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Analyzing green services in the business network of the shipping industry

Master's thesis in Supply Chain Management

LINA SISODIA
JOSEFINE SUNDBERG

DEPARTMENT OF TECHNOLOGY MANAGEMENT AND ECONOMICS
Division of Supply and Operations Management

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Josefine Sundberg

Department of Technology Management and Economics
Chalmers University of Technology
SE-412 96 Gothenburg
Sweden
Telephone + 46 (0)31-772 1000

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JOSEFINE SUNDBERG

Department of Technology Management and Economics
Division of Supply and Operations Management
Chalmers University of Technology
SE-41296 Gothenburg, Sweden
Telephone +46 31 77 21 000

SUMMARY

Due to globalization of society, the shipping industry has become an essential mode of transport. The shipping industry relies on fossil fuels and accounts for approximately 3% of the worlds GHG and CO2 emissions. Environmental issues have received global attention, and the shipping industry is being pushed to introduce more sustainable practices into their business because of new regulations as well as pressures from customers and other stakeholders.

This master's thesis is conducted on behalf of RISE Maritime Department, to find environmentally friendly and long-term economic solutions that can be applied in maritime logistics. The purpose of this master thesis is to investigate what green services in the shipping industry are offered and how they could be developed in collaboration with their stakeholders. To fulfil this purpose three research questions will be investigated:

1. What green services are offered today in Ro-Ro/Container shipping segments and how are these services structured?
2. What stakeholders in the shipping industry's business network are important to involve in developing green services?
3. How could green services in the shipping sector be developed in the future and what are their enablers and barriers?

Several methods were used to answer the research questions. Systematic combining was used to facilitate the process, this method entails collaborating between data and theory, the process is not linear. Initially a homepage scanning was made on various container and Ro-Ro shipping companies and after that interviews were conducted with the same companies that were included in the homepage scanning, and also one freight forwarder, this was done in combination with the theoretical framework.

After the data collection, analysis was made that green services in the shipping segment were mainly offering customers to purchase alternative fuels on their shipments in forms of carbon reductions, carbon compensations, carbon calculations and offsetting projects. The shipping industry's business network consists of various actors such as customers, freight forwarders, fuel suppliers among others, which are all important actors when collaborating in developing green services. Suggestions for how green services could look like in the future as well as further research has been made.

Keywords: Green services, Environmental services, Green innovation, Shipping, Business networks, Green collaboration, sustainable offers.

Acknowledgements

This master's thesis was conducted during the spring of 2024 in collaboration with RISE Maritime Department and marks our education at Chalmers University of Technology. We would like to say a special thanks to our supervisor from Chalmers, Frida Lind who have supervised and supported us during the spring. Thank you for valuable insights and encouragement during the way. We would also thank Vendela Santén and Sara Rogersson at RISE who have been supervising and providing valuable feedback on our thesis. Finally, we would like to say thank you to all the respondents that took their time to participate in the study.

Lina Sisodia & Josefine Sundberg, Gothenburg, May 2024

Glossary

Biofuel	Biofuel is a fuel type produced from biomass such as plants and waste. This fuel can be used for transportation rather than fossil fuels.
CO_2	Carbon Dioxide
ETS	Emission trading system is a cap- and- trade system set by the EU to control pollutions by providing economic incentives for reductions.
EU	European Union
GHG	Green House Gas
IMO	International Maritime Organization
LNG	Liquefied Natural Gas fuel is a natural gas that has been liquified. LNG is used instead on fossil fuels as it can be considered a cleaner gas
Ro-Ro	Roll-on-Roll-off vessel
Ro-Pax	Roll-on/Roll-off passenger vessel
UN	United Nation

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1.Introduction

The following chapter starts out with a background to introduce the subject of the master thesis and identify the problem of the project. This leads forward to the aim of the study and the research questions which will be investigated in the thesis. Finally, an overview of the disposition of the thesis is presented.

1.1 Background

With globalization of society, the shipping industry has become an essential mode of transport because of its easiness to reach all parts of the world with sea transport. The shipping industry plays an important role in the mode of transport and accounts for the majority of international trade – approximately 80-90% (Raza & Woxenius, 2023; Lun et al., 2014). Due to the increased globalization over the last years, this is also important for economic growth due to the ease of transporting large quantities of goods from one continent to another in a cost-effective manner (Lun et al., 2014).

The shipping industry also relies on fossil fuels which lets out GHG (Green House Gas) emissions such as CO_2 emissions (Lun et al., 2014). The industry accounts for approximately 3% of the worlds GHG emissions, and the CO_2 (carbon dioxide) emissions have increased every year (Faber et al., 2021). The levels were from year 2022 7,02 million tonnage of CO2 emissions in relation to 1990 where it was 2,37 million tonnages of CO2 emissions. This indicates that over the last 30 years, the CO2 emissions have increased approximately three times as much (Naturvårdsverket, 2024; European Parliament, 2022). The GHG emissions mainly comes from the heavy fuels that drive the ships and therefore, alternative fuels are highly on the agenda (Atilhan, 2021).

Environmental questions have grown attention over the last years and industries are being pushed to adapt more sustainable practices into their businesses. The UN implemented in the year 2015 the “Paris Agreement” which is a binding agreement between parties included in the UN. These parties have signed to limit the global warning by 1,5 degree the year 2050. This requires lower emissions of Green House Gases, which are now one of the biggest reasons for climate change (UNFCC, n.d).

Not only do regulations push industries to adapt more sustainable business practices, but there are also external pressures from stakeholders related to the industry. By increased attention for environmental questions, customers have also started to ask for more environmentally friendly alternatives with less carbon emissions (Raza & Woxenius, 2023).

This means that the shipping industry needs to take measures to limit their climate impact and adapt more green alternatives (environmentally friendly alternatives) to their practices. “Green services” are defined as services with less negative impact on the environment meaning less GHG emissions and minimized waste of resources (Cocca & Ganz, 2015). This could for example mean preparing for the use of alternative fuels, electrification, slow steaming or other upcoming technologies to have a more energy efficient fleet.

Some companies have already started their transition and it is stated by Yang (2017) that companies that brand themselves as green gains competitive advantages. This means that the industry needs to establish sustainable business models with services which are environmentally friendly and attractive for customers. Raza and Woxenius (2023) explain that shipping companies can, by offering green alternatives and answering the pressures from their stakeholders, reach long term benefits, both from an environmental, financial and competitive perspective.

As stated, there is an increased interest among the consumers in green services, however, there is still a limited number of customers actually willing to pay for these green services which needs to be investigated further.

This master thesis is made on behalf of RISE Maritime Department (Research Institute of Sweden), which is a research institute who collaborates with different industrial actors, universities among other, to find environmentally friendly and economic solutions that can be applied in the maritime logistics in the long term in the maritime industry (RISE, 2024).

1.1.1 Regulations in the shipping industry

The Swedish shipping industry follows various regulations and guidelines implemented on both a global- and regional level. On a global level, the International Maritime Organization (IMO) is the organ who regulates the shipping industry. IMO is a specialized agency of the United Nation who carries the responsibilities of safety and security of shipping worldwide (IMO, 2024). According to the official website, IMO is responsible for creating a regulatory framework that is applicable universally in the shipping industry. Some examples of these measures that IMO covers are the ships designs, construction, equipment, disposal and emissions.

In the revised IMO GHG strategy, the aim is to achieve net zero emissions from global shipping by 2050. The 2023 IMO strategy includes two different milestones for the shipping industry (IMO, 2023):

1. GHG reductions by 40% year 2030

2. GHG reductions by 70-80% year 2040

This IMO strategy is an addition to EU's "Fit-For-55" plan. The EU's "Fit-For-55" plan is a milestone on the way to 2050s emission free global target. The target for this plan is to reduce GHG emissions by 55% by the year 2030 compared to the year 1990 (Köhl et al., 2021). It also provides a package of measures to be applied by the shipping sector, e.g., Emission Trading System (ETS), taxations and onshore power in ports.

From the year 2024, the shipping industry will be regulated by the EU ETS. Earlier it was mainly energy companies, aviation etcetera which were encompassed by these regulations. EU ETS is a way of reducing GHG emissions to reach the climate goals from the Paris Agreement. In these regulations, there are limits in how much GHG emissions a certain company can pollute. The GHG emissions on EU-water are also taxed (Naturvårdsverket, n.d.). Further, a new regulation called ETS2 is about to be implemented and operated fully at excepted year 2027. This means that companies in all sectors have to monitor and report their emissions (EU, nd).

1.1.2 Container and Ro-Ro segment in the shipping industry

The shipping industry contains various segments such as container ships, tankers, bulk carriers, Ro-Ro and Ro-Pax. These different segments transport different types of cargo and have different kinds of vessels as well as operating differently (Lumdsen, 2007). In this thesis, the container shipping- and Ro-Ro shipping segment will be investigated.

Container ships are mainly large vessels which are loaded with containers which are lifted on by cranes in the different ports. The containers can be stacked on each other enabling large volumes to be loaded on these types of vessels. Because of their volumes, container ships are often used for long trades between continents (Lumdsen, 2007).

Ro-Ro is a shortened version of Roll On/Roll off and requires only ramps for loading which makes loading and unloading of cargo easy. They are mainly used for rolling units, meaning that they can transport cars, trailers etcetera. For shorter distances, it is a good mode of vessel because of its easiness for loading and unloading cargo in ports. However, for longer distances, it is hard to utilize the full volume capacity of the vessels and other vessel types are of better use (Lumdsen, 2007).

1.2 Purpose and Research Questions

The purpose of this master thesis is to investigate what green services in the shipping industry are offered and how they could be developed in collaboration with their stakeholders. This is done by identifying which current green services currently are being offered on the market in the Ro-Ro and Container shipping segments, meaning that other segments in the shipping sector will not be investigated. Furthermore, how green services need to be developed in the future to gain increased interest among the customers is going to be investigated. As aid to fulfil the thesis purpose the following research questions will be investigated:

RQ1: What green services are offered today in Ro-Ro/Container shipping segments and how are these services structured?

RQ2: What stakeholders in the shipping industry's' business network are important to involve in developing green services?

RQ3: How could green services in the shipping sector be developed in the future and what are their enablers and barriers?

1.3 Disposition of thesis

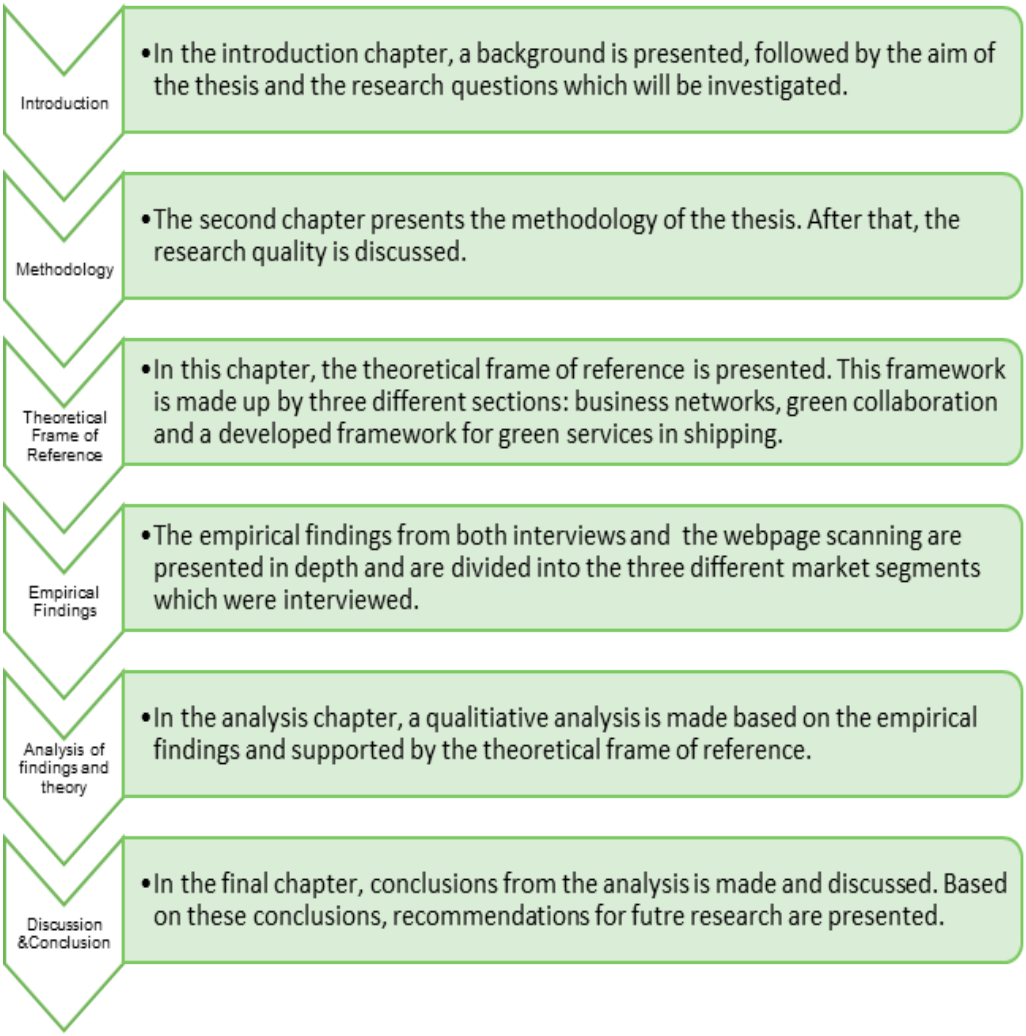

Figure 1: Disposition of thesis

2. Methodology

This chapter outlines the methodology that was used through this master thesis. First the research strategy is introduced followed by the different data collection methods which were used in this thesis. This is followed by the research approach which was systematic combining. Further, the method of analysis will be explained. Finally, the quality of the study is discussed.

2.1 Research Strategy

The research strategy of the thesis is, as previously described, of a qualitative nature. When conducting research, data collection is the foundation for the study according to Bryman & Bell (2015). For collection of data, semi-structured interviews and review of secondary sources have been used as methods. For secondary data sources, literature review was chosen as method from both academic books and digital platforms. A homepage scanning was also made where the shipping companies sustainability data was read and written down. The homepage scanning in combination with interviews allowed us to compare the different companies in the same industry regarding the research topic.

2.1.1 Homepage scanning

Initially, a “Homepage scanning” was made. Meaning that information was gathered from the shipping companies own homepages where they present their sustainability approach. Sallnäs (2014) describes that homepage scanning can be beneficial to get an understanding of companies' activities since they like to market what incentives and adoptions that are made in relation to sustainable development. This gave a foundation before the interviews to get an overview of their green services and how their sustainability strategies look like. Information was mainly gathered from the shipping companies' public material and their sustainability reports. This information was categorized to be able to identify common denominators which in turn aided in understanding what green incentives the companies are taking together with their sustainability targets and background about the company.

