Master's degree thesis

LOG950 Logistics

The Forthcoming EU-limitations on Sulphur Emissions and the Growing Usage of 45 foot containers: Challenges and Chances for Short Sea Shipping in the Baltic Sea Region

Niklas Alexander Beermann

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The Author

Niklas Alexander Beermann
(Molde, 27th May 2014)

Executive Summary

The following thesis is to be taken as a contribution to the EU project ”Transbaltic Extension”[1]. This EU funded project analyses the maritime transport environment of the Baltic Sea both under present conditions and likely future trends.

The shipping industry in the Baltic Sea Region currently faces its biggest challenges since the financial crisis in 2008. The implementation of new sulphur emissions limits in 2015 will force shipping operators either to the usage of higher priced fuel or to invest in new types of engines and exhaust cleaning and absorption systems.

The thesis concludes that a price increase for maritime transports in the Baltic Sea appears inevitable and that in consequence a cargo shift from sea to the road most likely will take place. Experts predict cargo shifts up to 46 % for certain trade routes which will burden the land-sided infrastructure even more.

As possible solutions for complying with the new sulphur limitations three main possibilities are identified: With regard to fuel the usage of Marine Gasoline Oil or Liquefied Natural Gas and as a technical solution the installation of exhaust cleaning systems, so called Scrubber. The data analysis from the practice favours the usage of Marine Gasoline Oil as the short term solution due to practical reasons.

In discussing the competitiveness of Short Sea Shipping, it is the common habit of transport decision makers to underrate the transport mode Short Sea Shipping even though it has a high potential with regard to its environmental friendliness.

The lack of customer focus and lack of collaboration with land sided modes and terminals is seen as main reason for this fact. For securing a higher customer focus Short Sea Shipping needs to concentrate on the needs of the customer and is hereby dependent on the contribution of other business partners and policy makers. A particular role in this context plays the terminal operator which constitutes the intersection between sea and land transport modes. Within this intersection many inefficiencies are occurring which partly can be abolished by terminal operators, while others need to be counteracted by simplifying and streamlining bureaucratic procedures which will need positive action by the authorities involved, in particular the European Commission.

In addition, the usage of 45-foot container is evaluated within the thesis. It was found that this transport unit is beneficial for all participants of the transport chain. In practice however this unit has not fully established itself, due to several challenges on the practical and administrative level. The thesis tries to summarize identified challenges and opportunities and based on that outlines the potential future strategies for the transport mode Short Sea Shipping in order to secure its competitiveness as a transport mode.

[1] www.transbalticext.fi

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List of Abbreviations

Abbreviation	Meaning
$US	United States Dollar
CO	Carbon Monoxide
CO_2	Carbon Dioxide
Con-Ro	Hybrid between Container Ship and Roll on Roll off
DNV	Det Norske Veritas
EC	European Commission
ECMT	European Conference of Ministers of Transport
EEDI	Energy Efficiency Design Index
EEA	European Economic Area
EPA	United States Environmental Protection Agency
EU	European Union
GDP	Gross Domestic Product
HC	Hydrocarbon
IMO	International Maritime Organization
IS	Information System
IT	Information Technology
JIT	Just in Time
Km	Kilometre
KPI	Key Performance Indicator
LNG	Liquefied Natural Gas
Lo-Lo	Load on Load off
LPG	Liquefied Petroleum Gas
MGO	Marine Gasoline Oil
MTO	Multimodal Transport Operator
NO_x	Nitric Oxide
NVOCC	Non-vessel Operator Common Carrier
Ro-Ro	Roll on Roll off
RQ	Research Question
SECA	Sulphur Emission Control Area (Europe: North Sea, English Channel, Baltic Sea)
SEEMP	Ship Energy Efficiency Management Plan
SECA-Directive	Lowering sulphur content of fuel to 0.1 % (or equal reduction in emission) in the SECA
SO_x	Sulphur Oxide
SPI	Service Performance Indicator
SSS	Short Sea Shipping
SWOT analysis	Analysis of Strengths Weaknesses Opportunities Threads
TEU	Twenty Food Equivalent Unit
TFCA	Total Fuel Cycle Analysis

1.0 Introduction

The result of several important international conferences at the end of the 20th century can be summarized as follows: Many worldwide economic activities are carried out in a manner harmful to the global natural environment. As a consequence of these findings, resolution terminology such as "Sustainable Manufacturing," "Sustainable Agriculture" and "Sustainable Transport" are used to foster new concepts within the economy (Leinbach and Capineri 2007).

Particular interest in this context is given to the concept "Sustainable Transport," bearing in mind that transport presently relies 95% on finite and non-renewable "fuel" (Leinbach and Capineri 2007). By considering the definition from the World Commission on Environment and Development (1987) defining sustainable development as "[…] development that meets the needs of the present without compromising the ability of the future generations to their own needs," the question of whether or not the present transport concept can be considered as "sustainable" can be validly raised. By taking into account the emissions and connected environmental impacts the present transport concepts create, it becomes clear that the present system will become gradually less sustainable over time if no changes are made in the future (Leinbach and Capineri 2007). According to Howi and Eidhammer (2013) the main challenge is to maintain a competitive transport business environment while meeting sustainable emission targets, even though the two goals do not exclude each other.

Turning to the potential different ways of transport, it is a basic fact that the maritime transport mode has the least CO_2 emissions per ton/kilometre. In consequence a modal shift to this particular transport mode appears advisable in order to meet the requirements of "sustainable transport". In addition, the European Union (EU) has acknowledged the environmentally friendly potential of the maritime transport mode and has consequently implemented policies in order to strengthen the competitive situation against road and rail haulage. This policy in particular is contained in the following EU papers: "European Transport Policy for 2010: Time to decide" (2001), "Motorways of the Sea" (2003), "Marco Polo" (2003), and "Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system" (2011) which all create a framework intended to strengthen Short Sea Shipping competition.

However, as a consequence of the international agreement on lowering Sulphur (So_x) and Nitric Oxide (NO_x) emissions stemming from maritime transports (launched by the "International Maritime organization" (IMO) and concluded in 1997), the maritime industry is facing challenges as well as opportunities internationally. The implementation of Sulphur Emission Control Areas (SECA) within the main European maritime trade areas, namely the North and Baltic Sea, has necessitated a broad rethinking within the maritime industry and all its connected stakeholders (Malmqvist and Aldèn 2013). In 2010 the SECA-Directive, first proposed by the IMO and implemented by the EU, has come into force. This essentially means the percentage of sulphur within the fuel used has to be lower than 1%.

This thesis will study and explore the consequences of the even stricter sulphur limits (> 0.1%), which are scheduled to come into play by 1 January 2015, for the maritime transport market in the Baltic Sea. This new regulation will force shippers to change to other types of fuel or to install exhaust gas cleaning applications in order to meet the future legal requirements. Certain predictions simulate various scenarios, but any scenarios will result in a cost increase for all sea transports. The new regulation is seen by most of the affected companies´ management as a threat which will most likely drive a substantial number of shipping companies into severe economic difficulties, including insolvency in many cases. Contrary to this negative assessment and expectation, other market observers consider this regulation as an incentive for new innovations within the maritime transport industry.

In general, changes within the maritime transport industry are inevitable. These changes need to be addressed. In the following the potential impacts on the maritime sector will be described and some major impacts on connected industries based on practical interviews with affected market participants and experts will be discussed. In addition, the logistical approach will be described as a means for counteracting the cost increase of the transport mode and to increase the attractiveness of the maritime transport mode. In this context the actual situation will be reflected and the major options which are presently open for dealing with the new regulation will be discussed. Following the description of possible development scenarios, based on both interviews and literature, these predictions will be used to evaluate possible business strategies and to give recommendations for mitigating possible negative effect of this directive.

The paper is structured as follows:

In the following sections the research problem will be determined and the framework of the paper will be set.

The methodological research approach used for the thesis will be described in section three.

Section four will provide the reader with an insight into the Baltic Sea Region (BSR) and the EU Directives for the Baltic Sea in order to highlight the important characteristics of this region.

Following (section five) Short Sea Shipping will be evaluated based on the review of adequate literature and case studies. Included in these sections will be approaches from the literature dealing with the implementation of Short Sea Shipping into supply chains. A detailed description of ship emissions and technological countermeasures will also be evaluated. Additional potential impacts of the SECA-Directive on the maritime and other related industries will be described.

Section six will then analyse the practical opinion based on the review of conducted interviews. This interviews as well as the literature review will be the base for a SWOT analysis.

In section seven, recommendations will be given to mitigate the negative effects of the Directive as well as a conclusion will be provided.

The structure of the paper can be illustrated in the form of an hourglass due to its composition of wider and narrower descriptive and analytical parts:

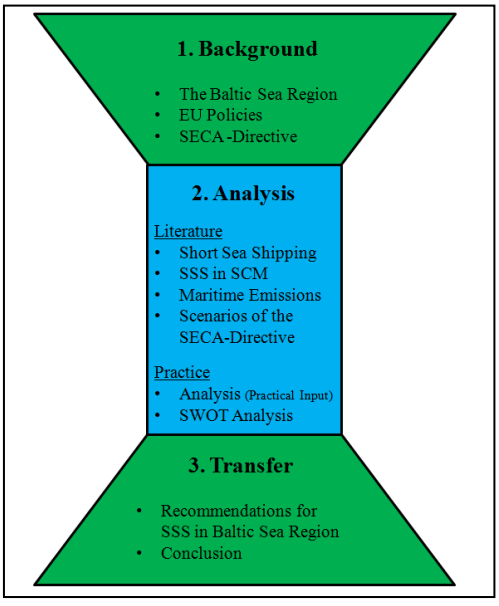


Figure 1: Structure of the Thesis

2.0 Research Problem

The following section will outline the research problem approached within the thesis. The importance of sea transport spans back to ancient times, this transport mode was especially inevitable within the Baltic Sea Region (BSR). The shipping industry, however, never fully recovered from the impact of the financial crisis in 2008 and is still suffering from a large amount of overcapacity, in particular container transports. Many shipping companies were forced to close down as a result of long-lasting deficits and strong competition from other transport modes. In contrast, the European Union as a whole is facing big congestion challenges related to land transport modes. This led to the implementation of several policy papers promoting the maritime transport mode, and especially the intra-European maritime transport mode, also known as Short Sea Shipping. These policies, however, are standing contradictory to the future implementation of the SECA-Directive, which will force shipping companies to use expensive fuel instead of traditionally-used heavy oil.

The research questions (RQ) to be evaluated within this thesis are the following:

RQ 1) What is the role of Short Sea Shipping within the Baltic Sea Region?

