shipping companies own *Zero Emission 2050* show both a willingness to transition and point to measures necessary to achieve their objectives. The strategy is a direct statement of what the industry is pursuing in terms of its objectives and aim. The industry is not obligated to comply with the strategy's measures, but it is a strategy made by the industry, and members of the NSA have given the strategy its full support. The signals the Norwegian shipping industry is indicating may have significant positive ripple effects. Given the strategy's

inclusion of beyond-compliance measures, the Norwegian shipping industry is also signalling the exploiting of their early-mover advantage, competitive advantage, and willingness and strength to move beyond 'business-as-usual'.

The industry is reading the signals, from the IMOs GHG-strategy, the EU's EU ETS and the Green Deal inclusion of shipping, and the national strategies, that the future for shipping is zero-emission. As part of the proactive strategy, the Norwegian shipping industry aims to influence and advocate for stricter environmental regulations at the IMO-level, the EU-level, and at the national level, as stated in the NSA *Zero-emission 2050* strategy. The uncertainties concerning regulation are hard to influence, as it is in the power of regional authorities and other flag-states. The Norwegian shipping industry naturally has the most influence over the Norwegian government's regulations and policies, as they are developed in close cooperation with the industry.

The industry has several disruptive technology projects to show off. Many of the projects have received a lot of media attention, e.g., LNG, hydrogen, ammonia, battery-hybrid solutions. Eidesvik's ammonia-project is one of several that have received significant EU-funding. The industry's influence in the EU is strengthened by the environmentally friendly technology developments, received funding, and innovation entrepreneurship. By showing the willingness to transition by pursuing a proactive strategy with innovation and successful prospects, the Norwegian shipping industry's positions are deemed. At the IMO-level, the industry's influence is weakest. The IMO's slow regulatory processes are a direct result of 174 member states with different interests and different response strategies to regulation. Not all nations industries can find an interest in or believe that they will benefit from changing their many who are still not capable of finding interest in changing their 'business-as-usual'. Still, the Norwegian shipping industry has been able to influence the decision-making by, e.g., proposing the gas-fuel regulation and been significant participators of climate- and environmental issue areas.

8.4. Can a proactive strategy be deemed to be a success?

Sustainability transitions are usually urgency driven rather than opportunity drive. The sustainability transition is urgency driven, as the targets set are ambitious, the current lack of zero-emission technology, and the fact that ships of being built today will sail until 2050. However, while the industry has a common understanding that climate change must be fought, the Norwegian shipping industry's sustainability transition is also opportunity-driven. The opportunities within can lead to fleet growth, economic growth, and even a stronger position in

the IMO and the EU, as the industry can show to results. At the national level, the industry might receive a more considerable, direct, or indirect, influence over regulation - and instrument setting.

The proactive strategy pursued can be deemed a success if the Norwegian shipping industry's innovative strength is upholding, considering the challenges and opportunities involved in the sustainability transition. Per now, the national policy instruments aimed at facilitating a transition are important, as the industry's financial situation needs to recover. At the same time, investments in technological development must persist or preferably increase. Therefore, policy instruments at the governance level can help bridge the gap of low equity and the need to invest in speeding up technological development. The Norwegian shipping industry cannot drive the sustainability transition itself; it is a common challenge of the international shipping community. The Norwegian shipping industry has, with its *Zero Emission 2050* strategy, successfully signalled their willingness. The industry's signals must be intercepted, acted upon by the Norwegian government, and communicated to the petroleum industry and wider shipping community. The signals from the industry must be intercepted, and acted upon by the Norwegian government, and communicated to the petroleum industry and the wider shipping community.

Given the high level of uncertainty concerning the future political - and market environment, regarding technology, economy, and regulations, the shipping industry cannot easily make rational and objective calculations of their economic interests and strategic responses. The strategic choices are drawn based on assumptions, forecasts, and interpretations of the future. The regulatory responses, political responses, technology, and new market prospects for various low-emission fuel alternatives are crucial elements of the shipping industry's climate change issue and emission reduction process. However, these perceptions are formed by the external and internal environment, and hence, the firms' political – and market responses. Also, the history and characteristics of the Norwegian shipping industry should be considered. The Norwegian shipping industry has a history of adapting to new market segments, being innovative early-movers, and at the forefront of regulations. The Norwegian shipping industry has proved that they can "think outside the box", strengthening the proactive strategy to be deemed a success.

