

Development of shore power for cruise ships: Case study of the Port of Stavanger, Norway



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Abstract

The growing cruise industry has impacted harbouring cities through noise and air pollution causing distress and harm to citizens. Shore power technology is a promising solution for these issues and is being implemented in the cruise industry. This paper explores the different perspectives of the development with attention to challenges and the use of regulations. The research is a case study of the Port of Stavanger where shore power is being implemented and local authorities are attempting to control the industry's impact on the city. Through document analysis of strategies, regulations and incentives as well as interviews with actors involved in the development, this research highlights the complexity of the cruise industry. Theoretical perspectives on energy transitions, governance and stakeholder management provides a deeper understanding of the challenges of regulating the industry and how the shore power development can be seen as a part of a larger transition in the cruise industry.

The paper discusses aspects of local regulation with attention to stakeholder management and governance theory to review the impact of local decision making. Aspects of the cruise lines approach to shore power is discussed in light of transition and regime resistance literature to explore the challenges and implications of regulating the industry. National regulation is explored as an option of increasing the speed of shore power development, where attention to the intricate operations and complex setting of cruise industry makes this task difficult. The paper aims to contribute to the maritime governance field when discussing the implications and challenges of regulating the cruise industry. A shore power development for the industry is feasible and called for, to which this paper questions the need of regulatory tools as a mechanism to ensure a stable and accelerated development along the Norwegian coast as a contribution to the global ambition of a sustainable development of the cruise industry.

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List of abbreviations:

CO₂e: CO₂ equivalents

Cruise industry: In this paper, refers to the cruise lines and their associated partners.

ECA: Emission Control Areas

EGCS: Exhaust Gas Cleaning Systems (Scrubbers)

EDG: European green deal

Dock: A fixed structure attached to shore to which a vessel is secured when in port.

GHG: Greenhouse Gasses.

Harbor: A section along the coastline where the ship and other water vessels are parked or stored.

IMO: International Maritime Organisation.

LNG: Liquid Natural Gas.

Mooring: Quays, wharfs, jetties, piers, anchor buoys

NABU: Nature and Biodiversity Conservation Union

NCA: Norwegian Coastal Administration.

NMA: Norwegian Maritime Authority.

NO_x: Nitrogen dioxides.

ODS: Ozone Depleting Substances

PM₂: Particles with matters smaller than 2 diameters.

Port: A place on the coast which has facilities for boats or ships to call into, and usually a village or town attached.

Port call: When a ship sail into a port to refuel, disembark passengers or use other port services.

Quay: A part of the river bank or coastline which has been modified so ships can dock at it *parallel* to the shore.

SCR: Selective Catalytic Reduction

Shipping industry: In this paper, refers to freighter ships, cargo ships, container ships and their associated partners.

Shore power: Cold ironing, onshore power supply, shore supply, marine power, alternative maritime power.

SO_x: Sulphur oxides.

SRH: Stavanger Regionen Havn (The Port of Stavanger)

WHF: World Heritage Fjords.

WPG: Worley Parsons Group

1. Introduction

The maritime sector has received significant attention from the international community and organisations in efforts to reduce emissions and seek a sustainable development. International standards for new ships and fuel requirements has been implemented in the last decades. Shore power technology in particular has made a stand in the maritime sector and shows positive effects on emission reduction and air quality in harbouring cities. International governments and maritime organisations seem positive to this technology and are working on implementing it all over the world. This will likely have a positive impact on global emissions from this sector and play an important role in the global overarching goal of a sustainable development.

However, this commitment seems to be lacking attention to one particular industry; the cruise industry. This industry is commonly not recognized as an important transportation method. The ships are not designed for freight or moving people from one place to another. Instead its focused on leisure and brings passengers on a round trip through several destinations. The industry has had an impressive growth in the past decades and is expected to grow even more in the future (Micallef 2020). These ships are big energy consumers and their size seems to see no limit. Their emissions are negatively effecting the harbouring cities and ultimately the global environment (Ellsmoor 2019). It is estimated the cruise industry has more CO₂ emissions per passenger-kilometers than economy class aviation with more than 30 million tons of fuel oil per year consumed globally, contributing 10% of the overall annual consumption of the global ship fleet (Trivyza, Rentizelas, and Theotokatos 2019). Cruise ships spend approximately 30% of their voyage in port, with the use of shore power the ships can turn off their engines and effectively have no significant air and noise pollution when in port. The interest of shore power for cruise ships has grown in recent years. Cruise ports along the Pacific coast of USA have had a steady development on the last decade, and has seen promising results in air quality.

In Norway the development has been significantly slower. In 2018, the Norwegian environmental organization Bellona urged more investment in shore power for cruise ships and stated that the cruise industry were willing to invest in the technology. Bellona criticized the government for being slow in regulating the industry and not funding the development.

They believed shore power is the future for cruise ships and if the development takes too long we risk losing the industry (Bellona 2018). The commitment from the Norwegian government has increased in the latest years through action plans and public funding systems. However, there are no international or national regulations aimed at shore power for cruise ships. This may leave the development mostly in the hands of the industry, the ports and local communities. This raises a question of the pace of development and possibly increased risk of losing the industry.

There is also reason to question the commitment of the cruise lines. Issues of cost benefit; price of electricity v.s. price of fuel, other technologies; LNG, hydrogen, scrubbers and cleaner fuel options have previously been regarded as more viable options for cruise ships. The cost of adapting the ships to shore power systems is a significant investment that some cruise lines may not be willing to make (The Port of Copenhagen et al. 2015; United States Environmental Protections Agency 2017). These aspect affect the onshore development as the shore power facilities are purposely designed for the cruise ships at a high cost. If ships are not investing in their part of the development then there is little reasoning for the ports to invest on their part. This is a dilemma frequently seen in transition - and market theory. It is also an aspect where governments may assist through regulations and restrictions.

1.1 Problem statement

Attention to noise and air pollution from the cruise ships in cruise harbours has put pressure on the local authorities and the cruise industry. Shore power is recognized as a viable option to reduce the ships pollution in port and a move towards a cleaner cruise industry. With the endorsement from the national government the cruise destinations are exploring the option further. Some ports have received public funding and are in final planning stages. Shore power development in the biggest cruise destinations in Norway could have a positive impact on the international development and the aim of achieving a sustainable cruise industry in different ways in addition to reducing the impact on local communities. The cruise industry have profiled their commitment to reducing their environmental impact and have implemented shore power on ships. The industry are positive to shore power as a part of their operations. However, there is uncertainty of how much of a commitment they are prepared to make. New engine technology and additional cost of shore power implementation are factors that may alter the industry's commitment and agenda. This raises a question of how the cruise industry will approach the development of shore power in Norway.

Internationally there are no regulation or laws specific to shore power, nor is there national Norwegian regulation on the matter. However local municipalities have taken action on the matter of securing a sustainable development of the cruise industry. Local communities and popular cruise destinations have set strict restrictions for future cruise operations, where shore power is integrated as a demanded use by 2025. However there are concerns of the effectiveness and the methods the municipalities use, raising questions if this is the best approach for the aim of green maritime industry, sustainable cruise industry and a growing tourism sector in Norway.

This thesis aims to research the impact of the currently enforced regulations and methods used by the different levels of authority in Norway, and explore the option of a national regulation directly aimed as shore power for cruise ships. There is few relevant peer-review literature on the matter of lacking regulations and the impact this has on development in the cruise industry. As the industry continues to grow, I find it important to research the possibilities of a national regulation in order to provide an insight into the possible path of shore power development at a satisfying speed.

To make this research more specific, I have chosen to focus on a case. This will allow me to bring forward detailed descriptions of actions taken in the matter of shore power for cruise ships. It will also provide a situated understanding of different actors agency and constraints, specific incentives and regulations that apply for this development. Stavanger city and the port of Stavanger has been chosen for the case in this study – a number of reasons make this case illustrative of the governance challenges posed by this particular industrial transition. The cruise industry has a prominent standing in the region and is expected to grow in the coming years. At the same time the community has expressed concerns with the air pollution. The municipality has taken action to secure a sustainable development of the industry through strategies and demands. There port of Stavanger is actively pursuing shore power for cruise ships and are in the final stages of securing public funding and moving forward with construction. These aspect allow for a detailed and informative study of how regulations and control over the dynamic cruise industry may reduce the impact of the industry.

In this thesis I will examine the current management of the industry in light of shore power development and analyse the impact this may have. Further I will explore the option of national regulation and pay attention to the lack of them and its implications on the future development of shore power along the coast.

With this aim I am asking the following research questions:

- How can the development of shore power facilities influence the cruise lines to transition to cleaner fleets?
- How is the Norwegian shore power development affected by public funding and regulation?
- What implications can a national regulation of shore power have on cruise lines and ports in Norway?

1.2 Aim and objective

In this study the aim is to provide an insight into the different aspects affecting the future of the shore power facility in the port of Stavanger. The study aims to show the contrasting perspectives of the major stakeholders in this process; the port/community and the cruise lines. Both of them are important actors in regards to the future of Stavanger's shore power plans as well as the future development along the Norwegian coast. The aim is also to show the difficultness of reshaping the cruise industry due to its complexity and independence. It will also shed light on the ramification of cruise lines investments; how it affects the city of Stavanger.

To accomplish this the research will collect data of opinions and actions from relevant actors. This data is compiled of interviews with key informants and documents relating shore power development which will be analysed to provide an overview of different perspectives. The study will hold a focus on regulations and subsidies with the aim of showing its effects on the development. Important laws and directives will also be analysed in light of the data collected to show whether or not the laws are aiding the ambition of shore power development. The data collected will also be interpreted with attention to transition theory. This means that the study will compare the current situation of the shore power development with theory on energy transitions. This process aims to give a perspective on what is expected to happen with within current circumstances, and provide a hypothetical expectation of what future development may be.

1.3 Scope of the study

In order to provide a sufficient analysis of the issue at hand it is necessary to narrow the scope of the study due to time constraints and data limitations. The following text provides an

overview of aspects of the issue that are *not* further explained in the paper. Some aspects may be mentioned in the research, but without a detailed description or reliable data.

This study focuses on the development of shore power in Stavanger. Attention will be given to other ports but without a detailed description of the project. There are ports in- and outside Norway with further shore power development that will not be discussed in this paper. The technological aspect covered in this study is limited to shore power technology. Other prominent emission reduction technologies such as Liquefied Natural Gas (LNG) and Exhaust Gas Cleaning Systems (EGCS) will be briefly introduced in this paper due to its relevance in choice of technology. Other technologies will not be covered in this research. Shore power technology is prominently used on various ships where the technology is slightly different. This is not being highlighted or further investigated in this study. There will be no significant differentiation of cruise ships make and model. Technical layouts and specifications are not addressed as it do not serve a significant impact on the issue at hand. Data on emissions from cruise ships are limited. Therefore this paper will refer to the maritime sector or shipping industry as a reference of emission following a clear identification of the source of emission. The aim of this is to illustrate the scale of emissions, this data will not be used in any further calculations in this research.

The stakeholders investigated in this study are limited as mentioned in section 1.2. However, it is acknowledged in the research that there are other stakeholders affected by this development that will not be mentioned. As the study is focused on the future of success or failure, aspects such as subcontractors, neighbours, smaller businesses or tourist attractions will not be discussed. As the study is focusing on laws and regulations, the major authorities influencing the cruise industry are described. However due to the scale of the maritime sectors and its many regulatory instruments and authorities, this description is limited. There are directives and policies might influence the development of shore power that will not be covered in this paper due to the uncertainty and magnitude. Additionally this study does not aim to give a clear pathway of development, but rather an insight into the potential of a shore power facility in the port of Stavanger.

The cruise industry has seen a drastic reduction in operations due to the pandemic of Sars-Cov-2 virus, referred to Covid-19 in future instances. As the time this thesis is written there is still uncertainty with regard to the effects of the pandemic and its impact on the industry. In this thesis, due to time constraint and uncomplete data the pandemic will not be described in

further detail. However it will be mentioned as an incident potentially affecting the development. In this research the cruise lines response is significant. However it has proven difficult to apprehend therefor other sources objectifying the cruise lines goals and intention have been used and are disclosed in the paper.

1.4 Research strategy

To answer my research questions I use an abductive research strategy. This strategy relates an observation to a theory and results in an interpretation. The aim of this type of research is to use theory together with observation to produce an interpretation of something specific. The aim is not to test the truth of the theory or to generalize (Day 2004). When interpreting and recontextualizing an individual phenomena within a conceptual framework or a set of ideas, we will be able to say something in a new way by observing and interpreting this something in a new conceptual framework (Danermark et al. 2002). In the literature review we observed the lack of regulations for shore power both on shore and off shore. The aim of this thesis is to get a better understanding of how fast a transition to shore power for cruise ships can go. In this process the theory will play an essential role in understanding a possible path of this transition. From this interpretation we could better understand the importance of international regulations for this sector.

With this aim I also adopt a discursive approach. This is described as an argumentative analytical frame for the study of political processes. A political conflict is seen as hidden in the question of what definition is given to problems and which aspects of social reality are included and which are not. A discourse analysis may show how discursive orders are maintained and transformed within politics. This approach is a method where the researcher looks at the tools used by actors to gain discursive hegemony and analyzes controversies over issues in a wider political context (Hajer 1995). Through this approach I may be able to shed light on the political position the cruise industry has taken in the discussion on shore power.

1.5 Thesis structure

Section 2 presents a literature review of peer review literature relevant to this thesis. The aim is to give the reader a perspective on what is already researched and published on this subject and where the gap in research exists.

To present the context of the research problem section 3 will give an introduction to the cruise industry with attention to the Norwegian market, stakeholders and its impact on the economy and local community. Further follows a general introduction to shore power technology and the development in Norway. A description of the The Port of Stavanger's plans for a shore power facility will also be presented. This section aims to provide the reader with information relating to the position of the cruise industry and the shore power development in relation to pollution issues.

Section 5 will present relevant theory that will be used in the analysis and discussion. With this the data collected will be linked to theory to provide discussion and answers to the research questions. In the next section the methods used in the research will be presented with a detailed description of how the information used in this paper was obtained and analyzed.

In section 7 the data collected will be presented. The information presented is related to the issues this research aims to answer. The section is divided into two sub-sections. Data collected through documents will be presented first with attention to regulatory authorities relating to the cruise industry and incentives aimed at the industry's development. The next sub-section aims as the actors perspectives on the development where data presented is derived through correspondents with representatives from the industry.

Next section contains discussions on aspects related to the research questions. Divided into three subsections relating to the research questions. This section aims to relate theory to the data collected to further investigate the future of shore power development in Norway. Aspects of local regulation, prospects of national regulation and the cruise lines objectives will be discussed with attention to the research questions.

The final section is where a conclusion is presented. Here an answer to the research question will be given to conclude the research in addition to final arguments and suggestions of further research.

2. Literature review

A literature review is a compilation of other research relevant to the theme of the thesis. Peer-reviewed literature and also non-academic sources may be used. It is important to be transparent in the use of sources, by citation as well as interpretation of the literature (Sovacool, Axsen, and Sorrell 2018). In this literature review a compilation of peer-reviewed

literature is presented. There is limited research on shore power for cruise ships specifically, therefore this review will present literature on different aspects of the subject.

The cruise industry has grown drastically in Norway in the last decade but research on the matter is lacking. The research available on cruising in Norway relates to the added pressure on the Norwegian health system and the welfare state (Dahl 2015, 2019; Eidem, Dolan, and Bjørneseth 2008) . With the increasing cruise tourism in the country, this may be seen as a pre warning for the Norwegian state as well as the cruise lines. There is no peer-reviewed literature on shore power development in Norway, but articles and company research has been conducted which is presented in section 3 of this paper.

The following sub-sections presents peer-reviewed literature on subjects related to shore power development. There are limited peer-reviewed papers on the cruise industry in relation to shore power or other emission abatement technologies with attention to regulation and development. The literature review presents papers on the impact of the cruise industry on local communities, perspectives on the cruise lines sustainable development initiatives and shore power development with attention to operational challenges. These papers provides examples of how the industry impacts a community, how the cruise lines are handling this issue and what challenges exist for implementing shore power. The scholarships provide perspectives on the complexity of the industry and aspects of concern when developing shore power for cruise.

2.1 Impact studies

As the cruise industry continues to grow it is gaining more attention amongst scholars. Most common are studies on the industry's impact on local communities with focus on the economic, social and environmental impact. These studies are not purely academic, the information comes from non-transparent and incomplete industry self-reporting and are often single method studies implemented after tourism has begun. Environmental impact has received more attention in the last years as climate change and sustainable development becomes more integrated in the global agenda. In terms of pollution the attention is often brought to the shipping industry as it dominates the maritime sector (Zhen et al. 2018). Research on international policy and incentives to increase the uptake in emission abatement technologies in the maritime sector exist. However, these papers are already outdated due to the updated international policies as well as technological development (Innes and Monios

2018). The maritime sector has enforced new regulation on emissions in the latest years, influencing the cruise industry which is presented in more detail in section 6 of this paper.

In a study of creating a tourism port in Honduras, MacNeill and Wozniak (2018) found evidence of failure to provide net-benefits for the local population in towns closest to the port. Research showed an increase in corruption, a diminished capacity for residents to provide for necessities in life and an increased environmental cost. The study concluded that policies at a local level and instruments in protection of the local community and environment are necessary to achieve a sustainable cruise tourism, especially at a local level. Further research points to the same aspect in Europe. Dubrovnik, Spilt and Lisbon are all popular cruise destinations. These cities are experiencing crowding, waste, security and crime risk. Research suggests careful planning of future development as cruise destinations is highly necessary. The residents realize that this industry creates opportunities but also problems that did not exist until the industry arrived, such as air pollution and social instability. In planning and management of tourism activities, environmental and social sustainability are becoming increasingly important factors to be taken into account. Climate change is also an aspect that strongly applies to the industry. There is a need to find a balance between less pollution, particularity and receptiveness of destinations and its residents and the changing motivations for the tourist on board (Kovačić and Silveira 2020). Even though the city of Stavanger and Norway are different from South America and Southern Europe there are still similarities between them such as; increased cruise traffic, environmental concern and crowding due to tourism and urbanization. Experience of other cruise destinations should serve as an example of the negative aspects the industry presents and justify the further attention of ensuring a sustainable cruise development in Norway.

These papers points to the cruise industry yielding positive and negative impacts for the local communities, where finding a balance and careful planning is highly important for the future growth of the industry. The next section provides a perspective of how the cruise lines are tackling this issue.