- *(1) What are the characteristics of the Baltic Sea Region?(4.0-4.4)*
- *(2) How is the maritime Short Sea Shipping market structure within the Baltic Sea Region?(4.5)*
- *(3) Why and in which form is there an environmental involvement on behalf of the EU in the Baltic Sea Region? (4.6)*
- *(4) What are the characteristics of Short Sea Shipping?(5.1-5.4)*

RQ 2) How can the maritime industry comply with the SECA-Directive? (5.5-5.6)

RQ 3) How will the limitation of sulphur levels by the SECA-Directive affect the Short Sea Shipping market within the Baltic Sea? (5.7)

RQ 4) How can the Short Sea Shipping industry remain competitive in the changing market environment of the Baltic Sea Region? (6.0-7.2)

- *(1) How can market opportunities be used through strength of Short Sea Shipping? (7.1.1)*
- *(2) How can market opportunities be used to minimize weaknesses of Short Sea Shipping? (7.1.2)*
- *(3) How can Strengths of Short Sea Shipping be used to minimize threads? (7.1.3)*
- *(4) What can be done to mitigate effects where weaknesses of Short Sea Shipping meet Threads?(7.1.4)*
- *(5) How can involved business partner support and promote Short Sea Shipping? (7.2)*

The first three research questions will be answered by the review of literature and research papers that have analysed the maritime transport mode under environmental considerations. Furthermore particular case studies which attempted to predict the impacts will be reviewed to describe possible consequences in compliance with the new directive.

The analytical section (Research Question 4) will be based on practical inputs in the form of analysed interviews. These interviews will be the basis for deriving possible strategies to mitigate negative effects.

2.1 Practical and Scientific Interest

Short Sea Shipping has always been a topic of the literature dealing with transport developments (Baird 2007; Paixao and Marlow 2000; Islam et al. 2011). A particular focus has been set on the strengths and weaknesses of this transport mode (Paixao and Marlow 2002) in consideration of competitive transport modes. With the implementation of the new sulphur emission regulations, the maritime industry, particularly the one operating within the Baltic Sea, is facing new challenges. As an answer to the new regulations, many practical papers focus on the effects of the new sulphur regulations (Malmqvist and Aldèn 2013; ESN, 2013; ISL 2010; Eyrin et al. 2010) on the shipping market. This research is trying to predict the effect of the regulation on the market and is elaborating possible solutions and adequate reactions. Most of these studies are a list of appropriate solutions, mostly of technical nature, which demonstrates how the market can answer the regulation with innovations. This thesis as a non-technical paper aims at evaluating recommendations for the commercial practice and works to use literature from the supply chain theory to strengthen the position of the transport mode Short Sea Shipping (Fusco, Sauri and De Melo 2013). The evaluation will be done under consideration of the strengths and weaknesses in the context of external threads and opportunities which might occur due to new regulations.

3.0 Methodology

In the following section the data collection method will be evaluated. The purpose of the thesis is to provide recommendations for the affected market participants in order to mitigate negative effects of the SECA-Directive. As the literature review has shown, there are many possible reactions due to unpredictable variables related to this topic. The goal of the data collection is to set the literature review into contrast with practical opinions and experience. This will help to gain a deeper insight and exploration into the topic.

3.1 The Case study

The research approach most suitable when evaluating the effect of the SECA-Directive on a particular group is the case study. The advantage of this research method is the in-depth examination of a problem using a relatively flexible research plan (Gill and Johnson 2010). Yin (2009) describes a case study as an in-depth investigation of a contemporary phenomenon by using multiple perspectives. The method which can be used to explore a problem is not limited to a particular type of data, rather it allows the usage of different data sources. According to Cooper and Schindler (2008) the case study is generally referring to research questions which try to explain how and why a phenomenon is occurring. Furthermore the case study in combination with interviews allows insight from different perspectives and is therefore contributing to the in-depth exploration of a problem (Cooper and Schindler 2008).

3.2 Qualitative vs. Quantitative Research

According to the literature focusing on research methods, there are two types: 1) qualitative research and 2) quantitative research. The respective research method is chosen based on the strengths and weaknesses of each technique. Quantitative data collection is the base for a quantitative research method and shows what is occurring and how often it will occur (Cooper and Schindler 2008). This is mainly completed with statistical data. According to Cooper and Schindler (2008) this research method is very objective and allows the exploration of a topic based on scientific analysis and is representative when it is performed with a large population. The quantitative approach is often used for theory testing and requires the researcher to keep distance from the research in order to avoid biased results. Quantitative data is often the base for the translation of events, attitudes or motivations into codes and categories. Negatively the reduction to numbers gives space for statistical data manipulation. Cooper and Schindler (2008) state

that within the business field, the accumulation and analysis of quantitative data constitutes a stable foundation for expensive and critical business decisions.

Qualitative research is defined by Straus and Corbin (1998) as "[...] any type of research that produces findings not arrived by statistical procedures or other means of quantification." According to Gill and Johnson (2010) this definition, however, is missing the main advantage of qualitative research: the exploration into why people do the things they do. Cooper and Schindler (2008) support this argument by stating that qualitative research is explaining "why" and "how" things happen as they do. This research method allows for an in-depth understanding of a situation. Normally the qualitative approach lacks the endorsement of the top management level based on the wide range of possible bias in data collection and interpretation. On the other hand, qualitative research provides a reflected description of events, situations and interaction between people and things (Cooper and Schindler 2008). In contrast to the quantitative approach, the qualitative approach is capable of providing insights necessary to make decisions. Possible sources for qualitative research are individual, in-depth interviews, case studies, ethnography, grounded theory action research and observations.

Within this thesis the qualitative research approach will be used. The advantage of this method is the in-depth understanding of the topic and reactions. While the quantitative approach tries to predict and check theories, the qualitative approach goes beyond this and allows more space for individual assessment of future situations. The allowance of the small sample size of this method and the possibility to set focuses during the data collection process contributes to the main goal of the thesis.

3.3 Process of Qualitative Research

According to Cooper and Schindler (2008) the research process starts with an in-depth understanding of the managerial problem. Qualitative research also requires a deliberate preparation by the researcher. The research process can be illustrated in the following figure:

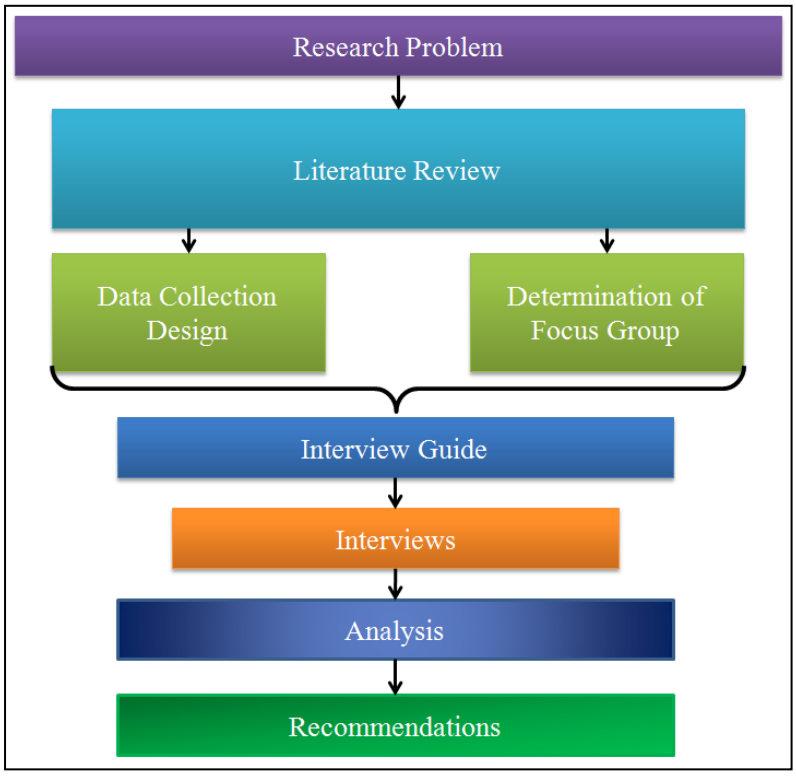


Figure 2: Research Model (orientated on Cooper and Schindler 2008)

The research model demonstrates that after the determination of the research focus, a focused literature review related to the research problem is done. This literature review can be seen as the preparation of the researcher who will gain an in-depth insight into the topic. Based on this insight the target group of the qualitative data collection process is determined. On the other side, the content of the data collection process is also determined. The combination of content (data collection design) and target group leads to an interview guide. Proceeding to the data collection in the form of interviews, the collected data is summarized and analysed. From the analysis of the data, recommendations are derived, strengthening the competitive situation of Short Sea Shipping.

3.4 Primary Data collection method: Interviews

An interview is a special type of conversation in which the interviewer's aim is to obtain knowledge of the respondent's world (Thorpe and Holt 2008). This technique is used as the primary data collection method for gathering data in qualitative methodologies (Cooper

and Schindler 2008). The interviews vary based on the number of people involved, the level of structure, as well as the relationship between the interviewer and interviewee. The interview can be conducted individually or in groups. The individual interview allows for the exploration of detailed individual experiences, opinions and choices. The interviewer needs to have an understanding of the interview issue and needs to encourage the interviewee to feel comfortable while also probing for detail. The researcher can either choose an unstructured interview, a semi-structured interview or a fully structured interview, similar to questionnaire with open-ended questions (Cooper and Schindler 2008). The structured interview has the advantage that the outcome of a particular interview is better comparable to other of the same type. On the other hand, Thorpe and Holt (2008) point out that a fully structured interview can constrain the interviewee to the agenda or the questionnaire and does not allow for variation in key aspects. Based on the characteristics of qualitative research, the focus on in-depth understanding, this type of research relies on unstructured or semi-structured interviews. This allows researchers to set individual focal points during the interview and to explore opinions individually.

The semi-structured interview was also selected as an adequate tool to collect data for this thesis. Based on the literature review, certain points-of-interest were explored and formulated into a list of questions. Additionally, the literature review was the base for the selection of interview partners. As interview partners, market participants within the SECA, as well as experts from famous research institutes and policymakers, were selected to provide a broad understanding of the business environment. Based on the variety of partner chosen, the semi-structured interview method allows the adjustments of focus points based on the individual position/attitude towards the SECA-Directive. The interviews were divided into two parts: 1) Short Sea Shipping and 2) SECA-Directive and expected impacts. The interviews are aimed for contributing to achieve two goals: firstly to question the foregoing literature review and secondly to recommend and formulate practices and strategies to comply with the directive. The Interview Guide can be reviewed in the back of this thesis.

The list of interview partners as well as the focal institution can be seen in Table 1.