This information together in combination with the interviews also provided a foundation for the empirical data. The same companies that were interviewed were

included in the homepage scan. However, when choosing the companies for the homepage scan there were a larger number which were narrowed down to those who in the end were interviewed, since not every company that were initially included in the homepage scan participated in the interviews.

However, it was important to read and handle this information critically since this is used as marketing for the Shipping Companies and to show their stakeholders how they are acting for the environment. Furthermore, it facilitated when constructing the interview guide as we were able to ask more company specific questions to aid our understanding of the shipping industry.

2.1.2 Literature review

Literature studies is an essential part of a project to clarify and give a foundation for the research and the theoretical framework. Hence, it is of importance for the authors to maintain objectivity and review this information critically (Bryman & Bell, 2015). Literature serves as foundation for the research is both important to get knowledge about the topic and aid when interpreting for the analysis (Dubois & Gadde, 2002). Both academic books and academic journals were used for gathering qualitative data. The articles were searched through the digital platforms Chalmers Library, Research Gate and Google Scholar. Keywords for search of the study were “Business Networks”, “Shipping”, “Green Services”, “Environmental Services”, “Green Innovation”, “Green Collaborations” and “Sustainable offers” in different combinations.

Information was also gathered from the shipping companies' own homepage where they present their sustainability approach and was written down and compared the information with other similar companies. This information together in combination with the interviews provided a foundation for the empirical data. The same companies that were interviewed were included in the homepage scanning.

2.1.3 Interviews

Interviews were one of the main methods used for data collection. The approach of the interviews was of a semi-structured nature. Semi-structured interviews are when questionnaires are prepared beforehand, but they are not static during the interview and no specific order needs to be followed. In other words, they are more flexible and allow

the interviewers to ask follow-up questions (Merriam & Tisdell, 2015). When semi-structured interviews are used in a study, it is common that the researchers form a "interview guide" where the themes and questions are predetermined to make sure that all information will be included in the interview, even if it is not followed strict (Bryman & Bell, 2015).

A semi-structural approach was chosen by the researchers due to its flexibility during the interviews with asking follow-up questions or changing the order of the interview questions during the interview. An interview guide (Appendix A) was prepared with questions and sent out to the companies in advance. The interview guide covered several themes such as background information and green services, see appendix A for a more detailed view of the interview guide.

Interviews were performed with different shipping companies in the container and Ro-Ro segment. One Freight Forwarder was also interviewed to get a more nuanced picture from the answers. The interviewees were selected together with RISE and were the same companies as were included in the homepage scanning as described earlier. The interviews were mainly on Microsoft Teams, but some interviews took place on site. Furthermore, the interviews were recorded if allowed by the interviewee and transcribed. Notes were also taken during the interviews if there would be any technical issues with the recording. The respondents are presented in table 1.

Table 1: table of respondents

Respondent	Company	Market Segment	Duration	Date
1	DFDS	Ro-Ro	~60 min	2024-03-15
2	Wallenius Wilhelmsen	Ro-Ro	~60 min	2024-03-18
3	MAERSK	Container	~60 min	2024-03-19
4	CMA CGM	Container	~80 min	2024-03-20
5	Hapag Lloyd	Container	~60 min	2024-03-21
6	MSC	Container	~60 min	2024-03-21
7	BWS	Freight Forwarder	~50 min	2024-03-22
8	Evergreen	Container	~45 min	2024-04-03

The interviews were mainly held in Swedish, but some participants were from other Nordic countries and thereby they were held in English to avoid misunderstandings due to language barriers.

2.3 Research approach – Systematic Combining

Research tends to be seen as linear processes, however that is not always considered to be the case. Dubois and Gadde (2002) suggest a research method called systematic combining, which was adapted in this thesis (figure 2). This method entails allowing the researchers to simultaneously work on empirical data with theory and therefore develop the topics during the research process. As a result, this allows the researchers for increased flexibility rather than what a linear process does. Dubois and Gadde (2002) mention two different concepts that are of importance when using this model, namely "Matching" and "Direction and Redirection".

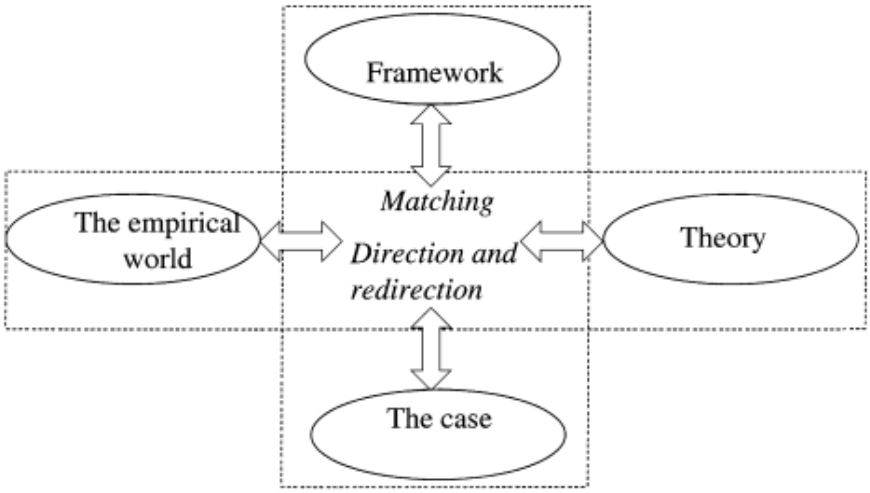

Figure 2: Systematic combining (Dubois & Gadde, 2002, p.555)

By opting for ''Matching', the researchers are allowed to go back and forth between theory and empirical data, this allows for new theory to be added when there are new empirical findings. These findings can change the direction of the study which is when the concepts of direction and redirection are in place (Dubois & Gadde, 2002)

In this thesis, systematic combining was used as a research method when the aim and research questions were defined. The research method began with conducting a pre-study, which was done by a homepage scanning of the shipping companies of interest. The aim was to gain knowledge and understand the research topics.

After the pre-study had been conducted, an interview guide was created formulating the interview questions for the sipping companies. Semi structured interviews were used for the empirical data. In parallel to this the theoretical framework was formulated and so the empirical data and theory was constructed at the same time. When new discoveries were made in the empirical data, the authors went back to theory and expanded it to match with the new empirical findings. These findings also changed the original direction of the theory and expanded the whole theoretical framework as new data needed to be analyzed.

2.3 Method of Analysis

The analysis started already after the interviews where important themes were written down. Some findings that came up during the interviews were repetitive and patterns could be identified but small nuanced differences could be identified. Two different market segments were primarily investigated, and the two segments were analyzed apart. However, during the analysis stage we identified that the same themes were brought up by both different segments which made us consolidate both the Ro-Ro and the container shipping companies.

This process was not linear, and the systematic combining approach was used also when conducting the analysis of data as we identified that more theory needed to be gathered to establish the interpretations from interviews. The theoretical frame of reference is divided into three different sections whereas the first section is about business networks which should aid to answer RQ2 along with the following section which is about green collaboration in service development. In the second section underlying chapters regarding green services and green washing are described and will aid in answer RQ1. This leads forward to the third section which is our own framework created to define Green Services in Shipping which connects the different theories and serves a foundation to answer RQ3.

2.4 Research Quality

Research quality entails various criteria to ensure that a study's findings are trustworthy and applicable. When conducting qualitative research, different factors encompass the methodology of a research process. To evaluate the trustworthiness and authenticity of a research, Bryman and Bell (2015) propose that four different criteria could be

evaluated to measure the trustworthiness for qualitative research. These criteria are credibility, transferability, dependability and confirmability (Bryman & Bell, 2015).

Credibility

Credibility can be argued as internal validity, which according to Bryman and Bell (2015) aims to create an understanding if the correlation between two or more factors affects the output. One way of establishing credibility is to let the respondents read what the researchers have captured from the interviews and verify what has been said (Bryman & Bell, 2015). In this research, all respondents that were interviewed were specifically chosen for their expertise in the field. This can verify the validity of the study as the conclusions drawn by the researchers were verified by the respondents and/or corrected to better reflect the actual situation. In collaboration with RISE, the researchers were able to gain worthy insights and guidance to receive feedback from the qualitative data gathered.

Transferability

Transferability aims to show if the findings from a study are general and applicable to specific research and are mentioned external validity (Bryman & Bell, 2015). In the case of this thesis, the research has specifically been limited to aim for the Ro-Ro and container shipping segments and its framework is therefore framed to this market. However, the contexts can be used for other industries with the same purpose that could be applied for future research.

Dependability

Dependability addresses how reliable the results of a study are and if the results remain the same or differ over time (Bryman & Bell, 2015). For this thesis, all interviewees were of direct correlations to the topic, and all possessed knowledge on matters such as green services, shipping industries and sustainability issues. The container shipping companies which were included in this study were some of the biggest container shipping companies in the world which provided strengths of the research. There needs to be taken into consideration that the majority of the interviews were conducted with the container shipping companies and that if given a larger variety of shipping companies then new concepts could emerge and be discussed.

While it was harder to get hold of respondents from Ro-Ro shipping companies and freight forwarding companies. However, the freight forwarder fulfilled their role since the interview was mainly to get a perspective from another perspective. The Ro-Ro shipping companies were only two which could give a narrow view of green services in this segment. But since they had different strategies for moving forward a wider perspective could be identified anyway. The homepage scan provided a solid foundation to tailor company specific questions for the interviews even if the base questions remained the same for all interviews.

Confirmability

Confirmability aims to disclose the objectivity of the study and its results. This means that the results presented can be confirmed by themselves based on the findings and not on the biases of the researchers (Bryman & Bell, 2015). To facilitate confirmability, the methodology of this study was conducted based on relevant information from the homepage scan, interviews and backed up by the theoretical framework.

3. Theoretical Frame of Reference

In the following chapters, the theoretical framework that is the foundation of this master thesis, is presented. The first section is about business markets as networks with underlying chapters regarding value co creation and power—trust in a business network. The second section is about green collaboration followed by green supply chain management, green services and green washing. Finally, our own framework is presented which sums up some of the theoretical references which formulate green services in shipping.

3.1 Business markets as Networks

The shipping sector consists of a complex network of different companies and stakeholders who manage various activities and exchange resources. Because of this, a mapping of the shipping sector's network needed to be done both in terms of getting an understanding of who the important actors are, but also what they do and how they integrate as well as the exchange of resources between each other. This is to be able to investigate Green Services and determine what part different actors play when buying – selling and developing these offerings. Håkansson & Snehota (1995) describes a business network as a business relationship between two or more parties which are connected to each other and share the same interests.

There are different ways to analyze and define a business network and many models exist to evaluate this. Gadde & Håkansson (1993) describes that business networks can be analyzed from the activates-actors-resources perspective and presents the ARA-model (figure 3).

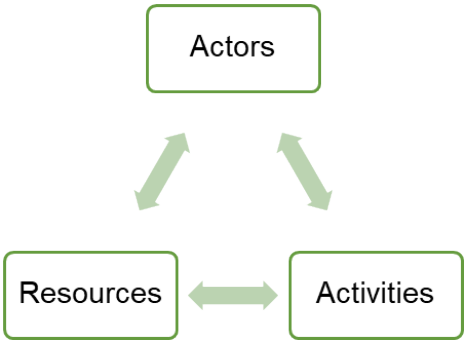

Figure 3: The ARA-model

With the ARA-model the bonds, ties and links between actors, resources and activities and that is what formulates the business network (Håkansson & Snehota, 1995). The idea of this model is that the three components are related and dependent on each other through different interactions (Gadde & Håkansson, 1993). The three components are described as actor bonds, activity links and resource ties. Additionally, it means that resources are shared between companies while activities are linked between them. The actor's dimension in a business network is important since they dispose of the resources and the activities towards other actors of the network (Håkansson & Snehota, 1995).

Actors in a business network can be companies which are bonded to each other, for example through a customer - supplier relationships where they share resources. When discussing actor bonds, this is the bonds which are related and connected with other actors in the business network. It can be third parties and it can be close relationships between the actors, but in some way, they interact with each other (Håkansson & Snehota, 1995).

Activities are those performed by companies internally, but they are also linked between the different actors of the business relationship which is why they are called activity links. These activity links can develop over time and are important for the financial development of all companies involved in the network (Håkansson & Snehota, 1995).

From the resource perspective, the resources can be either tangible such as physical resources such as production equipment and machinery, or intangible resources such as knowledge and information. Håkansson & Snehota (1995) argues that no company has all resources, it is when actors combine their resources, where most value is created.

3.1.1 Value co-creation

During the last years the focus of exchange of goods has shifted towards a widener perspective with a focus of intangible resources such as skills, information, knowledge and collaboration between parties in a business relationship (Vargo & Lush, 2004). This change has been the foundation for a shift in focus from internal value creation to integrated value co-creation between actors included in the business network (Vargo & Lush, 2004). Nenonen & Storbacka (2010 p.2) describes that:" the *locus of value*

creation is no longer perceived to reside within firm boundaries, but value is considered to be co-created between actors within the networked market". However, Perna et al. (2022) argues that value-co creation is not only to be focused on short-term collaborations, instead there should be a a focus on deeper interactions between the actors as well as managing complex relationships.

Perna et al. (2022) describes that value-co creation is when a new innovation is created through collaboration between the actors in the business network through interaction and combining of their resources which implies that resources exchange and interaction is the foundation for value-co creation. Further, Perna et al. (2022) highlights the importance of commitment for collaboration between the actors across the business network if co-created value should be perceived.

3.1.2 Co-Creating Value through Resource interfaces

When moving away from the view of resources as tangible goods which are exchanged through a buyer-seller relationship towards intangible resources and interaction through the whole business network (Vargo & Lush, 2004). The resources are described as *"continuous and dynamic" (Vargo & Lush, 2004 p.15.* Bocconelli et al. (2020) describes two different types of resource interfaces: resource interactions and resource integrations. Göcer et al. (2023) used the terms of resource interaction and resource integration when investigating how a start-up in the maritime logistics network integrated their resources in the containing shipping industry to achieve value co-creation. Figure 4 was used in Göcer et al. (2023) study to evaluate the resource exchange between different actors of the logistics network.