2.2 Sustainable development

With the increased attention to climate change the cruise lines are experiencing pressure from the market and its stakeholders. As a result the industry is increasing their efforts in building a sustainable industry by investing in new technology, reorganizing their market profile and

reducing single use items. Cruise liners are publishing extensive and systematically structured formal sustainability reports. However, a study of the reports from two largest ocean cruising companies; Royal Caribbean Cruises and Carnival Corporation suggest that these corporate approaches towards sustainability are “little more than so called greenwash ” (Jones, Hillier, and Comfort 2017:302). This practice is referred to as a “cynical ploy to attempt to assuage governments, consumers and pressure groups concerns about environmental and social impact of business activities” (Jones et al. 2017:302). Carnival Corporation and Royal Caribbean make up approximately 70% of the industry revenues and are often recognized as the face of the cruise industry. Majority of other cruise liners has not published any sustainability reports, which puts the two companies as representatives of the industry in terms of sustainability. The sustainability reports have been criticized for being limited in the use of formal international guidelines and unclear presentation of website information. Few have reported on specific initiatives and few have provide meaningful assessments of their performance impact. The reports often show their approach to sustainability is largely driven by business continuity (Jones et al. 2017). This may undermine the idea that the industry is committed to investing in sustainability as well as the timeline of a green shift.

If the market does not move in a sustainable direction on its own, regulatory tools may be used to nudge the industry into a pathway of sustainable development. Implementing new regulations in the maritime sector is complicated. One of the main reasons for this is the sheer size of the sector and the amount of money involved. Implementation of regulation may increase the cost of the stakeholders commercial activities and make the operation more complicated. The stakeholders that suffer the most may try to postpone the implementation of a new maritime regulation with the aim of reliving the burden. It becomes clear in this study that the regulations should target a fair balance of commercial cost and the benefits in order to facilitate the implementation process. Some commercial activities are vital for a stakeholder where new regulation may have considerable negative effects on these commercial activities and ultimately the stakeholder (Karahalios et al. 2011).

The research presented in this section signals that the self-reporting from the cruise lines may be biased and not a pure reflection of the industry’s actions. Implementing regulatory tools may be the next step to a sustainable development but it is a difficult task in the maritime sector.

2.3 Shore power development

On general terms shore power have operational challenges. Especially for ports with several small berths and a wide range of vessels where some vessels may be reluctant to remodel their ships to fit shore power connection. Larger ports have seen most of the development of shore power for all ship types due to the higher power demand which leads to a simple installation, higher emission reduction and shorter payback period. The cost of installation is often the deal breaker for ports. Norway is prominent in the development of shore power as a result of the governments ambitious plans and the ReCharge program where potential ports and ships are identified for shore power and battery hybrid operations. The Norwegian development has ramifications outside of its borders as ships enter international ports ready to receive power shore side. This notably applies for the shipping industry where ships regularly visit the same ports at a higher frequency and no seasonal limitations (Innes and Monios 2018). The Norwegian development may therefore act as an incentive for other ports to develop shore power facilities if ships are prepared to receive shore power. The plausibility of ships saving enough on fuel serves as motivation to install shore power connection on their ships. Ferries see a clear investment strategy as it frequently docks at the same quay on a highly regular schedule, which entails higher fuel saving and shorter payback period (Innes and Monios 2018). The same logic follows the cruise industry but at different ports in shorter operational season. As the cruise season is limited it becomes more challenging for ports and ships to justify the investment, but it also becomes more important that the ports it enters are equipped with shore power in order to maximize fuel savings and payback period.

Research related to the implementation of shore power shows that the technology is promising and often necessary in order to secure a sufficient emission reduction. A study conducted in the Port of Barcelona concluded that shore power systems are absolutely necessary to reduce Greenhouse Gas (GHG) emissions from berthed ships. The paper highlights the use of renewable energy (RE) as a base for shore power and characterizes this as a plausible solution. The authors encourages more studies to make it possible, especially relating to the use of RE to supply the ships with the energy needed (Rolan et al. 2019). The air pollution from the national electricity grids used in shore power is of concern where the inclusion of RE could ensure projects are as environmentally friendly as possible (Innes and Monios 2018).

The implementation of shore power for cruise ships is higher at larger cruise destinations. The Port of San Diego in California, USA implemented the technology in 2010 and has since expanded to provide power to a large share of their cruise calls (The Port of San Diego 2021). Other major cruise destinations in North America such as Seattle and Vancouver as well as in Europe where Rostock in Germany and Tallin in Estonia (Rostock Port 2021; The Port of Seattle 2019; The Port of Tallin 2020; The Port of Vancouver 2021). Many of these ports are not linked directly to the Norwegian cruise market, but the development could still have a positive influence on the Norwegian shore power development as by increasing the demand of the market and contributing to the shift in the cruise industry. A successful implementation of shore power in Europe and the USA may also result in the IMO encouraging other countries to utilize this technology. Stricter regulation could dramatically increase the price of fuel as seen with sulphur limits, NO_x regulations and addition of carbon tax. Stricter regulation on shore power and the increased fuel price may increase the savings of implementing shore power (Innes and Monios 2018). However higher fuel price may also result in increased investment in other emission abatement technologies making it harder to justify additional investment in shore power.

This section shows that shore power development is considered a necessary investment to reduce emission but it also signals that an international commitment from the ports is necessary to the transition to reach its full potential.

3. Background: The cruise industry in Norway

The cruise industry is one of the faster growing industries in the tourism sector. It is based on the idea of a floating luxury hotel capable of hosting thousands of guests while going from destination to destination. It is this so called “hoteling” function that is responsible for an excessive energy demand and the cruise ship industry is recognized as one of the most energy intense forms of tourism (Eijgelaar, Thaper, and Peeters 2010). The most popular cruise destinations are the Caribbean/Bahamas/Bermuda, followed by Asia and China. Northern Europe is in fourth place close behind Central & Western Mediterranean (CLIA 2021). The top countries in the European cruise markets is Germany, UK & Ireland and Italy (CLIA 2019b).

In Norway the industry has been the fastest growing form of tourism in the past decade with a variety of tours and trips. 850 000 cruise tourist visited Norway in 2019, which accounted for

3,6 million day-visits. It is difficult to estimate exactly how much of the total spending of cruise passengers enters the Norwegian economy. Approximately >90% of a passengers spending are acquired by the cruise lines and the remaining enters the Norwegian economy mostly through shopping, food and drinks, activities and local transport. Cruise tourist consumption is estimated to account for NOK 1.8 billion in 2019 (Innovasjon Norge 2019).

Cruise Norway AS is a prominent representative for the industry in Norwegian business sector and works closely with involved actors and the government to secure growth for the industry. The European cruise market is represented by the European Cruise Council (ECC) and Cruise Europe who advocates for the cruise industry aiming to secure stable and prosperous conditions for a continued growth of the industry (Innovasjon Norge 2007). On a global scale the industry is represented by Cruise Line International Association, Inc (CLIA), known as the world's largest cruise industry trade organization. CLIA represents seven regions around the world with 95% of the global cruise capacity, more than 350 partners including ports, suppliers, destinations, agencies and agents (CLIA 2019a). The global fleet of CLIA members consists of 270 ships, and further new 20 ships to debut in 2021. The association is committed to a sustainable development of the industry and has invested \$23,5 billion in ships with new technologies and cleaner fuel to reduce carbon emissions (CLIA 2021).

The rapid growth of the industry has led to increased cruise calls, bigger ships and more tourists. The increased attention to Norway as a cruise destination has added pressure to the local communities through overcrowding and pollution. Additionally research shows that the tourist are spending less at destinations than before and compared to other types of tourists. This has caused tensions in local communities. Citizens have complained of noise and air pollution, invasion of privacy and a general lack of control of the impact the industry has on locals (Walnum and Storrusten 2019). In the beginning of the 2020 cruise season the industry was heavily affected by the Covid-19 pandemic resulting in a cease of cruise lines activities indefinitely. There is uncertainty of when the industry will resume business and how this will look like, but a representative from the industry have stated the industry will return when the time is right (Sletner 2020).

The next subsection goes into further details on emissions from this industry to give a better understanding of what impacts this has on the local communities. An explanation on shore power technology and how this allows for emission relief is presented in subsection 3.2. Then

follows an overview of the shore power development in Norway and presentation of the Port of Stavanger as the case subject in this paper. The aim of this section is to provide an understanding of how shore power development can contribute positively to a sustainable cruise industry.

3.1 Air pollution

Emission from ships as well as road traffic, industry and woodburning are recognized as local air pollution; with adverse effects on human health (Nestaas, Andersen, and Brinchmann 2021). In the harboring cities, maritime activity creates a problem of great acuteness for urban pollution causing environmental problems affecting both human health and ecosystems (Maragkogianni and Papaefthimiou 2015). Local air pollution is affected by the surroundings such as topography, buildings, vegetation, temperature and wind direction. In some cases the pollution may be confined within the area around its source; mountains and building are hindering the transport of polluted air away from the populated areas (Air Quality in Norway 2021).

The ship's energy is traditionally supplied through an auxiliary generator running on diesel or marine fuel oil (Vaishnav et al. 2016). This method is associated with low energy utilization, noise and air pollution. The main substances are Nitrogen oxides (NO_x) Sulphur dioxide (SO_x), Carbon dioxide (CO_2) and Particular matter whose diameter is $< 2.5 \mu\text{m}$ (PM 2.5) (DNV GL 2015). NO_x is a term for Nitroxides NO and NO_2 which can lead to severe health issues in humans when inhaled. It is also responsible for smog and the dark cloud often seen covering cities known to reduce air quality. NO_x contribute to acid rain and low-laying ozone layer which can harm ecosystems, animals and plants (The NO_x Fund 2021b). The marine fuel used in ships contain sulphur. The sulphur is released as smoke and may oxidize further, forming sulfuric acid; a large contributor to acid rain. NO_x and SO_x can have adverse effects on the ozone layer in the troposphere, which results in the greenhouse effect contributing to global warming. SO_x is also a contributor to the formation of fine particles harmful to humans, when inhaled it can cause damage to the respiratory system. PM 2.5 are particles small enough to penetrate deep into the lungs and pass through tissue entering into our blood stream and thereby provoke health problems. PM 2.5 have in particular been shown to cause a major effect of cardiopulmonary and lung cancer mortalities in populations exposed in coastal areas (Rolan et al. 2019).

The local air pollution may often not be visible to the naked eye but are still dangerous to humans. Testing of air quality in port cities has shown cause of concern. A study done by NABU, a German NGO in the port cities: Hamburg, Venice, Barcelona and Bergen, close to cruise and ferry terminals showed levels of ultrafine particulates up to 100 times above background pollution. These levels surpasses concentrations next to main roads with dense traffic between 50 to 80 times. Compared to what is considered clean air the particle numbers exceeded the concentration level by more than a factor 400. Ultrafine particulates is a subgroup of particulate matter especially harmful for human health (Nature and Biodiversity Conservation Union 2017). There are currently no similar measurements done in other cities in Norway, but authorities monitor the air quality daily and warn residents when levels are dangerously high.

The cruise traffic made up 6.3% of the total domestic emissions from ships (Norwegian Government 2019). The Norwegian Environment Agency has published data on emissions from the vessels operating in Norway. The data is collected through AIS data monitoring the ships movement along with ship specifications collected from maritime databases which is then used to estimate fuel consumption. Combined with AIS data of speed and engine load it is possible to estimate the fuel consumption of a ships voyage and its emissions. The data displayed in table 1 and 2 are collected from the Norwegian Environment Agency database (Norwegian Environment Agency 2019). It is important to note that this data is representative of the *entire* voyage the vessels has. It is currently not possible to differentiate between when the ship is docked and when it is on route. In the case of shore power it is the emissions in port when docked that is of concern. However as this data provides a perspective of the possible reduction with the implementation of shore power. There is no data from 2020 available. But the 2020 cruise season can be considered an anomaly due to the adverse effect of the covid-19 pandemic and the data is insignificant for this illustration.

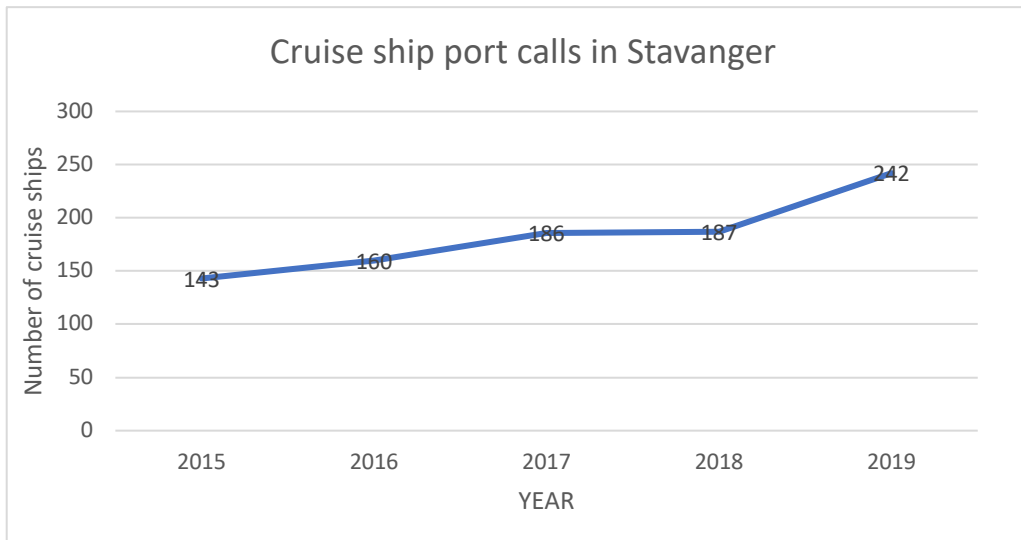


Table 1: Cruise ship port calls in Stavanger. Sources: Askildsen 2017, 2018; Fintland 2015; Norheim 2019; The Port of Stavanger 2020b.

Table 1 illustrates the rise in number of cruise calls This is most likely due to the increased attention to Norway as a cruise destination as well as Stavanger’s profile as a tourist destination. The data reflect a trajectory of the industry’s impact on the local and global environment. Table 2 illustrates the rise in emissions from cruise ships in Stavanger region in over five years.

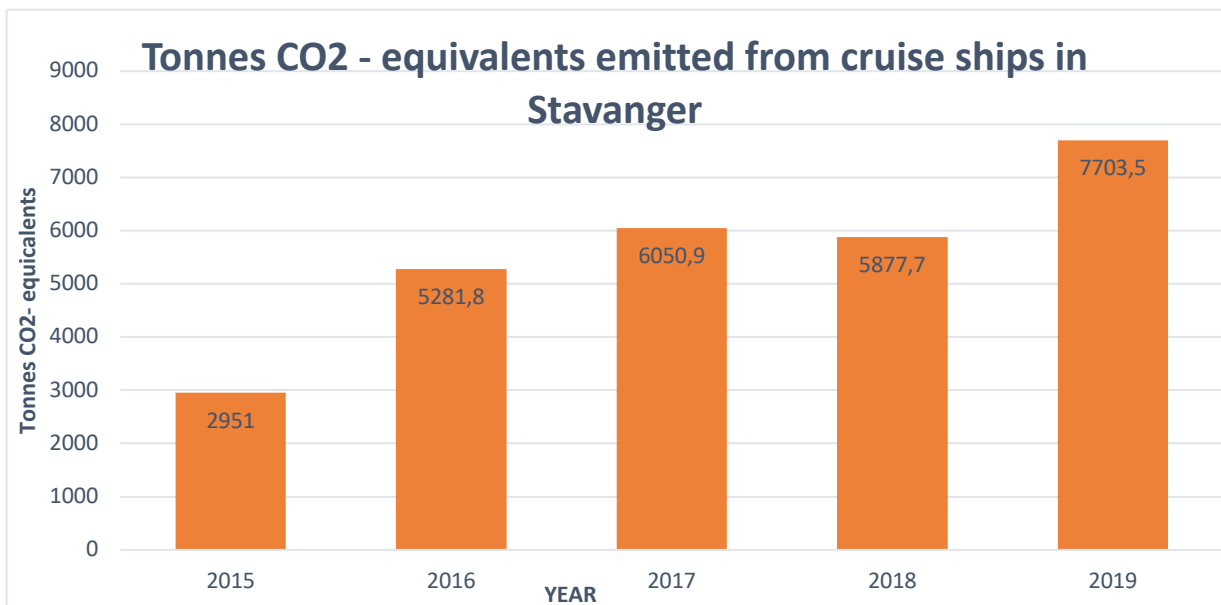


Table 2: CO₂ emissions from cruise ships in Stavanger. Source: Norwegian Environment Agency 2019.

Table 1 and 2 provide reason to assume that an increase in port calls reflect an increase in CO₂ emissions. In this case it is SO_x, NO_x and PM_{2.5} that are of concern, but as they are linked to the combustion process in which CO₂ is emitted, is it likely that emission of these three

substances follow the same curve. Especially in relation to the non-excitant shore power facility as well as lack of other regulations limiting emissions in this time frame.

Studies estimated approximately 53 400 people would die prematurely in Europe in 2020 due to air pollution from the shipping industry (Brandt et al. 2013). NABU argue that neither ship owners nor port authorities take effective, sufficient or comprehensive measures in order to protect local residents from toxic exhaust gases, even though this would be technically feasible. However, a switch to low sulphur fuel combined with the installation of particulate filters and SCR (selective catalytic reduction) catalysts would reduce air pollution by up to 99.9%. NABU has stated that the industry is running out of time to be completely emission-free by 2050 and few cruise liners have a clear strategy of how to reach the goal (Nature and Biodiversity Conservation Union 2020).

3.2 Shore power technology

In efforts to reduce emissions from ship engines authorities have implemented caps on emission of pollutants such as SO_x and NO_x . A cap is forcing shipowners and operators to act. The maritime sector has invested in Exhaust gas cleaning systems (EGCS) also known as scrubbers. The EGCS sprays seawater or fresh water with a caustic chemical into the exhaust gas stream in several stages. The pollutants reacts with the alkaline water, forming sulfuric acid. The system can be an open loop, where the wash water is discharged into the sea, or a closed loop where the wash waters is collected and stored onboard until it can be disposed in a suitable in-port facility. To offer more flexibility ships can use the a hybrid system which can operate in either closed- or open-loop. Open loop systems are becoming more restricted, and the wash water must meet requirements set in MARPOL (International Convention for the prevention of Pollution from Ships) before being discharged (DNV GL 2018).

However scrubbing does not relive other aspects of pollution such as noise and will need infrastructure for disposal of waste water. In efforts to further relive the emissions in the harbouring cities the use of shore power technology has been introduced. When a ship docks at port it no longer needs energy to move forward but it does need energy to power internal systems such as lights, heat, air condition and other appliances. This energy is traditionally supplied though an auxiliary generator running on diesel or marine fuel oil (Vaishnav et al. 2016). An alternative for using the onboard auxiliary engines is the use of shore power, also

known as cold ironing. This technology has a great impact on local air quality as it completely removes harmful emissions of NO_x, SO_x and other particles.