9. Conclusion

This thesis has sought to identify the regulatory challenges and opportunities for the shipping industry's sustainability transition to reach the international shipping community's targets. The narratives formed from the industry's perspective showed that the Norwegian shipping industry is pursuing a proactive response strategy, supporting, and advocating for stricter environmental regulations. The industry supports regulation, despite the regulatory uncertainties presented by international shipping's complex governance structure, leading to a patchwork of regulations hampering the 'freedom-of-the-seas' principle. In doing so, the thesis has paid loyalty to the qualitative research tradition's methods by interviewing key informants from the industry and the industry interest organizations, and document analysis. The aim of identifying the response strategy to environmental regulation was enabled by the guidance of the theoretical starting point of sustainability transitions. With these tools this inquiry was equipped with the appropriate tools, to illuminate the regulatory uncertainties that currently confront the shipping company's transition and whether the proactive strategy is deemed to succeed.

The key findings paint a picture of the Norwegian shipping industry as an industry with high ambition levels, current, and future regulatory challenges. The regulatory challenges include firstly, current lack of mature technology which plays a significant role in reaching the targets set by the IMO, the EU, Norway, and the NSA, and the future uncertainties of what the future fuel technologies will be; economic uncertainties to regarding the investment capabilities of the developing and implementing the necessary alternative technologies and whether the market will embrace the fuels; and the fear of a further complexified international and regional regulatory regime and the slow regulatory processes at the IMO.

Despite these pressing challenges, the Norwegian shipping industry also defines regulatory uncertainties as opportunities. Based on the industry's beliefs, the environment will not be prioritized before the industry must comply with stricter environmental regulations. After that, the demand for low- and zero-emission technology is expected to increase. Accordingly, competition will also increase. The Norwegian shipping industry regards their ability to exploit their technologically innovative early-mover advantages and competitive advantage, their ability to comply beyond expectance, and their focus of thinking ahead towards moving 'beyond business-as-usual', as opportunities in meeting the current and future regulatory uncertainties.

The opportunities found in the sustainability transition give the Norwegian shipping industry incentives to pursue a proactive strategy, thereby support and advocate for stricter environmental regulation. The industry believes environmentally friendly technology will result from stricter environmental regulation and requirements, preferably from the IMO to avoid complexities. The drivers of having a proactive strategy are the current and future competitive advantages, environmental management - and business-conduct, technology innovation, and influence in the regulatory processes.

The Norwegian shipping industries have several advantages and incentives to pursue a proactive response strategy. From an industry perspective, for the strategy to be deemed a success, the risks taken regarding business conduct and innovation must be profitable in the long run. The industry has agreed (ref. NSAs *Zero Emission 2050*) that zero-emission technology is the future and direction of international shipping. By influencing agenda-setting and decision making at the IMO, the EU, and the Norwegian government to produce stricter environmental regulations, continue to be frontrunners in innovation to achieve early mover advantages, the proactive strategy may be deemed a success. But because the regulatory uncertainties are significant, both in terms of future regulation, economic situation, technology trends, and the market, the situation can quickly turn. Regional and domestic regulations may further complexify the regulatory regime.

In the years to come, environmental – and climate change matters are expected to climb at the international shipping agenda. Regarding agenda setting and the Norwegian shipping industry's influence to reach the ambitions set, the Norwegian shipping industry may have to advance their advocacy- and influence strength, to set what the Norwegian shipping industry consider "appropriate" regulation at the IMO-level. The industry will also have to advance its influence at the EU - and domestic-level, as the transition to zero- and low-carbon fuel technologies will require effective industry appropriate support schemes and instruments that support the industry, and which do not complicate the opportunity-seeking shipping industry's operating environment. It is crucial for the Norwegian shipping industry to continue to "think outside the box" to uphold their advantages, for the strategy to be deemed a success also in 2050.

While this paper has been concerned with rather large and innovative shipping companies, further research could extend the scope to additional Norwegian shipping companies. Further research would benefit from building on the industry's international character. A global scope could be given by contrasting the Norwegian shipping industry's strategy with other countries' pursued strategy.