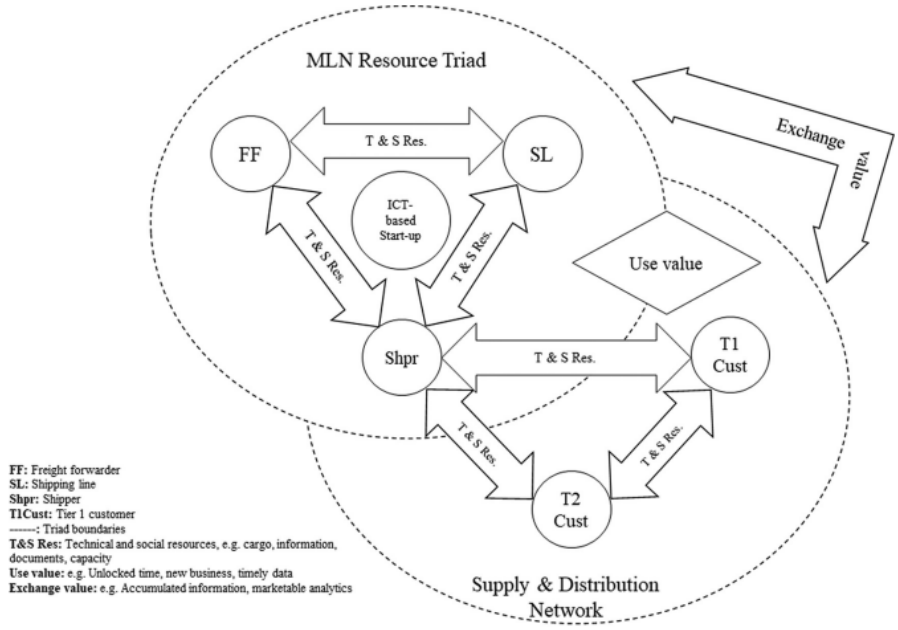

Figure 4: MLN resource exchange. Adapted from Göcer et al. 2023 p.6

In figure 4, the terms of use value and exchange value are mentioned. Both these terms are related to value cocreation in the business network (in this case the MLN). Value is co-created when different actors integrate their resources in different ways (Göcer et al. 2023). Use value is according to Göcer et al. (2023) when any actor of the network alone uses the resources, which have been exchanged in the business network. When these resources are used by that actor, value is co-created. Exchange value is another term used and means that value-cocreation is happening when actors contribute their preferences and decisions which can develop new resources (Göcer et al. (2023).

3.1.3 Power and Trust between actors in business networks

In order for a relationship to work there needs to be a certain level of trust, especially in business networks. However, when there is a competitive market and several actors, the element of power can influence the dynamic and change the balance in these relationships. When specifically looking in the shipping industries supply chain aspect, Sallnäs (2014) draws the conclusions that the shipping companies carries almost exclusively the power majority in the relationships.

Rogerson et al (2021) explains that power has several definitions but mainly interprets it as “the ability to evoke change in another’s behavior”. The shipping companies possess therefore the most power within relationships with other actors and can shift

the dynamic in their favor. Rogerson et al (2021) further explains that with power comes trust. These are often interlinked with each other, in various ways. Trust can be seen as "an expectation held by an agent that its trading partner will behave in a mutually acceptable manner". Trust can be found in various settings, long term relationships between buyer-suppliers has been shown to decrease the level of distrust between the actors (Rogerson et al., 2021).

3.2 Green collaboration in Service Development

Gunasekaran et al. (2015) elaborates that the basis for a collaboration through the whole supply chain is between partners that extends and develops over periods of time to achieve greater benefits within their respective firms in addition to the pressure to be environmentally responsible. Furthermore, Gunasekaran et al. (2015) explain that benefits can be the drivers for collaboration, as a supply chain collaboration between parties can lead to economic gain for the respective partners. Benefits can be recognized right away or have a long-term effect. In green supply chains, this collaboration would entail green benefits for all involved parties and be a long-term consequence of the benefits (Gunasekaran et al. 2015).

Green collaboration between companies and external partners, such as customers or suppliers, could also improve and speed up product development when developing environmentally friendly services and/or products. The benefit from collaboration is the access to knowledge and involvement with customers as for example test persons when a new service or product is developed (Melander, 2018). Additionally, Melander (2018) describes that customers should be involved early in the development stage since because of the exchange of knowledge which can fasten the development. Yang (2018) also highlights the importance of external collaborations when developing green services. To be able to reach a more sustainable business model, companies need to focus not only on their internal green services but also collaborate with customers to keep up with their competitors (Yang, 2018).

Hence, Melander & Wallström (2022) argues that there are not only collaborations inside the supply chain which can provide benefits when a company is making their business model more environmentally friendly. Horizontal collaboration can also be

important with i.e., intermediaries, governments, NGOs and even competitors. Benefits that can be reached through competitive firms' collaboration are innovations in green development through intangible and tangible resource exchange. One example of a sustainable business model through horizontal collaboration is through actors sharing costs to make an investment where the green innovation can be built and used by the different actors. However, it is important with mutual trust when these types of network structures collaborate so that not one part starts focusing more on the economic part rather than the environmental part (Melander & Wallström, 2022).

3.2.1 Green Supply Chain Management

Globalization has led to an expansive economic growth around the world, which leads to an increase in energy and material consumption. Seman et al (2012) explains that with this increase, there is a contribution to a depletion of natural resources and environmental issues. Therefore, it is becoming increasingly significant for companies to balance both economic and environmental performance. The authors continue by noting that companies have now realized that there are greater benefits of green practices and technology in business operations which influence the whole supply chain.

This leads forward to the term Green Supply Chain Management (GSCM). Yang et al. (2023 p.2) defines GSCM *"an operational-level strategy, which aims to help companies achieve a win-win situation between financial and environmental performance by conducting a series of environmental management practices over the entire supply chains"*. Chin et al. (2015) describes GSCM as having integrated environmental thinking into Supply Chain Management, allowing for sustainable performance enhancement and influencing the total environmental impact of a companies' supply chain activities.

Chin et al. (2015) hypothesizes a proposed conceptual model which links GSCM practices, i.e., green procurement, logistics, distribution, environmental collaboration, and sustainability performance. It is believed that with the presence of environmental collaboration, it would aid, facilitate, and ease the implementation of GSCM practices (Chin et al. 2015).

3.2.2 Green Services

The term "Green Services" is used to describe services that companies offer to customers which don't have negative impact on the environment i.e., less CO2 emissions and minimized waste of resources (Cocca & Ganz, 2015; Chang et al., 2017). Green services in the context of transportations are defined by Björklund (2011 p.12) as *"transportation service that has a lesser or reduced negative impact on human health and the natural environment when compared with competing transportation services that serve the same purpose"*.

Furthermore, Chang et al. (2017) emphasizes that companies which offer green services can gain benefits regarding competitiveness in comparison to other actors in the same market segment. Cocca & Ganz (2015) describes that benefits of offering green services can be increased brand image, cost savings through i.e., more energy efficient alternatives. Even if environmental concerns have been raised during the last years among stakeholders, green services tend to fall behind in the development, and companies tend to not see the cost benefits which follows by offering green services in a larger amount (Cocca & Ganz, 2015).

The adoption of alternative fuels in the shipping industry is one way of reducing their carbon emissions and making their operations more environmentally friendly. Hence, this requires investments which increases the costs for the shipping companies which will be passed on to their customers (Davydenko et al., 2022). To overcome this, Cocca & Ganz (2015) proposes that companies that are adapting green services should reach out to customers who themselves have a green agenda and promote these services as premium services.

3.2.3 Green Washing

Companies globally have started to pay increased attention to environmental issues occurring. External stakeholders are also putting increased pressure on firms to disclose their environmental performance (de Freitas Netto et al, 2020). The term Green washing has since surfaced, this term entails *"the intersection of two firms' behaviors: poor environmental performance and positive communication about environmental performance"* (de Freitas Netto et al, 2020, p.2).

Greenwashing is essentially companies that promote practicing environmentally friendly activities to the public and external stakeholders, however this is to deflect attention away from the activities that may be harmful to the environment (de Freitas Netto et al, 2020). Examples of green washing can be, according to de Freitas Netto et al (2020), non-reliable environmental claims, Non-toxic claims on products as all products have some dosage of toxicity, hazardous consequences such as disclosing information about inequality etc.

As a result of green washing, Corporate Social Responsibility (CSR). Companies have to aim for achieving performance on the triple bottom line, environmental, economic and social, in order to integrate social and environmental concern in the companies' operations and activities (de Freitas Netto et al, 2020).

3.3 Developed Framework: Developing green services in the shipping industry

The framework was developed to be able to aid for what factors that need to be in place when developing green services in shipping. This framework is based on three pillars which can be seen in figure 5.

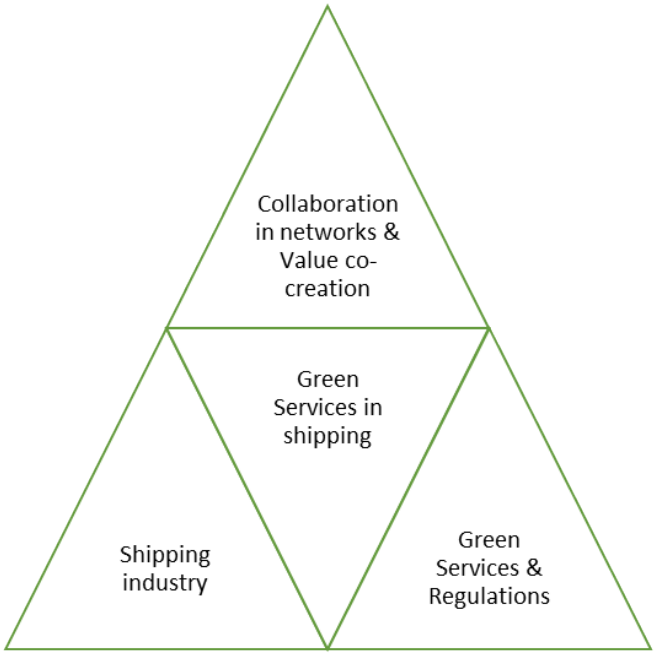

Figure 5: Overview of the developed Framework for Green Services in shipping

The first pillar is value co-creation and collaboration in business networks. Value co-creation entails the partnership between various actors in the business network (Göçer, Altuntas Vural, & Lind, 2023; Perna et al., 2022; Vargo & Lush, 2004) sharing their resources between each other to co-create value. This goes hand in hand green collaboration. Green collaboration allows for all actors in the entire supply chain to take part in the benefits within the collaborations (Gunasekaran et al. 2015; Melander 2018, Yang, 2018).

The context of our study, the shipping industry, is the second pillar. Actors in the shipping industry can consist of shippers, forwarders, customers, governments and environmental organizations among others. Green collaboration can allow for a speed-up process in developing environmentally friendly services and products as the collaboration allows for access to knowledge (Yang 2018; Melander 2018). A horizontal collaboration can be beneficial in this industry as it can promote trust and structure which leads to economic gains for all parties as it is sharing costs for the investments made for green innovations (Melander & Wallström, 2022). The industry is heavily market dependent and therefore is very competitive, which could allow for low levels of collaboration between different companies and actors. It could indicate that value co-creation by sharing resources and green collaboration is not so apparent at this time.

Regulations and green services form the third pillar of this framework. Green services are services that has less or no negative impact on the environment (Cocca & Ganz., 2015; Chang et al., 2017; Björklund., 2011) The green services are impacted by the regulations presented by IMO and EU which means that regulations are connected to this pillar. The Swedish shipping industry adheres to global regulations set by the International Maritime Organization (IMO), aiming for net zero emissions by 2050 with interim targets for GHG reductions (IMO, 2023). The industry is also impacted by the EU's "Fit-For-55" plan, which includes measures like the Emission Trading System (ETS) to reduce emissions. Starting in 2024, the shipping sector falls under the EU ETS regulations, with a new ETS2 system planned for full implementation by 2027, requiring emission monitoring and reporting across all sectors (EU, n.d).

4. Empirical Findings

This chapter presents empirical findings of which have been collected through both the homepage scanning, but mainly from the interviews. First information gathered about the shipping industry in general will be presented. It will be divided into the three different segments which were investigated, namely the Container-, Ro-Ro segments and also one Freight forwarder.

After that an overview of the companies involved will be presented as well as the answers provided during the interviews with the respondents. All companies have answered questions from the same "interview guide" however, some questions have been tailored for the specific companies to get further detailed information in addition to the web page scanning. These answers will be complemented by information gathered from the homepage scanning which was made early in the study.

During the interviews and homepage scanning, some market specific concepts were repeatedly used namely the "Mass balance concept", Insetting and Offsetting. To clarify these terms and make it easier for the reader to follow, the concepts will further be explained.

Mass balance concept

Mass Balance Concept is a solution used by shipping companies to be able to compensate or reduce carbon emissions in the company's own network by using different types of fuel solutions. The mass balance concept makes it possible for shipping companies to mix different fuel types, however, it is not certain that the alternative fuel is used specifically on the exact shipment that the customer pays for. However, this is secured by calculation and verification of how much CO2 a certain shipment pollutes. This method is used because the alternative fuel can't be bunkered in every port meaning that the reduction/compensation might not be on the specific route that the customer pays for.

Insetting

This concept refers to carbon reduction for the fleet's own supply chain. This can be done by, for example, integrating operational changes such as slow steaming or opting for renewable energy sources such as wind assisted propulsion.

Offsetting

Offsetting can be seen as external project in terms of compensating for a fleet's emissions. These projects can be environmental projects, for example planting a tree in Africa or purchasing carbon credits from environmental projects such as reforestation. However, this service tends to be cheaper for the customer than other green services.

Main differences between these three concepts are that mass balance concept is internal carbon compensation, insetting is internal carbon reduction and offsetting is external carbon compensation

4.1 Container shipping companies

The container shipping lines all have offices located Sweden even if their origin is from different countries. All interviewed container shipping companies belong to the largest container shipping companies in the world and have a global network. In table 2, an overview of the container shipping companies is given.

Table 2: overview of container shipping companies

Company Name	**Origin**	**Sustainability Goals**	**Shipping Lines**
CMA CGM	France	Long term: Net Zero Emissions: 2050	Global
Maersk	Denmark	Net zero emissions: 2040	Global
MSC	Italy	Net Zero Emissions: 2050	Global
Hapag Lloyd	Germany	Net zero emissions: 2050	Global
Evergreen	Taiwan	Net Zero Emissions: 2050	Global

4.1.1 CMA CGM

Sustainability ambitions

CMA CGM is the third largest container shipping company in the world with container shipments globally. Respondent 4 explained that CMA CGM is a family-owned company, with approximately 70% ownership. The owner is very conscious of the environment and wants to invest in a green strategy. To reduce their carbon footprint, the company introduced LNG (Liquid Natural Gas) vessels which reduce CO2 emissions by approximately 20-25%. This contract started year 2017 and should aid in reducing their CO2 emissions in accordance with IMOs milestone for 2030. However, this is not enough reductions to achieve net zero emissions 2050.

Therefore, they have started to introduce biofuels as alternative fuels which have less CO2 emissions, approximately 84-85%. This biofuels solution is based on frying oil and to make it available on the market and make sure there is enough biogas, they have invested in the production of biogas. Today, it is a shortage of alternative fuels on the market according to Respondent 4.