This technology has already been used in the shipping industry for an extended period of time. The use on cruise ships had been growing, but not fast enough. There is minimal up to date information on the number of cruise ships equipped with shore power. According to a 2015 report from the Port of Copenhagen, approximately 10% of the world cruise ship fleet are modified for shore power. Most of those ships sail the waters off the west coast of USA and Canada. The European cruise market has seen few ships with this instalment in place (The Port of Copenhagen et al. 2015). According to CLIA's 2021 State of the Industry Report, Shoreside electricity (SSE) has been implemented in 32% of the existing global fleet and another 25% of existing ships will be retrofitted. Another 58% of new capacity is committed to be SSE compatible (CLIA 2021). According to ENOVA's calculations, the price of preparing any ship for shore power can run anywhere between NOK 200 000 - 1 370 000, depending on what electrical current is needed as well as other additional features; connection of both sides of the vessel, PMS and frequency converter (ENOVA 2021). There is an established international standard for shore power connections, which does make it easier to further develop this technology (DNV GL, 2015).

The years 2020-2021 proved challenging for the cruise industry due to the Covid-19 pandemic and the impacts it had on a global scale. For the cruise industry this resulted in an industry halt, where a large number of sailings were cancelled. This affected the ports and destinations as their clients stopped coming for an indefinite and extended period.

3.3 Shore power development in Norway

Many Norwegian ports have implemented shore power in their operations. The shipping industry has received most attention in this development. This is due to large amount of freighter ships that enter Norwegian waters and the magnitude of petroleum business present along the west coast of Norway. Ferry routes have also been prioritized for shore power. There is approximately 130 ferry routes in Norway on a regular schedule. These routes are essential for many communities in moving people and goods. Cruise ships are large contributors to pollution in the port cities. This is due to their high energy use and need for powerful systems. These factors also make them a good candidate for shore power because of the potential of reducing fuel consumption and pollution (DNV GL 2015).

Development along the coast of Norway is recognized as having potential to reduce GHG emissions as well as local air and noise pollution in ports. Research shows a total of 1.2 million tonnes of CO₂e was emitted in Norwegian waters from domestic and international shipping in 2018. For comparison, the total Norwegian emissions was 52.2 million tonnes CO₂e (Environment Norway 2020). It is estimated that the use of shore power has the potential to reduce CO₂ emission by 2.9 million tonnes in the 2021-2030 timeframe, provided a full scale shore power development for all ships in all ports within 2030 (Zero and Green Shipping Program 2020).

The development has been slow in the last decade. This is linked to the idea that there is no use in building a facility because no ships are prepared for shore power - and no ships are preparing because no ports are ready to provide power. In efforts to end this chicken-and-egg situation of stagnation, a governmental support was implemented through the company Enova. They organized subsidies for funding to the ports in efforts to speed up the development shore side, eliminating the “ship status” from the equation. Approximately NOK 660 million has supported 93 shore power facilities, where 54 are ready and 28 are in project development stage. Along the coast line a total of 300 connection points over 118 facilities excluding ferry charging facilities are operating (Zero and Green Shipping Program 2020). Despite this growth in access points for shore power the development of prepared ships is moving slow.

The port of Bergen has the largest potential for shore power in Norway, followed by Oslo and Stavanger based on emission data (DNV GL 2015). The Port of Kristiansand opened a shore power facility in 2014 providing power to passenger vessels on scheduled routes to Denmark operated by Fjordline and Color Line, as well as freighter ships on different locations. In 2018 the port finalized Norway’s first shore power for cruise ship facility, with funding from the EU (The Port of Kristiansand 2021). The port of Bergen completed their facility in May 2020 with Enova funding. This is Europe’s largest shore power for cruise ships facility capable of supplying three cruise ships simultaneously (The Port of Bergen 2020). Oslo received support from Enova in 2020 for a preliminary project on shore power for cruise ships, and it expected to have a facility in place in the coming years (The Port of Oslo 2020).

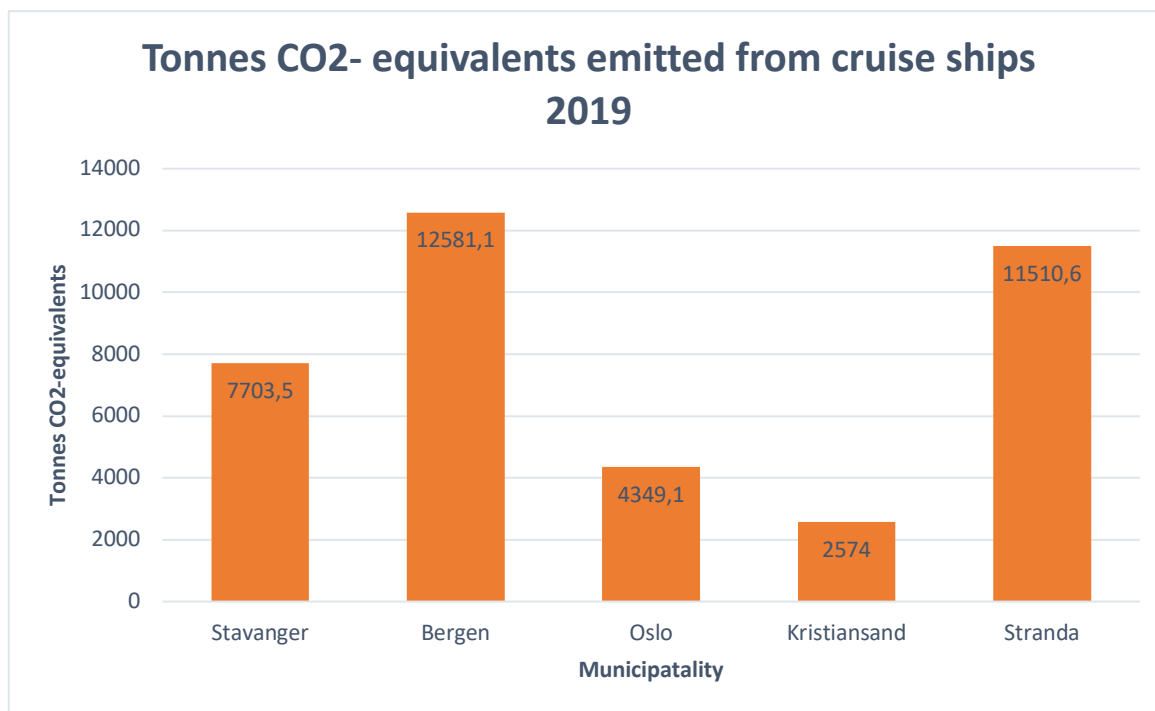


Table 3: CO₂- emissions from five major cruise destinations in Norway 2019. Source: Norwegian Environment Agency 2019.

Table 3 illustrates CO₂e emission from the cruise industry in the respective municipalities. Stranda is the municipality of the WHF destinations Geiranger and Hellesylt, two of the most popular cruise destinations in Norway. Stranda municipality had the highest amount of port calls (354) in 2019. Bergen municipality was the second most visited, with 338 port calls at one destination in the city of Bergen, followed by Stavanger in second place. In total national increase in cruise port calls was 8% from 2018 to 2019 (Norwegian Coastal Administration 2020).

3.3.1 The Port of Stavanger

The port of Stavanger (SRH) has set environmental goals of offering effective, competitive and environmentally friendly services. Serving an important role in the community it aims to fulfill its owners climate- and environment-goals. It is owned by the three regional municipalities: Stavanger (81.88 %), Sola (16.75%) and Randaberg (1.36%). The board is appointed a four year period by the owners and are local politicians in active duty (The Port of Stavanger 2020a).

The port has 680 000 m² land area and 5500 meters of docks spread out over five areas in the Stavanger region. With over 50 000 port calls per year combined, the environmental impact is significant. SRH published their environmental plan for 2020-2030 based on the Sustainable

development goals (SDG); SDG 7 (Clean energy), SDG 9 (Innovation and infrastructure), SDG 11 (Sustainable cities and societies), SDG 12 (Responsible consumption and production), SDG 13 (Stop climate change), SDG 14 (Life below water) and SDG 17 (Cooperate to achieve the goals). Developed by the United Nations (UN) the SDGs are goals for the global community in the battle against poverty, inequality and climate change, where SDG 7 focuses on “ensuring access to affordable, reliable, sustainable and modern energy for all” (United Nations 2021b, 2021a). In SRH climate plan SDG 7 refers to shore power with establishing shore power for cruise and other vessels starting in 2020. It also refers to the aim of establishing charging opportunities for electrical passenger vehicles in connection with cruise calls. SRH are also working on a fossil fuel free in/out sailing of the port as well as mooring vessels (The Port of Stavanger 2020c). In a report from DNV GL on behalf of Enova (2015) research showed that the Port of Stavanger was heavily dominated by offshore ships. These ships spend long time in the ports and demand a fair share of energy. However, the ro-pax-ferries and cruise ships also make up a large share of the ports energy use and are defined as potential candidates for shore power.

Plans for a shore power facility was initiated along with Worley Parsons Group Rosenberg (WPG) in 2019. WPG runs a shipyard based on Buøy, an island across the bay from Stavanger city center. A shore power facility would provide power for ships docking in Stavanger city port and in the ship yard on Buøy. The funds needed was NOK 58,9 million. Unfortunately the application did not meet the criteria of Enova funding due to a large share of out of service ships (repairs, storage and classification operated by WPG) accounting for almost half of the kWh potential. The kWh -potential of the project was thereby reduced from 20 009 864 kWh to 10 784 906 kWh when removing out of service ships use. Even so, the application for funding was denied by Enova (Manager of operations, SRH, Personal communication 01.02.2021).

In 2020 SRH entered into a corporation with Lyse AS – a prominent energy provider in the Rogaland region. The partnership received NOK 500 000 in funding from Enova for a preliminary project of shore power for cruise ships with the aim of creating a business model, establishing the grounds for further development of the project. The project is dependent on future funding from Enova realize the facility. A gross estimate of the total cost is NOK 100 million, where governmental funding is capped at 40 % of total cost. (Manager of operations, SRH, Personal communication 01.02.2021)

The cruise calls in Stavanger has dominantly been placed at the city center quays. Figure 1 shows an overview over a section of the city center waterfront where cruise ships have frequently docked. This areas is populated by restaurants and promenades on both sides of



Figure 1: Map of the Port of Stavanger, City centre area. Retrieved from Temakart Rogaland.no on 20.05.2021. Markings added.

inner port (vågen, vestre havn). A shore power facility aims to provide connection points at three different quays. Possible placement is shown in figure 1; Standkaaien (blue), Skansekaaien (green) and a new quay; Bjerkstedkaaien (red). Exact placement is not officially determined. The planned facility will require an area of 400-500m² and an estimated 24-28 MW power demand to provide the ships with the power needed. There is little open space along the waterfront, additionally there are residential areas and public

recreational areas occupying the space. The most viable option is currently in the Bjerksted area. This area consist of mountain where an option to create a “mountain hall” under the Bjerksted park (green area, top left corner). This would provide the space needed for the facility as well as other amenities required to operate the facility. The power would be provided to the other quays by strategically placing a smaller transformer- and converter station. This project coincides with other construction plans for the area. The grounds has been approved for hotels and business center. This project hold potential for future development of the area and also allows for utilization of the area. However, the project has not yet been approved. The developers are in stages of planning and need to provide a strong business plan including technical specification, layouts and operational plans. They would also need to communication with cruise lines to get a perspective on their intent of shore power and future use. This is all essential information in securing public funding for the facility. The developers have state that financial support is essential for the project to be completed (Project developer, Lyse AS personal communication 19.02.2021; Manager of operations, SRH, personal communication, 01.02.2021).

The objective of this shore power project is grounded in corporate responsibility and the local and national aim of reducing emissions and securing a sustainable development. This project serves no economic profit for the developers, it is merely an expense. The project will have the greatest impact on local air quality while also contributing to overall emission reduction.

4. Theoretical perspective

Theory in research enhances robustness and accuracy as well as the relevance and impact of the findings. It will also connect elements in research data to generate findings which fit into a larger framework of other studies. It is useful in several stages of the research process; defining the aim, developing data collection and providing a framework for data analysis as interpretation (Stewart and Klein 2016). A theoretical perspective provides a particular language, a conceptual framework, or collection of “theoretical” concepts and related propositions, within which society and social life can be explained (Blaikie and Priest 2019:160). In the following sections theoretical perspectives relevant for the aim of the thesis will be presented. Lastly a summary of those theories is presented to provide a specified perspective of relevance to this research and its intended purpose and use.

4.1 Multi-level perspective

The transition theory multi-level perspective (MLP) aims to characterize different dimensions and elements of a sustainable transition in society. This theory understands transitions as arising from the interplay between multi-level dimensional developments. According to this theory, this happens on three analytical levels; niches, socio-technical regimes and an exogenous socio-technical landscape. Each level is the space of specific events. In the niches radical innovations take place, often seen as new technology that aims to contribute to the transition. In the next level; socio-technical regime, we find the established practises and associated rules. Here the incumbent actors are constrained to the existing systems. The overarching level is known as the socio-technical landscape which functions as a technical and material backdrop that sustains society. The three levels are in an interplay and build on each other. The core of the MLP is that niches build up an internal momentum. The landscape may experience changes and puts pressure on the regime leading to a destabilisation of the regime. This creates a window of opportunity for the niches, who may break through into the regime and the mainstream markets (Geels 2014).

In this research shore power technology is *not* identified as a niche in development. This is due to its prominent standing in the maritime sector. Shore power is recognized as having broken through to the regime and changes in the landscape are occurring leading to the regime – maritime sector– experiencing pressure to transition. The cruise lines are seen as incumbent actors in relation to the MLP. The landscape, in this relation, is focused on a sustainable development and environmental impact. This is seen on the global political agenda as well as local and community level, even on an individual level. The negative impacts of fossil fuel consumption is widely known as a “bad thing”, referring to pollution and climate change. National governments, in this case Norway, are shifting their focus and efforts on reducing the nation’s climate impact, especially fossil fuel consumption. This shift in priorities arguably puts pressure on the regime; maritime sector. This pressure has already led to a more environmentally friendly focused regime with innovations and development to decrease climate impact. Shore power development can be seen as an action relating to the pressures of the regime.

Building on Geels’ MLP, there is reason to assume the incumbent actors will resist the transition described further in the following section.

4.2 Regime resistance

The cruise industry and its incumbent actors are influenced by the expectations of sustainability from the landscape. The push towards shore power relates to these increasing expectations from the consumers but also from society’s institutions. This can be seen as signs of early destabilisation where actors are formulating doubt and asking question about the sustainability of existing practises, technologies, beliefs and business models (Turnheim and Geels 2013). The attention to cruise lines environmentalism has been questioned in literature and by the public. It is a difficult industry to control but also to transform due to number of operations involved in a single voyage. Even so, the attention to environmentally friendly and sustainable development is still affecting the cruise industry globally. The ongoing development of shore power for cruise, though at a slow pace, suggests the regime is already experience a destabilisation where the niche (shore power) has broken through. Regime destabilisation is defined as pressures from external environments creating problems for firm-in-industries such as financial loss, worsening reputation, decreasing support. These problems may undermine the firms commitment to the existing regime (Turnheim and Geels 2013). The shore power development could bring on financial losses for the cruise lines if

regulations are enforced and voyages are restricted. The reputation of the cruise lines are also affected if they fail to transition in a timely manner. These aspects may erode on the cruise lines commitment to a green maritime sector, which could be seen through regime resistance.

Recognising the cruise lines as incumbent actors in a destabilising regime, it is fitting to use the theory of regime resistance in connection to the MLP. There are four ways the regime actors can resist fundamental system change. The first form is known as instrumental form of power and resistance. The regime usually has more power than the niches and different actors combine their resource to achieve their goals and interest. The second is discursive form of power, which refers to their powerful position and media access. By using different framing tactics they can shape what and how issues are being discussed. Material form of power draws on technical capabilities and financial resource to improve the technical dimension of regime. By investing in other technology accompanied by discourses and promises of solutions that are “just around the corner”, the actors may ward off possible regulation. Lastly is the institutional form of power which is imbedded in political culture, ideology and governance. This power relates to the governments gain of the business from the incumbent actors, leading to favouritism and privileges. Its argued that big business has “structural power” because states depend on the key industries to provide jobs, taxes, economic growth and dynamism. The actors may use structural power in at least three ways to influence the policy makers in their favour: dependency, policymaker internalization and corporate political strategies (Geels 2014).

The cruise industry and the cruise lines can be seen as big business actors with structural power. The Norwegian tourism sector relies on cruise tourism for jobs, destination popularity and further tourism development. The influence of the cruise industry on policy makers can be seen in how the industry positions itself in the shore power development debate. The cruise lines serve as a dependant actor in that they arrive every season with tourists who spend their time and money at destinations. It also allows for the tourism sector to provide cruise specific attractions at the destinations. Policy maker internalization can be seen in the form of unions and representational companies present in different nations. In Norway the most prominent cruise actor is Cruise Norway AS which can be seen as a spokesperson for the industry and is involved in national decision processes regarding the cruise industry. CLIA is also a prominent union actor of the worldwide cruise industry. The organisations are involved in international decision making processes as well as national processes. Speaking for the majority of all cruise lines makes them a powerful actor in these processes and the potential of

influencing the policymakers at a high level. Further the industry may use several forms of corporate strategies to influence policy makers. The use of sustainability reports serve a purpose beyond establishing themselves as a sustainable company for the costumers. It may also serve as a tactic profiling themselves for their costumers and stakeholders as well as national and international authorities.

4.3 Polycentric governance

Polycentricity is described as the degree of connectedness or structuring of a polycentric domain and/or system. On one end it may be a loose network of actors engaging in weak forms of coordination based on sharing information in a passive manner. On the other end it may be more extreme where actors are bound together through formal systems of coordination. This system allows actors to share information actively and the bond is characterized by a great deal of trust (Jordan et al. 2018). Polycentric governance theory is a holistic view of governance, where multiple centers of autotomy operate with overlapping jurisdictions. Normalized patterns of social order occur as the centers interact through mutual adjustment (Setzer and Nachmany 2018). It is a complex form of governance where multiple decision making centers operate with a degree of autonomy, where the centers are acting on their own behalf without centralized coordination. These centers are also overlapping because they are involved at multiple jurisdictional levels and include special-purpose governance units that cut across jurisdictions. This type of governance has the potential of finding a balance between centralized and fully decentralized or community based governance. A polycentric governance arrangement allows for good coordination and communication between the units and actors, but it is not a given (Carlisle and Gruby 2019).