Bibliography

Alter, K., & Raustiala, K. (2018). The Rise of International Regime Complexity. *Annual Review of Law and Social Science, 14*(1), pp. 329-349. doi:10.1146/annurevlawsocsci-lawsocsci-101317-030830

Blaikie, N., & Priest, J. (2019). *Designing social research* (3 ed.). Cambridge: Polity Press.

Boasson, E. L., Andresen, S., & Hønneland, G. (2008). *Internasjonal Miljøpolitikk.* Oslo: Fagbokforlaget.

Ćetković, S., & Skjærseth, J. B. (2019). Creative and disruptive elements in Norway's climate policy mix: the small-state perspective. *Environmental Politics, 28:6*, pp. 1039-1060. doi:10.1080/09644016.2019.1625145

Corsi, G. (2018). *The IMO's GHG strategy: A Step Toward Meeting the 2 degree Target?* Retrieved June 19, 2020, from Climate Institute: https://climate.org/the-imos-ghg-strategy-a-step-toward-meeting-the-2-target/

Danermark, B., Ekström, M., Jakobsen, L., & Karlsson, J. C. (2002). *Explaining Societety: Critical Realism in the social sciences.* London: Routledge. Retrieved from https://profs.basu.ac.ir/spakseresht/free_space/explaining%20society.pdf

Dey, I. (2004). Grounded Theory. In C. Seale, *Qualitative Research Practice.* London: Sage Publications.

DNV GL. (2016). *Charting a Course for Green Costal Shipping: Input to the Norwegian government's commission on green competitiveness from Green Costal Shipping Programme*. Retrieved from https://www.dnvgl.no/Downloads/Roadmap%20-%20Green%20Coastal%20Shipping%20programme_tcm9-88222.pdf

Eidesvik Offshore ASA. (2020a). *About Eidesvik*. Retrieved June 20, 2020, from Eidesvik: https://eidesvik.no/about-eidesvik/

Eidesvik Offshore ASA. (2020b). *Innovation*. Retrieved June 20, 2020, from Eidesvik: https://eidesvik.no/innovation/

European Commission. (2020). *EU Emission Trading System (EU ETS)*. Retrieved May 13, 2020, from European Commission: https://ec.europa.eu/clima/policies/ets_en

Fjose, S., Basso, M. N., Aamo, A., Pedersen, S., & Jakobsen, E. (2020). *Kartlegging av nærskipsfart - sammensetning, alder, lønnsomhet og utfordringer med flåtefornyelse.* Oslo: Menon Economics. Retrieved from https://www.regjeringen.no/contentassets/c00fb69b0b9d49479f5130d7e222a013/menon-publikasjon-19-2020-endelig__.pdf

Frattaroli, S. (2012). Qualitative Methods. In G. Li, & S. P. (Eds.), *Injury Research: Theories, Methods, and Approaches* (pp. 221-233). Boston, MA: Springer US.

Fuenfschillinga, L., & Binza, C. (2018). Global socio-technical regimes. *Research Policy, 47*, pp. 735-749. doi:10.1016/j.respol.2018.02.003

Geels, F. W. (2002). Technological transitions as evolutionary reconfiguration process: a multi-level perspective and a case study. *Research Policy 31*, pp. 1257-1274. doi:10.1016/S0048-7333(02)00062-8

Geels, F. W. (2010). Ontologies, socio-technical transitions (to sustainability), and the multi-level perspective. *Research Policy, 39*, pp. 495-510. doi:10.1016/j.respol.2010.01.022

Given, L. (2008). *The SAGE Encyclopedia of Qualitative Research Methods.* London, New Delhi, Singapor, Los Angeles: SAGE Publications, Inc.

Grin, J., Rotmans, J., & Schot, J. (2010). *Transitions to Sustainable Development. New Directions in the Study of Long Term Transformative Change.* New York: Routledge.

Gupta, S. D., Tirpak, N., Burger, J., Gupta, N., Höhne, A. I., Boncheva, G. M., . . . Saijo, A. (2007). Policies, Instruments and Co-operative Arrangements. In B. Metz, O. Davidson, P. Bosch, R. Dave, & L. M. (eds), *Climate change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 756-807). Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.