Table 1: List of interviewees

Name of Interviewee	Focal Institution
1. Mr. Michael Tasto	Institute of Shipping Economics and Logistics
2. Mr. Gustav Malmqvist	MIDEK, AB
3. Mr. Andreas Göttsche	BUSS Ross Terminal GmbH & Co. KG
4. Mr. Kurt Bodewig	European- TEN-T – Coordinator
5. Mr. Harilaos N. Psaraftis	Technical University of Denmark
6. Mr. Lutz Birke	Hamburg Port Authority
7. Mr. Lasse Pipoh	Short Sea Shipping Promotion Centre (SPC)
8. Mrs. Lorena Bückler and Mr. Christof Schwaner	German Ship-owner Association
9. Interviewee #9 *	Maritime Consultant Company

* *Respondent wants to remain anonymous*

3.5 Validity and Reliability

The validity and reliability of the research method is secured by the diversification of the interview partners. This method is called "triangulation" and allows the researcher to overcome bias which might occur by only collecting data from one particular source (Gill and Johnson 2010). The topic SECA-Directive in particular needs to be investigated from different angles to allow adequate evaluation, instead of reflecting one particular opinion. Additionally, the main goal of the thesis to give recommendations for the maritime industry which is an international business makes it reasonable to diversify the data collection also on an international level.

3.6 Unit of Analysis

The thesis is exploring the effects of the stricter sulphur limits within shipping fuel and how the negative effects can be mitigated. The research questions which are stated above are aiming to explore a) the effects and b) possible ways to react adequately to the negative effects. As a result, the Unit of Analysis within the research will be the short sea shipping transport market of the Baltic Sea in its business environment.

Figure 3: Unit of Analysis

Due to the fact that Short Sea Shipping is a business involving many stakeholders, it is reasonable to put the major focus on Short Sea Shipping as well as consider the most important related businesses as illustrated in Figure 3.

4.0 Background: The Baltic Sea

The encyclopaedia Britannica (2014) defines the Baltic Sea as an "[…] arm of the North Atlantic Ocean, extending northward from the latitude of southern Denmark almost to the Arctic Circle and separating the Scandinavian Peninsula from the rest of continental Europe." The Baltic Sea ranges over 368,000 km² and is the largest expanse of brackish water worldwide. Graphically the Baltic Sea can be illustrated as follows:

Figure 4: Baltic Sea Region (Baltic Sea Region 2014)

However for the purpose of this thesis the Baltic Sea definition will be expanded so that Norway also becomes a bordering nation. This basis for this expansion of the definition is due to the high market involvement of the Norwegian maritime industry within this area and the connected affection of Norway by the SECA-Directive. Based on the high number of abutting nations, the Baltic Sea is the centre for international trade between the involved nations (Kersten et al. 2012).

The Baltic Sea Region (BSR) is of particular interest because it was one of the fastest growing economical regions in the world, with exception of the years of the crisis which had hit this region especially hard. It is estimated that the region will grow from 2.9 - 3.1 percent in 2014 which is however still under the average growth potential of four percent (ACL 2014).

4.1 The Baltic Sea Region

The following section will describe the Baltic Sea Region in detail. Due to the different levels of economic development per country, as well as other country-specific characteristics, it is reasonable to analyse them in with a separate focus. In the end the importance of logistics within this region will be described and analysed.

In contrast to the preceding definition, Kersten et al. (2012) describe the Baltic Sea Region (BSR) as the abutting nations to the Baltic Sea, including Norway and Iceland. In this region live approximately 60 million inhabitants, whereas the Scandinavian countries account for 45 % of the population (Baltic Development Forum 2011). All countries apart from Norway and Russia are member states of the EU. Norway, however, as a member of the European Economic Area (EEA), has access to the internal market of the EU. Within the BSR all countries have strong trading relationships to each other, resulting in the regions forming part of the top ten import and export partners for each individual country (Kersten et al. 2012).

Another point illustrating the diversity and complexity within the BSR is the Corruption perception Index which is provided by Transparency International (2013). Four of the top five nations (least corruption worldwide) are located within the BSR region (Denmark 1st, Finland and Sweden 3rd, Norway 5th). On the other side, countries such as Estonia (28th), Poland (38th), Lithuania (43rd) and Latvia (49th) have room for improvement. Russia in particular, with its ranking of 127th out of 175 nations, demonstrates that the cultural differences varying widely within the region might cause cultural problems when it comes to transnational cooperation.

4.2 The economic importance of the Baltic Sea Region

In the Global Competitiveness Report 2013-2014 (GCR 2014) which is regularly published by the World Economic Forum, the countries Germany, Sweden and Finland are declared to belong to the world's top ten most competitive countries. The companies operating within the BSR not only have access to the described 60 million inhabitants directly bordering the Baltic Sea, but can also access other countries such as Belarus and Russia, which together comprise of 640 million inhabitants (World Economic Forum 2011).

According to Kersten et al. (2012), the BSR is accounting for approximately 11 % of the EU's gross domestic product (GDP). Within this calculation the Scandinavian countries

contribute 62 %, the northern parts of Germany and North-western Russia 13 % each, all Baltic States combined (Lithuania, Estonia and Latvia) seven percent and the northern part of Poland five percent. The overall value adds up to 1,300 billion Euros. The GDP shows that the BSR evolved over the last 10 years into an important European growth region with growth rates between seven percent and 10 % in 2007. In comparison, the growth rate in the Scandinavian countries and Germany was only between one and six percent. The crisis had a very large impact on the BSR economies. The can be seen in the following illustration:

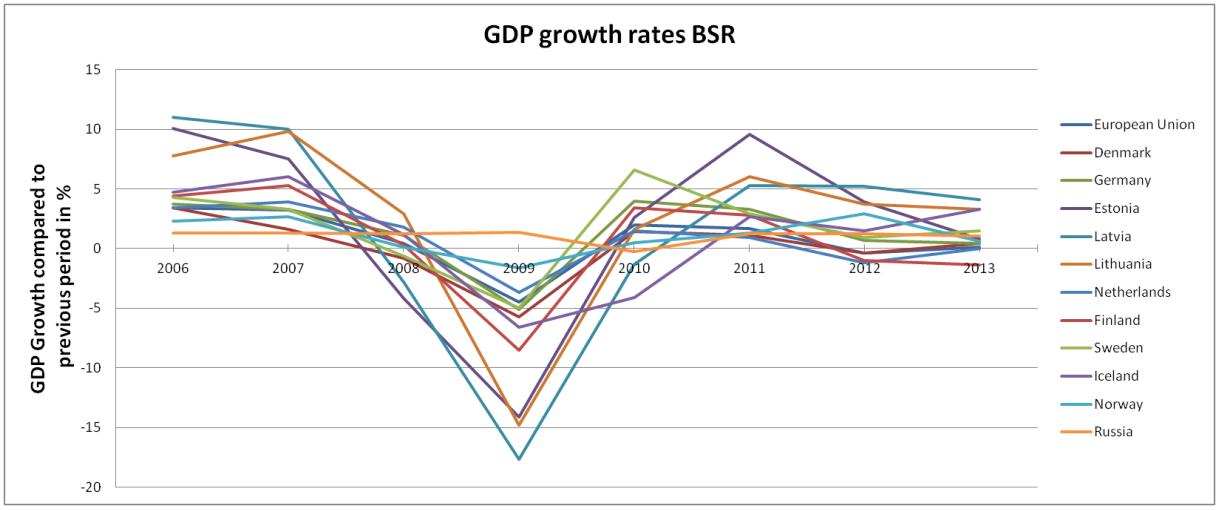


Figure 5: GDP development by country of the BSR (Eurostat 2014)

It can be seen that BSR countries still have not recovered completely from the impact of the crisis, resulting in bigger economic differences between developed countries (Germany, Scandinavia) and transitional countries. The values which are displayed for 2010/2011 reflect an economic recovery in the BSR, and it can be seen that although the growth of the economies is lower than before the crisis, there is still some growth within them (EU 2013).

4.3 Logistics in the Baltic Sea Region and the EU

Due to the geographical location and economical dynamics, logistics is one of the major points-of-interest for the BSR. The transports within the BSR take place through all common transport modes including road, rail, sea, inland water shipping, air freight and pipelines (EU 2013).The largest importance in the intra-European freight transport has still the road transport mode (49 %) followed by the Short Sea Shipping mode (40 %) and the rail mode (11 %), as can be seen in the appendix (Appendix 1). Due to the importance of logistics for the economic development of regions, the EU aimed to build solid

fundamentals for this development by publishing a so-called White Paper of Transport in 2011 (European Commission 2011). This paper points out the importance of the transnational transports on the one side, but also highlights the economic, social and environmental framework of this growing society. Kersten et al. (2012) state that many goods are transported from Russia, a country rich in resources, via the Baltic Sea to the consumers living in central and western Europe.

4.4 The Logistic Performance Index

The Logistic Performance Index (LPI) is yearly measuring the logistic quality of 155 countries worldwide. The evaluation of the LPI is mainly based on six criteria to determine the quality of the logistic market. These criteria are 1) efficiency of transports, 2) quality of infrastructure, 3) ease of arranging competitive prices shipments, 4) competence and quality of logistic service, 5) tracking and tracing ability and finally 6) the frequency of on-time deliveries (Worldbank 2014). Within this measurement, Germany is named as the best logistic performer in 2014. Within the top ten worldwide, three countries of the BSR are ranked: Germany (1st), Sweden (6th) and Norway (7th). Other countries such as Denmark (17th) and Finland (24th) also have a very good logistic performance. Furthermore, countries such as Poland (31st), Latvia (36th), Estonia (39th) and Lithuania (46th) also have a relatively good ranking. Although the performance of the Baltic States does not seem to be outstanding, rather average, the improvement becomes apparent when considering their ranking in 2012: Latvia 76th, Lithuania 58th and Estonia 65th (Worldbank 2012). The ranking of Russia (90th) still has room for improvements in the logistic sector in this country.

4.5 Maritime Transport in the Baltic Sea Region

The importance of shipping within this region is significant based on the geographical conditions of the Baltic Sea. It also provides a link to the important economic regions worldwide. This can, in particular, be seen by the container cargo handled in the port of Hamburg, which is used as a hub for intercontinental incoming and outgoing freight. According to the Baltic Container Handbook (2013) Hamburg is the most frequently used transhipment point for the BSR with 55 fixed services (June 2013). Hamburg is followed by Bremerhaven (41 fixed services), Rotterdam (37) and Antwerp (11). Therefore the hub role of the port of Hamburg for the BSR is dominant and it is likely that it will continue to increase further. In the beginning of 2012 Rotterdam was strongly rivalling with

Bremerhaven for the position of the second port of choice with 46-47 single rotations, but according to the Baltic Transport Journal (2013) the German ports were able to maintain their position. Container turnover was again rising in 2012 with nearly 9.5 million TEU handled (Baltic Container Handbook 2013).