Polycentric governance has a three key advantages. The first one refers to the adaption, where polycentric governance may be more capable of adapting to changes than centralized forms of governance. Due to the self-organizational structure the systems may gain experience which allows them to change their rules and behavior as they adapt to changes in the social and ecological environment. It is to be expected that the centers will not settle on a single policy or approach but will experiment to continue to improve and adapt institutions. The system is made up of rules and norms applying to all actors in the system, which act as a binder in the array of policies and strategies. However, it is important that rules and norms allow entry of new actors and enable new pathways for institutions which make room for new ideas, methods, partnerships and alliances. The centers learn from each other through information

exchange and thereby avoid the trial-and-error process which would take a longer time and could delay changes to a point where it may be too late. The learning process may be through a formal or informal interactions with other actors or levels of authority (Carlisle and Gruby 2019).

The polycentric governance systems is often recognized as a very fitting for natural resource systems as its decision making centers are at different levels vertically; national, regional, state and operate across political jurisdictions. Local decision makers have ability to quickly respond to environmental feedbacks and make them quipped to adapt to local interest and norms. Issues of air pollution are often not confined to a single jurisdiction and is therefore harder to relive through the actions of existing decision makers. The profile of the polycentric governance system allows for the entrance of a new decision making center with appropriate jurisdiction through collaboration with existing decision making centers. The last advantage of polycentric governance is reduced risk of institutional failure and resources losses. Due to the overlapping decision making centers with a degree of autonomy at different levels of jurisdiction the risk of failure is spread out over different institutions/decision making centers. As centers have the ability to adapt to local needs, a policy would have an increased chance of success in opposite to an overarching centralized policy (Carlisle and Gruby 2019).

The shore power development can be seen through a polycentric governance view in reference to how the decision making centers are pursuing the development. The local municipalities have the autonomy and authority to enforce certain regulations on the cruise industry within their jurisdictional area. Stavanger municipality has published a cruise strategy pursuing sustainable development of the cruise industry and emission relief in the region. Their intent serves the aim of acting on their own behalf without centralized coordination. Several Norwegian cruise destinations has produced joint demands for the cruise industry. This can be seen as a coordination of jurisdiction and exchange of information on the same level of authority. The polycentric governance theory give context to the reasons for local initiative rather than national restrictions. It also provides reasonable arguments as to why it may be successful. However, the use of national regulation may be a more effective tool, especially in the case of shore power and the cruise industry. Due to the complex and dynamic regulatory circumstances in the maritime sector, national restrictions may present as a more fitting opportunity to regulate an industry to achieve an even development along the coast.

The importance of governments in a polycentric governance view is debated, where some scholars suggest the governmental institutions are distant from the society they govern. On the other side, states and their government has a unique position in polycentric governance that cannot be filled by any combination of non-state activities. National regulations sets rules and a trajectory for other actors and may promote effective coordination at a societal level. In the polycentric governance model governmental actions are an interlace of non-governmental and governmental units at different levels. These units will cooperate, compete, interact and learn from each other (Cole 2015). Governments task are not simple and will not always be successful as it is challenging to shape actors and markets towards a low carbon society (Setzer and Nachmany 2018). In shore power development the complexity of the industry certainly does not make the task of national regulation easy. At the same time with the aim of shore power facilities for cruise at the majority of popular cruise destinations, a national regulation may have a higher chance of success.

The shore power development can be seen as unstructured and complex where it is rooted in different societal domains, occurs on varying levels and involves various actors with dissimilar perspectives, norms and values. In transition management literature this is defined as persistent problems (Loorbach 2010). Policymaking for such problems become highly complex due to the uncertainties, different actors and perspectives in need of consideration. Shore power development have a variety of actors affected or affecting the process, especially relating to a possible national governance which may influence the industry greatly. Governance is driven by trends such as European integration, internationalization and empowerment of societal actors. The EU and the international maritime sector influence the Norwegian governance through agreements and standards but also in relation to innovation and development of the sector globally. A possibility of shore power regulation would need careful consideration to ensure compliance with international commitments and the development of the global cruise fleet.

4.4 Stakeholder management

Stakeholder management urges corporations to consider the impact of their actions and decision making on the various stakeholders. It focuses on fair treatment, by the firm, of its various groups of stakeholders (Fassin 2012). In general, stakeholders are defined as individuals or organizations that are affected by a development or who affect the development of a project (El-Gohary, Osman, and El-Diraby 2006). Each of these groups of individuals or

organizations play a vital role in the success of the business enterprise. Each of these groups has a stake in the modern corporation, hence the term “stakeholder” and “stakeholder management”. Who is to be considered stakeholder is a variable, as this aspect varies and change; not all employes are alike, and not all governments are alike (Freeman 2010).

The project in the Port of Stavanger is a part of a larger development strategy of implementing shore power for the cruise industry. The individual project has particular stakeholders grounded in the local community and businesses. The facility is also a part of a larger development scheme which adds additional stakeholders. National agencies and institutions concern with tourism and the maritime industry are affecting the development through their actions. These are in stakeholder literature often referred to as indirect stakeholders, where direct stakeholders are the shareholders and employees (Fassin 2012). An example is the Norwegian cruise and tourism organizations, who are aiming at improving the cruise industry and increase tourism to the nation. Increased cruise tourism leads to more ships, where local authorities are trying to limit the amount of ships and prioritize shore power-prepared vessels which is a limited group of cruise ships. Literature of stakeholder involvement in private-public-projects emphasis that a positive involvement with stakeholders can be a factor that may “make or break” a project (El-Gohary et al. 2006). Stakeholders is considered relevant in a strategic management process, where the aim is to chart a direction of the firm. Groups which can affect the direction must be considered to reach the aim of a strategic management (Freeman 2010).

The port authority must constantly be prepared to adopt to new roles in order to cope with the changing market environment. The ports have been recognized as not being able to provide all necessary tools to cope with the highly competitive market environment and to secure their position in the global transport network. It has been suggested that port authorities aim to go beyond that of a traditional facilitator to the extent they can play an important role in the creation of core competencies and economies of scope by an active engagement in the development of port-related activities. The most important role however is port networking to gain competitive advantage which would allow them to go beyond the port boundaries in physical investments and managerial capabilities (Notteboom and Winkelmanns 2001).

In a study of large scale transport infrastructure development in the Port of Antwerp, the path of continuous reflection on who and what matters in decision making was explored. The research argues that stakeholder based analysis and long-term strategic port planning based on

stakeholder inclusion can act as a driver for governance change in the boarder port region or port systems. The concept institutional distance refers to the spatial aspect of stakeholder management and is used to show the increasing challenges of stakeholder management when a firm decides to invest internationally. The concept is determined as the distinction between “home” environment and “host” environment stakeholders, with the fact that stakeholder groups in different countries have different views on what constitutes corporate citizenship. An increase in institutional distance will typically make it more difficult for foreign multinational enterprises to maintain organizational legitimacy (Dooms, Verbeke, and Haezendonck 2013). In relation to shore power development and the cruise industry, the perspective of institutional distance is relevant when distinguishing between environments. Cruise lines can be seen as multinational enterprises; registered in one country, HQ in another, routes in multiple nations across the world. With this background the cruise lines are often more invested in global matters and may focus their attention to international environmental issues. Shore power on the other hand is for the most part a local pollution reduction initiative and not necessarily the biggest concern for the cruise liners. In this perspective one may recognize a institutional distance between the cruise lines and the local stakeholders; local community, creating a situation where the cruise lines struggle to be recognized as legitimate organization caring for the local community.

The research on port expansion in Antwerp points to the positive outcome of taking the dynamic and spatial dimension of stakeholder interest into account. The ports investment and its evolving governance path may be influenced (Dooms et al. 2013). Management literature suggest that collaboration between business, government and stakeholders is necessary to solve issues of sustainability. Stakeholder management and industry self-regulation have succeeded in reaching the smaller goals of sustainability, but the bigger issues are more complicated. Research suggest that where stakeholder pressure can bring sustainability issues forward – government intervention is necessary to set the stage for meaningful action and to ensure follow through. Without government, self-interested stakeholders can pressure firms to move away from the complex, long term challenges of “wicked problems of sustainability”. And without stakeholder pressures, industries may self-regulate to the extent they cannot fulfill their ethical obligation. Big business interrelating with government and stakeholders is necessary to secure new sustainable development (Dorobantu et al. 2018). In relation to shore power development along the coast of Norway, the national government has set the stage with their ambitious goals of emission reduction and the inclusion of the maritime sector through

actions plans and incentives. On the aspect of following through on the action plan the government may be flawed relating to the complex situation of creating a facility in ports and securing cruise lines voyaging in Norwegian waters. If a collaboration between business, government and stakeholders is necessary to solve issues of sustainability, then one would expect that decision making of demands and future development in cruise destinations would include the industry. Unfortunately this has not been done in the case of Stavanger municipality and other cruise destinations demands for the cruise lines.

4.5 Energy transitions

Shore power development can be seen as the start of an energy transition in the cruise industry with a shift from traditional combustion engines running on fossil fuels to a new renewable energy source. An energy transition is seen as a single energy source or group of related sources dominating the market during a particular period or era, eventually to be challenge and then replaced by another major source or sources (Melosi 2010). Sovacool refers to timing as essential element of consideration in transitions, stating that if a transition does not occur quickly enough, it may be too late. Some transitions were rapid due to being managed or incentivised (Sovacool 2016). Research suggests that shore power will play an important role with any future engine technology. Actors have raised concern with the pace of Norwegian development, stating that we might risk losing the industry. A situation where the cruise lines invest in other engine technologies and not in shore power is plausible. If that happens there is a risk of the cruise lines not investing in shore power in the near future, leaving some destination ports with either a facility not in use or ships with noise and air pollution.

The development of shore power for the Norwegian cruise market is driven by the local regulatory and market pressure. As mentioned the environmental organization Bellona has urged the government to take action to secure a stable development to reduce the risk of losing the industry. Scholars has explored the subject of governed energy transitions with attention to pace of a transition. research on historic transitions highlights an optimism of more governance in future transitions, where the role of policymakers at international, national, regional and local levels can contribute in speeding up the transition (Kern and Rogge 2016). The cruise industry and the maritime sector adds a complexity to an energy transition in several areas. The aspect of nationality in the maritime sector creates dimensions to the traditional the polluter pays principle and becomes harder to follow up through

traditional control schemes. This relates to ships “belonging” to one country but emits pollution in other countries. This is not an unknown scenario and is similar to what is known as “wicked problems” in climate mitigation. Such problems are recognised for almost unresolvable since any solution to the problem will result in other issues without it being a wrong or bad solution in the first place (Brown, Harris, and Russell 2010). A ship is subject to several different authorities and institutions in different nations making it difficult to assert and maintain a certain level of control throughout a ships voyage. Applicable laws may coincide and work together. But they may also coexist, where some nations may have stricter or different regulations than others. As the cruise industry build on moving from one destination to another it becomes important to have a joint effort from the policymakers at different levels and preferably different nations. The cruise lines do have the option of removing themselves from a transition by moving their operations to another destination. This is an aspect the policymakers are already taking into account in the process of regulating this industry.

4.6 Summary

Viewing the shore power development through the MLP brings a perspective of larger transition occurring in the maritime regime; the transition to a zero-emission maritime sector. The development of shore power facilities and the increased attention to the cruise industry’s impact on the communities are factors of a destabilizing regime; in which the cruise lines can be recognized as an incumbent actor. The cruise industry is being pressured to transition to shore power and change their activities to adapt to the regime. But the incumbent cruise lines have different forms of power to resist the transition and delay the development of shore power. In the following chapters, the cruise lines incentives to adapt are presented. In the view of regime resistance, the cruise lines actions can be placed in relation to other aspects of the development; such as local regulations and Norwegian shore power development.

Further the theory on polycentric governance provides perspectives on the use of local initiatives and how it affects the shore power development and the cruise lines incentive to go transition. Stakeholder management theory shed light on the methods used in the development of local regulation and provides insight on implications of lack of stakeholder involvement. When viewing the shore power development as a part of a larger energy transition, theoretical perspectives on energy transitions and governing transitions gives a perspective on national regulation. The use of national regulation of shore power for cruise ships is an option worth

considering, but is also a complex task. Polycentric governance is relevant to provide insight of the positive outcome of a national regulation contrary to local regulations.

5. Methods

An important part of the research design is the methods of which the researcher use to collect data. With the aim of this research I find it suitable to use two methods for collecting data to build my thesis; case study and qualitative methods.

As the research take place in Norway, I am obliged to follow the guidelines of the Norwegian center of research data (NSD). This research will use personal information with the aim of establishing contact with relevant informants. Following the guidelines provided by the university and NDA I registered the project on the NDA website. This process included providing information on the project; date of active research, aim of the thesis as well as information of who would participate in the project as informants. At the time of registration I was unsure of who in particular would participate. Therefore I informed of the data I would use and how it would be handled. In this case the personal information of participants was: name, title, contact info; email and telephone, institution. Most of the participants had this information available to the public online. Nevertheless this information is confined to the research period which is to end at submission date; 15. June. 2021. The information will then be deleted from record. This is in compliance with the NDA guidelines as well as it is not necessary to include to fulfill the aim of the thesis.

5.1 Case study

A case study is known as “an empirical method that investigates a contemporary phenomenon in depth and within it’s real-world context” (Yin 2018:15). It is an in-depth examination of one or more cases and associated contextual conditions (Sovacool et al. 2018). Its ability to deal with a full variety of evidence including documents, artefacts, interviews and observations is seen as its unique strength. There are two ways of doing a case study; single or multiple case study. I find a single case study most fitting for this research based on time constraint and limited resource available (Yin 2018). There is common misunderstanding of single case study not being suitable for generalizing. However Flyveberg (2004) has criticized this and stated it depends on the case of study. The aim of this study is not to generalize all cruise lines or the maritime green transition, but to provide insights and perspective on the transition for parties involved and aim to show actors that influence the transition in this

current time and space. For that aim a single case study is suitable. Case studies have various purposes; explanatory, descriptive and explanatory research (Yin 2003).

For this thesis the Port of Stavanger (SRH) is chosen as the case. The port has experienced an increase in cruise calls over the years and is working towards becoming a more popular cruise destination as well as becoming an emission free port. Aligned with these goals the administration along with the municipality are seeking financial support to implement a shore power facility for cruise in the central port. An analyses of expectations, limitations as well as challenges for SRH and the other parties involved may provide information useful in analysing the future of shore power for cruise ships. If and when SRH finalises their project they might be the one of the few ports in Norway to have this amenity in place for cruise lines. This may have an effect on the future development in the rest of Norway and the rest of the international cruise industry. SRH has been chose as a case because it is at a stage of development where they are facing situations that define the project. This thesis may therefore be helpful to other ports who wish to accomplish the same as well as other institutions and regulatory authorities when working on shore power development.

5.2 Qualitative research

The use of qualitative research techniques is aimed at collecting data on opinions, attitudes, perceptions and understandings of people and groups in different contexts and the methods have a greater manageability and predictability in terms of outcomes (Blaikie 2009). For the aim of this research a qualitative approach is fitting. Further this research takes the form of a discourse analyse where I have looked at communication and meaning in relation to their social context.

In the data collection process I have used the tools semi-structured interviews and document analysis. These approaches are preparatory and exploratory by nature, and their structure allows me to access particular perspectives in depth (Sovacool et al. 2018). Specifics on how I used these methods are described further in sub-section 5.4: data collection. Documents are treated qualitatively where phenomena's are identified among witch connections are established (Blaikie 2009). Document analysis of public regulations and values will also serve this purpose and compliment the interview data. With the aim of this research I found it necessary to conduct interviews to get a real-life perspective on the issue at hand. Issues where identified in the documents analysis of which the interviews aimed to provide an

understanding of how the actors are approaching the overreaching goal of reduced emissions in ports and a transition to shore power for cruise. This will provide insights on their part of the transition relating to their significant investments.

Qualitative data has a reputation for being difficult to corroborate and replicate. This is because the researcher themselves are usually the measuring instrument and no two researchers are the same (Blaikie 2009). If one interviewed the same individuals as presented in this interview there might be contradicting answers due to the change of social setting, process, community etc. The answers might not be the same as presented in this research due to the informants as well as the researcher perspective having changed. However as this research does not aim to give a definite answer or a direct path of future development, but merely an understanding of the current situation, the research stands as an opportunity of learning and informing. If answers and information change by the time a corroboration were to be conducted, this again serves the opportunity of learning of what has been done differently in the time passing. Therefore I find this not to be an issue in using this research method for this project.

5.3 Validity and reliability

In any research, the question of reliability and validity is apparent. The goal in a qualitative research is to capture social life in the manner that rings true to the experiences of people who are being studied. The core of validity in qualitative methods is truthfulness. This method is reliable by observing and measuring in a consistent and self-conscious way (Neuman 2014). This also relates to the results or the interpretation being correct and trustworthy.

There are some aspects in the data collection process that should be taken into account in the preparation, collection and interpretation process. In document analysis the researcher should take into account the perspective, agenda and biases of those who produced the document (Sovacool et al. 2018). When choosing a document, need it be a peer-reviewed or not, the author and the objective of the paper may be different from the researchers intentions. This may affect the validity and result in a biased research paper. The researcher needs to be critical of the documents ownership, author and intent to ensure its fitting for the study.

In the interview process the researcher should be aware of his or hers own bias or social desirability bias (Sovacool et al. 2018). The aim of an interview is to get a deeper understanding of the interviewees perception of the phenomena, and not the researchers idea

of the problem. When preparing for the interview it is important that the researcher is aware of a potential bias. Questions should be mindful of the interviewees position in regards to the subject of study. They should allow the interviewees perception on the subject to come forward and not what the researcher finds fitting for the study. What and how questions are asked in an interview may affect the response given from the interview. If a question is asked differently than intended in the prepared questions, it needs to be taken into account when interpreting the data. This is to ensure that the interviewee is not cited wrongly and unfairly. When interpreting data and correlating them to other variables it is important to ensure that they are in fact correlations and not due to other causes. This is known as internal validity and is important for the study's reliability (Sovacool et al. 2018).

5.4 Data Collection

Different approaches of data collection were used to build and support the research. The research is compiled of different aspects providing different perspectives of the issue. This is known as triangulation and serves to reduce bias in the research and improve critical thinking. The selection of data in this research has taken the form of a single-stage-non-probability sampling. This method is often used in both qualitative and quantitative methods where the sample is based on judgment rather than probability. As the case of matter is not aimed at generalizing a population or an industry but merely seeks an insight into the development, it is fitting to use judgment when gathering a sample. Further the selection of data takes the form of snowball sampling. This is a non-probability method also known as network or chain referral. In process of establishing contact with possible informants I relied on referrals to other individuals of which the original informant had knowledge of. I also used theoretical sampling in which the social researcher collects, codes and analyses data in a continuous process and where decisions about sample size are made progressively (Blaikie 2009). In this research process additional informants have been contacted as the research moved forward and additional information was needed.