These transitions from fossil fuels towards alternative fuels are expensive and no profit has been made for doing it, *"it is expensive to do these changes, we are driven by that we want to reduce rather earning money from it, actually it has only been increased costs for us". – Respondent 4*

Respondent 4 believes they can still pertain to this strategy even though there is no economic profit as they are family-owned, meaning that other shareholders don't question the profitability in the same amount.

Green Services offered

The company offers a portfolio with alternative solutions called ACT+ which is available for customers and the structure is according to the mass balance concept. In this portfolio, their two renewable fuels solutions are included (LNG and Biofuels), and the customer can buy the reductions from CMA. After that, the customer becomes certified by a third party where they can show how much they lowered their emissions by buying alternative fuels for their shipment.

Furthermore, Respondent 4 describes that many customers want to track their CO2 accounting emissions. These emissions are counted through the whole chain – meaning from the production of renewable fuel to the combustion of it. However, when the customers are buying the reductions, it is not always that they buy the reductions on the shipment they are doing since the vessels which are driven by alternative fuels are on shorter distance trips. Instead, the reductions are the same amount but on another journey. On the question of how customers get hold of the Green Services, Respondent 4 explained that often they have long-term contracts and collaborations with customers who buy emission reductions so there are negotiations about contracts which are set for a longer period of time.

Furthermore, Respondent 4 explains that they also offer "offsetting" as part of their ACT+ product to their customers. However, Respondent 4 argues that this is not something they actively work with selling to their customers because that is not something that will lead to reduce their own carbon footprint even if it compensates for the carbon emissions. However, it is marketed to their customers and included in the ACT+ product. Respondent 4 discusses that offsetting is though cheaper than their other solutions since the structure of this service is that the customer pays a small amount of money to plant a tree in i.e., Africa which does not lower their own emissions, instead it is more of a compensation for the emissions.

Demand from customers for Green Services

When CMA started offering LNG 5-6 years ago, Respondent 4 described that there was an interest in the market, and they received a lot of cheers for making these investments. For every year, the demand for ECO delivery increases. However, respondent 4 continued by "*There are customers that are interested in decreasing their carbon emissions, but there are still very few of the total amount – there is one thing about saying you want to, but the percentage that actually wants to buy this is another thing".*

Meaning that there are a limited number of customers who really want to buy their Green Services. Furthermore, Respondent 4 resonates that the increased costs are what slow down the demand for Green Services since alternative fuels today are more expensive than fossil fuels and compares it to when persons go grocery shopping:

"It is like when we go to the grocery store, if the ECO bananas cost 12 SEK and the other bananas cost 10 SEK, most of us won't pay 2 SEK extra for an ECO banana, we chose the one for 10 SEK". - Respondent 4

The cost issue is something that Respondent 4 return to several times and argues that the reason that customers don't want to buy the Green Services is because the transportation companies are for companies in a later CO2 emissions scope, so they rather do reductions in their own value chain before looking at the full Supply Chain. Respondent 4 continues to say that the customers should not be "blamed" for not wanting to buy Green Services. There are customers who have a totally green approach, and they buy the Green Services in a large amount. However, there are still only a few of the customers that want to pay extra for emission reductions.

Collaborations when developing Green Services

Collaboration with different stakeholders is important when developing Green Services. Respondent 4 describes that the company collaborates with one of their biggest competitors since they share the same interest and value basis about the environment. Even if they are competing for the same customers, they share the same view about the production of renewable fuels. Today there is a shortage of production of renewable fuels which is why the two companies have decided to work together so there is enough supply. Together they are investing in R&D of new technologies which are needed to reach the targets set by IMO and EU.

"We are doing a lot of research on alternative fuels, we are not just sitting and waiting, hoping that some magic fuel will come that will make us climate neutral" - Respondent 4

The company also collaborates with fuel suppliers, Respondent 4 describes that they have invested 12 000 tons in biofuels in a biogas plant in France. Furthermore, Respondent 4 argues that this investment sends signals to the market since they want to buy alternative fuels, then the production plant has to produce to meet the demand.

Another actor which is important are the authorities and Respondent 4 describes that *"we have been positive that there are regulations now that forces everyone who emits*

actually pay something. That is great, because it makes these who have gotten away with it before finally have to pay for it".

When asked about the question if customers are involved in the development of Green Services, Respondent 4 states that customers are not involved in the development and as for now, there are more important collaborations that needs to be in place before customers can be involved in these innovations.

Challenges with offering more Green Services

Respondent 4 states that since they operate and compete on a global market, the increased prices can be a competitive disadvantage against companies which are not following the same directives as Swedish companies. Therefore, more incentives on a global level need to be implemented.

Respondent 4 continues by describing that ít is one thing being strict on the Swedish market since it is a relatively small market however, on a global level the competition is totally different and potential outcomes with offering more Green Service and increased costs which follows is that customers look for other shipping companies.

4.1.2 MAERSK

Sustainability Ambitions

Maersk is the second largest shipping company in the world. Maersk is the container shipping division of the Danish owned company A.P. Möller, the division is active in 130 countries and owns around 740 ships. With a goal of net zero by 2040, Maersk aims to ensure the entirety of their fleet is green. Therefore, to reduce carbon footprint as much as possible they aim to procure only new boats that are carbon neutral. After 2040 Maersk aims to only offer 100% green solutions to their customers.

Maersk uses both slow steaming as one way to reduce their emissions as sailing at a lower speed allows for less fuel usage and thereby reduces carbon emissions. Respondent 3 explains that Maersk uses mass balance concept on their entire transportation, meaning carbon compensation is done on one transportation mode however it may not necessarily be the transportation that the customer has paid for. Respondent 3 highlights that Maersk wants to make sure that sustainability permeates

throughout the entire supply chain not only from buying and selling green services but also, for example, from purchasing Fairtrade coffee for the office.

Green Services offered to customers

The Green Services that Maersk offers to their customers are alternative fuels, Maersk Eco Delivery and emissions dashboard. Maersk offers vessels running on biodiesel and green methanol, this in an effort to reach their goals of net zero 2040. Currently Maersk possesses a vessel called Laura Maersk, their first vessel that is based on green methanol, it drives mainly shorter routes in Europe. MAERSK wants in the future to offer green services as a standard, citing: *"When you're riding a bus, you don't pay extra to ride on a bus that is electric, it just happens to be electric". - Respondent 3*

Though it may not be on the route that the customer pays for, however specific inquiries are often met, if for example, the customer wishes to have a full green logistics solution by i.e., electric truck drive the product on a specific part of the transportation then Maersk will accommodate the request.

Another green service that Maersk offers is Emissions Dashboard where the customer can see how much CO2 their shipment is generating. However, respondent 3 candidly mentioned that the only thing that can be considered green and of value is the fuel that the transportation method is using. The green services that Maersk procures are the alternative fuels and if the customer asks for specific inquiries regarding green transportation.

Demand for Green Services

Respondent 3 considers that the demand for green services varies among the customers. Many customers ask for them but the willingness to pay for them varies. How customers choose to "go green" in their supply chains are different, some of the customers argue that the transportation is one important part while others look at other actors in the supply chain. However, Respondent 3 argues that overall, the demand and awareness of their green products are relatively high, but the extra cost is considered an issue for some of the customers.

Collaborations when developing Green Services

Collaborating with suppliers specializing in alternative fuels, propulsion systems, and energy-efficient technologies holds promise for Maersk. These partnerships could enable the development and implementation of innovative green solutions. Respondent 3 means that by making sure that enough boats and fuel are available, there should not be any hinderance to "go green".

Respondent 3 mentions that engaging with government agencies and regulatory bodies on a global scale is essential for navigating regulatory requirements and incentives related to environmental sustainability. Respondent 3 highlights that all the work that is being done in Sweden and in the EU can only aid in small amounts however much larger scale collaborations are needed to gain stronger market force for compliance.

Respondent 3 elaborates that in addition to collaboration with regulatory bodies there is also a need for collaboration amongst the shipping companies. There is a need for all the shipping companies on the market to collaborate. This in an effort to even out the playing field and have fair competition.

Challenges with offering more Green Services

Respondent 3 argues that the main challenges with offering more green Services is the increased costs associated with these services. For customers, they need to make an active choice to be part of the "go green" journey, and since they are in different sustainability stages, there are fluctuations in the willingness to pay for it.

Another challenge is, according to Respondent 3, the unbalanced competition which occurs when all actors in the same market don't "play by the same rules". Meaning that the regulations which today are set by the EU need to also be on a global level. For example, ships who go on EU water need to pay taxes for emissions but between other continents, the rules are not the same. To balance this competition, all actors in the shipping segment on the global market must agree on going green. It is also important that all shipping companies collaborate to increase the demand for alternative fuel products according to Respondent 3.

4.1.3 Hapag Lloyd

Sustainability Ambitions

Hapag Lloyd is a German Shipping Company in the container segment and is active in 140 countries in the global market. It is, according to Respondent 5, one of the oldest shipping companies in the world.

The company's sustainability goal is to be carbon neutral in 2050 according to the scientific targets and to follow regulations set by IMO. However, Respondent 5 describes that they are not in the frontline when it comes to sustainability as there are not any solutions out on the market yet that allows 100% environmentally friendly solutions.

Many incentives regarding digitalization have started to be implemented. One of them is for container tracking, which should be ready when the new EU ETS regulations must be followed, which allows the customers to track their own emissions. The digital solutions in the shipping industry fall behind in regard to other industries in the transport sector according to Respondent 5. They also work with a biofuels solution from residual products which are able on certain routes to reduce their emissions.

Green Services offered to customers

Hapag Lloyd offers biofuels solutions in accordance with the Mass Balance concept, this product is called “Ship Green”. ‘’Ship Green’’ is stored and bunkered in Singapore and Rotterdam (Netherlands), this is because these two ports do not have CO2 emission difficulties.

Customers buy CO2 compensation and pay the same amount as their containers emit, this is calculated by Hapag Lloyd. However, it is not possible to use biofuels on all routes even if the customers pay for it so instead the same amounts of CO2 compensation as the customers have bought are used on another route where it is possible. Respondent 5 argues that “*Maybe that is here where customers get skeptical... however, this is a real compensation, it is not that we planted a tree somewhere. We actually remove fossil-based fuel somewhere and replace it with biofuels”. - Respondent 5*

After the customer has bought the compensations, they get a declaration stating how many tons of CO2 emissions they have saved by purchasing Hapag Lloyd's service.

Customers can by themselves look at different pricing options on Hapag Lloyds homepage and buy the service online and add "ship green" if they want to buy CO2 reductions. On the homepage the customers can see how much their container transport will emit and thereby decide how much they want to compensate. Their compensation offerings are either 25%, 50% or 100% CO2 compensation. Respondent 5 describes that fuel is a large cost factor when buying transport which in turn makes most customers choose to start at a low percentage (25%).

Demand for Green Services

Regarding the demand for Green Services, Respondent 5 describes that customers are at different maturity levels in regard to purchasing Green Services. Because of tight budgets, the sustainability question in their external logistics is not the customers' main priority. Even if there are many customers that are interested in hearing about their offerings, Respondent 5 describes that because of the increased costs, it often ends there, and they choose not to buy those services.

However, Respondent 5 states that there are customers interested in buying these services. One segment mentioned is luxury car manufacturers which often ask for Green Services. Mainly the Respondent thinks this is because they offer electric cars, and these product lines are labeled as sustainable, and this includes the distribution as well. Respondent 5 also describes that they have also have a large customer who has a very green policy internal, and they were one of those who pushed for Green Services in Shipping and asked Hapag Lloyd for opportunities.

Collaborations when developing Green Services

Customers are important when developing Green Services according to Respondent 5. To involve customers in the development, Hapag Lloyd are educating them by seminars online where they invite experts to discuss environmental questions. Respondent 5 also believe that transparency around their products is essential and describes that customers

can take part of all information regarding their Green Services, there are no secrets it is fully transparent.

When getting asked about if there are other important collaborations, for example freight forwarders or fuel suppliers to be able to offer more Green Services. Respondent 5 states that Forwarders are hard to involve because they are a bit far behind with their sustainability strategies and it is also a very competitive market with much pressure on lowering prices. Respondent 5 continues by discussing Freight Forwarders situations and describe that as for now, maybe is not the perfect time for that segment due to the global economic state which have been at low levels with high inflation and disruptions in the traffic which causes higher costs and longer lead times.

Further collaborations such as those with fuel suppliers were not discussed by Respondent 5. However, Respondent 5 discusses industrial collaborations between companies in the same segment where they have cooperated with other actors. With these companies they create synergies and share the same sustainability values. By these alliances they also minimize competition between each other. Hapag Lloyd is expected to create an alliance with Maersk in 2025. This alliance was formed because of their ambitious sustainability targets and aims to combine their fleets to offer better schedule reliability and delivery quality according to Respondent 5.

Challenges with offering more Green Services

Respondent 5 highlighted the increased costs which follow Green Services, as the biggest challenge with offering these alternatives. Since the Green Services are a more expensive alternative, it is where the final decision falls upon. Because of the global economic situation with inflation and increased interests, and current global events with wars in different places, sustainability is of a lower priority to the customers. However, Respondent 5 argues that with new regulations such as the ETS where customers have to account for their emissions, the Respondent thinks it will be an increase in demand.

The availability of alternative fuels is another challenge mentioned by Respondent 5. Today, it is only possible to bunker these fuels in specific ports for logistics reasons, and these needs to fit into their global network so it works operatively.

4.1.4 MSC

Sustainability Ambitions

MSC is the world's largest container shipping company and is family-owned but with an external CEO who was appointed in 2020. According to Respondent 6 this has led to an increased importance for environmental questions which is the CEOs main priority and one of his biggest focus. The sustainability incentives and emission reductions solutions are rather new to the company's business model and were introduced in the year 2020-2021.

New technological solutions which reduce CO2 emissions are one thing that they work actively with by i.e., efficient fleet designs and specifically with technical solutions in how to reduce resistance when travelling overseas since this requires less power from the engines which in turn leads to reduced carbon emissions.

Green Services offered to customers

Respondent 6 describes that MSC offers a product called MSC Biofuel Solution. This solution is their first certified carbon insetting program which allows the customer to reduce CO2 emissions. Respondent 6 states that this product is rather new and was launched in the year 2020-2021 so it is rather new to their business model. MSC Biofuels Solution works according to the "Mass Balance Concept" means that the company buys biofuels for use on the customer's shipping route and the customers pay for the CO2 reductions, which is the difference between regular fuel and the cost for biofuels. MSC bunkers biofuel in some of the ports which are included in their route network. However, biofuel is not available at all ports yet, meaning that customers might pay for their reductions and get a certificate, but the use of the fuel is on some other vessel in their global network (MSC,2024).