One third of the total amount was handled in three Russian Baltic ports. Also a large step forward was made by Poland with 1.7 million TEU in their three ports. The new role of Gdansk as a transhipment hub for Russia also needs to be considered in this context (Baltic Container Handbook 2013). Most ports and terminals have exceeded their handling peaks from 2011 and are already past the results from years before the crisis (Baltic Container Handbook 2013). The following figure illustrates the top fifteen container ports within the Baltic Sea Region (including Norway), whereas Hamburg as the most important transhipment hub was included with all TEU handled for the BSR[2]:

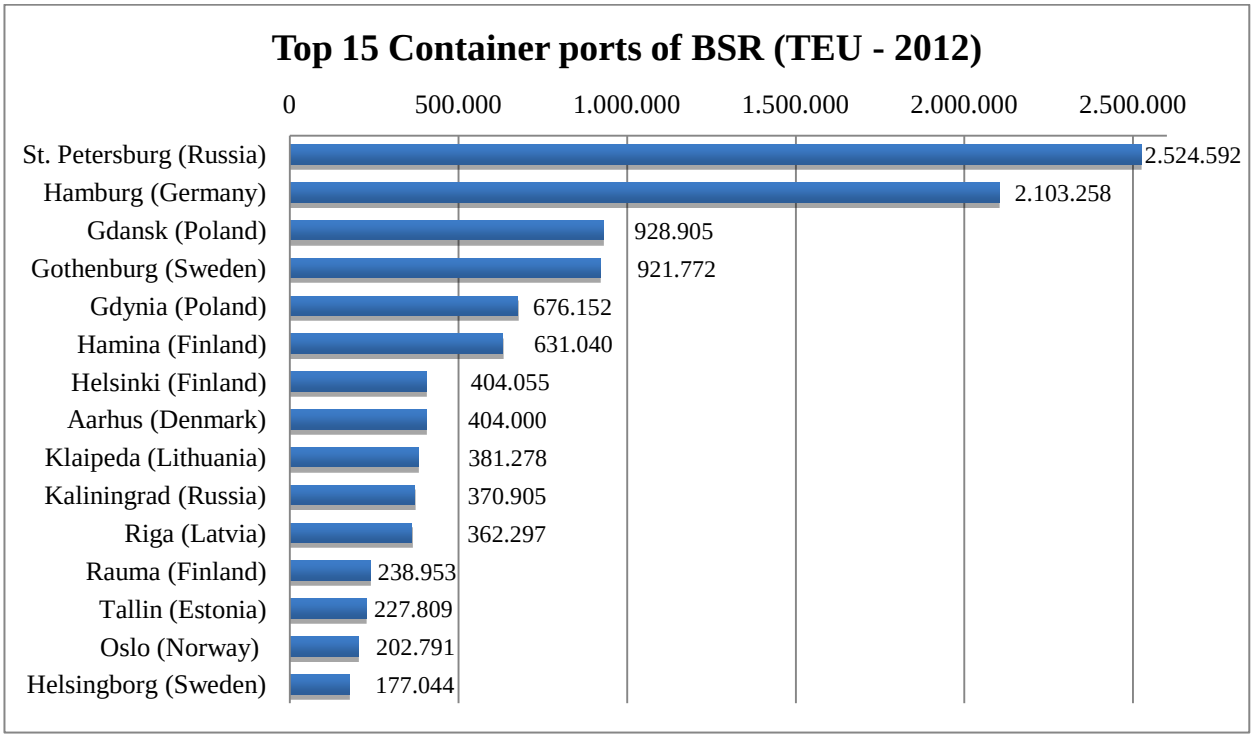


Figure 6: Top Fifteen Container-handling Ports (Baltic Container Yearbook 2013)

The major container growth of the region had taken place in the ports of St. Petersburg (+ 160 thousand TEU), Gdansk (+240 thousand TEU), Gdynia (+60 thousand TEU), Riga (+59 thousand TEU), Kaliningrad (+45 thousand TEU) and Tallinn (+30 thousand TEU). The Baltic Container Yearbook (2013) states that the established Scandinavian ports, for example the ports in Finland, only grew on a moderate level. The sum of 9.5 million TEU

[2] Data ”Hamburg” from internal statistics (Port of Hamburg Marketing)

handled in 2012 within the BSR (excluding Hamburg) is divided in 9.2 million container boxes handled by Lo-Lo and 240 thousand TEU transported by Ro-Ro/Con-Ro, conventional or Lo-Lo-tramping. The latter market is dominated by the port of Lübeck (D), Hanko (FIN) and Kiel (D) which handled together 214,000 TEU.

The container shipping market within the Baltic Sea is characterized by a high density of container shipping companies, which employed a total number of 149 container ships in 2013. Table 2 is listing the container shipping lines operating within the Baltic Sea and their total TEU capacity.

Table 2: Container Shipping Lines BSR (Baltic Container Handbook 2013)

No.	Operator	No. of Ships	Total TEU capacity (in BSR)	Ships average TEU	Market Share
1	MSC	18	31.854	1770	20,17%
2	Unifeeder	30	31.661	1055	20,05%
3	Seago Line	13	17.587	1353	11,13%
4	CMA CGM	16	15.501	969	9,81%
5	Team Lines	10	8.884	888	5,62%
6	Hapag-Lloyd	6	7.497	1250	4,75%
7	Containerships	8	7.005	876	4,44%
8	00CL	5	5.970	1194	3,78%
9	TransAtlantic	9	4.420	491	2,80%
10	Green Alliance	3	3.393	1131	2,15%
11	Eimskip	2	2.930	1465	1,86%
12	Sea Connect	4	2.650	663	1,68%
13	Delta Shipping Line	3	2.604	868	1,65%
14	X-Press Feeders	3	2.561	854	1,62%
15	SCA Logistics	2	2.072	1036	1,31%
16	Mann Lines	3	1.974	658	1,25%
17	MacAndrews	3	1.896	632	1,20%
18	Samskip	2	1.816	908	1,15%
19	K-Line	2	1.387	694	0,88%
20	Tschudi Lines	2	1.016	508	0,64%
21	Green Feeder	2	1.016	508	0,64%
22	APL	1	1.008	1008	0,64%
23	Swan Container Line	1	868	868	0,55%
24	Hackling Seatrans	1	374	374	0,24%
	Sum	**149**	**157.944**	**1060**	**100%**

Although MSC is offering the highest capacity within the market, the biggest fleet of container ships is controlled by Unifeeder with 30 ships. They are followed by MSC (18)

and CMA CGM (16). The market share of each company is calculated from the percentage of the companies TEU capacity on the Total TEU capacity. This was done under the assumption that market power can be defined over TEU capacity instead of by employed number of ships.

4.6 Involvement EU Policies in BSR

In the following section, the involvement of the European Commission which is executing the resolutions of the European Union will be described. Its policy papers can be divided into three groups whereas each group is addressing a particular instance. While the "EU strategy 2020" is describing the plans for the EU as a whole, the "EU White Paper: Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system" is focusing on EU transports in general. Finally the SECA-Directive is focusing in particular on a specific environmental field of interest.

4.6.1 EU strategy 2020

The EU strategy 2020 was launched in 2010 when the crisis eroded the economies within Europe. This strategy aimed to setup goals for the EU which help to maintain an advanced economical position within the world economies. Next to goals such as an employment rate of 75 % for the 20 to 64 year old population of the EU also other goals are affecting the transport sector (EU 2010). One of these goals is the reduction of greenhouse gas emissions by around 20 % compared to 1991. This is directly addressing the European transport sector, due to its high proportion of emissions.

Another ambition of this strategy is the implementation of "A single market for the 21st century" (EU 2011). The strategy is aiming to foster a stronger, deeper, extended single market within the EU in order to balance the trend of economic nationalism caused by the crisis. Even though there is a legal existence of a single market, businesses are still facing different legal systems which are hindering the transnational trade. The strategy is trying to tackle this problem, by fostering cohesion projects within the EU. This point of the Strategy 2020 is directly affecting the international transport. Transports are often facing bureaucracy burdens even within the EU resulting in increased transaction cost. Psaraftis (2005) describes that Short Sea Shipping especially is facing obstacles when it comes to customs procedures, even though the transport is only intra-European. The strategy paper emphasizes that the EU will increase their investment in infrastructure and transport networks under the premise of low carbon emission. In summary, the strategy

2020 from the EU aims to strengthen the import and export position of Europe with all its connected challenges such as transport infrastructure and emission reduction.

4.6.2 EU White Paper: Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system

The White paper was published in 2011 and refers to the EU strategy 2020. This paper directly addresses the transport plans of the strategy paper and lists details how to achieve the goals. The EU is aiming to create a more competitive transport system where larger volumes of freight are consolidated and individual transports are only for the last mile.

The maritime transport sector is directly addressed by naming that the emission of greenhouse gas should be cut down about 40 % (optimal 50 %) by 2050 compared to 2005 (EU 2011). Another emphasis within this paper is the creation of the single European transport area. Hereby the paper puts a particular focus on the mode air, rail and maritime shipping, based on the existing bottlenecks caused by technical and/or legislative obstacles. The implementation of a so called "Blue Belt" in the seas around the EU is aiming to simplify the formalities for ships operating among EU ports. Within the paper a goal is "[...] the removal of restrictions on cabotage, abolition of barriers to short sea shipping." (EU 2011) As an initiative to reach this goal, the EU is planning to foster investments in IT, reviewing restrictions on port services and enhancing the transparency of port financing in order to avoid distortion of competition.

4.6.3 SECA-Directive

The emission of exhaust gases and particles from seagoing ships is significantly contributing to the total emission from the transport sector (Eyring et al. 2005; Corbett and Fischbeck 1997) and is therefore affecting the chemical composition of the atmosphere, climate and regional air quality. Eyring et al. (2010) state that 70 % of emissions from oceangoing vessels is occurring within 400 km of the coastline along the main trade routes. Next to the CO_2 emission, side emissions, which are usual in maritime transports, such as SO_x and NO_x, are contributing to the acidification of shallow coastal waters. These so called "anthropogenic" has a significant impact on the ecosystem and can be transported large distances by air from its sources. Since ship exhaust gases contribute to the worldwide pollution of the air and sea, several international, local and regional legislators have implemented more and more rules and regulations for the emission of ships.

Already in 1998 the International Maritime Organisation addressed this topic and suggested emission regulations (IMO 1998). This regulation planned a certain emission regulation for international operating ships following a detailed schedule called “ANNEX VI of MARPOL” (the international Convention for the Prevention of Pollution from Ships). Within this directive IMO declared the goal of emission decrease of NO_x of about 30 %, based on lower engine speed of international operating vessels. From the beginning of the year 2000 all new ships had to comply with this regulation and have a “NO_x optimized engine” meeting the requirements.