5.4.1 Document

A variety of documents have been used in this research to present and substantiate different perspectives of the involved actors. The documents have served as an important component in enlightening how institutions are working towards developing shore power. Documents is the most searched data in this study. Document analysis is a way of analysing the underlying

themes in the documents (Morris and Ecclesfield 2011). The majority of document data used is secondary and tertiary data, which are data generated or analysed by another researcher (Blaikie 2009).

Documents used in this research have been available online through the respective company/institution in subject. Attention has been brought to find the most reliable and direct source. In some cases this has not been possible, e.g. number of cruise ships entering SRH in the past years which was collected from news articles available online. In this case I choose to acquire the data through a tertiary source; online news articles from the previous years. Government papers or official papers from national and international authorities have been the largest contributor in this study. These documents are official reports and white papers as well as statements published on their own website. Reports are often outsourced to agencies or private institutions but published on the government official website. National documents are often perceived as reliable sources but one should not ignore the presence of bias or errors (Bryman 2012). During the data collection process sources are processed with caution to its origin, but with attention to displaying the different perspective of actors. Statistical data used in this research originate from a variety of sources. This information proved very valuable for this study by offering detailed information on the current development as well as parameters for future development. Statistical sources have been chosen with attention to potential error and bias.

5.4.2 Expert interviews

For this study I found it necessary to interview persons from different institutions related to the subject. The essential rationale of interviews is enabling the researcher to gather contrasting and complementary talk on the same issues. The data collected could serve as a resource and reflect the interviewees reality outside of the interview (Rapley 2004). Main object is the Port of Stavanger as this research is a case study around its development. In November 2020 I contacted the project developer in SRH via email to get feedback on my research idea and information regarding the case. I received a response not long after stating he was not working on the shore power project directly, but was going to speak to colleagues and get back to me. Unfortunately I did not hear back even after a follow up email. At that time I decided to wait until January to contact SRH again allowing me to spend time researching the subject and be more prepared. Additionally Christmas break was approaching where

businesses might have obligations to finish before the holiday and may not prioritize my requests.

In the beginning of 2021 I contacted the cruise manager as well as the Director of SRH on their official email. The two were listed in a published cruise strategy by Stavanger municipality as contact persons on the matters of port responsibility of the strategy. In this email I explained my research idea and the issues I was looking into. I further offered a conversation on the matter to enlighten me on other issues or aspect of the case, as well as suggestions of relevant persons to contact. The cruise manager responded positively and suggested a phone call to talk more on the subject. Due to Covid-19 restrictions as well as practicality, a phone call seems appropriate for the topic; getting more information on the issue and routes moving forward. The cruise manager kindly sent over a list of persons and contact information who might be able to assist me in this research, in line with what we discussed over the phone. This list became very valuable for my research. I also contacted him later in the study seeking contact information of other people who became relevant as the research progressed. The director of SRH called me in regards to my email where I was able to further explain my idea and reasons for researching the matter. We agreed I would send a couple of questions via email. The director also suggested I contacted the project leader in Lyse AS to whom I was given an email. Through a mutual friend I was given the contact info of the environmental chief in Stavanger municipality, who responded with contact information of a relevant advisor working the case of shore power in Stavanger.

Before moving forward with the list of possible informants I had accumulated at this point, I developed an interview guide. The guide included main questions and allowed for follow up questions. The questions varied between the informants in some areas and were directed at their specific position relevant to the case. Some of the questions referred to overarching matters relevant to the case and were relevant to majority of the informants. The interview guide is included in Appendix A in this paper. As the guide allowed for follow up questions, not all questions that were asked are listed. The aim was to give the interviewee the opportunity to respond to questions more freely and in their own terms. In return, the data collected could provide a detailed understanding of the way the informant perceives the social world under study. When analysing and coding the data I needed to be cautious of how the questions were asked and interpreted to avoid drawing assumptions the interviewee did not intend for (Qu and Dumay 2011).

The next step was to contact relevant actors where a majority came from the list given by SRH cruise chief. I choose to send them an email using my outlook account provided by UiS clearly stating my credentials as a student.

I structured the emails to possible informants in the following way:

- Introduction to who I am and my reasons for sending this email.
- Short explanation of the thesis and issues I am looking into.
- Reason why I think the receiver would be helpful to my research.
- A list of questions (4-5) to give a better perspective on what I seek from them.
- Offering to set up an interview via phone call or online meeting.
- If other people where more fitting I would appreciate getting their contact info.

My intent with this layout was make it clear what I need from them without overstepping my position. I also wanted to make it easier for the respondent to get a clear idea of what they are getting into and not scare them away with an request for an interview right away, but a mere suggestion if it became easier to answer that way. I made sure to be polite and modest by sending my appreciation for any response and feedback. In my research period, spring 2021, the Covid-19 pandemic was still in effect. This meant that many employees in various institution were assigned home office. Additionally restrictions on social contact and physical meets were enforced. At this stage in the pandemic this was the new normal. Many informants dismissed the option of a verbal meeting (online or phone) and opted for answering my questions via email. Given the circumstances I sense this is connected to the pandemic situation; home office, kids in home school, frequent meetings online. Additionally I requested information for a master thesis, to which many might have limited interest to set aside time of their day. Therefor I decided not to stress the matter of verbal interviews by frequently asking. I was also very happy with the responses I received in terms of details, opinions and perspectives. All informants expressed interest in the case and opened the door for more questions.

As mentioned the cruise director provided a list of contact info to relevant actors both internally and externally of SRH. A full list of all informants who participated to this paper is provided in Appendix B. The individuals are representative of the different institutions involved in the shore power development in Norway. These are both private and public institutions. The aim of the selection of informants was to get a variety of perspectives from

different angles of the shore power development in Norway. During preliminary research of the topic, it became clear who was most relevant to the case. The port of Stavanger, Stavanger municipality and national authorities. Another important actor was the cruise industry. At the beginning of this project I assumed it could be difficult to get a statement from them because of impressions I received during the literature study and news articles. I was provided the contact information of three important actors in the cruise industry, however I only received responses from two; Carnival Corporation Group and Cruise Norway AS. These informants became very valuable in this research as it provided a perspective of the *only* type of client of this facility. I am disappointed that I was not able to collect data from other direct sources in this industry, especially from CLIA. However, the responses I received were very useful for the aim of the study.

The sources of data are categorized as semi-natural setting, where the researcher ask individuals to report on their own activities, attitudes and motives or on social process and institutionalized practises. The individuals are therefore recognized as informants or representatives (Blaikie 2009). I received responses from most of the persons I contacted. Four of them agreed to an video-or phone call, as per my suggestion. This was appropriate for the questions I asked in regards to the specific respondents work responsibility. This gave me the opportunity to structure the conversation as a semi-structured interview. This type of interview is flexible, accessible and capable of disclosing important and often hidden facets of human and organisational behaviour (Qu and Dumay 2011). These interviews were not recorded. I found this to be to technically challenging due to the medium used, and the respondents were potentially freer in expressing themselves without being recorded. I did take handwritten notes during the interviews which became useful when analysing the information.

The majority of informants responded to the questions via email. This allowed me to respond with new questions building upon statements in the answers I received as well as more detailed questions on the topic relevant to their professional title. I found this method to be very efficient as it allowed the informant as well as myself to respond in their own time, most often the same or following day after the first correspondence. This communication method does affect the viability of the data collected because it gives the informant option to revise their answers before I receive it. This means that the answers I received are more refined than what I might have received during a verbal communication. However, with the limitations of Covid-19 pandemic and the aim of the thesis I found this communication viable and sufficient for the task at hand. The answers I received where often detailed and explanatory enough to

which it provided information I needed and scenarios which I could research further through documents or other informants.

For both scenarios, email and verbal communication, I requested a conformation that I was allowed to use the answers they provide in the thesis. I also informed them that I would send them a copy of their statements before submission and of their right to retract statements at any time. All respondents agreed to this in writing (email) or verbally.

5.5 Data analysis

After the data is collected the information is analysed and contextualized. In qualitative research a central activity is a special kind of coding for data analysis which can facilitate description, analysis and theory generation. As the aim of this research is not to develop concepts and theory but rather to describe current stage of development I have chosen not to code the data extensively by using a codebook or similar classification tools and methods.

The collection of data through interviews and documents has been a continued process during the research. Documents have been the largest contributor of facts and information on stage of developments. Interviews have been aimed to get a second opinion as well as social perspective on correlating issues found in document discovery. In the data collection process I have continuously highlighted issued revolving around the subject of the thesis. These highlighted issued have then been further investigated through more documents and interviews. I have found this process to be effective and well suited the aim of the thesis and my research methods. I have used study methods such as mind maps and spider maps, to sort and link information found in data collection and analysis. This has been done digitally though computer programs and by hand on paper. Techniques such as free writing, where one simply writes continuously and lets ideas flow have also been helpful in connecting information. This allowed me to let my mind run freely and still keep record of possible links which could be further researched and verified.

6. Research findings

This section presents information collected in the data collection phase of this study. The aim is to show relevant aspects of the path of shore power for cruise ships. The first subsection explains the regulatory authorities that are applicable to the development of shore power, this includes ships and ports. It is a difficult sector regulate as many different institution have

jurisdiction in different areas that make up the sector. The aim is to show the most prominent laws and regulations that affect how shore power developed and used. Other tools are used to push the development of shore power along the Norwegian coast line. Subsection 6.2 is an overview of the prominent subsidiary systems and other relevant tools. As the Norwegian government has chosen a path of incentivising instead of legislating, this section is particularly relevant for the aim of the thesis. Further distinctive viewpoints of the development will be presented in subsection 6.3. Interviews with several relevant institutions revealed different perspectives on the development which come into play when discussing how the development may move forward.

6.1 Regulatory authorities

There are several institutions regulating the maritime sector on different levels of authority. Pollution control is a difficult area to regulate and control in this sector due to the intricacy of the actors involved. All ships are required to register in a country and are thereby subject to this nation's laws and regulations. This is known as the flag-state where the ship sails under the flag of the nation. The flag state has jurisdiction over the ship and is responsible for assuring the ship follows international regulation and standards. However when a ship enters another nation's jurisdiction the hosting nation has the authority to take direct enforcement action under the nation's laws against the foreign-flagged ship. This is often related to accidents of pollution. If an accident occurs in international waters the case is often referred to the flag state, where in many cases the response from the flag-state has been poor (Copeland 2008).

A prominent principle used in environmental law is the polluter pays principle, where the intent is cost of pollution are reverted back to the one responsible for the pollution. In the maritime industry this principle is somewhat difficult to follow due to the complexity of the sector and regulatory authorities. In the case of air pollution it becomes even more complex as ships voyage from different ports at different times and the totality of the air pollution a city is subject originates from different ships sailing under a variety of flags.

The use of shore power shows promise in effectively reducing air emissions but the implementation of shore power faces challenges due to the intricate system of regulations the industry is subject to. Presented in the following sections are the most prominent legislative authorities of which the industry is subject to. In order to understand the dynamic of the

implementation of shore power it is important to have a perspective of these authorities and regulations.

6.1.1 International Maritime Organization

The IMO is a body of the United Nations and set international maritime vessel safety and marine pollution standards. Representatives from 174 major maritime nations make up the organisation. Norway has been a member since 1958 (International Maritime Organization 2019). Cruise ships that are sailing under the flag of one of these representative countries are subject to the requirements set by the IMO regardless of where they sail. The flag states are responsible for all ships registered under their flag.

The IMO has established the 1973 International Convention for the Prevention of Pollution from Ships, known as MARPOL. This protocol has six annexes covering various sources of pollution from all ships and provides overarching framework for international objectives. However they are not sufficient to protect the marine environment alone, it needs to be ratified and implemented by the sovereign states (Copeland 2008). Specifically Annex VI of MARPOL addresses air pollution from ocean-going ships. Annex VI defines the Emission Control Areas (ECA) where emission limits are implemented. This includes the Baltic sea area, the North sea area, the North American area and the United States Caribbean sea (Zhen et al. 2018). The emissions of concern are SO_x, NO_x and Ozone depleting substances (ODS).

Ships have used heavy fuel oil derived as residue from crude oil distillation with a high sulphur content. Annex VI requires ships to limit sulphur content in the fuel to 0.10% as of January 1st 2020 in all ECA zones, and 0.50 m/m (mass by mass) outside ECA zones. As a result of this limit the most standard fuel has a very low sulphur content. There also the option of using scrubber systems as long as they achieve the same reduction. The new limit was forecast to lead to a 77% drop in overall SO_x emission from ships – a reduction equivalent to 8.5 million metric tons of SO_x (International Maritime Organization 2020). There are no explicit PM emission limits, though SO_x limits indirectly affects PM emissions, especially with the use of scrubbers.

Annex VI cite NO_x control requirements for installed marine diesel engines of over 130 kW output power. The requirements are set in different levels (Tiers) of control based on the ship construction date (International Maritime Organization 2017). Tier II and Tier II limits are global. Tier III apply only to the ships operating in ECA areas, e.g. ships operating in the

Baltic Sea ECA and the North Sea ECA shall comply with the Tier III limits as of 1. January. 2021 (International Maritime Organization 2017).

Tier	Ship construction date on or after:	NO _x requirements (interpreted)
I	1 January 2000	Defined in the 1997 version of Annex VI.
II	1 January 2011	Defined in the 2008 amendments to Annex VI. To be met by combustion process optimization. Emissions must be cut by 75% to go from Tier II to Tier III.
III	1 January 2016	Requires dedicated NO _x emission control technology. 80% less emissions than Tier I.

Table 4: Tier requirements of NO_x emissions from ships. Source: International Maritime Organisation, 2017.

The IMO does not differentiate between ship type, size or voyage. Cruise ships are thereby *not* exempted from these regulations. However issues of responsibility is present. As mentioned previously the flag states and port states have rights and responsibility to enforce compliance (International Maritime Organization 2020), but there are concerns of the effectiveness of this method and execution by the flag states.

The IMO has no specific regulation concerning shore power. With the current regulation on emissions it does offer the option of shore power installment as a tool in some cases. But the regulations are aimed at the complete voyage of a ship where shore power only accounts for the time spent in port – shore power is then not sufficient to meet these standards. As a result the companies need to invest in other technology to comply with the standards of IMO, adding significant cost to the ship investment.

6.1.2 European Union

The European Union has jurisdiction over the member states and associate countries through the EEA agreement – which includes Norway. This agreement is the base of trade through Europe and heavily influences the maritime sector as an important trade method. An increasing number of European ports have or plans to install shore power facilities. In 2014 the EU decided that all major ports in Europe *should* be able to provide shore power by the

end of 2025. The problem is that this directive was formulated with a *loop hole*. Directive 2015/94/EU, article 4 §5 states:

«Member States shall ensure that the need for shore-side electricity supply for inland waterway vessels and seagoing ships in maritime and inland ports is assessed in their national policy frameworks. Such shore-side electricity supply shall be installed as a priority in ports of the TEN-T Core Network, and in other ports, by 31 December 2025, unless there is no demand and the costs are disproportionate to the benefits, including environmental benefits» (European Parliament 2014).

The directive states that national governments shall assess the need for shore power and prioritize the network of shipping and transport. This statement does not necessarily include cruise ship calls. There is also leeway for the national governments to decide not to invest in shore power facilities if they find the demand too low, the project not cost efficient or no significant threat to the environment. The primary demand in the market for shore power comes from the shipping industry and ferries where more ports are investing in such facilities aligned with the EU directive.

As a part of the European Green Deal (EGD) the EU has increased its attention to emission reduction in the maritime sector. The green deal is “an action plan to boost efficient use of resources by moving to clean and circular economy, and restore biodiversity and cut pollution”. The aim is zero net emission of GHG by 2050 and economic growth is decoupled from resource use where no person or no place is left behind. The commission has also proposed an European climate law to turn this political commitment into legal obligation. The EGD aims to reduce GHG emissions by at least 40% by 2030 (compared to 1990 levels). The EGD action plan explains how to ensure a just and inclusive transition and outlines investments and financing tools available. Aspects such as investments in environmentally-friendly technologies, cleaner, cheaper and healthier forms of private and public transport as well as decarbonizing the energy sector are some of the actions required to reach these goals. The EU has also set up the *Just Transition Mechanism* to provide financial support and technical assistance to support the move towards the green economy. At least €100 billion will be distributed over the period 2021-2027 in the most affected regions (European Commission 2019). The EGD is a strong initiative from the Union to shift the focus of the global economy and assist in the transition.

The shipping industry makes up a 13,6% share of the EU transport emissions. Sources suggest that a relative slow movement from the IMO has triggered the EU to take action on these emissions and has included the industry in the EGD. There are some reports of future regulations of the shipping industry where the EGD can direct docked ships to use shore-side electricity and reduce fuel consumption (xChange Solutions GmbH 2020). According to Smart Green Shipping, the inclusion of shipping emission in the EGD comes with serious challenges due to the complexity of the industry. International shipping involves many ships calling at many different ports in many different countries. This raises the issue of who is responsible for what share of the emissions. It is suggested the EU has run out of patience and is proposing to act independently of the IMO to address emission reductions from global shipping in the Green Deal (Stambler 2020).

The EU's actions on shipping emissions shows promise for the future of the industry. It is unclear if these emissions account for the cruise industry. Either way it does increase attention of the sector and possible solutions to reduce emissions from the sector. Shore power in general can be seen as recognized by the EU through the Directive 2015/95/EU as a potential path of sustainable development of the maritime sector. The initiative to increase shore power development is an important objective to increase overall investment in the sector with the aim of developing a greener maritime sector.

6.1.3 Norwegian regulation

The Norwegian government recognizes the need of a green shift in the maritime sector. In 2019 the Action plan for Green Shipping was published as a roadmap of cutting domestic GHG emission, strengthening the Norwegian maritime industry and playing a part in the global technological developments. This aims to be done through a combination of public tools and market based solutions. In the 2019 state budget, 50 million NOK was invested in effective and environmentally friendly ports, with the aim of streamlining logistics, transport of goods and have a positive climate and environment effect. Shore power in general has been recognized as an essential element in developing emission free ports. On the other hand shore power for cruise ships was *not* recognized as a viable investment due to the cost compared to ships in ordinary traffic, and thereby did not meet the requirements for public funding in 2019 (Norwegian Government 2019). The government asked the parliament to compile an international standard and establish a strategy for shore power in the biggest ports and cruise ports in Norway within 2025 (Ministry of Climate and Environment 2018). This changed the

layout for the shore power development in Norway and funding for shore power for cruise ships is available through Enova (further discussed in subsection 6.2.1.).