The biofuels are from second generation cooking oil which the company bunkers in different ports and it can be applied in any tank of their vessels. It is also possible to use mixed fuels which Respondent 6 explain is a big advantage because it offers customers a flexibility in how much they want to reduce their emissions depending on how much they want to pay and how important the logistics operations are in regard to

their own sustainability goals. This fuel can reduce emissions up to 86% if customers buy a full tank.

Furthermore, Respondent 6 describes that it sometimes can be hard to calculate the exact amount of CO2 reductions because of unforeseen events for example longer times in the harbors, weather conditions which make the shipping trip go faster or slower or if they had to skip one harbor. However, since this offering is relatively new, Respondent 6 discusses that in the future when they have worked on it more, they could offer reductions retroactively to assure the exact amount.

Another product they offer aside from their Carbon Insetting Product is their Offsetting product. Here customers pay for projects which are outside MSC's own shipping value chain (MSC,2024). According to Respondent 6, the projects are what they to reduce the carbon footprint in the future i.e., planting trees and helps with different water projects in southern China.

Demand for Green Services

On the question regarding what the demand looks like for their Green Products, Respondent 6 states that the demand varies a lot and there is a big mix which means that there is not a specific market segment that demands it more or less, it is more on an individual company level. There are customers who buy their Green Products, and many customers want them to include emission reductions in the calculated quotations.

Respondent 6 argues that customers who still don't buy their Green Products might do that in the near future when they need to account for their emissions and that this will increase the next year, 2025, because of the new ETS regulations. However, Respondent 6 discusses that the company probably sells their Green Products better than the average in their segment in Sweden.

Collaborations when developing Green Services

When developing Green Services and working towards a sustainability target, collaborations with different stakeholders are of importance. MSC describes that they work together with stakeholders i.e., fuel-specific partnerships, governments and

customers to decarbonize the supply chain. The exchange of knowledge, technical expertise, resources and the sharing of risks aids in adapting Greener Services. However, it is important that they work towards the same sustainability targets. MSC is currently in an alliance with Maersk called 2M which is set to end in January of 2025 due to different values.

However, Respondent 6 states that: "*we don't collaborate with customers when developing Green Services. The only collaboration we have with them is that they buy our Green Services, if that can be counted as a collaboration?".*

For now, Respondent 6 don't see how the customers can be involved in the development of Green Services, but it can be an alternative in the future. Further, Respondent 6 discuss that there are other important collaborations that needs to be in place in order to develop the Green Services and this is the Governments, not only on national or EU-level, but also on Global level. Respondent 6 describes that there are need for more push from the Governments and they are positive about more strict emission regulations. Because of the world economy which has been unstable the last years, it is need for more push from the Governments cause customers tends to hold their money and not buy Green Services for "the good sake".

Challenges with offering more Green Services

Even if Respondent 6 argues that their Green Products are attractive to their customers on the market, there are challenges with offering a wider range of Green Services. The main challenge, Respondent 6 describes by *"if all customers we had wanted to buy our biofuels solutions, there is not enough biofuels in the world to sell to the customers".* Meaning that there are product shortages with alternative fuels and in this case, biofuels. Respondent 6 continues with *"There is a lot of supply from second generation cooking oil which could be used to biofuels, which are now goes to waste... This needs to be taken care of so we could use it and apply it as biofuels".*

To be able to offer a wider range of Green Services, there is a need for more Research and Development and push from authorities according to Respondent 6. Respondent 6 continues by discussing that if they want to affect the products they need to be in the front line and support R&D financially. Another thing that is important to overcome the challenges is that every company, in all market segments, both shipping companies,

forwarders, suppliers and customers, answers to the regulations from authorities that are demanded.

4.1.5 Evergreen

Sustainability Ambitions

Evergreen is the world's seventh largest container shipping company, and is growing rapidly according to Respondent 8, and aligned with the company's growth, their emissions also increase. Regarding sustainability, Evergreen has an ambitious sustainability target, which is to achieve 50% reductions in the year 2030. This is a quite aggressive target in relation to other container shipping lines according to Respondent 8. Evergreen is today developing solutions which should offer carbon reduction instead of carbon compensations, because that is what a Green Service really is according to Respondent 8.

Different sustainability incentives have been taken to reach their sustainability targets both short term and long term. For example, they have ordered methanol ships which pollutes less CO2 emissions. They also work with different technologies such as slow steaming and more efficient ships to lower the power from the engines to reduce their carbon emissions. Digitalization is also an aid where Evergreen can both track their emissions as well as monitor the ships in an efficient way, meaning that if there are bad weather conditions which needs more effect from the engines, they can change the route to sail more efficient.

Green Services offered to customers

As for now, Evergreen does not offer any Green Services towards their customers. However, they have projects which are in the start-up phase and work with different strategies in how to establish a more sustainable container fleet. According to Respondent 8, this makes it easier to integrate with customers scope 3 emission reductions, which are the external supply chain operations.

Demand for Green Services

Regarding the demand for Green Shipping solutions, Respondent 8 states that two different customer segments are particularly interested in Green Services. These segments are large sized companies which are reviewed by auditors. These customer

segments have high demands on them regarding sustainability from both the society but also from the auditors to make sure that the whole value chain is sustainable. The other customer segment is these biggest customers suppliers, mainly because they need to work according to the same regulations to continue to be a supplier.

Even if Respondent 8 see an increase in demand from these specific customer segments, the Respondent stated that "*If we look from a climate perspective, the demand is all too low today, we are in a climate crisis and are about to boom the 2-degree target (Paris Agreement), so from this perspective, the demand is too low"*. Meaning that the demand for Green Services is still relatively low. Respondent 8 continues by "*on the other hand, there have not been any good products on the market. The knowledge has been relatively low around sustainability questions, especially in the shipping segment. So, it is not until now you can see a wake-up call"*.

From the end of year 2023, Respondent 8 says that the interest for Green Services has increased, even if it is slow, and more customers question how they can reduce their CO2 emissions in the logistics operations. Respondent 8 thinks this increase is because of the new ETF regulations, and if there come more aggressive regulations, the Respondent thinks that the demand will increase sharply.

To increase the demand, they discuss sustainability questions with their customers. However, there is a deviation in interest among the customers and they are in different maturity stages regarding sustainability questions. Respondent 8 also describes that the sustainability question is prioritized differently depending on where in the world they talk to their customers. In Sweden we have come quite far regarding sustainability, but if they talk to customers in Germany where they have a large operation, there is very low interest about these questions.

Collaborations when developing Green Services

When discussing collaborations when developing Green Services, Respondent 8 thinks that it is hard to involve customers in the development because companies tend to focus more on their internal company KPI's. In this, the shipping companies have a big challenge, to make the environmental problem visible to their customers and show how

serious this issue is. Respondent 8 discusses that communication with customers is important to get them to understand the seriousness of the environmental issues, but also how the products can aid these problems and establish trust about their products.

Respondent 8 also discusses that other collaborations are important to be able to offer more Green Services. Especially, Respondent 8 pushes for cross-regional collaborations between shipping companies. Even if the EU pushes for different regulations, it is a global problem and therefore, it is needed to work over the regions and establish global collaborations and work towards common environmental goals.

Challenges with offering more Green Services

In many of the interviews conducted, the respondents discussed that the biggest challenge except from the demand for Green Services are the product shortage for alternative fuels:

"*There is another problem, and it is that the access or the supply for green fuels for example methanol, biofuels, LNG or whatever, is too low today. If you look at MAERSK for example, who have a very strong sustainability profile with methanol ships. But to drive these ships, they have in big terms almost allocated all agricultural produced biogas. So, the demand is not a big issue because we can't offer something that doesn't exist" -- Respondent 8*

Respondent 8 describes that there needs to be a better balance between demand and supply from both the shipping companies and the energy manufacturers to overcome the alternative fuel shortage. There also has to be higher acceleration in the production of alternative fuels, which is needed if the shipping companies demands more of the products. This could lead to a decrease in price and more attractive to the customers.

Another challenge regarding Green Services according to Respondent 8 is "*it has not been enough driving forces in the shipping industry to change from marine bunker fuel or heavy diesel fuel until last year".* Furthermore, Respondent 8 is positive to new regulations from IMO, but thinks they can be even harder with their regulations. Today ships can be manufactured with dual engines, meaning that ships can be driven on mixed fuels. Respondent 8 proposes that all new ships which are built should be driven

only by alternative fuels to avoid shipping companies only choosing the cheapest alternative, this is why a push is needed from IMO.

Despite the product shortage issue, there is another challenge, namely the cost issue. It is expensive for the shipping companies to exchange their whole fleet and switch to alternative fuels. However, Respondent 8 highlights *"yes, it will be expensive for the shipping companies, but it is a planet that is destroyed, so that calculation needs to be considered as well"*.

4.2 Ro-Ro shipping companies

The Ro-Ro shipping companies interviewed are both from Scandinavian countries with offices in Sweden. There are some differences in their operations and their routes. An overview of the Ro-Ro shipping companies included in this study is presented in table 3.

Table 3: Overview of the Ro-Ro shipping companies

Company Name	**Origin**	**Sustainability Goals**	**Shipping Lines**
DFDS Seaways	Denmark	Net Zero Emissions: 2050	Europe and Northern Africa
Wallenius Wilhelmsen	Norway	Net zero emissions: 2040	Global

4.2.1 DFDS

Sustainability Ambitions

DFDS Seaways is a Danish service shipping company of 155 years. They have two divisions, one for ferry and one for logistics and every division is based on Ro-Ro shipping. The official targets for sustainability are a 45% reduction in CO2 by 2030 and then net zero emissions by 2050. The strategy to obtain these targets, according to respondent 1, aims to only purchase vessels by 2030 that will be ran on either methanol or ammonia. They have also reduced emissions on several existing fleets, one way has been by route optimizing which means to change route on their freight depending on weather conditions and by that use less power from the engines.

Green Services offered to customers

According to Respondent 1, DFDS offers customers CO2 reductions as their Green Service, and this service has been offered for about a year now. These reductions come

from marine biofuel which contains 25% less CO2 than normal bunker fuel. When customers buy these reductions, they are given a certificate saying how much CO2 they have reduced by using this specific service.

The certificate is provided by an external auditor to validate that the emission reductions are really made in the network. The auditor also assures that the reductions are the exact amount that has been specified, so that DFDS don't sell more than they actually reduce.

Two different services are offered, "direct emissions reductions", which is their insetting product where the emissions are made on the customers' own freight. However, this solution cannot be used on every route DFDS are shipping.

The other solution is their "indirect savings" within DFDS logistics network, and this is according to the mass balance principle. Meaning that the customer buys a certain amount of reductions and DFDS fuels one vessel in their network with biofuels. However, it may not be on the customer's specific route. Respondent 1 describes that this principle is used because it is not possible to use biofuels on all of their different routes. In both different solutions, the customers are awarded with the certificate and biofuels is what reduces the emissions. These services have, according to Respondent 1, been offered for about a year now. For now, these services are offered according to a standardized model.

Respondent 1 describes that DFDS don't have an offsetting product, and this is mainly because they don't see the sustainability profit by offering this service. Instead of focusing on external projects to compensate for CO2 emissions, DFDS wants to focus on what they actually can do in their own network.
"What we want to focus on is to actually reduce our CO2 emissions. Which you are not doing by offsetting". - Respondent 1

The green services offered are mainly offered to their largest customers. Respondent 1 describes that they get hold of the green services during quarterly meetings where this subject is always high on the agenda.

Demand for Green Services

Respondent 1 argued that the demand for green services is more like a push system rather than a pull system. By this, Respondent 1 means that DFDS is the ones that puts green services on the agenda and trying to push the customers to buy these services rather than customers asking for it. The reason behind this lack of demand, Respondent 1 thinks, is because of the increased costs which follow the green services and the fact that customers would rather look at their own internal production than external logistics. *"... it makes more financial sense for them to create emission reductions in their production facilities for instance. It is just cheaper to do it right now in that way rather than starting to look at external transportation."* - Respondent 1

However, Respondent 1 does mention that even if the demand for green services is a bit slow, it has started to gain more interest and there are customers that buy the services today. Industrial customers such as car manufacturers customer segments that want to buy green services.

Collaborations when developing more Green Services

According to Respondent 1, DFDS closely collaborates with their customers when developing their green services and argues that this is one of the key stakeholders which needs to be involved in the development. One example was presented by the Respondent where one of their large industrial customers is involved in the development of deploying ammonia fueled vessels which currently are in an early phase of development.

Further, Respondent 1 highlighted that when developing green services, openness and transparency are of importance and that is how DFDS involves the customers. The costs for going green are passed on to customers so that they can pass them forward to the end customers. Meaning that they make sure that all costs are covered, but DFDS don't make any profit of them.

Challenges with offering more Green Services

Respondent 1 clarifies that unless there is not a close collaboration with the customer, then they will not get any new customers. Respondent 1 further explains that the need for a strong customer commitment is needed so that even if there are fluctuations in the

price, they will still be given loyalty by their customers. Otherwise, stronger competitors can be more attractive to the customers.

Further challenges are the increased costs which will follow the exchange of their whole fleet so they can run on CO2 neutral fuels, and this is something that needs to be done before 2050. Respondent 1 also highlights that there is a need to work on more energy efficient solutions in general for their shipping services. For instance, ammonia which is one alternative fuel DFDS are looking into has 25% less energy intensity than marine bunker fuel which means that four times as much ammonia is needed when fueling vessels with this. Therefore, more energy efficient innovations are needed if they should be able to convert their whole fleet to green.

4.2.2 Wallenius Wilhelmsen

Sustainability ambitions

Wallenius Wilhelmsen, WW, is a Norwegian based shipping company. They possess 125 Ro-Ro vessels in their operations, they transport all over the world. Sustainability is high on the agenda with a short-term sustainability goal to reduce their carbon emissions by 45% the year 2030 and net zero emissions in 2040. To reach these sustainability goals, they have invested in vessels that will be run on green methanol which are net zero emission fuel. They are also working on different innovative projects such as how to sail Ro-Ro ships on wind power.

Green Services offered to Customers

In the beginning of 2023, Wallenius Wilhelmsen started to offer their green service called “Reduced Carbon Services” to their customers. This means customers are buying carbon reductions by purchasing biofuels for their transportation and it is according to the mass balance principle. This means that all customers can purchase this service, but alternative fuel can only be allocated on certain routes, so the reductions are not always on the customers' own cargos transport. According to Respondent 2, these services are based on a general concept but can differ on an individual level between the customers. However, Respondent 2 argues that it would be easier to have more standardized solutions since it requires more administration and coordination with individual differences.

When customers buy these services, they are assigned a declaration providing how much CO2 emissions they have saved which is signed by a third independent party to validate that the reductions have been made.