The other part of the protocol addresses the emissions of SO_x. Effective from May 2005 the IMO set limits for deliberating emissions of ozone depleting substances. On this day the sulphur content of shipping fuel was limited to 4.5 % for all ships. Furthermore the Sulphur Emission Control Areas (see Appendix 2) were installed in 2006, beginning with the Baltic Sea (North Sea in 2007). On the base of the above mentioned “ANNEX VI of MARPOL”, which addressed the global shipping community, the EU setup a specific directive (SECA-Directive) for the Emission Control Areas within the EU.

The EU saw a special demand for such legislation, due to the high population density within the coastal areas of the northern area of the EU. Furthermore the IMO considers the Baltic Sea as a “Particularly Sensitive Sea Area” which needs special protection due to “[...] its significance for recognized ecological or socio-economic or scientific reasons and which may be vulnerable to damage by international maritime activities.” (IMO 2014a). Therefore the SECA-Directive sets up stricter environmental rules for this area, particularly for the sulphur emission, to preserve the life quality of populations living at the coastal area (EU 2012).

The following picture illustrates the connection between IMO and the EU directive and the sulphur limits:

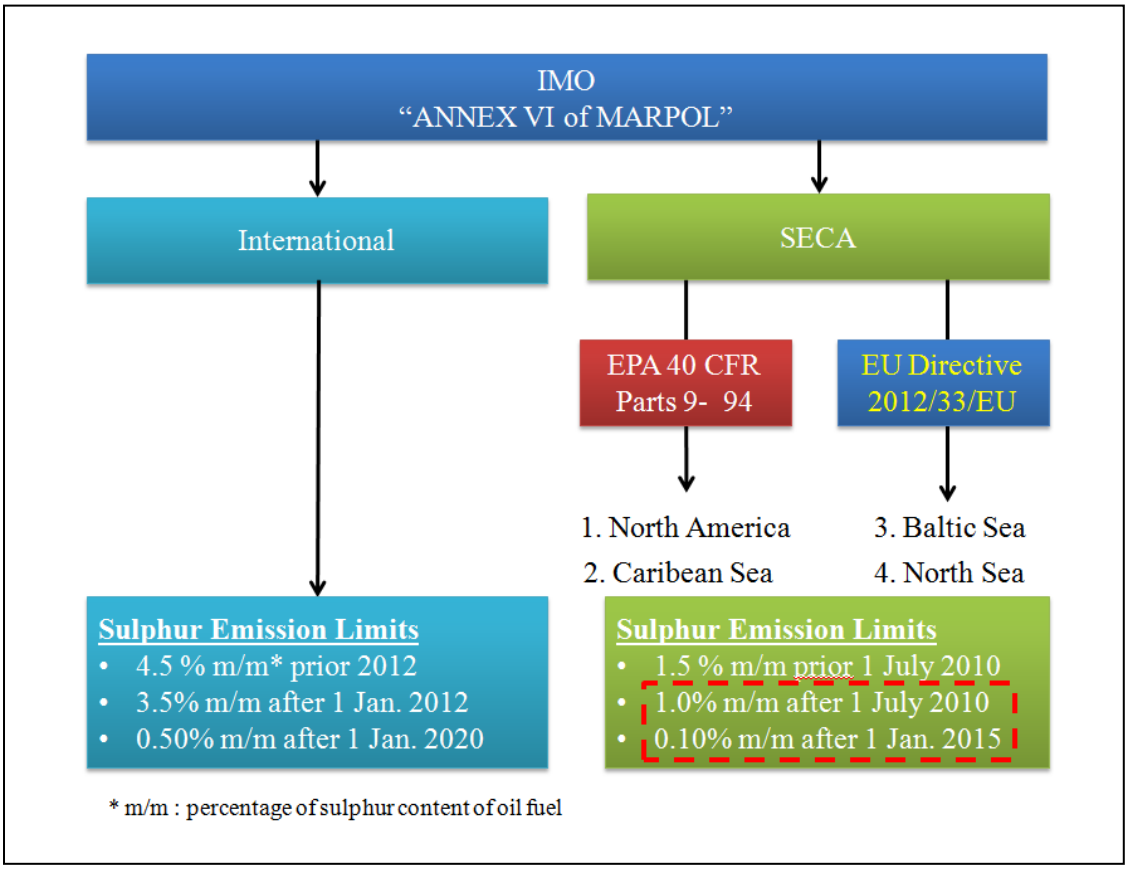


Figure 7: Overview Sulphur Emission Legislation Framework (orientated on IMO 2014b; EU 2012)

Remarkable is the concentration of the Directive on fuel the ships are using. When implementing this legislation, the EU was aware of the effects which might occur, such as scarcity of high quality fuel resources, higher prices for this fuel and the competitive situation with other transport modes. Therefore the Directive also considered technical emission abatement methods such as some types of scrubbers which clean the exhaust of the ships. The directive emphasizes that these methods can provide the same effect as by using the low sulphur fuel. Furthermore the Directive suggests the usage of alternative fuels, for example liquefied natural gas (LNG) or bio fuels. Finally the Directive is aware of the fact that it is, in a way, building obstacles for the transport mode "sea" and is trying to mitigate the risk of a modal shift to the street by suggesting the possibility of State aid from the member states.

5.0 Literature Review

5.1 Definition of Short Sea Shipping

Within the academic literature the term "Short Sea Shipping" (SSS) is often used without a previous definition. Nevertheless by using a focused research, certain definitions can be identified. The European Commission defines SSS as "[…] the carriage of goods by ships among the ports located in the geography of Europe or among these ports placed in non-European countries having a coastline on the enclosed seas around Europe."(Leinbach and Capineri 2007). Another definition provided by Stopford (2009) defines SSS as a distribution service from regional main cargo ports, such as Rotterdam, to other ports. Additionally Stopford (2009) uses the ship size as an identifying feature and determines the limit for SSS-vessels between 400 dwt and 6,000 dwt. There is however no firm rule regarding the size, as it can be seen in the average size of operating vessels in the BSR (Table 1). A third definition is provided by the ECMT (2001) describing SSS as "[…] a maritime transport between ports in mainland Europe, including a) intra-European national coastal shipping, between two ports of the same country; b) intra-European international shipping whose ports of origin and destination are European ports; c) the European leg of inter-ocean trades." The same institution (ECMT 2002) later defines SSS as transports involving a sea or ocean leg without ocean crossing. Moreover Paixao and Marlow (2002) divide SSS into three sub sectors: the feeder market, the intra-European market and the cabotage market. In conclusion it can be seen that there is neither a clear definition of SSS within the academic literature nor a common understanding among the professional maritime institutions. For the continuing evaluation of the thesis the following definition will be used:

"Short Sea Shipping is the transport by ships between European ports as well as non-European ports without any ocean crossing and can take the form of a feeder service, pure intra-European transport or cabotage service."

5.2 Characteristics of Short Sea Shipping

5.2.1 Categories of Short Sea Shipping

Based on the foregoing definition of SSS, the following section will explain several types of SSS in order to provide a complete understanding of this particular field. Paixao and Marlow (2002) divide SSS into four different categories.

The first category consists of traditional single deck bulk carriers. These are used for the transportation of neo-bulk cargoes such as forest or steel/metal products. In certain cases these types of vessels are also able to carry traditional bulk cargos. This however demands specific construction flexibility of the ships.

The second type Paixao and Marlow (2002) mention are container vessels, which replaces the general cargo vessels and can carry high value cargoes and provides a link to ocean-bound container vessels. These vessels consist mainly of a TEU capacity ranging from 150 to 500 and operate under the schedule of the intercontinental operating big vessels, whereas bigger ship sizes are currently more common. According to Paixao and Marlow (2002), within Europe these types of vessels are operating in four main areas: the Mediterranean Sea, the English Channel, the Atlantic Coast and the Baltic Sea.

The third category within the SSS business comprises of ferries. This category is described by Paixao and Marlow (2002) as an extension of road transport, and in some cases, given a commitment of high capital investment, also the extension of rail. This class of ships is capable of transporting both, passenger as well as the wide range of cargoes including palletised cargo, accompanied or unaccompanied trailers, semi-trailers, swap bodies, railway wagons, cassettes or project cargo. Paixao and Marlow (2002) identify this category as having a strong presence in the Baltic Sea Region.

The fourth category is the bulk carriers and tankers with a dimension of less than 3000 deadweight tonnes and is engaged in the pure, conventional dry and liquid trades such as mineral oil products, chemicals, liquefied petroleum gas (LPG), coal, iron ore and grain.

The fact that more and more break-bulk cargo and even bulk cargo is becoming containerized creates an association of European SSS that is equal to Container SSS (Paixao and Marlow 2002). The trend of transporting unitised cargo is fostering the competition between the transport modes because a substitution becomes less complex. SSS is competing on two different levels. While the Ro-Ro services are competing with SSS on the near sea with road transports, based on cost and physical geography, Lo-Lo services are competing on longer distances, which imply a competition with the rail mode. The cost of a Ro-Ro mode over long distances is lacking cost competiveness due to the costs which occur by operating trailers accompanied with drivers. This point is supported by Peeters et al. (1995) who state it only becomes economic to carry driver accompanied trailers if and when the Ro-Ro ferry transport is covering the resting/sleeping time of the driver. Due to SSS being a special example of a break within the logistics chain, the Lo-Lo

service is only economical when transport cost savings take place during the SSS voyage. By considering this fact it is clear that a perfect synchronisation of the interface logistics operation has to be developed since idle cargo adds no value.

5.2.2 Short Sea Shipping Markets

Paixao and Marlow (2002) differentiate SSS into three main areas: the feeder market, the pure intra-European market and the cabotage market. The feeder market can be seen as a continuation of the deep sea shipping market based on the establishment of hub and spoke transport systems within the maritime transport industry. Therefore the feeder market is suffering from the same mode competition pressures as the ordinary pure European shipping market. However, the feeder services are seen as an extension of door-to-door services. Paixao and Marlow (2002) continue their description with the thirdly named category of SSS, the cabotage market, which can be integrated into the previous categories as pure domestic and island trade. It is therefore possible to summarize the three different possible types of SSS into one big market. SSS is a shipping market which is either pure intra-European transport where the final destination is already reached or a feeding extension, national (cabotage) or transnational.

5.2.3 Types of Short Sea Shipping Services

The SSS market can offer three diverse types of SSS services, and can be divided into the supply and demand side. Turning to the demanding side there are the customers who are served by the supply side, the liner shipping companies, shipping agents, freight forwarder, port organisations, stevedoring firms, inland transport operators or a combination of these in the shape of non-vessel operator common carrier (NVOCC) or multimodal transport operator (MTO). Paixao and Marlow (2002) use the logistical point-of-view to create three classifications for SSS in order to determine the ways in which SSS can be implemented in the logistical chain and how the market demand can be served. Hereby they are using the service level as a classification criterion.