The regulation and supervision of cruise ships voyaging in Norwegian waters is under the jurisdiction of the Norwegian Maritime Authority (NMA), directed by the Ministry of Trade, Industry and Fishery and the Ministry of Climate and Environment. Overall there cruise industry are subject to a regulatory framework applying to all ships voyaging in Norwegian waters based on the international framework. However in 2019 specific requirements for cruise ships entering the World Heritage Fjords (WHF); five west Norwegian fjords, were implemented. To be allowed entry the ships must comply with restrictions on discharge and emission. The requirement's target known substances such as SO_x, NO_x and PM, following IMO regulations. The ships are required to use specific scrubbers and are subject to NO_x emission requirements that become gradually stricter in the upcoming years after its implementation in March 2019. The ships also face requirements of environmental instruction for the individual ship and prohibition against incineration of waste onboard. Unlike the IMO regulations, ships constructed before year 2000 are not exempted from the regulations unless meeting requirements of historical ships set by the NMA (Norwegian Maritime Authority 2019a). Cruise lines are the target of these requirements and many cruise lines would have to modify their ships to comply. Concerns were raised regarding the short implementation timeline, cost of ship modification and aspects of the restrictions being too strict. The final stage of the timeline are due in 2025 are the strictest requirements enforced compared internationally. Despite the concerns from the cruise lines the regulation was in enforced in March 2019, giving the cruise lines six years to adapt if they want to visit the fjords (Norwegian Maritime Authority 2019b).

The government aims to implement zero emission restrictions for cruise and tourism ships as well as ferries as soon as it is feasible, by 2026 at the latest (Norwegian Government 2019). The NMA has recommended a deadline of 2030 due to the current lack of viable options of emission free technology and thereby give the industry time to adjust and implement the technology needed. The current emission restrictions allows for the extended deadline as emission will be strictly monitored and enforced. These requirements are effective in projecting the aim of the government and protecting the environment. The WHF has been a major draw in the Norwegian cruise market. These requirements seek to protect the environment from the negative impact of cruising and secure a sustainable growth. A zero emission requirement could have a negative effect of transferring ships to other ports and

destinations where zero-emission technology is not applicable. An extension to 2030 for zero emission requirement would give the industry more time to implement viable options as well as improvement of critical infrastructure. The NMA is also looking into extending a zero-emission requirement to all fjords for a more effective output (Norwegian Maritime Authority 2020b, 2020a).

Shore power for cruise ships is not mentioned in any national requirement but it indirectly plays a significant part in the ambitious goal of zero-emission cruise ships by 2030. Promising technologies such as ammonia, hydrogen and battery technology may be dependent on shore power to minimize the use of fuel while in port. Zero emission technologies are still under development and there is not yet a determined path for cruise ships. Shore power technology is in some sense a step in the right direction and will most likely have a significant impact on how the future ship engine is developed. In other words; the development of shore power in Norwegian ports can be seen as a one step closer to a zero emission cruise industry.

6.1.4 Local regulation

Stavanger municipality has committed to reducing GHG emission and increase its efforts in sustainable development. The council has approved an ambitious climate and environment plan 2018-2030 with the aim of reducing GHG emission by 80% by 2030. The plan contains specific goals in areas such as agriculture, water management, energy and consumption and production patterns, protecting ecosystems, using marine resources sustainably and actively working to counter climate change and its consequences (Stavanger City Council 2018). The municipality has stated that they are invested in doing their part to reach the national commitment of reducing emission by minimum 40% (Ministry of Climate and Environment 2020).

The action plan involves several sectors in the region where emission reduction is possible. The cruise industry has received negative feedback from local resident over the past years. Complaints about crowding, air and noise pollution, intrusion of privacy has caused a negative perspective among citizen of the cruise operations in the city. As a result, the municipality has increased its efforts in controlling the impact the industry has on the local community; both socially and environmentally. In 2020 the municipality published the cruise strategy 2020-2030 with the aim to develop Stavanger as emission free cruise destination with high economic impact; a sustainable cruise destination with high regional economic growth,

low environmental impact and management of the local community. The SRH was a participant in the strategy development along with other local tourist companies. The strategy is divided into four areas; environment, product development, cost efficiency and marketing, building on the United Nations 10 principles of sustainable development of tourism. Interim goals of environment include emission free- or low emission sailing in the region, shielding the Lysefjord from ships that do not meet WHF emission standards, reducing emission in onshore vehicles related to the industry; passenger transport, operation vehicles, and fewer large ships at inner docks of the port. Awaiting the completion of the planned new cruise quay at Bjerksted, the majority of cruise calls will be assigned quays further away from the inner port to reduce the impact on Strandkaaien and residential area of Old Stavanger. Additionally the number of cruise calls is aim to be reduced compared to the peak years of 2018/2019 and the least environmentally damaging ships shall be prioritized (Stavanger Municipality 2020).

In the category of least environmentally damaging ships are ships with shore power connection. In the strategy the aim is to offer shore power for cruise by 2022. Currently the project is still in development stage with the aim of securing public financial support as soon as possible. There are still uncertainties relating to the when the facility in Stavanger will be completed, but assessments predicts the facility will not be ready by the 2022 cruise season. The SRH project is ambitious in the construction plans and aims at being versatile to future developments and new utilization methods. The sheer scale of the project; facility inside the mountain and new quay, requires extensive planning and construction time. The strategy was published in late 2020, at a stage where the shore power project had not secured the much needed public funding. The aim was set in a process where both the municipality and the port authority was involved. However, as the municipalities is the majority shareholder in the SRH there is reason to question who had the majority vote on the timeframe of shore power. Additionally SRH has stated that they aim to contribute to their shareholders goals of emission reduction and sustainable development. The limits to a 2022 deadline is mainly timeframe of construction and the complexity of the project. Even though the facility may not be ready by the 2022 season, the project will most likely still move forward as long as public funding is secured.

In a joint effort to reduce the environmental impact from the cruise industry the country's largest cruise destinations have agreed on 14 *joint demands* for cruise ships operating in vulnerable areas along the fjords and coastline. Oslo, Bergen, Ålesund, Stavanger,

Kristiansand, Trondheim, Stranda (Geiranger and Hellesylt), Eidfjord, Aurland (Flåm), Molde, Rauma, Tromsø and Nordkapp with their respective ports are supporting the agreement. It is important to note that Norwegian public ports are, for the most part, publicly owned, where the surrounding municipalities are shareholders. This implies a strong connection of municipalities aims and the ports aims (Ministry of Transport 2015). However, 23¹ operating cruise ports has not signed and supported joint demands. This may reduce the impact of the initiative as it allows for ships to avoid these restrictions.

<i>Joint demands for the cruise industry by Norwegian municipalities</i>	
#1	All cruise ships operating in Norwegian fjords, vulnerable areas in Norwegian waters or Norwegian cruise ports must operate in line with the requirements for emissions of NOX and SOX, as described in the new regulations from the Norwegian Maritime Directorate for the World Heritage Fjords, with probably entry into force from 1 March 2019
#2	Common requirements for the use of shore power for cruise ships, for all Norwegian cruise destinations, with effect from 2025.
#3	Common requirements for emission-free operation of cruise ships, including entry and exit to all Norwegian cruise destinations, as soon as this is technically feasible. It is aimed at timing the requirement for emission-free operation when auditing the declaration in 2021.
#4	From 2021, priority calls for cruise ships that can document the use of climate and environmental measures, through documentation of, for example, EEDI and EEOI, by the allocation of time of call and berth.
#5	Envision that the shore power facilities should have standardized interfaces for connection and disconnection, so that calling ships can use the same type of equipment in all Norwegian cruise ports.
#6	Work together for an annual incremental increase in state shipping fees, for oncoming cruise ships that do not use shore power, in ports where shore power is available.
#7	Annual incremental increase in municipal port charges for oncoming cruise ships that do not use shore power in harbours where shore power is available.
#8	Investigate multipurpose opportunities by establishing cruise ship shore power Installations, to increase utilization and reduce shore power costs
#9	Examine the possibilities of covering the cruise ships' heating needs at the quay.
#10	Require zero emission solutions in all cruise-related bus transport from 2022.
#11	Require zero emission solutions in all transport of goods, waste treatment, maintenance and other services related to the cruise ship's call from 2022.
#12	Work to allow new law to provide the maximum number of cruise passengers per day, as well as the maximum number of cruise calls per day.
#13	Consider whether there are alternative and more suitable quay areas for cruise operations based on the environment, safety and passenger volume.
#14	Work together to ensure that Enova prioritises funds for maritime industry to a greater extent in order to stimulate faster development of shore power in cruise ports.

Table 5: Joint demands for the cruise industry by Norwegian municipalities. Source: Stavanger Municipality and Olsen, 2019.

¹ Alta, Arendal, Bodø, Brønnøysund, Farsund, Fredrikstad, Hammerfest, Harstad, Haugesund, Kristiansund, Lofoten, Longyearbyen, Mo i Rana, Narvik, Olden, Rosendal og Jondal, Sandefjord, Skjolden, Smøla og Hitra, Sortland, Telemark, Ulvik og Vik.

The Norwegian spokesperson for Carnival Cruise Corporation has stated that a number of the demands are not *in the hands* of the cruise lines but aimed at port operations (Director Destination Affairs, Carnival Corp, Personal communication 24.03.2021). However demand # 2 can be seen as directed at the cruise lines. Demand #2 states: “Joint demands for the use of shore power for cruise ship, for all cruise destinations, in effect from 2025.” (Stavanger Municipality and Thomas Bore Olsen, 2019). The demand points to an ambition of ensuring the cruise industry take action on the implementation of shore power on their ships by implementing a restrictions on the use of the technology to be able to access the ports.

A deadline of 2025 gives the ports and the cruise lines time to adjust and implement. However the demand lacks a strong footing in maritime law. The Norwegian Coastal Administration (NCA) states that ships cannot be denied entry to the port on the basis of not having shore power connection. However the port authority can assign less desirable quays for the ships to dock and effectively removing the ships with significant air pollution from the city centre (Senior Advisor, NCA, personal communication, 19.04.2021). Further the port authorities do make agreements with cruise lines before the season start and collect information on ships arriving during the season. At this stage the port may specify requirements of ships entering the port; such as emission limits and shore power connecting. The ports may also raise fees of ships not meeting requirements in addition to placing them at quays further away. Cruise lines that do not meet the requirements may not be satisfied with the alternatives of port entry and choose another destination all together.

Demand # 3 states: “Joint demand for emission free operation of cruise ships, including inn and out sailing to all Norwegian cruise destinations, as soon as this is technically possible. (...)” (Stavanger Municipality and Thomas Bore Olsen, 2019). This demands puts pressure on the cruise lines in terms of upgrading their ships to meet a specific standard. However as it is points to *as soon as it is technically possible*, there is uncertainty of when this will apply. Cruise lines vary in size and technical specificity narrowing the door of *one size fits all* solution. This demand of emission free sailing presents itself as a far-fetched goal within the maritime sector; where all ships are emission free – but also something for the industry to strive for.

The list of demands does not have an expiration date and cover several aspect of the cruise industry in Norway. It serves as a collective effort by the Norwegian cruise destinations to take action on the negative aspects of the industry within the means of regulation. On the

other hand it also serves as a “fire extinguisher” of the increasing attention to the negative impacts of the cruise industry. The demands are at first glance effective and takes control of the impact the industry has on the communities and natural environment of the places the ships *visit*. Assuring the public of consequential action is taken and things will change. But the list of demands are not serving a just purpose of actually changing the industry. The demand to use shore power is more complicated than it presents where a many ports do not have enough power supply to sustain the demand. Problems relating to funding and demand adds additional problems of the development along the coast. Further, there is not mention of punishment for defying the demands besides the ports individual fees and ships quay placement. The list of demands serve a stronger purpose of calming the local community and manifesting that the authorities are doing something about the problem; without actually doing anything drastic.

6.2 Incentives

Energy transitions and sustainable development is often framed thorough government incentives and other subsidies. New technology may need a push or a window of opportunity to find a footing in the dynamic society. This can be done through public funding or financial support from the public or the private sector. In the transition to a low-emission society, the Norwegian government has offered subsidies to private corporations and public institutions to promote the shift to new technology and further development aimed at the national goal of emission reduction.

Shore power development have different options for public funding in Norway. This section will provide a description on the most relevant actors of subsidies and incentives in the shore power development. The aim of this section is to provide the reader with information relevant to the current development in Norway. It is important to note that other actors may also provide support for the cruise lines and also port development, but in this research the most prominent and relevant for the aim of the thesis are in focus. Especially cruise lines being international organizations may have other options of subsidies, but due to the complexity of the industry and time constantans with this study, this aspect is not further discussed in this paper. In this section three different forms of incentives for shore power development will be presented. The first is the most prominent governmental incentive organization Enova, which have a long standing within the Norwegian low-emission path and is also the most relevant funding channel for Norwegian port development. Further follows a presentation of the

Norwegian NO_x fund which can be seen as a innovative way of organizing incentives. Lastly the EPI system will be presented, a Norwegian invention of data collection in the maritime industry that opens doors for incentivizing the “good” ships, and punishing the “bad” ships. These three tools have a prominent standing in the maritime industry and thereby have the potential of affecting the development of shore power positively as well as negatively.

6.2.1 Enova

The Norwegian Ministry of Climate and Environment has focused their efforts in development of energy and climate technologies and reduction of GHG emissions through Enova SF, a public funding organization. Enova aims to exploit renewable energy resources effectively as a tool for creating a low emission society. The organization contributes financially to get projects implemented. Both private citizens and companies can apply for investments. With the establishment of standard connection for shore power in 2019 investment in shore power for cruise ships was established. There are three areas of financial support; preliminary projects of establishing infrastructure, establishment of infrastructure and retrofitting of vessels. General demands apply in terms of nationality, cost-efficiency, innovation and value-chain potential, followed by specific demands for each area. Over all it is clear that the government is protecting its investments by securing reliable recipients and viable projects.

Support from Enova is essential for SRH to realize their shore power for cruise ships -project. It has already received funding for the preliminary project of establishing infrastructure which has abled the project to move forward to the next stage. However the project is still in need of financial support in order to establish infrastructure and complete the project. The process is time consuming and costly as these types of shore power facilities as they have a higher power demand. SRH is located in a larger port with prepared infrastructure which leads to lesser challenges in terms of power availability. Other cruise ports in Norway are located in more remote areas in terms of grid infrastructure, which may lead to more complicated and costly issues to solve. Enova is aimed to be financial support for such issues, but as with any investment the costs should be considered a viable investment. For that reason, shore power for cruise ships was not applicable for public funding. But as the market grew and technology improved as well as cruise lines preparing, the prospects of such facilities became better leading. Additionally Enova is a public organization working to achieve the goals of the national government, which means that investments are made in line with the governments agenda.

The ships seeking financial support for retrofitting of vessels may get up to 40% of the cost covered by Enova if they either are registered in Norwegian ship registries NOR or NIS, have a minimum of one-third of their operations in Norwegian waters, or a minimum of one-third of their port calls in Norwegian ports. Carnival Cruise Corporation, one of the largest cruise lines in the world, states that they are not eligible for financial support from Enova due to it being a foreign registered organization as well as not having a third of their ships registered in the Norwegian ship registry. Therefore any development of their large fleet is most likely financed of their own capital. If cruise companies qualify for financial support internationally has not been disclosed in this research and further discussion of the matter assumes that no other financial support is offered to international cruise lines.

6.2.2 NO_x fund

The NO_x fund is founded on the NO_x agreement between the Norwegian state and the Norwegian business sector which allows members to pay a small fee to the fund instead of high fiscal fee to the government. The member organizations can apply for financial support in NO_x reducing projects. The NO_x fund is based on the mutual agreement between the Norwegian government and industry to reduce NO_x emissions in Norway. The fund has played an important role in the Norwegian maritime industry become a leading edge in an international market. The stricter international emissions requirements has provided opportunities for the Norwegian supplier industry to expand outside the Norwegian market due to an increased demand for NO_x reducing technologies (The NO_x Fund 2021a). Carnival Cruise Corporation pays their fees to the fund, however they are not eligible for support from the fund for their fleet. The continued affiliation with the fund may point to the cruise lines upholding their corporate responsibility. Their payments contributes to the financial support of other projects.

6.2.3 Environmental port index

The Environmental Port Index (EPI) is developed in collaboration with DNV GL and numerous shipping industry experts to calculate the environmental impact of ships. EPI AS is a shareholding company owed by port organizations and municipalities operating ports. The aim is empowering ship owner and port operators to increase their operational efficiency while reducing their impact on the environment. It includes four core elements; the EPI baseline, the EPI Portal, the EPI Score and the EPI Reports.

The Baseline established a ship's maximum tolerable environmental impact while at port based on factors such as CO₂, SO₂, NO_x and particle levels. The Portal is tool used by the crewmembers on a ship to record their vessels key utility data; fuel consumption, emissions levels and power usage during their time at port. This data is then compared to the ships Baseline to calculate the EPI Score between 0-100. Ships are given higher scores for beating their Baseline and lower scores for falling short. Two reports are generated after a ship's stay in port. The Port Operator report provides the port authorities with the EPI Score of each ship, which includes cumulative year-to-year data for all of the port's ship visits. This allows the port operators to identify challenging areas and develop ways to support ship owner in reducing port pollution. Additionally the Ship Owner Report is generated providing the ship owners a full report of the ships performance while at port allowing the owners to clearly see which areas offer opportunities for greater efficacy and potential associated benefits. EPI is used by 111 cruise ships owned by 18 different ship owners and 16 ports in Norway. The system is currently not used in ports outside Norway. The EPI scoring system offers the possibility of ports rewarding environmentally friendly ships. It also allows for penalties or increased port fees for persistent polluters (EPI 2020). This could serve as an stimulant for cruise lines to modify their ships but it would require a significant amount in fees or strict penalty to have that effect – which is up to the individual port. The system has great potential of monitoring and effectively controlling the shipping and cruise industry. We could see a greater impact as it expands outside of Norway in the future and becomes a joint effort from the maritime sector.

6.3 Perspectives on shore power development

In data collection through interviews similar as well as contradicting perspectives on the development came through. In this section these views are presented to give an overview of how stakeholders are perceiving the future of shore power for cruise in Stavanger and along the Norwegian coast.

6.3.1 Motivation for developing shore power

The development of shore power for cruise ships has many hurdles to overcome and it does not appear to be a good financial opportunity. Even so, the development is moving forward, though in a slow speed, but what is motivating the involved partier to invest in shore power?

The Norwegian state has a national goal of emission reduction in all domestic activities with the aim of reducing the environmental and climate impact and contributing to the Paris Agreement. In return this means Ministries with their respective departments, administrations and agencies as well as counties and municipalities have the same goals; adapted to their circumstances and capabilities. The path of development is thereby determined by the national government and the actual process of development is in the hands of respective departments, municipalities and so on. This is representative of the polycentric governance, where the government aims to provide the path of governance and the lower authority is provided the tools to follow the path. The action plan for green shipping can be seen as a specified path for the Norwegian maritime sector aligned with the national goals, where authorities are given activities and specific goals to aim for.