The biofuel which WW uses is from used cooking oil and the plan is to replace approximately 10% of their heavy marine fuel with this in the year 2024. Furthermore, Respondent 2 explains that WW has purchased new vessels which are operating purely on green methanol which will aid in reaching their aggressive sustainability goal presented in table 3. Hence, these vessels will not arrive until 2026-2027, but when they arrive, WW is planning to introduce a net zero service offering towards their customers.

Further, Respondent 2 describes that the customers get hold of their green services through individual meetings and sales pitches. Mainly it is on the agenda when there are renewals or negotiations about contracts with their customers. Another channel where they highlight their green services is through articles in the media.

Demand for Green Services

Respondent 2 at WW explains that there is a growing demand for green services in the market and states that the replacement of 10% biofuels which were discussed in the previous section, is possible due to the increased demand from their customers which the Respondent 2 express as *"surprisingly attractive"*. The increased demand is mainly because of more awareness of their green services but another theory in why the demand has grown recently is presented: "*It has been a very tight market in our segment the last few years with too much cargo and too little capacity.....some customers might see it as they are strengthening their change to get space on our vessels if they also purchase the green services from us" - Respondent 2*

The customer segment that is most driven about green services is the car manufacturers. However, Respondent 2 says that you could see fluctuations regarding the demand in this segment depending on which continent the car manufacturer is located and also on the value of the cars. Premium branded car manufacturers which offer electric premium cars have a high sustainability ambition themselves which puts pressures on WW as a supplier to keep up with this agenda.

Collaborations when developing more Green Services

Respondent 2 believes that partnerships with different stakeholders such as fuel suppliers, regulatory bodies, customers and technological partnerships. In regard to fuel suppliers, Respondent 2 clarifies that you need partnerships with them to succeed in the overall transition journey from fossil fuel to greener alternatives. This is because fuel suppliers need to have their production facilities in place when the shipping companies start to demand more alternative fuels. For the suppliers to be able to ramp up their production, they need early commitments from the shipping companies and that is why it is important to establish long-term partnerships according to Respondent 2.

When it comes to new projects for innovating alternative ways of travelling overseas, and specifically on wind-power. This project is called "Orcelle" and will be the first Ro-Ro vessel travel on wind-power which reduces 90% of carbon emissions in relation to regular fuel. In this project, different stakeholders are included, both customers, which is of importance to make sure that they are able to develop a concept that fits the needs of both the operator and also the customer. In these types of projects other technological collaborations are of importance such as cross-industrial partnerships and academic collaborations.

Respondent 2 argued that it would be beneficial with more incentives and regulations from the government and regulatory bodies such as IMO to create a more level playing field for all shipping companies. Meaning that some shipping companies could take advantage of not going green. This is where i.e., IMO aids to make sure that everyone needs to move in the same direction.

Challenges with offering more Green Services

The main challenge, according to Respondent 2, is that the cost of going green is very expensive. 2 implies that:

''From the customer side to begin with, because they are very cost conscious, and we need to be competitive to make it kind of work for them.''

Further, Respondent 2 describes that the global shipping market has the tools to reach the decarbonization targets, but it needs to be put together in a cost competitive way so that the customers are willing to pay for it and then it can be ramped up. When asked about the shortage of fuels, which other shipping companies are concerned about,

Respondent 2 agrees. By all the tools, the Respondent means that there is shortage of i.e., green methanol but there are ways to produce it. *"... there's no green methanol really available yet. There are ways to produce it and we have to make a commitment upfront now for green material if you want to use that in 2027... So, it's definitely a huge challenge" - Respondent 2*

Further, Respondent 2 describes that it is the shipping companies that need to drive the development of alternative fuels forward and create partnerships with the fuel suppliers. That is what for now is what is hindering WW from ramping up their green services.

4.3 Freight Forwarder in the Container Segment

One Freight Forwarder was interviewed to get a more nuanced picture. This mainly was because the majority of Respondents both in the Container segment as well as the Ro-Ro Segment said that Freight Forwarders were not driven about that the shipping companies offering more Green Services because of different reasons such as they are not the product owners and acts in a price competitive market. Therefore, it would be interesting to get a Freight Forwarders perspective of the subject.

4.3.1 Blue Water Shipping (BWS)

The Freight Forwarder interviewed was BWS (Blue Water Shipping) which is a Danish owned company. They don't operate their own shipping lines, instead customers book freight from BWS and they forward it to other shipping lines and carriers. BWS operates on the global market and has offices in 80 countries all around the world.

BWS sustainability strategy aligns with the scientific targets meaning the IMOs targets and to achieve net zero emissions by the year 2050. According to Respondent 7, BWS offers both Insetting and Offsetting incentives towards their customers to work towards their sustainability targets and reduce their carbon emissions, these will be further explained in the following chapter. These incentives were implemented in 2021 so it is rather new to their business model.

Green Services offered to customers

Respondent 7 explained that they have two different types of green services which are offered to customers. BWS Insetting product is that customers can compensate for their shipping transport from one port to another. Respondent 7 presents the example if a customer ships containers from China to Sweden over a period, which have had a carbon footprint of a certain tons CO2. Then, BWS calculate how much emissions this have provided and purchase Green Fuel from a Company in Amsterdam (the Netherlands) and pay the difference. These CO2 credits are then transferred to the customer and BWS secures that the customer is carbon compensated for the footprint their shipment has arisen even if that specific transport sails with some sort of bunker fuel. This is how BWS can offer Green Fuels, meaning in terms of carbon compensation. BWS other Green Service is their Offsetting product which customers can buy. Respondent 7 describes that this can for example be planting new forests in different parts of the world or reforestation.

Customers mainly get hold of Green Services as information from BWS and Respondent 7 describes that, even if customers don't ask for these products, they always put these issues on the agenda. Respondent 7 continues by saying that they are working on solutions where customers more easily can get hold of the product. For example, directly from the web booking formula when the customers make the freight booking. However, Respondent 7 argues that there is not enough demand from the customers yet for these types of services.

Respondent 7 also discusses that from time to time, BWS buys Green Services from the shipping companies when they are offering the possibility to buy "Green Freights". These services are mainly bought if they are included in the freight or if the customer asks for it.

Demand for Green Services

Respondent 7 describes that the demand for Green Services is fluctuating among the customers. There are customers that are interested in buying these services. However, many customers are in a learning phase meaning that the willingness to invest and pay for it is just a few at the moment.

Further Respondent 7 describes that *"we have a few customers that are eager to see if they can reduce or compensate for their footprint as well"*. Respondent 7 continues by discussing that there are also customers that have certain product lines that are sold as a sustainable product, then the whole supply chain needs to be environmentally friendly, and they buy these services.

However, the vast majority of the customers are more interested in hearing, seeing, learning about the Green Services on the market, but the focus mainly lies in doing the reductions in their own production sites at first and the external logistics and distribution activities lies in a later scope regarding emissions reductions.

Collaborations in developing Green Services

Respondent 7 argues that collaborations are important with both customers and suppliers to be able to reach their sustainability goals and develop Green Services.
When involving the customers regarding Green Services, Respondent 7 mainly discusses that BWS needs to inform the customers about the extra costs which will affect the end users. Since BWS mainly don't work with the end users of different products, they try to be a middleman and distribute the costs. Meaning that if there is a 10% increase with Green Service, then they will try to distribute the costs and also take some of the costs themselves to achieve cost reductions for the customers. This is to make the whole Supply Chain take some proportion of the extra cost and get it started in terms of that.

Other collaborations that are of importance are the ones with the shipping companies where they try to discuss different opportunities about what they can provide BWS with and by that what BWS can offer to their customers regarding Green Services. However, Respondent 7 argues that the Shipping Companies are relatively closed when discussing because they collaborate with more Forwarders than BWS. To be able to offer more Green Services, Respondent 7 claims that there is a need for more collaboration between the Forwarders and the Shipping Companies.

Challenges with offering more Green Services

One of the main challenges with offering Green Services is according to Respondent 7 the increased costs for the customers and this is also an obstacle to offering more Green

Services for the company. To solve this, Respondent 7 thinks that more regulations about CO2 emissions are needed before customers really accept the increased charge for their freight. These regulations should mainly be from global level authorities, but also from EU and regional authorities. Respondent 7 continues by describing that EU is actually in the frontline in taking sustainability initiatives. However, on a global level, the authorities are lacking behind.

These regulations are also needed to balance the companies in the same sector. Respondent 7 claims that it is not beneficial if BWS gets too expensive in comparison to their competitors. Then they would have to look at different solutions to reduce the costs and need to do everything at a lower price to not lose their customers. If the increased costs of offering the Green Services are regulated because of the push from authorities, then this won't be a problem.

Another challenge with offering more Green Services is the lack of supply, in this case green fuels. There are too small volumes available because there are few that invest in the productions site because of the scare for lack of demand. There has to be a better balance between demand and supply according to Respondent 7. Further, Respondent 7 describes that they ask if they can bunker ships with sustainable fuels if they pay the extra cost. However, BWS can't go to the larger shipping lines and order them to travel on Green Fuel. It is up to the shipping companies themselves. Therefore, the need for more flexibility and availability is important to be able to offer more Green Services.

5. Analysis

In the following chapter an analysis of the empirical findings will be performed supported by the theoretical frame of reference. This chapter will start with an in-depth analysis of the green services offered, followed by analyzing the business network of the shipping industry. Further, different collaborations between actors in the shipping network will be analyzed.

5.1 Analysis of current Green Services

Green services tend to be quite new to shipping companies' business models. For some of the shipping companies, the green service has been sold for a few years now while for others the green service offered was introduced when new regulations were added in the last year (2023). With the definition of green services as services with less impact on both society and the environment compared to the original services which have higher impact (Björklund, 2011), it could be identified that all shipping companies had different services to lower their emissions and reduce their impact on the environment. In table 4 it is summarized what green services that the companies have implemented to reduce their emissions and reach their sustainability goals.

Table 4: Summary of Green Services with a short description

Green Service	Description of the services
Alternative Fuel	Alternative fuels are either sold as carbon reductions or carbon compensations. All interviewed companies used the mass balance principle as the structure of the service. Different fuel types were used: LNG, Biofuels, Biodiesel, Green Methanol.
Certificate of CO2 emissions saved	Customers achieve a certificate confirming how much emissions have been saved by buying a green service. The emissions are counted by the shipping companies and verified by a third party.
Emissions Tracking	Shipping companies offer customers to be able to track how much emissions their container/goods have/will let out. Emissions dashboard is one example which is used for monitoring CO2 emissions.
External projects for carbon compensation	Offered to customers to compensate for their climate impact by paying a small amount of money for external projects. Called offsetting. The projects are i.e., water projects or planting trees. This doesn't have any effect on the shipping companies' own carbon reduction process.
Full Green Logistic Solution	Customers can ask for a total green logistics solution meaning that shipping companies offer green shipping together with i.e., electrical road transport to achieve a total carbon neutral freight.
Insetting	When customers purchase carbon reductions, it can be saved to an "emission bank" where they can see how much they have saved and apply it to their scope 3 emissions savings.
Slow Steaming	Sailing at a lower speed to lower the power from the engines and thereby use less heavy marine fuel.
Technologies to achieve emission reductions	Efficient ship designs to lower the power from engines and thereby lower the fuel consumption to reduce CO2 emissions. Route optimization to analyze weather conditions, when there is bad weather the engines need to work at higher power which can be avoided if the possibility to change direction during the travel.

However, not all services presented in table 4 are services which are sold to customers and could depending on the situation be regarded as a green practice for the companies to take actions to lower their fleets emissions. Many of the respondents enhanced that shipping companies are looking at ways of re-designing the ships to make them more efficient so less power from the engines is needed, as well as optimizing the routes.

With the definition of a green service as a service offered to customer with less negative impact on the environment (Cocca & Ganz, 2015; Chang et al., 2017) it can be argued that slow steaming and efficient ship designs are not a green service in this purpose since customers can't buy i.e., slow steaming or technological development as a service itself. In table 5 green services offered to customers are presented.

Table 5: Green Services Offered by the interviewed companies.

Green Services offered	**Services offered by the interviewed companies**
CO_2 Reductions	Reduced carbon services (biofuels) (Wallenius Wilhelmsen) Biofuel solution (MSC) Eco delivery (methanol, biofuels) (Maersk) ACT+ (LNG, biofuels) (CMA CGM) Insetting product (biofuels) (DFDS)
CO_2 Compensations	Ship Green (biofuels) (Hapag Lloyd)
CO2 Calculations	Emissions dashboard (Maersk)
Offsetting Product	Included in the ACT+ (CMA CGM) External projects offered by MSC

As seen in table 5, the majority of the green services offered are related to alternative fuel solutions to reduce emissions in their own network. The carbon reductions and carbon compensations could be seen as a quite equal type of service since either they reduce or compensate the customers freight by using the mass balance concept. However, the respondent at Hapag Lloyd as well as the homepage called it their carbon compensation service and that is why those are separated in table 5. It could be argued that the offsetting product also is a kind of carbon compensation, however, the difference is that the carbon compensation that Hapag Lloyd are offering is compensations in their internal network while the offsetting product is outside the companies' network. The offsetting project is one of the services offered by MSC and CMA CGM, which is a cheaper alternative for the customers. However, it is not really something that reduces the emissions even if it compensates emissions by investing in projects. The offsetting was highly discussed among some of the respondents where they argued that offsetting can be seen as the easy way out since it really doesn't reduce any emissions in the shipping industry's own network.

The structure of the green service offered was, according to some of the respondents, customized, which required a lot of administrative work and the need for standardized services were discussed by many of the respondents.

5.1.1 Green Services planned to be offered

To meet the global sustainability targets and achieve net zero emissions there are different ways for going forward. Wallenius Wilhelmsen was one of the companies that had a clear plan and are planning to offer zero emissions reductions as their green service as soon as the green methanol ships are operating which aligns with MAERKS plan for moving forward with green methanol ships which will soon be operating.

Many of the shipping companies expressed that customers have started to ask to track their CO2 emissions. As some of the shipping companies were already offering this, most of those that were interviewed did not offer this yet but are planning to start offering this. Another green service which is planned to be offered is carbon reduction retroactively which should increase the reliability of the carbon reduction service. To sum it up, the green services planned to be offered by the interviewed companies are:

- Net zero emissions reductions (by green methanol)
- Tracking of container emissions
- Carbon reductions retroactively

However, some of the shipping companies were not really sure if the "perfect" green service was found yet but were quite confident that selling carbon reductions was the right way of moving forward. However, these shipping companies stated that there is need for more research and technological development cause otherwise, they will not be able to reach their climate goals.

5.1.2 Comparison of Green Services in both Segments

When analyzing the green services offered in the two segments of Ro-Ro and Container, it could be seen that there are no differences in what green services are offered, instead it is more on a company level. The differences that could be seen between the companies could align with the company's different maturity levels regarding sustainability and their long-term sustainability targets (table 6).