Hackmann, B. (2011). Analysis of the governance architecture to regulate GHG emissions from international shipping. *International Environmental Agreements: Politics, Law and Economics, 12*(1), pp. 85-103. doi:10.1007/s10784-011-9155-9

Hove, H. V., Meling Jr., S., Solbakken, F., & Ingjerd, A. (2018). *Det er lov å snu*. Retrieved July 09, 2020, from Bergens Tidende: https://www.bt.no/btmeninger/debatt/i/5VzoAO/det-er-lov-a- snu.

Jakobsen, E. W., Mellbye, C. S., & Holmen, R. B. (2013). *Norske offshorerederier - skaper verdier lokalt, vinner globalt.* Norwegian Shipowners' Association. Retrieved June 30, 2020, from https://www.menon.no/publication/norske-offshorerederier-skaper-verdier-lokalt-vinner-globalt/

King, N., & Horrocks, C. (2010). *Interviews in Qualitative Research.* London: SAGE Publications.

Kuzemko, C., Lockwood, M., Mitchell, C., & Hoggett, R. (2016). Governing for sustainable energy system change: Politics, contexts and contingency. *Energy Research and Social Science*(12), pp. 95-105.

Köhler, J., Geels, F., Kern, F., Markard, J., Wieczorek, A., Alkemade, F., & . . . Wells, P. (2019). An agenda for sustainability transitions research: State of the art and future directions. *Environmental Innovation and Societal Transitions, 31*, pp. 1-32. doi:10.1016/j.eist.2019.01.004

Lachman, D. A. (2013). A survey and review of approaches to study transitions. *Energy Policy, 58*, pp. 269-276. doi:10.1016/j.enpol.2013.03.013

Lister, J. (2015). Green Shipping: Governing Sustainable Maritime Transport. *Global Policy, 33*, pp. 118-129. doi:10.1016/j.gloenvcha.2015.06.011

Mahajan, S. (2019). *Charting the 2019 maritime regulatory landscape*. Retrieved August 18, 2020, from Gard: http://www.gard.no/web/updates/content/26910125/charting-the-2019-maritime-regulatory-landscape

Maritimt Forum. (2020). *Sjøkart for grønn maritim vekst: Politikkanbefalinger for mindre utslipp og mer konkurransekraft.* Maritimt Forum. Retrieved July 20, 2020, from http://s3-eu-west-1.amazonaws.com/maritimt-forum.no/documents/Sj%C3%B8kart-for-gr%C3%B8nn-maritim-vekst_feb2020.pdf

Merkard, J., Raven, R., & Truffer, B. (2012). Sustainability transitions: An emerging field of research and its prospects. *Research Policy, 41*(6), pp. 955-967. doi:10.1016/j.respol.2012.02.013

Miljødirektoratet. (2020). *Klimakur 2030: Tiltak og virkemidler mot 2030.* Regjeringen. Retrieved May 14, 2020, from https://www.miljodirektoratet.no/globalassets/publikasjoner/m1625/m1625.pdf

Monios, J. (2020). Environmental governance in shipping and ports: Sustainability and scale challenges. *Maritime Transport and Regional Sustainability*, pp. 13-29. doi:10.1016/b978-0-12-819134-7.00002-2

Norwegian Ministry of Climate and Environment. (2015). *New Emission commitments for Norway for 2030 - towards joint fulfilment with the EU.* Meld. St. 13 (2014-2015). Retrieved April 10, 2020, from https://www.regjeringen.no/contentassets/07eab77cc38f4085abb594a87aa19f10/en-gb/pdfs/stm201420150013000engpdfs.pdf

Norwegian Ministry of Climate and Environment. (2019). *The Government's action plan for green shipping.* Retrieved April 30, 2020, from https://www.regjeringen.no/contentassets/2ccd2f4e14d44bc88c93ac4effe78b2f/thegovernments-governments-action-plan-for-green-shipping.pdf

Norwegian Ministry of Trade, Industry and Fisheries. (2015). *Maritime Opportunities - Blue Growth for a Green Future: The Government's Maritime Strategy.* Oslo: Norwegian Ministry of Trade, Industry and Fisheries. Retrieved from https://www.regjeringen.no/contentassets/05c0e04689cf4fc895398bf8814ab04c/maritim_strategi_engelsk_trykk.pdf