The shore power facility in Stavanger can be seen as a joint initiative from local institutions to reach the national goal. Stavanger municipality seeks to contribute to the national goal and aims to reduce total emissions by 80% by 2030 – where port activities are significant contributor. The municipality is the largest shareholder in SRH who recognizes their responsibility in contributing to shareholders reaching their environmental-and climate goals. The municipality is also the largest shareholder in Lyse AS (45,735%) who refer to their community responsibility for investing in this project and see no economic profit from their investment (Project Manager, personal communication, 19.02.2021; Lyse Konsern 2021).

In the private sector the responsibility aspect also stands as a motivation for the development. The cruise lines have in recent years extended their efforts in reducing their climate footprint and GHG. Carnival Cruises Corporation states that this is the *right thing to do*. The product their selling and are making a living off are the scenic experiences of the Norwegian nature and environment. If this is not *clean* it will ultimately lower the standards and affect the experiences their trying to sell negatively. Put bluntly; if they don't take care of the environment they don't have any product to sell (Director Destination Affairs, personal communication, 24.03.2021).

To summarize, the motivation seems to build on the corporate and societal responsibility of the parties. The ports development and municipalities strategy can be traced back to the national agenda, where the agenda aims at fulfilling international agreements such as Agenda 21 and Paris agreement. The cruise lines refer to their product and the risk of losing the very product their trying to sell. In one perspective one would expect the development to move

faster if the motivation falls on the responsibility. The current pace of development is relatively slow, years behind other nations and ports. In the following section we assess the limits and challenges of the development with reference to authority and involved parties to get a better understanding of what is holding the back the development and the transition to shore power.

6.3.2 Challenges and limits to authority at multiple scales

Looking at the development of shore power for cruise in Norway there are aspects that can be questioned: why are there not more facilities in place along the Norwegian shore line when we know that the technology works to fulfill the aim of lowering the emission from the cruise and maritime industry? With this in mind, the following section will describe some of the challenges and limits authorities face in the process of developing shore power for cruise ships.

The development of shore power along the Norwegian coast is largely up the local authorities. The Norwegian costal administration (NCA) handles issues of costal administration, pollution preparedness and maritime safety. But do not have jurisdiction over the ports development as long as it is within the bounds of Norwegian law and meet Norwegian standards (Senior Advisor, personal communication, 19.04.2021). It is therefore up to the port authorities to control the development and cruise industry. However there is the question of what means are available to efficiently steer the development in the right direction and possibly increase the speed of transition. The NMA have jurisdiction over ships registered in Norway and foreign flagged ships sailing in Norwegian waters. These agencies are administered by Norwegian ministries and work with the maritime industry to secure a sustainable development in all aspects. However, as the domestic ports are not under their direct authority, they face challenges in the aspect of shore power development.

The NMA recognizes a challenge with central politicians often making decisions without checking facts or involving agencies, such as the NMA. This especially applies to areas of environment and pollution (Head of Department, personal communication, 01.02.2021). This can be seen in the case of WHF restrictions, a document prepared by the NMA on mission from the government which is now being reviewed for an extended deadline. This issue can also be identified in the demands for cruise ships at Norwegian cruise destinations initiated and signed by the municipalities. This initiative was not discussed with the NMA, Norwegian

Costal administration (NCA) or cruise lines representatives. As a result the impact of the demands might've been weakened due to the lack of experienced authorities having a voice. The NCA pointed to their experienced legislative department who work closely with international maritime law might have been a useful tool in establishing demands. For example demand #2; all cruise ships to use shore power. The municipalities do have authorities to make such a demand, but on certain terms. By international maritime agreements, it is not possible to deny entry of ship on basis of shore power availability onboard. However, the municipality and the port authorities do have the jurisdiction to place the ships as quays to the ports pleasing. Those quays may be further away from the city center. Essentially the demand does not have the effect of forcing ships to use shore power if they want to enter into the port of Stavanger. It does however make it less desirable, but not impossible for cruise ships to enter without shore power connecting as it offers a less appealing option for the passengers and their product.

The cruise industry was not consulted on this matter either. In communications with a cruise representative during this study, the matter seems to be lacking authenticity by the industry. The industry will most likely respect the demands in the best way possible, but will also exploit any loop holes to their advantage such as demand #2 and port entry availability. If the aim of the municipalities was ensure a sustainable development of the cruise industry in the region, it seems appropriate to involve the industry to find the best possible solution and lay the path for success. Instead, the method chosen by the municipalities play more to the hand of force to protect their own. The question is if this was the best way to do it? Involving the cruise industry as a stakeholder in the process could benefit the portrayal of the initiative of securing a sustainable development of the industry. In a sense, the two parties could work as a together rather than fighting for the same goal on different sides.

Another issue recognized by the authorities relates to the complexity of the cruise industry and the national agenda.

“First and foremost it is a challenge with finding a balance of strict national regulation which may result in none or few cruise ships calling at ports in Norway versus demands maintaining an acceptable environmental standard.” (Head of department of legislation and contracts, personal communication, 01.02.2021).

Significant negative consequences for residents receding and making a living off the industry along the coast is likely if strict regulations are enforced on cruise ships. A balance of what is viable economically and technically for the cruise lines is important to acknowledge to best avoid issues where cruise lines redistribute their routes. In relation to shore power, the NMA has suggested a national regulation of shore power connection specifically for cruise ships, similar to what has been done in the WHF and NO_x emissions in 2019 (ref. subsection 6.1.3) This is legally feasible, but with regards to viability of the industry it becomes intricate. A law demanding shore power connection challenges power accessibility for ports due to the high demand of power used on cruise ships. Additionally it may add significant costs to the cruise lines at point where the Norwegian development does not yet have the capability of feeding the demand. This issue aims at a dilemma of supply and demand. Enova also points to the same aspect of supply and demand, where a shore power facility have energy needs that some ports cannot meet due to grid infrastructure compared to port placement and therefor may not be able to sustain requirements of a shore power law. This leaves the cruise industry in an unfair position of meeting the requirements but not being able to utilize the benefits. Larger scale issue of grid development and power supply relates to the national goal of low- and zero-emission society (Advisor, personal communication, 16.04.2021). A large share of this technological development aims at electrifying the society, putting a strain on the national power grid to be updated and constructed to handle the future demand.

If a shore power regulation is enforced too early in the development we may risk losing the cruise industry as they may not have the economic standing to handle the cost of reconfiguration on their ships and decide to move their operations to other destinations. Shore side development may also face large obstacles in relation to power availability and the grid development, add on the risk of losing the industry, there might not be any market left for the ports to source. For the cruise lines the challenge is currently strongly linked to the slow onshore development. Carnival Cruise Corporation has stated that close to 50% of their ship fleet has shore power connection installed and are ready, or almost ready to connect where it is available. But with few ports having shore power ready it becomes challenging for the corporation.

“There are different parameters in play when a ships route is decided, shore power is one of these parameters. As the development continues is reasonable to assume that more shore power prepared ships sails along the Norwegian coast” (Director Destination Affairs, personal communication, 24.03.2021).

An increased development of shore power facilities in the busiest cruise ports in Norway may prompt the cruise lines to invest further and assign the prepared ships to voyage in Norwegian waters. Relating back to a possible national shore power regulation, a situation where majority of ports are prepared with shore power is the ideal situation for an effective national restriction. But with the challenges of supply and demand and power availability, this development may take too long – adding to the risk of losing the industry by being too slow in development.

6.3.3 Prospects for transition governance

The development of shore power for cruise ships has been a slow process in the last years. The technology has been available, tested and tried by other industries and is therefore not seen as a new invention. This roll out and use in other industries has been beneficial for the cruise industry too, as a market has been present the technology has continued to evolve. The enrollment of shore power for cruise in the Enova funding program has opened doors for a faster development. But the strict restrictions for funding narrows the opening and requires careful planning and extended deadlines – reducing the speed of development along the coast.

There are two respective sides to a development of shore power: onshore and offshore. The biggest cruise operator in Norway, Carnival, states that close to half of their ships are ready, or soon to be, to receive shore power at destinations. CLIA projects that shore power connection will be implemented on a large number of ships in the next couple of years. Not surprisingly, these ships need a connection outlet to maximize their investment.

The onshore development is assessed and boosted through national agendas and strategies. The use of incentives and subsidies is projected as the national tool of path creation where Enova is profiled as the a prominent source of public funding. Enova's mission is to help the technology and development get footing in the respective sector/industry. It is not aimed to fully fund a transition and will therefore eventually stop funding to let the market take over. In every funding scheme there is a question of *when* to stop funding. In the case of shore power Enova support port development of shore power for cruise ship and Norwegian ships reconstruction to shore power. The complexity of the cruise industry adds another dimension to when they should pull funding for shore power projects. Currently there is uncertainty of when they decide to retract the funding. If they pull out too soon there is a risk of a lacking development in the future. If they wait too long the money might be distributed unfairly

leaving other sectors behind in their goal of zero emission (Advisor, personal communication, 16.04.2021). As the Enova is an institution under the Ministry of Climate and Environment, they too follow the national agenda. As ports have clearly stated that they heavily depend on the support from Enova, the pressure of continued funding is important for the future development.

The pace of the onshore development can be traced to the national agenda. It was not considered as a viable investment in 2019, but with the development of standard connection by the EU the situation changed and funding through Enova was approved. However, the development did not gain significant speed as a result. The national action plan for green shipping was intended to lay the grounds for a transition in maritime sector and included the cruise industry. But did not provide any more tools for the ports or cruise lines to achieve the goals. Managing Director in Cruise Norway AS points to the pace in the national level and says; “there is a lot of talk, but little action” (personal communication, 09.02.2021).

The challenges and limits of the development of shore power can be seen as a symptom of an incoordination of the national government. A national action plan without sufficient support systems, funding and infrastructure leading to a slowed development and added struggles for the involved parties. With the current pace of development and the established apparatus of action the shore power for cruise ships-transition may very well be accomplished in due time. The Port Director of SRH states that their intention moving forward with the shore power facility in Stavanger is based on supplying the needs of the market (personal communication, 17.01.2021). In other words, their backdrop for the project is shore power being something the market – the cruise lines – wants, and thereby will use the facility when it is ready. This is highly likely to be true. But there are still questions relating how a facility in Stavanger may influence the larger development along the Norwegian coast. There are also aspects of the methods by the cruise lines which may lead to a period of insufficient use of the shore power facility in Stavanger. But most significantly, is the uncoordinated and delicate governance from national and local authorities aiding the cause and aim of the shore power development or is it holding it back?

7. Discussion

In this section the information disclosed in the previous sections will be discussed in reference to theoretical perspectives. The section will analyse four aspects of the development and use

relevant theory to give a more in-depth analysis of implications the current regulations and activities presents. The subject of this thesis is complex with perspectives and implications that might not have been mentioned or discussed in this paper due to the time constraints and lack of available information. Nonetheless, the information discovered serves the aim of providing a perspective of how the current development is moving and what can be improved to better the outcome of the shore power for cruise ship development.

7.1 Risk of losing the industry

The transition to shore power for cruise ship separates itself from traditional energy transitions because it does not entail a radical change of energy source. The ships will need another energy source when operating at sea. Traditionally this is supplied through combustion engines but technological development is moving forward with the aim of low- and zero emission engines. It is probable that new engine technology will be dependent on shore power for various reasons. For example, shore power allows for complete shutdown of engines reducing noise pollution which may not be applicable with other engines. Additionally it allows for the engines to save the engine resources for their time out on sea instead of in port. New ships may be integrated with battery technology where shore power may be utilized as a charging station, similar to what is seen in ferries and smaller oceangoing passenger transport ships (Zero and Green Shipping Program 2020). Whichever engine technology becomes the new standard for cruise ships is uncertain, but it is possible that shore power will be an integrated feature. The development of shore power for cruise ships along the coast of Norway could assist in the energy transition of the cruise industry by laying the grounds for future development and an industry that sustains as many aspects of pollution as possible.

Following the theory of Sovacool (2016) energy transition are dependent on timing; where if an energy transition does not occur quickly enough it may be too late. In the case of shore power it may be considered too late if other emission reduction technologies becomes the integrated solution. This may occur if the onshore infrastructure of shore power is not in place but national regulations of ship emissions are tightened too soon. The Norwegian government is pursuing the possibility of extending the deadline of zero-emission voyages to 2030 and possibly extending the restriction to account for all Norwegian fjords (Norwegian Maritime Authority 2020a). Local municipality are aiming at the same aspects of zero-emissions sailing in the regional waters. Shore power is not the sole solution to emission free sailing. The most

prominent technology fitted for this are scrubbers and LNG. If scrubbers are installed on cruise ships as a contingent of sailing in Norwegian waters, the interest of shore power may fault. The same goes for LNG though at a larger scale as this technology requires larger development of infrastructure onshore.

The development of shore power for cruise could experience issues with power supply relating to the national grid development. This issue coincides with global concern of power supply, intermittency due to renewable energy sources and the increasing electrification of the society (Schaber et al. 2012). In a smaller scale within the maritime sector, the popular cruise destination Flåm, Aurland in Norway had issues of power supply to sustain shore power for cruise. This delayed the process of development with increasing cost and construction (Managing Director, personal communication, 09.02.2021). This issue applies to smaller communities in rural areas along the coast. A national regulation of shore power use for cruise ships could be delayed if the availability of shore power along the coast is limited. For a regulation to have the optimal effect, the cruise ports should be able to accommodate the restriction by offering shore power. On the other hand, if a national regulation is enforced it could incentives the smaller ports to move forward with shore power but a significant cost.

The fact of the matter is that the future cruise industry in Norway is moving in a direction of shore power to ships where ports and cruise lines are investing in this technology. The risk of losing the industry depends on whether or not the development onshore aligns with the cruise lines expectations of shore power connections. In the following sections different perspectives of how the maritime regime is organizing a transition are discussed to shed light of the complexity on the issue of developing the shore power infrastructure while handling the risk of losing the industry.

7.2 Effective local regulation

The local municipalities are recognising the impact of the cruise industry and have taken action to secure a sustainable development of the industry. Several cruise destinations in Norway are or are planning to implement shore power technology. Aligned with the development, municipalities are regulating the industry to take use of this technology. This section examines the current local regulations with attention to how the initiatives impact the industry and aspect of improvements.

In view of the MLP the municipalities can be seen as a part of the exogenous socio-technical landscape putting pressure on the socio-technical regime to transition. Stavanger municipality have in the last years recognized the risk the industry poses on the local community and taken action to reduce the impact it has on the city. Their intent to steer the development of the cruise industry is shown in two public documents; *the cruise strategy* and the *joint demands* for the cruise industry. These documents serve the aim of profiled targets for the future of the industry and its presence in the local communities. Both documents list shore power as reasonable investments. Other aspects such as transportation and local tourism and handling are also listed as aspects of improvement to secure a sustainable development of the industry. The documents serve the purpose of showing the path for the development and adding pressure to the cruise industry; the regime, by profiling how the society would like the industry to be. If the rest of the regime; the ports, tourist attractions, reach their goals, the cruise industry could be perceived as not caring for the local community or environmental aspect of their destinations.

The initiatives of regulating a sustainable development of the cruise industry can be considered a good method in view of polycentric governance. The local authorities have jurisdiction and autonomy to regulate the industry and also has the knowledge of local needs and implications of the industry. The initiative of *joint demands* can be seen as a coordination of jurisdiction and exchange of information on the same level of authority, where cruise destinations are putting forward an appeal to the industry to secure their own values. The coordination serves the purpose of unity between the different ports and can be considered a force of hand towards the cruise lines. The *joint demands* for the cruise industry are signed and supported by fourteen cruise ports in Norway. However 23 other cruise ports did not support the demands and has not signed on. The mayor of Stryn has stated that they may not be able to redeem some of the demands in their cruise port Olden. Financing a shore power facility by 2025 as per the demands would be challenging (Siem 2020). The other ports not supporting the demand are smaller ports outside the larger cities and there is reason to assume that the majority of those face similar challenges as Olden.

With a majority of cruise ports not backing the demands, the argument of a force of hands by the municipalities cripples. If a shore power development becomes confined to those fourteen ports it opens the door for cruise ships to choose other destinations if they do not comply with the regulations. In this perspective, the decision-making centers could have benefitted from a higher degree of polycentricity; where all cruise municipalities were bound together through

more formal institutions instead of acting to their own benefit. As such, a scenario of cruise defying the regulations and moving their business to other less restricted ports could be avoided.

In a polycentric governance view, the decision-making centers are communicating, sharing experience and knowledge to learn from each other and find the best solution. In the case of the local initiatives for regulation of the cruise industry, the municipalities where the main decision-making centers within their jurisdiction. However, other decision making centers such as the NMA and the NCA have a long standing involvement in the cruise industry and the international maritime sector. A higher degree of involvement of these actors could benefit local initiatives. One example is the NCA's legal department with high competency of maritime regulations and port-related matters. Through the NCA's network the local municipalities could get a new perspective of other cruise ports challenges and successes in regulating the industry. The legal department could also offer guidance on regulatory boundaries of the municipality's ports activities. The Head of Department in NMA stated that it is a challenge that decision makers and government official are not consulting relevant agencies before making decisions. Even though relevant agencies and the municipalities have the same aim, they have different perspectives where they could gain knowledge and experience from each other.

The cruise lines were not involved in the decisions of local demands. Some of the aspects did not directly concern the cruise lines own operations, but the ones that did, such as shore power demand and zero-emission sailing would require significant costs for some ships. The larger cruise lines; Carnival Corp, MSC and Royal Caribbean, may have a better opportunity to ensure compliance with the regulations than smaller cruise lines. One could view this as a signal from the municipalities where they don't want ships who cannot afford to pay for their emissions. But dependency on cruise tourism is varied throughout the cruise destinations, where some smaller cities are more dependent on the income of the cruise industry. Larger cities may depend less on the cruise tourism and therefor see a better opportunity to execute stricter restrictions on the industry, allowing the risk of losing some tourism if some cruise lines do not meet the local standard. Smaller ports may not have the same view and are more dependent on the short cruise season. Involving the cruise lines in the decision making could offer a perspective on the intentions of the cruise lines moving forward in the shore power development.