The three different classifications can be seen in Table 3 (Paixao and Marlow 2002).

Table 3: Types of Short Sea Shipping Services (Paixao and Marlow 2002)

Logistic classification of short sea shipping	
Type of Service	**Sub-types of Service**
Dedicated SSS	
Systems SSS (multi-port)	• Self centered service • Disenclavement service • Network mixed service
Standard SSS	

On the one had there is the highly specialized service ("Dedicated SSS") customized to the demanding party. This part includes a deep involvement of certain players, meaning there needs to be a close cooperation among all players involved in the supply chain to meet the requirements of the shipper and/or the customer.

On the other hand there is the standard SSS service offered by liner services. These liner services offer a frequent, scheduled and customary seaborne transport between predefined ports. The involvement of the players on the supply side, mentioned above, is more standardized and no special service for the costumer is offered.

Between these two SSS types derives a third type of SSS service balancing between standard liner services and customized designated services. This type is called System SSS and is a hybrid between standard and dedicated SSS. It can occur in three forms as illustrated in Figure 8. This type-differentiation allows building up the appropriate connection between SSS and Supply Chain Management. Depending on the demand on the customer side the supply side of the SSS is able to offer an appropriate service. Paixao and Marlow (2002) identify different elements that can be part of SSS and that can show the wide service/product-range of SSS: multimodal/intermodal, intra-EU cargo, unitised cargo units, floating stock, information and facilities network.

The ultimate aspect requiring consideration in order to provide a complete SSS description is the explanation of the different kinds of characteristics of companies acting within the market. Companies operating in the SSS market can either own a considerable number of their own ships with which they serve the market or they own only one or a very small number of ships often employed under shipping pools.

In conclusion this chapter can be summed up in the following illustration:

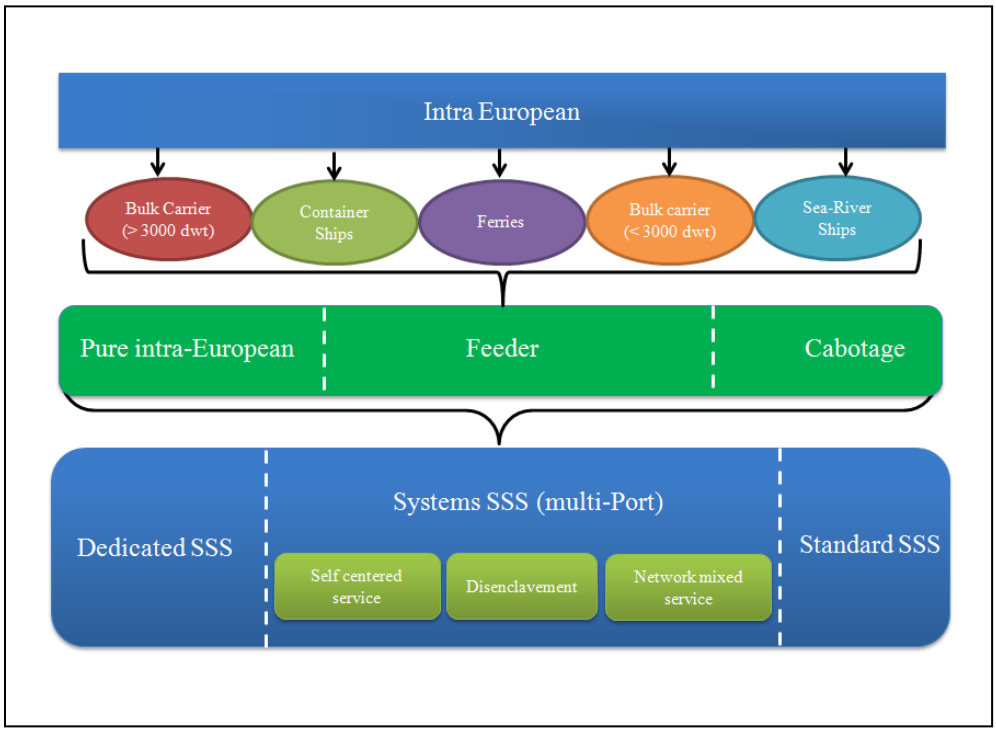


Figure 8: Short Sea Shipping – Graphical Summary

5.3 Strengths and Weaknesses of Short Sea Shipping

5.3.1 Strengths

As a major strength favouring the SSS, the geographical environment of the EU can be seen: the facile accessibility of ports (Islam et al. 2011) combined with the long total EU coastline, exceeding 67,000 km (Paixao and Marlow 2002), builds a good competitive situation for SSS. Additionally Paixao and Marlow (2002) state that 60 % to 70 % of all industrial and production centres of the EU are located within 150 to 200 km of the coastline.

Another big strength of SSS is the possibility to carry higher volumes than other modes and thus resulting in a better use of economies of scale (Islam et al. 2011). The economies of scale allow SSS to offer services at lower freight rates and therefore exploit an underused available capacity without incurring high capacity-related investment costs. Rojon and Dieperink (2014) describe SSS as the only transport mode making it possible to carry bulky goods and raw materials at an affordable price. This plays a particular role in the door-to-door transport of certain cargo types, namely dry and wet bulk by coastal and sea-river vessels (Paixao and Marlow 2002). Based on its geographical advantage and the

named capability to carry high volumes of goods, SSS is able to foster the integration, cohesion and economic development of remote areas within the EU or even beyond.

Based on the fact that SSS an extremely capital-intensive industry is, the market has higher entry barriers than for example the road transport. This gives players already in the market the advantage to develop transport systems/networks where the most capital intensive mode is already present (Paixao and Marlow 2002). Islam et al. (2011) as well as Paixao and Marlow (2002) both name the unlimited capacity of the sea as another advantage. While there is an era of congestion on landside modes, the capacity of the sea is virtually unlimited and the demand of infrastructural maintenance or extension is by far lower. SSS does not require sea lanes but only superstructure along the coast that may contribute to safety of navigation. As a result the investment in infrastructure can also be seen as an investment in the attractiveness of SSS, for example a vessel traffic management information system which helps to guard the effect of the broken transport chain. Considering the timetable restrictions of driving hours in some countries of the EU the sea offers a seven day-a-week transport possibility. New tax schemes for road transport, such as Eurovignette in which a function of distance travelled and number of days remaining in a country defines the amount to pay, are also favouring the maritime transport mode. Paixao and Marlow (2002) continue that consequently the cost of port maintenance and port investments is low compared to all land transport modes, especially by considering the external costs such as congestion and pollution.

The only external cost necessary for an SSS business and might be carried by "not directly involved participants" is an adequate port infrastructure which needs to handle entry and exit of goods by avoiding congestion. This however has to be organized on a mutual base with the involvement among different players to prevent the existence of bottlenecks in transport chains. According to Paixao and Marlow (2002) this situation implies that SSS does not need innovation in the form of new investments in infrastructure, but the performance can be easily increased by the cooperation of SSS and business related players. The implementation of a new philosophy would increase the flexibility, creativity, integrity, leadership and openness to learning, which will help to handle market uncertainties and new logistical challenges like Just-in-Time (JIT). Related to the capital intensity, which gives the players of the SSS business a competitive edge, there is also the skill and knowledge level of the players acting as a high entrance barrier (Paixao and Marlow 2002). Based on the major implications of accidents on sea, e.g. the EXXON

Valdez, the level of legislation on a national and international level is very high. Therefore the knowledge and skills of SSS actors are more difficult to be imitated than those of their competitors from the land modes.

In 2012, the energy consumption of the transport sector accounted for 31.8 percent (Eurostat 2012) of the total EU energy consumption. By considering the low energy consumption which water transport requires in general (Eurostat 2013), SSS can contribute to the reduction of energy consumption within Europe. As another external cost Paixao and Marlow (2002) name the average daily congestion of 4,000 km within the road network in the heart of Europe. This congestion, associated with social cost, can only be removed or reduced by investing in new infrastructure which needs to be made on the expenses of other social cost.

Additionally Islam et al. (2011) mention much lower CO_2 emission per ton-km as one of the big strengths of SSS. Thus the external cost can also be extended to the smallest emission of CO_2 which SSS have on all transport modes. The following illustration shows that the respective percentage of CO_2 emission, combined with the rail mode, are the lowest (SSS included in Navigation):

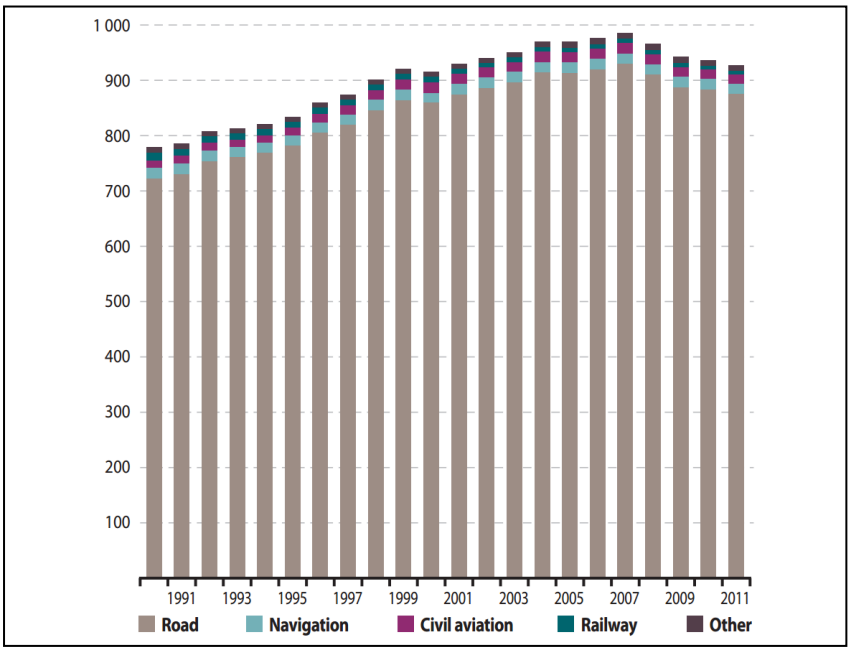


Figure 9: EU-28 Greenhouse gas emission from transport in million tons (Eurostat 2013)

This low emission standard helps countries to reach the carbon monoxide (CO) and hydrocarbon (HC) targets established by the Kyoto protocol (Paixao and Marlow 2002). The CO_2 emission (g/ ton-km) is highest for the truck, 0.063, compared to container vessels with 0.037 and Ro-Ro vessels 0.053 (Hjelle and Fridell 2010). Based on the fact

that the emissions exhausted by the maritime industry are remaining harmful, collaborations between shipping lines try to implement innovative environmental standards as it will be described later in the thesis. Esty (1994) observes that the willingness and ability to be innovative is a decisive factor for economic success rather than the traditional factors of competitive advantage (cost and differentiation).