Norwegian Shipowners' Association. (2014a). *About*. Retrieved May 18, 2020, from Norwegian Shipowners' Association: https://rederi.no/en/about/

Norwegian Shipowners' Association. (2014b). *Industrial Policy.* Retrieved May 18, 2020, from https://rederi.no/en/about/diciplines/naringspolitikk/

Norwegian Shipowners' Association. (2020a). *Norsk skipsfart klimanøytral innen 2050*. Retrieved May 20, 2020, from Rederi.no: https://rederi.no/aktuelt/2020/klimanoytral-innen-2050/

Norwegian Shipowners' Association. (2020b). *Zero emissions in 2050.* Oslo: Norwegian Shipowners' Association. Retrieved May 20, 2020, from https://rederi.no/rapporter/

Psaraftis, H. (2018). *Sustainable shipping: A cross-disciplinary view.* Cham: Springer.

Ringdal, A. D. (2019). *Innspill til NOU 2018:17 Klimarisiko og norsk økonomi*. Retrieved May 15, 2020, from https://www.regjeringen.no/no/dokumenter/horing--rapport-fra-utvalg-

som-har-vurdert-klimarelaterte-risikofaktorer-og-deres-betydning-for-norsk-okonomi/id2622397/?uid=7bb65d55-c97e-4e7d-ba1b-a189d7ef3c9b

Roe, M. (2007). Shipping, Policy and Multi-Level Governance. *Maritime Economics & Logistics, 9*, pp. 84-103. doi:https://doi-org.ezproxy.uis.no/10.1057/palgrave.mel.9100173

Roe, M. (2013). Maritime governance and policy-making: The need for process rather than form. *Asian Journal of Shipping and Logistics, 29*(2), pp. 167-186. doi:10.1016/j.ajsl.2013.08.003

Rogge, K. S., & Reichardt, K. (2016). Policy Mixes for sustainability transitions: An extended concept and framework for analysis. *Research Policy, 45*(8), pp. 1620-1635. doi:10.1016/j.respol.2016.04.004

Rolsdorph, N., & Austnes, K. (2007). *EU- Norges viktigste handelspartner*. Retrieved July 19, 2020, from SSB: https://www.ssb.no/utenriksokonomi/artikler-og-publikasjoner/eu-norges-viktigste-handelspartner#:~:text=Dersom%20vi%20ser%20p%C3%A5%20handel,rundt%2070%20prosent%20av%20totalen.

Skonnord, O. P. (2018). *Norway targets IMO to halve global shipping emissions by 2050.* Retrieved June 04, 2020, from Reuters: https://www.reuters.com/article/us-norway-shipping-imo/norway-targets-imo-to-halve-global-shipping-emissions-by-2050-idUSKCN1HC1OG

Sovacool, B. K., & Geels, F. W. (2016). Further reflections on the temporality of energy transitions: A response to critics. *Energy Research and Social Science*(22), pp. 232-237. doi:10.1016/j.erss.2016.08.013

Stalmokaitė, I., & Yliskylä-Peuralahti, J. (2019). Sustainability Transitions in Baltic Sea Shipping: Exploring the Responses of Firms to Regulatory Changes. *Sustainability, 11*. doi:10.3390/su11071916

Steen, M. (2018). Et grønt maritimt skifte? Muligheter og barrierer for omstilling til en mer miljøvennlig skipsfart. In G. Rusten, & H. Haarstad, *Grønn omstilling - norske veivalg* (pp. 45-62). Oslo: Universitetsforlaget.

Stensvold, T. (2009). *IMO følger Norge*. Retrieved July 20, 2020, from Teknisk Ukeblad: https://www.tu.no/artikler/imo-folger-norge/254451

Stensvold, T. (2010). - *Hva vil du bli husket for, Stoltenberg?* Retrieved June 02, 2020, from Teknisk Ukeblad: https://www.tu.no/artikler/industri-hva-vil-du-bli-husket-for-stoltenberg/237825

Stensvold, T. (2019). Handlingsplan skal halvere utslipp fra skipsfarten på 11 år: - Vanskelig, men mulig. *Teknisk Ukeblad*. Retrieved from https://www.tu.no/artikler/handlingsplan-skal-halvere-utslipp-i-skipsfarten-pa-11-ar-vanskelig-men-mulig/468155

Stensvold, T., & Jensen, A. B. (2020). *Kan bli "game changer" for nullutslipp på skipsfart verden over*. Retrieved from Teknisk Ukeblad: https://www.tu.no/artikler/verdens-forste-eidesvik-bygger-om-viking-energy-til-ammoniakk-drift/483392?key=QsoQgU7t

Tjora, A. (2013). *Kvalitative forskningsmetoder i praksis* (2 ed.). Oslo: Gyldendal Norsk Forlag AS.