Table 6: comparing shipping companies sustainability targets and their start year for offering green services.

Company	**Long-term sustainability target**	**Company started offering Green Services**
CMA CGM	Net Zero Emissions 2050	2017
MAERSK	Net Zero Emissions 2040	2018
MSC	Net Zero Emissions 2050	2020-2021
Hapag Lloyd	Net Zero Emissions 2050	2023
Evergreen	Net Zero Emissions 2050	*Planning to offer 2024*
DFDS	Net Zero Emissions 2050	2023
Wallenius Wilhelmsen	Net Zero Emissions 2040	2023

Both MAERSK and Wallenius Wilhelmsen, which had a quite aggressive target in comparison to the other shipping companies with net zero emissions 2040, which is earlier than the targets set by IMO, had a clear agenda on how to move forward. For the shipping companies who started offering green services earlier, it seemed like they had a larger portfolio of green services with both technological development and carbon reductions to their customers. As for MAERSK, which are a frontrunner and started their green strategy early, have invested and adopted green services earlier. Meaning that they have secured their alternative fuel their new innovations. Wallenius Wilhelmsen, which also has fuel secured, also looks at new innovations such as wind propulsion on Ro-Ro ships.

CMA CGM also adapted green services early and started using LNG on their vessels as a transitional fuel while they are aware of that this will not be what achieves net zero emissions 2050 which is their target. However, they have secured the alternative fuel by investing in Biofuel/LNG-fuel suppliers' plants in France. Other companies investigating alternative fuels are DFDS who are testing ammonia as alternative fuel

which also is a zero-emission fuel. However, there are both benefits and drawbacks to this alternative fuel.

Evergreen i.e., who are about to start offering green services to their customers in the near future argued that there have not been any good products out on the market. However, these "later adopters" could reach benefits with faster implementations because R&D is already made on different green services. But what can be a consequence of being a later adopter might be that alternative fuel is already secured by other actors in the same market which is described by the respondent for Evergreen.

Other differences that can be seen between both segments are on the technological level since there are differences in the design of the vessels and they fulfil different purposes. What could be identified is that customers seem to demand CO2 Calculations which most of the shipping companies could offer both in the container and also in the Ro-Ro segment.

5.1.3 Availability and Visibility of Green Services

All interviewed companies in both segments which have green services promote these offerings on their homepages to make them visible for their stakeholders. For some shipping companies, which want to be in the frontline regarding sustainability like MAERSK and Wallenius Wilhelmsen, they reach out to other media channels to make their green services more visible. When MAERSK for example introduced their first vessel operating on green methanol, the vessel visited different ports which achieved much awareness in different media channels. Many respondents argued that there are not enough customers asking for their green services, however, the availability could be seen as quite fluctuating between the shipping companies.

However, there are different ways in how customers really get hold of the green services. Many shipping companies argued that the demand for green services is low and that they try to push the customers to buy the services instead of customers really asking for the green services. Since many contracts between the shipping companies and their customers are signed for a long period of time, the green services are up for discussion when there are negotiations about contracts. Other ways of offering green services to customers are presented by MSC which always offers their Biofuel Solution

when customers ask for an RFQ. This makes the customers also see the different pricing options which the alternative fuel follows.

Hapag Lloyd have a different strategy for making their products more available for customers. Here customers can by themselves look at different pricing options on Hapag Lloyds homepage and add their ship green product together with how much they want to compensate. This was also discussed with MSC where the respondent stated that as for now, it is not economically worth implementing this type of digital solution because of the low customer demand.

5.2 The Business Network of The Shipping Industry

The shipping industry contains a complex network of actors with different relationships between each other which aligns with Håkansson & Snehota (1995) definition of a business network. Since it can be seen as a network the ARA-model can be used for mapping the actor bonds between the participants of the business network. The business network of the shipping industry can also be analyzed by the ARA-model to determine what resources each actor possesses and how they interact with their resources as well as how their activity links look like.

Through our research, two different segments were investigated, the Ro-Ro segment and the Container segment. However, in this context of a business network, both segments will be mentioned as "the shipping industry" because according to this research, there are no big differences between the segments in what their business networks looks like on an overall basis.

When analyzing from the ARA-perspective, three different components are being looked into. The actor bonds, resource ties and activity links (Håkansson & Snehota, 1995). The shipping sector consists of a complex network with multiple actors with both direct and indirect relationships. A mapping of the actor bonds is shown in figure 5.

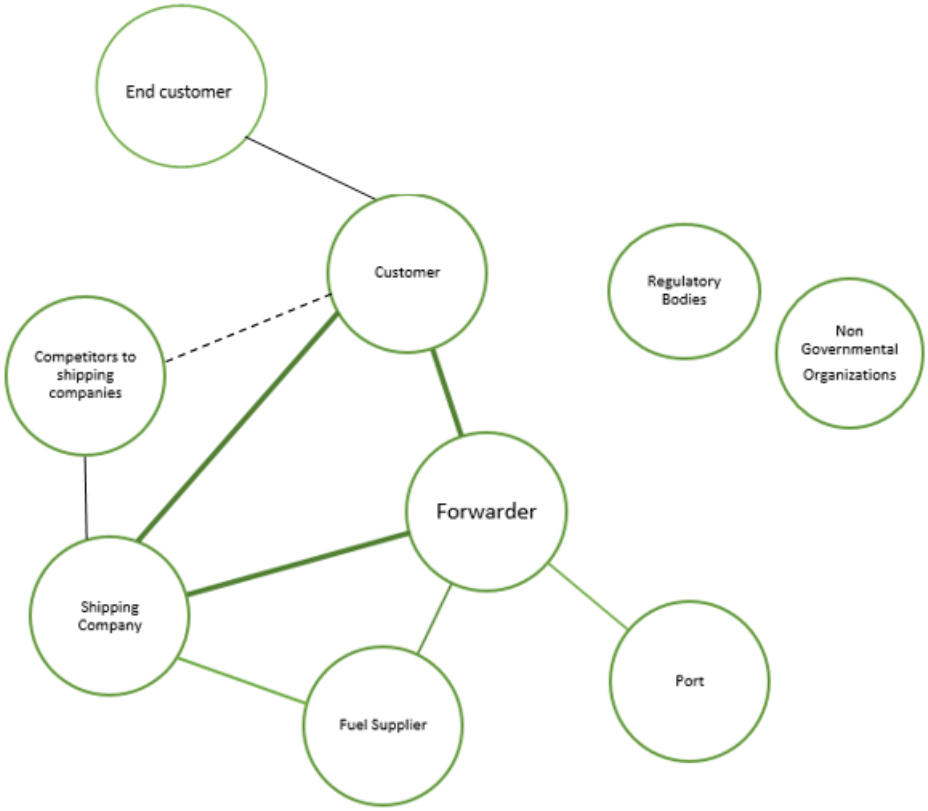

Figure 6: Mapping of actors of the shipping industry

In figure 6 a mapping of the actors in the business network of the shipping industry is presented. Based on the actor's description as participants from different companies with relationships to each other (Håkansson & Snehota, 1999), it can be argued in how regulatory bodies and non-governmental organizations are included in the shipping industries business network since they don't have any relationship to these actors and don't share any activities or resources. Therefore, they are included in the figure, but without any bonds drawn. However, they are still important actors which affect the business network, specifically when introducing green services as. The thicker bonds in figure 4 formulate the main triangle in the shipping companies' network, shipping company-forwarder-customer. The customers and especially the larger sized customers often use more than one shipping company for their transport. Thereby, they are bonded to the shipping company's competitor as well. The competitors to the shipping companies are important to consider in the network, since even if they compete against each other, they are also working together and formulate alliances in different questions.

Shipping company

The shipping company's main activity is to ship their customers' goods from one port to another, and they are able to reach destinations globally. Resources they possess are vessels which have a certain loading capacity. Depending on if the company is a Container shipping company or a Ro-Ro shipping company, the vessel designs have different features and capacities (Lumdsen, 2007). This could affect which customers they have and what type of cargo they are transporting.

Competitors to shipping company

Other shipping companies which can be seen as competitors are also included in the shipping industry's network. Examples were described by some of the respondents where alliances have been created between both those companies included in the same market segment, but also Ro-Ro and container shipping companies can together formulate alliances. Activities which are linked relate to capacity sharing, investments in new projects, such as sustainability projects. What could be identified when conducting the interviews was that shipping companies tend to serve the same customers with their shipping activities.

Fuel Supplier

Fuel suppliers are an important actor in the business network of the shipping industry, especially when it comes to developing green services. They are responsible for producing the alternative fuel which is then purchased by the shipping companies. Resources they possess are agricultural for producing alternative fuels which the shipping companies can invest in. The fuel suppliers require demand from the shipping companies to be able to produce the fuel, and the shipping companies needs the supply to be available so they can buy.

Port

Ports are included in the business network of the shipping industry since they are an important actor. In ports fuel is bunkered, and when it comes to alternative fuels there are only a certain number of ports where this fuel can be bunkered. Because of these limitations, shipping companies need to adapt the mass balance principle when selling green services to their customers.

Freight Forwarder

Freight forwarders can be seen as intermediaries as they offer both sales and procurement of transportation. Freight forwarders purchase transportation from the shipping companies and then sell it to customers. They often have contact with many various shipping companies and customers. Freight forwarders maintain various resources of their own including having their own transportation methods such as trucks.

Customer

The customers either purchase their transport from the shipping company or from the freight forwarder. From larger customers such as car manufacturers, they can be customers to a lot of different shipping companies, but mainly they are customers to a freight forwarder who then buys the transportation from the shipping company. The customers are sometimes involved in developing different services where they have knowledge from their perspective.

End customers

End customers are the customers' customer, and they don't have any direct connection with the shipping companies. However, they are the ones that carry the cost of the freight in the end which makes them an important actor when developing green services. Meaning that they share an indirect relationship with the shipping companies and their activities and resources could affect the shipping companies.

5.2 Collaborations for Green Services

All shipping companies can agree that there are not enough regulations and incentives from the government globally for customers to push more for green services, there is rather a pull system from the shipping companies.

According to some of the shipping companies, there is currently more economically feasible to reduce emissions in production rather than logistics as it is easier to control and minimize for the customer. This then leads to low demand from the customers to push for green services when using shipping companies for transportation. As regulations enforced by officials such as EU and IMO, shipping companies have to opt for offering customers green services to follow the regulations, however due to low demand from customers it can become financially hard for the shipping companies to completely transition to net zero emissions. This can make customers turn to other shipping companies who do not have to follow the regulations as strictly and can give better options for prices and transportation. By globally enforcing regulations that benefit the agenda for climate change this can be a push for the customers to buy green services.

5.2.1 Collaboration between shipping companies

Shipping is a competitive market and highly price dependent, which makes it a tough market. Customers have more buyer power in this market, shifting the power dynamic (Sallnäs, 2014) which makes shipping companies turn on each other to gain the most competitive advantage, this leads to less focus on climate issues and how to offer sustainable services and rather on offering the lowest prices. In order to make sustainability and green services a priority for both customers and shipping companies a horizontal collaboration would be beneficial (Melander & Wallström, 2022). As of today, there are alliances in the shipping industry, one such example is the 2M alliance between MSC and Maersk, which will be terminated by January of 2025. Maersk and Hapag Lloyd are instead joining forces and creating their own alliance. This is a form of horizontal collaboration, where competitors are collaborating based on shared values and ambitions (Melander & Wallström, 2022).

However, in theory this collaboration idea may work but there is a divide between shipping companies as some believe the larger actors have more influence and can therefore have a larger share of the available resources such as alternative fuels for their fleets leaving little to the smaller actors in the market, this shifts the power dynamic and allows for little trust (Rogerson et al, 2021). While many shipping companies mention that the problem is not product shortage but rather there needs to be more advancements for the development.

5.2.2 Collaboration between shipping companies and forwarders

The forwarding market can be considered highly price dependent, even more so than the shipping market, according to the forwarding company interviewed. Historically, there is little to no collaboration between shippers and forwarders according to the respondent as both actors have different activities leading the relationship between the two to be more transactional rather than strategic.

Another reason for lack of collaboration between the two parties is due to both being in highly competitive markets and due to globalization, the markets have a tendency to overlap, leading to competition between the actors rather than collaborations. Because of this competition, often times shipping companies do not prioritize have a collaborative relationship with forwarders, although from a forwarder's perspective, they wish to increase the collaboration in order to gain competitive advantage and further develop the market.

When interviewing both various shipping companies as well as the forwarder, most shipping companies did not see the need for further collaboration between forwarders and the shipping companies. Maersk, Hapag Lloyd and BWS did see the need for further collaboration. Even out the playing field and allow for the power dynamic to shift so that not majority of the power lies within the shipping companies (Sallnäs, 2014). Maersk, Hapag Lloyd and BWS all agree that this is an essential part in achieving full green logistics operations, this will aid in achieving a develop green supply chain management, which according to Yang et al (2023) aims to help companies achieve a win-win situation between financial and environmental performance.

5.2.3 Collaboration between shipping companies and customers

In aspects of collaboration between the shipping companies and customers there is a divided opinion between the respondents. Most shipping companies interviewed argue that they collaborate with customers and that it is important for the development of green services which aligns with Melander (2018) who enhances that customer involvement in green service development could lead to benefits such as faster development with access to knowledge the buying side of the service.

However, some of the respondents argue that collaboration with customers is too difficult yet, but they think that this is something they can do in the future. These shipping companies argue that the only collaboration they share with customers is that they purchase their services, if that can be considered a collaboration, but nothing further than that. This was mainly because they are at an early stage with their service development. However, Yang (2018) enhanced that it could be beneficial to involve their customers already in an early stage of green service development to be able to keep up with competitors who might already have adopted a sustainable business model. One way of collaborating with customers was presented by one of the shipping companies who educated their customers about sustainability. This could be one way of introducing them to green service development and to gain increased knowledge about sustainability in shipping.

Additionally, there could be other ways to collaborate with the customers. As most of the shipping companies stated, even if the demand is too low, there are customers that want to buy and be a part of the green service development. These customers could form alliances together to create a larger demand for the green services and set requirements and make investments to aid the shipping companies in going green.

5.2.4 Collaboration between shipping companies and fuel suppliers

Given the aspect of green collaboration, a collaboration between fuel suppliers and shipping companies is essential to further the development of alternative fuels. By opting for a horizontal collaboration, shipping companies can aim, for example, to purchase from the same fuel supplier which leads to investing in not only productions sites but also technology to increase the development of alternative fuels. This is

essential to match the supply and demand of the alternative fuels, as some shipping companies mentioned that there is not enough fuel on the market to sustain the demand.