Paixao and Marlow (2002) continue that there is an increasing environmental regulatory pressure on industries such as SSS which is fostering businesses to be innovative. Next to incurring cost of these regulations the pressure is helping to improve the total quality of the business, which will in the long term compensate the incurred cost. Lastly, by conserving the environmental friendliness of SSS the number of fatalities related to SSS is relatively low compared to other modes, in particular the road.

The advantages of SSS can also be seen by the consideration of the economical point-of-view (Paixao and Marlow 2002). The intra-European ship industry can actively contribute with their knowledge and skills to the success of SSS in the form of adaptation of the ship design to SSS business. Already 50 % of all ships produced in Europe are designated to this particular market. This means that the comprehensive knowledge is not lost, even though a pressure to reduce the cost is arising from the Far East. The value of "Knowledge/Information/Skills" is actually seen as the most valuable asset of companies based on the fact that it is not easy to be imitated and can be acquired only over time. Additionally advantages of SSS are the higher safety levels of dangerous goods, based on the long distance of this cargo to humans, which would not be the case when using road transports. Furthermore SSS is capable of carrying large indivisible heavy unit loads which would be a problem for other transport modes. Finally SSS is one of two underused transport modes which leave space for a higher and intense capacity usage (the other one is the rail mode).

In conclusion the advantages of SSS can be summed up to seven main points (Paixao and Marlow 2002):

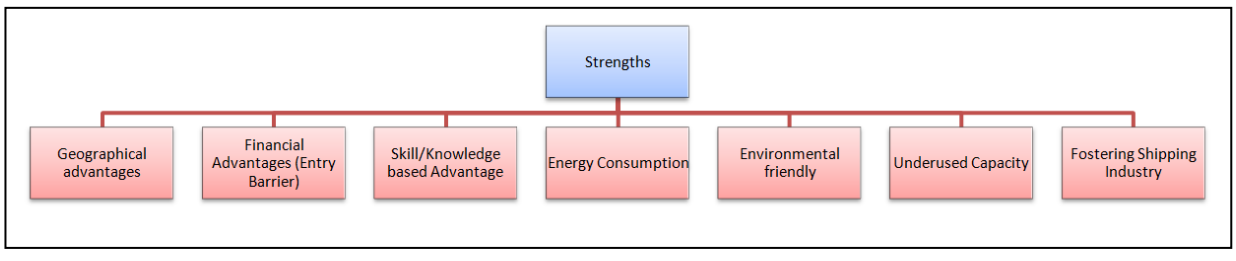


Figure 10: Major Strength of Short Sea Shipping

While all the named reasons are supporting the maritime short sea shipping transport mode, there is still room for SSS to improve and further room to exploit its potential as it will be outlined later in the thesis.

5.3.2 Weaknesses

Although a list of strengths was described before, SSS also has a number of shortcomings which stand in contrast to the named points of strengths. The first weakness Paixao and Marlow (2002) mention in their essay is the incapability to offer door-to-door transport service, with the exception for liquid and dry cargos which can be directly delivered to dedicated and private terminals. This problem arises based on the fact that SSS is a part of a broken transport chain (Medda and Trujillo 2010). Consequently SSS is depending on the collaboration with other land sided modes in order to provide a door-to-door service. This kind of collaboration is necessary for the pre and end carriage legs of the transport chain and requires therefore an inland infrastructure such as port terminals. Therefore the implementation of organisational culture of shipping companies is very important towards the development of a common corporate structure which is focusing on improving the SSS business and its customer service.

Port operators are in charge of carefully planning the development of a port layout so that the operations can be carried out smoothly and the occurrence of any sort of waste and friction which will affect the whole network can be minimized. The time variable becomes extremely important in the choice of transport because of the related inventory cost for the shipper. Paixao and Marlow (2002) state, studies have shown that road haulage has a cost advantage of 35 % against SSS. This means in practice that the transport mode which includes an SSS leg needs to be 35 % cheaper in transport in order to remain competitive against the uni-modal road transport. The interesting point in this comparison is that the service which SSS offers has already internalized all external cost, such as congestion and noise, which needs to be added for the road transport. By not considering the external cost in this calculation, an artificial demand for road transport is created.

Also contributing to the opportunity cost is the lack of cooperation between seaborne and landside modes with respect to interconnectivity, interoperability, or the availability of broad information technology/information system (IT/IS) which support the whole transport chain in terms of flexibility (Paixao and Marlow 2002). Road transport is, in terms of flexibility, the benchmark for all logistic strategies based on their frequent

departures and delivery possibilities, whereas SSS is far behind this benchmark (Medda and Trujillo 2010).

This lack of flexibility is also related to another problem. The benefits for shippers in terms of economies of scale and distance offered by this mode only arises when the critical mass is reached, which compared to other modes is much higher in SSS. Rail and road use small mobile units and therefore can diminish the economy of scale. Paixao and Marlow (2002) explain the phenomenon by naming the critical mass for an average truck as 40 tonnes and the one for the train, depending on the size from 1,000 to 3,000 tonnes. Additionally SSS uses, compared to other transport modes, a very expensive cargo handling infrastructure such as seaports and dry ports which increase the cargo handling costs as a result of cargo transfer operations, whose performance is critical for the success or failure of the mode integration.

There are namely two types of cost which can be seen as having some kind of inefficiencies. Firstly there is usually additional storage costs connected to the cargo handling based on the inefficiency of the cargo flows, until cargo is despatched to the destination. Based on the fact that storage is not adding value to the cargo, this is one kind of inefficiencies which is incurring within the ports.

As a second type of inefficiencies Medda and Trujillo (2010) mention the administrative burden SSS cargo handling requires. The paper work, which is connected to the road transport, is by far lower than the one for SSS. It can be shown that SSS is the transport mode within the EU with the highest rate of bureaucracy in regard to cargo handling (Psaraftis 2011). These documentation requirements can be divided into five groups: navigation control, cargo operations, reporting in and clearance outwards, checks on ship safety and reporting for custom clearance (EU 1998). The most interesting point hereby is the necessity for custom clearance documents, even though, in most cases the cargo origin is within Europe. Psarafti (2011) for example mentions that in comparison a truck from Barcelona to Hamburg is free from customs procedures while a shipper is facing customs procedures even though the origin and destiny is the same. The effects are the time variable as well as the cost variable, due to the required effort from the shipper for fulfilling these procedures.

Another factor negatively affecting the time variable of the transport is the length of time ships stay within the port or related water ways (Paixao and Marlow 2002). Under certain circumstances, for example when the port is an inland/river port, additional supplementary

safety navigational procedures need to be considered. One example in this context is Antwerp, where it takes approximately one day to ply the river because of the low speed requirements for safety reasons. This concept of slow speed due to safety reasons is important because of the competitive advantage of faster ships, which try to compete with faster land modes, is ceased when the shipper decides to call this particular port (Levander 1992). This problem is not unusual within the northern port environment for example the port of Hamburg also has this requirement, which is affecting the SSS business. Additionally, Medda and Trujillo (2010) mention that the reliability of the transport mode SSS in terms of departure and arrival times is rather low due to many unpredictable factors such as weather and sea conditions. Considering the efficiency of the emission values of sulphur oxide (SO_x) and nitrogen oxide (NO_x) SSS is lacking behind their competitors on the land side. Hjelle and Fridell (2010) describe that the emission of SO_x is standing with 0.32 grams per ton/km for the Ro-Ro vessel in contrast to a Euro4 truck with 80 µg/ tonne-km. Additional emissions such as NO_x are also highest for container ships and Ro-Ro vessels compared to other land modes (Hjelle and Fridell, 2010).

Another weakness of SSS comes from the infrastructural side: Within the transport infrastructure of Europe there is often a lack of a good connection between SSS and other land modes, especially the rail mode (Paixao and Marlow 2002). This fact is often hindering the development of strategic partnerships with other transport modes which is crucial for the success of SSS. Hsu, Huang and Yu (2009) mention the lack of partnerships as a big obstacle in implementing a compatible Information System which would speed up SSS involved cargo handling. This lack of partnership results in inefficiency. The missing compatible infrastructure is mainly based on the complex hierarchical structure within ports which is not beneficial for the implementation of cooperative partnerships. The decision making process within the port has many different levels and is often lacking a joint management, which could support SSS business in regards to transit times, punctuality, flexibility, availability and frequency of services, the timing of departures and frequency of services (Paixao and Marlow 2002; Medda and Trujillo 2010). These performance indicators are crucial for the success of SSS because they are the fundament for an intermodal partnership and need to be considered by all players within the port.

Medda and Trujillo (2010) observe that the port infrastructures itself is often not prepared for SSS and is not favouring this type of business. As an example, quay lengths or

numbers of berths can be named. These often cause queues of ships, especially from SSS, which sometimes are disadvantaged in front of deep sea carrier. Additionally there can be a lack of adequate cargo equipment or downtime of this equipment which creates inefficiency within the port environment. This results in lower handling rates and associated cost increase, which is further emphasizing the lack of transparency of port charges.

Donnelly and Mazieres (2000) state that port charges in short trades including the transfer cost can account for 70 to 80 % of the total cost. The lack of transparency of port charges also creates an obstacle to identify real port costs as well as the comparison of port cost in context to economic performance of the port. This lack of transparency is a big obstacle in creating a fruitful cooperation between the shipping industry and the port operator.

The lack of cooperation and transparency between the port and the shipping industry is also causing knowledge gaps on behalf of the ports regarding needs and future trends within the shipping industry (Paixao and Marlow 2002). These knowledge gaps are also affecting the loss of information about end customer needs which hinders customer orientated innovations crucial for the competitiveness of this transport mode.