United Nations. (2020). *Oceans and the Law of the Sea*. Retrieved from United Nations: https://www.un.org/en/sections/issues-depth/oceans-and-law-sea/#:~:text=The%20oceans%20had%20long%20been,all%20and%20belonged%20to%20none.

Vormedal, I. (2011). From Foe to Friend? Business, the Tipping Point and U.S. Climate Politics. *Business and Politics, 13*(3). doi:10.2202/1469-3569.1350

Vormedal, I., & Skjærseth, J. B. (2019). The good, the bad, or the ugly? Corporate strategies, size, and environmental regulation in the fish-farming industry. *Business and Politics*, pp. 1-29. doi:10.1017/bap.2019.30

Waage, R. (2009). Can a proactive approach to environmental challenges prove a competitive advantage in the maritime industry? The case of the Wilh. Wilhelmsen Group and the car carrier industry (Master thesis). Retrieved April 30, 2020, from https://openaccess.nhh.no/nhh-xmlui/handle/11250/168925

Wan, Z., Makhlouf, A. e., Chen, Y., & Tang, J. (2018). Decarbonizing the international shipping industry: Solutions and policy recommendations. *Marine Pollution Bulletin, 126*, pp. 428-435. doi:https://doi.org/10.1016/j.marpolbul.2017.11.064

World Maritime News. (2020). *ICS: Regional Shipping Regulations Creating Chaos*. Retrieved from https://worldmaritimenews.com/archives/158352/ics-regional-shipping-regulations-creating-chaos/

Yin, R. K. (2018). *Case Study Research and Applications Design and Methods.* California: SAGE Publications Inc.

Zacher, M., & Sutton, B. (1996). *Governing global networks: International regimes for transportation and communications.* Cambridge: Cambridge University Press. doi:10.1017/CBO9780511521812

Appendix 1: Interview guide

(Translated from Norwegian to English)

Consent:

- Is it okay for you that the interview is to be recorded, transcribed, and subsequently utilised within the frameworks of this project? Data emerging during the interview will only be utilised for this investigation and are not be shared with external parties.

- At any given time, you have the right to withdraw your consent, even after the interview. In terms of citing and paraphrasing, data deriving from this interview and utilised in the text will be sent back in advance of the submission date, so that you may verify the citations prior to publication. Your personal data will not come forth in the thesis.

Brief introduction of myself, the study and the projects aim.

Introductory questions:

1. Can you tell me about your company/organization and what your position includes?

2. How would you describe your (or your institution's) role in sustainability related work, and how extensive is your experience on the matter?

Theme 1: Sustainability transition

3. What are your thoughts about the "green" transition in the shipping industry?

4. In what way have the sustainability focus played a role in your business conduct?

5. How do your company/organization relate to the ambition level set in Norway (50% by 2030) and the IMO (50% by 2050)?

6. What opportunities lies within the transition for your company/Norwegian shipping industry?

7. What challenges do you face, now and further down the road?

Theme 2: The political environment and different governance levels

8. How would you describe the present political environment in respect to environmental regulation?

9. How do you work in the face of regulations and adoption of regulations, at the national, EU and international level?

10. Do you consider that you have any influence?

Theme 3: Regulations and requirements

11. How do you relate to environmental regulations becoming stricter?

12. Do you have a strategy for how to meet the coming regulations?

13. Do you see more opportunities or challenges in the face of stricter regulations?

- if yes, why and what?

- if no, why not?

14. How would you describe the way forward from here?

Wrapping up

Are there any additional perspectives and aspects that you think is necessary to include in my project?

Do you have any suggestions of reports, regulations, or laws that you think is necessary to include in the analysis?

Do you have any suggestions to other informants that would be valuable to contact?

Thank you very much for your participation!