6. Discussion: Green Services in shipping industry context – drivers and barriers

In the following chapter, a discussion regarding the enablers for- and barriers against offering and developing more green services. This discussion will lead forward to a discussion about how green services could look like in the future and what factors need to be in place in order to develop these services further.

6.1 Enablers for Green Services

From collected data, it can be argued that there are enablers for offering more green services. The most important ones were that the demand is expected to increase due to new regulations, customer commitment, collaborative factors and economic benefits.

Demand expected to increase due to regulations

The respondents argued that new regulations from IMO are a key enabler for improving and developing their Green Services. With the revised IMO regulations, shipping companies need to adapt to lower GHG emissions practices (IMO,2023). However, not only the shipping companies are affected by more aggressive regulations, with the new EU ETF2 regulations which include that companies need to account for their emissions (EU, n.d.). Some of the respondents argued that this probably will lead to an increase in demand from customers meaning that shipping companies need to opt for selling a larger volume of green services. This has also been identified already since customers' demand for green services has slowly started to increase and the questions have started to come from different customers who wish to get their carbon emissions counted for.

Customer commitment

Another driving force for offering more green services could be to strengthen the customer commitment. Some of the respondents argued that there are customers that want to have totally green operations including the external logistics and transportation operations, i.e., luxury car manufacturers which sell electrical cars. This also provides a chain-reaction since these customers' different suppliers need to operate in the same way, meaning that they also need to “ship green” since they in many cases work under the same standards.

Collaborative factors

Collaborations which are formed for development of green services could lead to benefits for actors involved. As most of the shipping companies mentioned lack of alternative fuels as one of the main challenges with offering more green services, a collaboration between shipping companies and fuel suppliers could aid in balancing the demand and the supply. It can also speed up the service development if a collaboration occurs between shipping companies and customers (Melander, 2018).

By collaboration, long-term relationships between actors in the business network can be formulated, which also increases the level of trust but also evens out competition between the different actors. Collaborative factors between the shipping companies can also yield in resource optimization, standardization, knowledge and information sharing in best practices (Vargo & Lush, 2004; Nenonen & Storbacka, 2010).

Economic benefits

As some of the shipping companies described, they are working to get a more efficient fleet and use of less power from engines which in turn lowers the fuel consumption, this is not only a benefit regarding emission reductions but also lower the costs due to lower fuel consumption which aligns with Cocca & Ganz (2015) proposed economic benefits with establishing more energy efficient services. This means that financial benefits can be gained by developing their freight operations and converting to a more efficient fleet via i.e., slow steaming.

6.2 Barriers against offering more Green Services

There are various barriers for why green services are not offered in a greater occurrence. To categorize the different barriers from the data collected, the main barriers are: Increased costs, material shortage (alternative fuel), low customer demand, regulations and a competitive market.

Increased costs

All shipping industries agree that offering green services leads to increased costs which also aligns with Davydenko et al., (2022) who describes that investments are required when developing green services which lead to increased costs. For shipping companies, this is due to having to change their entire existing fleet and supply chain to

accommodate for fossil free options. During the interviews some of the respondents argued that no profit is made from offering green services, instead it is only increased costs for both the customer and the shipping company.

Material shortage

Material shortage has been explained in two ways. As there is not enough demand for green services/alternative fuels then fuel suppliers are not producing as much as they should. Another explanation is that larger shipping actors are overpowering the supply leaving less alternative fuel for smaller shippers. This creates an imbalance in the purchasing and distribution of fuel leading to material shortage. Observation has been made that it is a combination of both but with a large part of low demand as customers and shippers are not in alignment of only purchasing/selling green solutions.

Customer demand

As of today, it is still cheaper for customers to lower emissions in their own production than it is to lower logistical emissions such as transportation, according to the shipping companies. This leads to customers not prioritizing their transportation choices and therefore rather going for the cheapest alternative that the shipping companies can offer. This is how the respondents from the shipping companies resonate with low customer demand. The respondents further explain that green alternatives are always put on the agenda for each new contract renewal and also always offer green solutions to the customers, however customer often neglect the green services offered as it is considered too expensive.

Regulations

IMO is in charge of setting global standards that all shipping companies must adhere to, however these regulations are fairly newly imposed. As for governmental bodies, not all countries think in the same way when it comes to the environment, meaning that regulations are not the same globally for the shipping industry. This creates a barrier for offering more green services, as gained insights form the shipping companies, due to not having the same standard of regulations globally in a highly competitive market, shipping companies actually loose market shares by only offering green services which can be seen as a cost rather than investment.

6.3 How could green services look like in the future?

As seen previously, there are both enablers and barriers for companies to offer a larger number of green services. However, development of the green services is needed in order for the shipping companies to meet their sustainability targets as well as the scientific targets with 40% reductions to 2030 and net zero emissions 2050 (IMO, 2023). It could be identified that the green services need to be developed, which was also stated by many of the respondents. Hence, the way of moving forward to reach the targets, they were not so certain about. With the enablers discussed in previous section, it could be analyzed that developing more green services are followed by benefits from different perspectives and shipping companies needs to see their long-term benefits with offering green services. However, some barriers were identified with large costs for the shipping companies, product shortage and far too low customer demand. To overcome these factors, we can go back to the framework of development of green services in shipping.

To be able to develop green services in shipping, stronger collaborations need to be formed between actors of the shipping industry's business network and resource interaction to achieve value co-creation. Instead of focusing on that collaboration is that customers purchase their services, there is need to shift the focus from only the exchange of goods to the exchange of information and knowledge (Vargo & Lush, 2004; Nenonen & Storbacka, 2010). Shifting focus would further benefit the shipping companies as exchanging information and knowledge would allow for i.e., resource optimization, skill development and learning, relationship building and trust. While some of the shipping companies already included customers in the green service development, it could be beneficial to introduce them early in the innovation process to understand their needs and preferences (Melander, 2018; Yang, 2018) and it can even be possible to use them as "test persons" when developing the new services (Melander, 2018). To overcome the barrier with low customer demand, shipping companies can reach out to the customers which have a total green agenda (Cocca & Ganz, 2015). It is stated that there are customers that demand green services even if it is not the majority of them yet.

Through the business network of the shipping industry, value co-creation can be reached when different actors integrate their resources in various ways. Shipping companies can form alliances with their competitors to invest in fuel supplier's production plants to overcome barriers with product shortage. However, it is important that all actors included in this collaboration pay attention to the environmental aspects of it and not only shift the focus to the economic aspects, so to prevent competitive imbalance (Melander, 2018).

In the shipping companies' business network, trust needs to be established for their services. While many of the shipping companies described that they have a large transparency regarding their green services, others did not mention this. A larger transparency could be needed to develop more trust for their green services (Rogersson et al. 2021; Sallnäs et al., 2014). Aiming for increased transparency regarding the shipping companies' green services can allow for the customers to become more aware of what services the shipping companies offer, prompting more customers to go green in regard to their logistics. This in turn will increase the availability of the services (Cocca & Ganz, 2015) as well as increase compliance of regulations set by regulatory bodies such as IMO and EU.

Regulations are an important aspect to take into consideration as they can be a determining factor in how engaged shipping companies and customers are to offer/buy green services. Even though many of the regulations are global, shipping companies notice differences between regions and countries which are discussed as one barrier for developing more green services. Swedish shipping companies tend to be in the frontline about green shipping practices while companies from other countries don't have sustainability as high on the agenda. Thereby, the shipping companies want stricter regulations from IMO and other authorities so that no companies which doesn't follow the regulations can gain benefits from "not going green" by i.e., could have lower prices for their services since they are using ordinary marine fuel.

What many shipping companies argued was that the green services need to be more of a standardized structure, today some of the services are offered in a customized way to customers which requires a lot of administrative work, which are both costly and time consuming. Not only by a standardized structure but also introduced as a standard

service in their portfolios in the future. For now, they are more offered as a separate service which needs to be integrated into the companies' business models. As customers mainly demand cost calculations on their carbon emissions, shipping companies need to develop this service to make sure to fulfil the customers' requirements and needs.

From the shipping companies' perspective, the cost issue seems to be the largest obstacle when it comes to offering more green services which aligns with (Davydenko et al., 2022) view of the barriers against green services. What they need to do is to see the long-term benefits which are awarded by improved brand image and economic benefits (Cocca & Ganz, 2015).

As discussed earlier, there is a need to develop green services to reach the global set targets and several of the companies are already working on new technological innovations such as wind propulsion on Ro-Ro ships and other alternative fuels such as ammonia. In these innovations, collaboration between actors in the business network is of high importance since all can contribute with their respective resources. There are more challenges which occur with new technologies such as how to calculate emissions if the vessels are operating on wind power. Therefore, the development of these services is important in collaboration with stakeholders.

7. Conclusions and suggestions of further research

In this chapter, the findings of the thesis will be presented in relation to the research questions. Furthermore, suggestions of further research will be presented.

RQ1: What green services are offered today in the Ro-Ro and Container shipping segments, and how are these services structured?

The green services that are offered in the Ro-Ro and Container shipping segments are carbon reductions/compensations in different set ups mainly by offering customers to purchase alternative fuel on the shipments. These services can be offered in customized ways that reflect the ambitions and values of the individual shipping company. As we can see the structure of these green services is the following:

- CO2 Reductions
- CO2 Compensations
- CO2 Calculations
- Offsetting Product

Mainly the carbon reductions/compensations are offered through the mass balance concept and insetting which is described in previous sections. The offsetting product can be seen as a variant of carbon compensation but not in the internal supply chain.

RQ2: What stakeholders in the shipping industry's' business network are important to involve in developing green services?

The stakeholders in the shipping industry's business network that we identified as important in the development of the green services are customers, fuel suppliers, freight forwarders and regulatory bodies such as EU and IMO have been observed to be important to involve in developing green services. These stakeholders all play different but essential roles in the business market, which needs to collaborate intensely with each other to further develop green services to sustain the demands of the future markets.

RQ3: How could green services in the shipping sector be developed in the future and what are their enablers and barriers?

The results of the analysis shows that there needs to be standardization amongst the green services offered in the shipping industry, meaning that offering standard green services to customers would allow for increased flexibility for the shipping companies to develop more green services, less time consuming and costly due to increased administrative work as well as aid in the shift to completely "go green".

However, in order to reach the sustainability targets, the shipping companies need to limit the option of other alternatives than greener alternatives which makes the green services as a standard service. Hence, this requires collaboration between the important stakeholders, which has been suggested previously. As discussed, there are barriers for offering only green services meaning large investments in new vessels together with low demand from customers. However, the drivers presented previously and to see the long-term benefits needs to be considered during the transition phase.

Collaborations on a global scale in the shipping industry would allow for an even playing field for all the shipping companies on the market. Today one of the barriers is that the importance of sustainability as well as regulations can vary between countries, having an even playing field would decrease the competition between shipping companies and decrease the benefits for the shipping companies that do not "go green." As regulations are an important aspect, it is of importance and what pushes the transition forward.

7.1 Suggestion for further research

This thesis has been investigating some of the container and Ro-Ro shipping companies to identify what green services are offered today and what collaborations that are needed when developing green services. However, the thesis was limited to only a few Ro-Ro shipping companies and mainly the largest container shipping companies. To further analyze the green services and identify more green services could provide other green services which are not included in this thesis.

We have investigated what actors in the shipping industries' business network and what types of collaborations are of importance when developing green services. Further research in the area could be to identify use value and exchange value to reach value co-creation in the business network to identify important resources actors integrate with when developing green services.

Further development of alternative fuels needs to be made and investments in fuel suppliers technology and infrastructure to facilitate this change can aid in implementing more sustainable business models and practices in the companies. Other renewable energy sources should be researched to understand how they can be implemented on the existing and coming vessels and how these new technologies can be implemented as a green service which can be sold to customers.

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Appendix A – Interview Guide

Bakgrundsfrågor

- Berätta lite om företaget (bakgrund): Vilka fartyg har ni? Vilka linjer?
- Hur arbetar ni med hållbarhet?
- Vad är era hållbarhetsmål (långsiktiga, kortsiktiga)?
- Vad har ni för hållbarhetsstrategier?

Kunder / leverantörer / intressenter

- Vilka är era största kunder?
    - Om de nämner speditörer, fråga vilka, om de nämner transportköpare, fråga vilka.
- Vilka av era kunder är drivande beträffande hållbarhet?
    - Är de inblandade i utvecklingen av de gröna tjänsterna?
- Vilka andra viktiga samarbeten har ni för att erbjuda gröna transporttjänster?
    - Ex. bränsleleverantörer, speditörer, liknande.

Hållbarhet

”Green” services – Hållbara tjänster

- Hur ser efterfrågan på gröna tjänster ut idag?
- Vilka gröna tjänster erbjuder ni till era kunder idag?
    - När började ni erbjuda detta?
    - Har ni planer på att erbjuda andra gröna tjänster?
    - Finns det andra gröna tjänster ni erbjudit tidigare?
- Vilka gröna tjänster köper ni?
    - Från vem köper ni dessa gröna tjänster?
    - Hur länge har ni gjort det?
- Hur marknadsför ni de gröna tjänsterna mot era kunder?
- Hur får kunden tillgång till en grön tjänst? (behöver kunden betala för detta)?
- Hur märker ni den eventuellt ökande efterfrågan av gröna tjänster?
- Vad för utmaningar kan ni se med att erbjuda ett större utbud av gröna tjänster?
- Hur anpassar ni era gröna tjänster utifrån kundens behov och önskningar?
- Samarbetar ni med era kunder i utvecklingen av gröna tjänster?
- Hur samarbetar ni med kunderna i utvecklingen av de gröna tjänsterna?
    - Om ni inte samarbetar: Skulle ni kunna samarbeta med kunderna för att utveckla gröna tjänster?
- Vilka förutsättningar sätter kunderna på de gröna tjänster som de kan erbjuda?
- Vad för möjligheter/utmaningar finns det genom att involvera kunderna i utveckling av gröna tjänster?
- Hur samarbetar ni med andra (t.ex. bränsleleverantörer) i utvecklingen av gröna tjänster?

Framtiden

- (Hur arbetar ni för att nå era hållbarhetsmål?)
- Hur utvecklar ni era gröna tjänster för att nå dessa mål?
- På vilket sätt hade kunder kunnat involveras mer i utvecklingen av tjänsterna för att hjälpa er att nå målen?
- Finns det andra viktiga samarbeten som behöver komma på plats för att erbjuda gröna tjänster?
    - Med vilka?
    - Vad för samarbeten?
- Vilka gröna tjänster tror du behövs utvecklas för att kunna förutse framtida marknadens behov?
- Vad skulle behövas för att driva på utvecklingen av gröna tjänster?

DEPARTMENT OF TECHNOLOGY MANAGEMENT AND ECONOMICS
DIVISION OF SUPPLY AND OPERATIONS MANAGEMENT
CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden
www.chalmers.se

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