These issues relates back to the challenge of finding a balance of strict regulations but not too strict to lose the industry in some areas, especially relating to environmental issues. Another way of regulating the emissions from the industry is through the EPI system. The ports may use EPI as a tool to keep control of the cruise ships entering the port with options of sanctioning the worst polluters. Additionally, the local regulations are profiling the use of higher fees as a penalty for not using shore power. Taxes, fees and other fines imposed on cruise ships may pose a significant threat to the economic viability of a cruise destinations. If the charges are high, ships may withdraw with a loss of tax revenues, jobs and direct spend revenues (London 2012). It is important that the fees are more than just symbolic, but too high fees may have unwanted consequences. The ports and municipalities may work on the opinion that the environment and the well-being of the citizens are more important than the cruise lines business. However there is a question if this reasoning is viable in the long term, especially if the higher fees only lead to ships changing destinations within Norway seeing as the *joint demands* are not yet signed by all cruise ports and individual ports have the authority behind EPI.

The local regulations are a step in the right direction for regulating and improving the sustainability of the cruise industry. The local cruise strategy and the joint demands are not set in stone so to speak, but still serve the aim of setting the stage for future development. It serves as a strong standing of how the municipalities want the cruise industry to be. It is not a radical new path for the cruise industry and allows time for the industry to adjust while raising expectations for the cruise lines. Additionally these initiatives are not written into law and strongly rooted in the constitution, which means it can be easily modified and altered as the transition moves ahead and challenges occur. This may be an advantage for municipalities to learn from other cruise destinations around the world and adapt to the changing industry. One example of this are the effects of Covid-19 pandemic on the cruise industry. The aftermath of the pandemic is still uncertain and it is possible that it may affect the path of shore power development.

7.3 Regime resistance from the cruise lines

The cruise industry is investing in their fleets with the aim of protecting the product they are selling and evidently the fight against climate change through less emissions. Shore power technology is recognised by the cruise industry and is being utilized already. Statements from the industry point to compliance with the aim of shore power development. However the

cruise lines are incumbent actors in Norway and internationally to a point where they may have power to shape the transition to fit the industry's wanted pace. This section examines the power dynamic between the cruise industry and the stakeholders to shed light on how the cruise lines actions may delay a shore power transition.

The cruise lines hold powerful positions in the landscape to the extent that they are important stakeholders in the tourism sector in Norway and internationally. One aspect that sets the cruise industry apart from other tourism sectors is that cruise lines have the option of taking their business elsewhere. In other sectors such as hotel and camping it is the consumers choice of where to take their individual business. Cruise lines make that choice for several thousand passengers when they decide destinations. This gives the cruise lines power and destinations have a limited say in whether, when and how cruise ships visit (Bonilla-Priego, Font, and Pacheco-Olivares 2014). This is especially true for smaller cruise destinations, seasonal cruise destinations and destinations in less developed nations heavily dependent on the cruise tourism such as the Caribbean (Lester and Weeden 2004).

In another perspective they local communities do have some power over the cruise lines in terms of reputation. The cruise industry profile their commitment to protecting the environment they expose and the product they sell. As the season is limited in Norway and the cruise lines are an international business, the "environment" they are protecting is different throughout different destinations. For example, the natural environment in the Caribbean is quite different from Norwegian fjords. Additionally there are cultural and social differences between the destinations. In this aspect, the cruise lines may have an increased institutional distance where "host" environment stakeholders are different. This adds complexity to the cruise lines corporate citizenship where actors view the negative aspects of the cruise lines differently. In the Caribbean, waste water and plastic pollution has been the most concerning aspect of the industry, where in Norway overcrowding and air pollution has received the most attention (Dolven and Brasileiro 2019; NTB 2019). In a sense, the work being done to reduce the impact of cruise in the Caribbean may not be recognised by Norwegian stakeholders. This may create a situation where the cruise lines struggle to be recognised as a legitimate organisation caring for local communities. This may spark disbelief in the local community and a resent towards the industry. In Norway, the public outcry for better control of the cruise industry has pressured the local authorities to handle the issue; resulting in recent demands and strategies.

The local initiatives are aimed directly at the cruise industry with the intention to secure a sustainable development, demanding changes and responsibility from the cruise lines. This can be seen as a destabilisation of the regime. The cruise lines are subject to added pressure from external environments where there is added cost of adapting, financial loss if failing to adapt along with worsening reputation and decreasing support. Recognising the cruise lines as incumbent actors in the maritime regime suggests they have different forms of power to resist a transition to shore power.

The cruise lines hold powerful positions in the Norwegian tourism sector and have access to media to shape the discussion in their favour, known as discursive power. Their presence brings not only cashflow, but also attention to Norway from prospect travellers as well as attention to the local communities from the international tourism sector. Further the cruise lines position themselves as environmentally friendly to the extent being concerned about the impact their business has on the product they are selling. Their reports and actions may also attempt to reassure potential customers and nations seeking their business of their care for the environment. The cruise lines may be shaping the public discussion of shore power where the industry is ready but the onshore development is not. This is seen in Norwegian news publications in several instances in the last years; by Aida Cruises in *Teknisk Ukeblad* (Stensvold 2016), and by Carnival Corporation in TV2 (Olaussen, Hermansen, and Trodal 2018). These statements work to assure the public of their care for the environment, increase their legitimacy and corporate citizenship. It may also serve as a ploy to remove themselves from the problem by presenting themselves as the good guys, and putting more pressure on the onshore development.

The cruise lines' presence in the Norwegian tourism sustains a degree of structural power. The government aims to increase the tourism to the nation, where the cruise industry is an important actor. The risk of losing the industry if restrictions are tightened is a strong hand for the cruise lines in negotiations with the government. Material form of power is shown by the cruise lines' investment in other technologies rather than shore power. Cruise lines are investing in LNG, ammonia and scrubber systems (CLIA 2021). LNG may not succeed in nullifying GHG missions, but it is a promising path for the reduction of pollutants such as SO_x and NO_x (Lindstad and Riialand 2020). Investments in LNG could allow the ships to comply with emission restrictions and reduce the environmental impact. Shore power may not be necessary to implement as the argument of air pollution fades if a ship uses LNG. This

may be used as an argument for the cruise lines of reliving any strict shore power requirement.

The development of shore power along the coast is dependent on cruise ships being retrofitted. Though it is expected that cruise lines will follow along with the onshore development. Many ships are already prepared according to the cruise lines' self-reporting. It is also anticipated that more ships with shore power will sail in Norwegian waters as the quantity of onshore facilities increases. The cruise lines may use their power to resist the transition to shore power. But as development moves forward the positive outcomes of a transition may exceed the negative, such as fuel savings and increased corporate legitimacy. Even so, Norwegian cruise destinations have enforced regulations on shore power for cruise ships, pointing to a disbelief in the industry's commitment to local pollution reduction.

7.4 Implications of national shore power regulation

The Norwegian government is showing attention to the development of a sustainable cruise industry. Their efforts are displayed through initiatives such as the action plan for green shipping, the Enova funding scheme and emission restrictions of the WHF. Placing the current development of shore power within the multi-level perspective may provide a new perspective by viewing this as a part of a larger transition of the regime. Recognising the shore power technology as having broken through to the destabilized regime, the transition will move forward in the interplay between landscape and regime. The national government have the option of defining the path of development in the regime through national regulations of the regime. In this section we explore the different aspects of a national regulation of shore power with the aim of enlightening the complex task of governing the cruise industry.

The shore power development can be seen as a part of a gradual shift to zero-emission maritime sector, where shore power is expected to be a relevant application to future low or zero emission ship engine. It is likely that such engines will first and foremost take advantage of the shipping industry before crossing over to cruise lines. A full transition in the maritime sector and the cruise industry is an enormous challenge requiring infrastructure development at a high cost. Energy transitions are not recognized as a rapid process, which especially applies to the maritime sector where long term planning is highly integrated. Power grid infrastructure upgrade will play a significant role in the development of shore power for

cruise due to the high energy demand of these ships. A full scale development of shore power along the Norwegian coast will therefore require a significant investment from the national government and the industry to reach its full potential. The ports will need to invest in a shore power facility at a high cost and only used for cruise ships during a limited season. Moreover the cruise lines would have to invest in retrofitting their ships, but unlike the ports, cruise ships may voyage in other regions outside the Norwegian cruise season, possibly reducing their payback period. One could therefore argue that cruise ships may get a faster return on their investment than the ports would. The Norwegian government is offering public funding for Norwegian ports, but international cruise lines are not applicable to this scheme. There is optimism amongst scholars on governance in transitions, pointing to policy makers at different levels may speed up the transition. The case of the maritime sector is complex due to the many levels of authority impacting the operations. The development of shore power for cruise is on the agenda at many of these authorities, which point to unity in the progress of a transition. The local initiatives are aiding the cause, but the use of national regulation may contribute to a stronger unity in the development.

It is necessary to find a balance of incentivising and the use of legislation to further the development of shore power. This is a challenge for the decision-makers such as the NMA, who will need to find a balance of restricting the industry while ensuring viability of the complex cruise industry. The incentive system for port development of shore power for cruise is mainly through the Enova program, guided by the national agenda. The documents analysed in this research points to a positive attitude towards the development, but it is not profiled as crucial or highly encouraged. As a result, the funding of shore power facilities are limited. Public funding is described as crucial for ports and there is a low probability of a full scale development without it. This situation may delay the timeline of shore power development, ultimately exposing citizens and the environment to unwanted harm. The use of national regulations in the cruise industry requires careful consideration to avoid being too strict or confusing while also having an impact. Government regulation which are obscure, inconsistent or fragmented can pose a significant risk to the operation of a cruise ship as well as lead to added cost of compliance (London 2012). The national government do have a unique opportunity of setting a trajectory for other actors and promote effective coordination at a societal level. In a polycentric governance perspective a national regulation of cruise ships using shore power when in Norwegian port could be the push some municipalities

needs. Though it would be challenging for some ports, especially relating to financing, it could shape the market and bring about change.

National governments do have the opportunity to set a clear path of development that any combination of non-state activities cannot. In the case of shore power development this may be the route to take due to the nature of the problem and the variety of actors involved. The case of the WHF may stand as an example where the government pushed through and the cruise industry would have to obey. Though the WHF requirements were rooted in IMO regulation and were not new to the industry, it is still considered strict and somewhat invasive regulation of the cruise industry. The persistent problem of local air pollution is a challenging task for the national government. On one hand the government wants to grow the cruise tourism and on the other hand want to protect the environment and local communities from harm. Though it would be challenging due to the complexity of the issue and industry, there could be an advantage to governing the transition to shore power at a higher degree than what is being done. The national government would have to accept the risk of losing the industry but may gain knowledge from the local authorities experiences with their local regulations as well as the WHF requirements.

The potential of a national shore power regulation could impact the shore power development for cruise in Europe, and potentially globally. A regulation of shore power use by cruise ships is already implemented in other countries. Though there are variations between the cruise industries in different nations such as population of harboring cities, port placement and infrastructure, a Norwegian regulation may still have an impact on the global cruise industry. The addition of another country demanding the use of shore power for cruise ass pressure to the global cruise industry. Other nations may look to Norway as an example of how they can regulate the industry. And maybe most importantly the air pollution levels in cities can be significantly reduced contributing to increased welfare for citizens and possible a higher tolerance from the local community in regards to the cruise tourism.

8. Conclusion

This paper reviews many aspects of the shore power for cruise development with attention to local initiatives, cruise lines approach and national regulation of the industry. The complicated cruise industry with its multiple stakeholders, regulatory authorities and

responsibilities is difficult to manage. This paper has examined the different perspectives of the development with the aim of providing an in-depth view of the complexity of a transition to shore power. In the beginning of this paper, three research questions were presented. This section will provide answers to these questions based on the information disclosed through the research.

The cruise industry has stated that they are committed to reducing the impact of their operations and are investing in technologies with that aim. Shore power being one of them. The first research question was: *How can the development of shore power facilities influence the cruise lines to transition to cleaner fleets?* This answer relates to viewing the development of shore power as a part of a larger energy transition in the cruise industry. Firstly, as the development of onshore facilities moves forward and more destinations in Norway are offering shore power, this technology becomes a more viable option for the cruise lines. Therefore, more shore power facilities will in and off itself become an incentive for the cruise lines to transition to cleaner fleets. Secondly, the cruise lines may experience additional pressure from the local communities to transition. If the industry does not transition to shore power it may reduce the company's corporate legitimacy and support from the destinations they visit. This may build frustration with the stakeholders and prompt stricter regulations and restrictions, penalties and fees. The cruise lines have the option of removing themselves from the transition by changing destinations and seeking ports without restrictions. But as larger cruise ports implement facilities smaller ports may have increased incentive to develop shore power as the market demand goes up with more ships using shore power. Additionally, local regulations may tighten with the increased development, making it harder for the cruise lines to deviate from the restrictions.

There is a need to find a balance of incentivising and regulating the industry to ensure viability and development, which aims at the second research question: *How is the Norwegian shore power development affected by public funding and regulation?* The public funding and the current regulations are guided by the national agenda set by the government, as seen in the agenda for green shipping and the overall national emission reduction commitments. Evidence from the empirical research shows that ports are heavily dependent on public funding to implement shore power facilities. This largely relates to the cost of construction due to the high energy demand of cruise ships. The public funding scheme is limited which could be considered a contributing factor to a slow development. The Enova funding program is designed to assist an energy transition and aid the development in its start-phase, and not

fully fund the total transition. This means that the funding of shore power facilities will stop at some point. Exactly when this occurs is undermined. As the development moves forward and more ports and ships are using the technology, the development may find its own footing and move on a market basis. At which point public funding may be scaled back. With the current dependency of public funding for port development, it becomes critical that Enova does not reduce its funding too soon. This may affect the development negatively as the balance of ships and ports with shore power is still fragile. The public funding aspect in the shore power transition is in other words essential for the development into the unforeseeable future.

The current regulations for shore power; joint demands and local cruise strategy, are aiding the development by projecting a clear aim towards the cruise lines. These initiatives can be viewed as show of hands towards the cruise industry where the policy-makers are protecting their own environment within their jurisdiction. The shore power development is affected by these regulations in three ways; One, holding the cruise lines accountable for their emissions by directly targeting the industry with restrictions and promoting shore power as a viable option. Two, creating a united front towards the cruise lines through joint demands, though the number of ports not supporting the joint demands does diminish this argument, the initiatives are aiding the development by creating a path of development for the industry. Three, establishing a market base for the ports investment in shore power with the aim of regulating the shore power use for cruise lines, stimulating to growth of the technology. The local regulations are effective in the development of shore power in Norway, but could benefit from a stronger collaboration with stakeholders to ensure knowledge and perspectives are shared between the stakeholders prior to level of authority.

The development of shore power is driven by the national aim of emission reduction and projection of a green maritime industry. Current regulations are somewhat uncoordinated where municipalities are protecting their own by the use of their jurisdiction. A national regulation of shore power has been discussed and is feasible. In this scenario, the last research question is: *What implications will a national regulation of shore power have on cruise lines and ports in Norway?* This plays to the challenge of finding a balance in restricting the industry but not pushing them away. The complexity of the industry and the many aspects of the development makes it difficult to find the right timing. Ideally the government regulation should be enforced at a time where the development is far enough along to handle the consequences of restrictions. A national regulation of shore power use by cruise ships, is

affiliated with high risk of losing the industry in a situation with limited number of ports having shore power. But as development moves forward, the scenario of a national regulation becomes more viable and promising. The ports may benefit from a national regulation as the development becomes recognized as a sound investment and shore power becomes a necessity in the cruise industry. This situation adds reassurance for the ports, particularly the smaller ports that a facility will benefit the community and is not a unstable investment associated with financial risk. A national regulation may serve as unity between the ports ambitions. If enforced at an earlier stage, a national regulation may also provide stability for further public funding of shore power facilities in ports.

A national regulation of shore power for cruise ships will affect the cruise lines where the Norwegian cruise market becomes more restricted. It is possible that the cruise lines may choose other destinations outside Norway if a regulation is enforced. But it is more likely that the cruise lines will accommodate the restrictions. The shore power development is occurring internationally, which affects options for the cruise lines. Take into account the cruise industry statements of shore power development, the risk of route changes are minimal as long as the regulations are apprehensible and in a timely manner with attention to what is technically feasible. Governing the overall transition to “greener” ships will most likely occur at one point, either internationally from the EU or IMO, or nationally. Considering the challenge of international governing of the cruise industry, the national government has an opportunity to set a clear trajectory aligned with the aspiration of a green maritime industry and possibly influence the international community to seek the same goal.

The cruise industry is complex and dynamic in many ways and difficult to regulate, but not impossible. Even though the technology is prominently used in the maritime sector, implementation to the cruise industry creates new issues of consideration; new infrastructure, tourism growth and risk of losing the industry. Shore power for cruise should be considered an investment in the long-term strategy and not just reducing local pollution. Not only because it will likely be involved in future cruise engine technology, but also because it sets the trajectory of a sustainable cruise industry.

8.1 Further research

Further research on matters relating to the cruise industry is encouraged and there are many research opportunities for further study. Aspects of national regulations on the cruise industry

may provide relevant information for future development, specifically more in-depth analysis of the implications to smaller Norwegian cruise destination. Additionally, the cruise lines are, in my opinion, very interesting study objects. Studies on what implications the cruise industry has on destinations have been conducted and are valuable for the development of the industry. On the path of sustainable development for the cruise industry and particularly the local impacts of the business, I find it important to highlight both sides and pay attention to the cruise lines challenges. Studies on the complex narrative the cruise lines navigate in their industry would be a good contribution to the development.

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Appendix A: Interview Guide

These questions were used as a basis for the interview with the respondents in this study. Some were altered to fit in with the conversation as it went along, to keep the layout of a semi-structured interview. The questions listed are aimed at getting the respondents perspectives on matters relevant to the study.

- What are your obligations in your position at you work place?
- What is your view of the development of shore power for cruise in Norway?
- What challenges does your organization have in relation to the development?
- How is the collaboration with other institutions on this matter?
- How do you view a possible regulation of shore power for cruise?
- What are some important aspects in need of consideration in the development of shore power for cruise?

Further questions would build on the answers from the respondent and questions aimed directly at the work of their institution/organization. As majority of the data collected were conducted through email exchange, the questions were adapted to fit the information the respondent brought up. Additionally some of the questions were not asked in the listed form as the respondents gave information relevant to the questions before they were asked, to which I only clarified the matters. This is particularly true to questions relating to challenges, where informants presented challenges throughout the conversation.

Appendix B: List of Informants

Title	Company
Advisor	Enova
Senior Advisor - Department of Transport Planning and Mobility.	Norwegian Coastal Administration (NCA)
Head of Department of Legislation and Contract	Norwegian Maritime Authority (NMA)
Port Director	The Port of Stavanger (SRH)
Manager of Operations	The Port of Stavanger (SRH)
Cruise Manager	The Port of Stavanger (SRH)
Advisor	Stavanger Municipality
Managing Director	Cruise Norway AS
Director Destination Affairs	Carnival Cruise Corporation
Project Manager	Lyse AS