By building a comparative bridge to the airline industry it can be stated that the development of service performance indicators (SPI), which are common in the airline industry, is currently not possible for SSS on an appropriate level (Welsh 2000). Paixao and Marlow (2002) describe that the lack of "service-focus" is contributing to the bad image of SSS and demands a modernization to increase attractiveness. SSS is still using traditional performance indicators which highlight their strengths in contribution to the gross domestic product (GDP), the number of people involved in the sector, the number of ship movements and its evolution, or cargo handled in terms of quantity or value. These indicators are however not very suitable to create a modern logistics strategy, whereas Paixao and Marlow (2002) suggest indicators such as timeliness, consignment care, compliance and corporate efficiency. The image of SSS in front of freight forwarders does not have a very good reputation for two reasons. Firstly, the SSS is not very transparent in terms of precise and comprehensive market information. This prevents the development of intermodal services and long term partnerships with customers, which would offer a competitive advantage as it can be seen with other transport modes. Marlow and Glen (2009) add to this, stating that the availability of useful SSS statistics is rather low. These statistics are crucial in order to make an appropriate market analysis and reveal market

potential and market niches for strategic partnerships. The second reason is that SSS operators have a very entrepreneurial attitude lacking corporate structure and culture. The SSS business operators have a rather passive movement towards new marketing strategies embracing customer focus, growth and building up of new (innovative) transport concepts, as well as partnerships or alliances with other mode operators (Medda and Trujillo 2010). Van Gunsteren et al. (1993) summarize this lack of innovations when they state that SSS is actually a business of single operators rather than of professional and goal-seeking network of operators who are trying to meet the more and more customized logistical needs of their customer. Even though this statement was done in 1993, Medda and Trujillo (2010) confirm this attitude or at least the idea that SSS has an old-fashioned image.

In the end Paixao and Marlow (2002) name a list of other barriers SSS is facing as an obstacle for success. The first point is the time restrictions for labour within the terminals. These are sometimes affecting the stay of the ships in the port and therefore resulting in extra costs and delays. Finally, a list of shortcoming can be named such as insufficient traffic coordination, managerial problems, delays caused by locks and bridges, and lack of adequate storage facilities. Additional, from the managerial point-of-view, SSS is suffering from weak coordination links between the shippers and the customers and a limited internal willingness for innovations connected to the lack of an externally-orientated information system which would improve the relationship to the customer and to other transport modes (Wijckmans et al. 1996; Medda and Trujillo 2010).

In summary the weaknesses of Short SSS can be divided into following main groups as it is illustrated below:

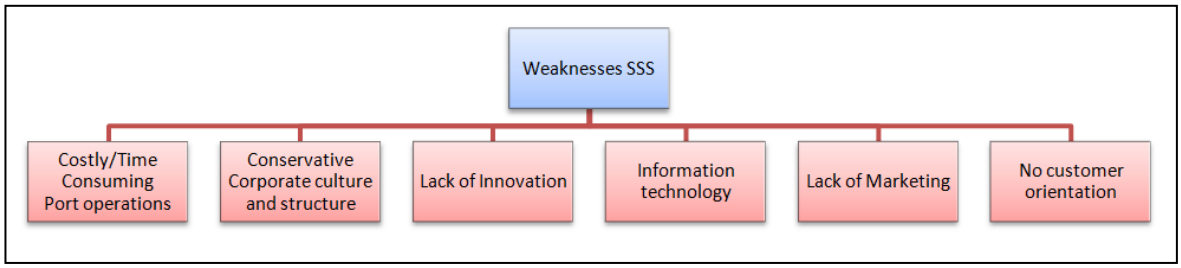


Figure 11: Major weaknesses of Short Sea Shipping

5.4 Short Sea Shipping in Supply Chains

While the previous section described the strengths and weaknesses of SSS, the following will describe potentials of SSS within a complex supply chain.

This approach is provided by Fusco, Sauri and De Melo (2013) who evaluated the role of Short Sea Shipping within the supply chain. The authors leave the operative level considering only the pure port-to-port transport and upgrade it to a more strategic level. Fusco, Sauri and De Melo (2013) stated that there is a high potential of SSS to be implemented in supply chains of particular industries.

According to Baird (2007), in the intracontinental scope maritime transport loses importance as it is less favoured compared to others in the road transport mode. This mainly results from the fact that the road has externalized the infrastructure costs, giving it a competitive edge. Nevertheless the competitive situation between SSS and road has been widely studied, with a main focus on point-to-point routes. The implementation of SSS into the supply chain of a company falls short in this consideration. Fusco, Sauri and De Melo (2013) are considering the type of Ro-Ro and container transport (Lo-Lo) as possible SSS forms to be implemented in the supply chain. According to Peeters et al. (1995) and Medda and Trujillo (2010), SSS is in general competing with the road haulage in dimensions of time and costs. This is extended to dimensions such as flexibility, reliability and resilience when the involved ports are Motorways of the Sea (Periakis and Denisis 2008). In this context a particular role is played by the Ro-Ro operator. According to Hjelle and Fridell (2010) the environmental advantage SSS has in general, is much smaller for Ro-Ro ships reaching similar numbers to the road transport, considering the environmental footprint. According to Sauri and Spuch (2010) the environmental competitiveness is expected to increase by considering the environmental legislations of the future, particularly the forthcoming SOx emission limitations in 2015. Next to the advantages, the usage of SSS will bring more complexity within the transport chain and makes it less reliable. Therefore the decrease in time and/or costs by choosing SSS has to be significant to be competitive against unimodal modes (Feo, Espino and Garcia 2010). Based on the fact that the maritime leg of the intermodal transport chain accounts for most of the cost, the shipper is vulnerable to the behaviour of the shipping line (Morales-Fusco, Sauri and Lago 2012). The criteria why shippers are choosing sea transport vary within the literature. Fusco, Sauri and De Melo (2013) describe the choice of the mode as depending on quantitative and subjective, qualitative parameters. Some studies also state that the

subjective parameters, like served quality, are leading to the choice of mode (Lu 2003). However, it is usually considered that the most determinant criteria are the types of cargo and the business structure of the transporter combined with the force of habit and reluctance to change (Danielis et al. 2005). The qualitative aspects considered can also include the safety of cargo, together with reliability or even resilience and adaptability (McKinnon 2007). These findings are congruent to the findings of Swahn (2006) who conducted a survey in which transport buyers where asked which criterion is most decisive for their choice of transporter or transport mode. Figure 12 shows the results of the study:

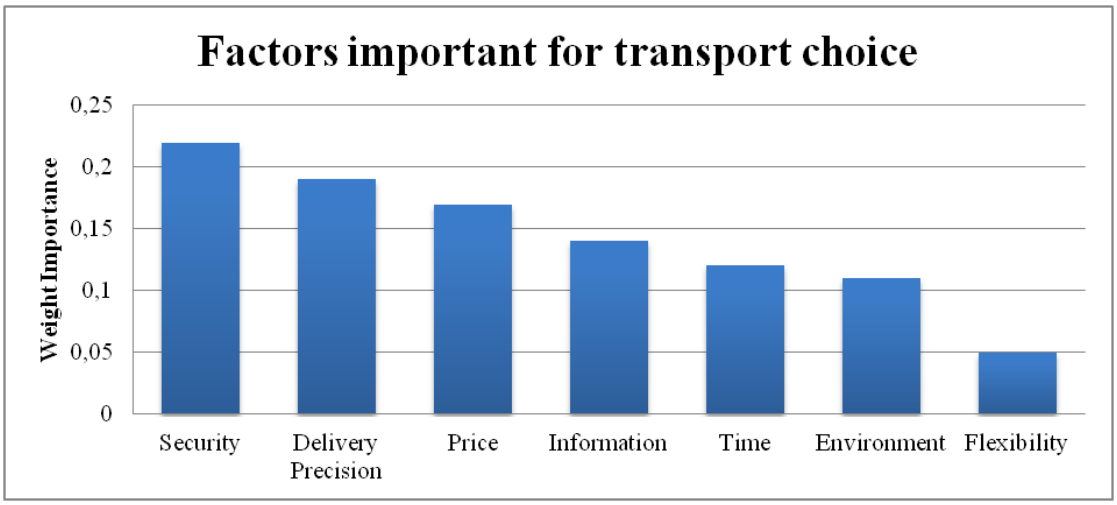


Figure 12: Shippers choice of transport mode (Swahn 2006)

The same author also had conducted a survey with forwarding companies and asked them which criteria they expect to be weighted most. Here price criteria were named most frequently (Swahn 2006). The foregoing selection criteria are focusing mostly on the operative level which means the selection of a transport mode for a particular shipment. The approach used by Fusco, Sauri and De Melo (2013) addresses the strategic level of companies' supply chains. On this level selection criteria become more complex, due to the connection of supply chains to production characteristics. These production systems have particular characteristics which can be divided into five fields: 1) Location: Production vs. Supplier vs. Customer, 2) Production-Process, 3) Demand, 4) Goods (cargo) and 5) Stock Policy.

These production characteristics can be translated into requirements or challenges for SSS as a transport mode (Fusco, Sauri and De Melo 2013). The first two characteristics (Location and Production-Process) are defining the geographical concentration of volume. The availability of enough cargo to achieve an adequate capacity level is essential for a short sea shipping operator. Based on the larger capacity, higher cargo volumes are needed

to achieve a competitive edge against the road transport mode. Based on its flexibility, Fusco, Sauri and De Melo (2013) describe the truck "winning" the competition when the frequency and volume of cargo is low.

The characteristic number three (Demand) is challenging short-sea operators in a way that supply chains are characterized by demand fluctuations based on uncertainty and seasonality (Fusco, Sauri and De Melo 2013). These variations in demand are threatening short sea shipping operators due to a possible lack of capacity utilisation (Haralambides 2004). However, SSS is also able to absorb fluctuations within the demand better than other transport modes, based on the bigger capacity. This for example happens at the automobile manufacturer SEAT which agreed to an annual average load of the shipping lines from Barcelona but is able to decide the exact quantity of vehicles six hours in advance (Fusco, Sauri and De Melo 2013).

The last challenge occurring is related to the characteristics number four and five (Goods (cargo) and Stock policy) which address the stock characteristics of the production. The cargo value is a decisive factor which is limiting the time which can be spent for consolidating cargo to gain a perfect usage of capacity (Fusco, Sauri and De Melo 2013). A high cargo value will result in higher opportunity costs and makes the time variable decisive. Perishable goods are also in a similar situation where time is relevant for the selection of the transport mode. The value of goods is related to the stock policy of the supply chain which is in reverse related to the frequency of transport. This frequency becomes important based on the connected reliability which is important for the stock policy. In summary it can be stated that higher cargo value diminishes the relative weight of transportation cost in favour of time and reliability.

In conclusion the biggest competitive edge of SSS in a supply chain is the ability to absorb variability in the demand and the economies of scale. According to Fusco, Sauri and De Melo (2013) the distinction between SSS-Lo-Lo (ordinary container traffic) and SSS-Ro-Ro allows a better tailoring of the provided service to the supply chain. While SSS-Lo-Lo is suitable for low value cargo allowing longer transit times, SSS-Ro-Ro is potentially competitive when the concentration and the value of cargo is high and thus time becomes crucial. The evaluation has shown that SSS is capable of being implemented into complex supply chains and remains currently under-used in this regard.

5.4.1 Capacity Utilisation

The involvement of SSS in a supply chain requires commitment to a business partner. As a result, the shipper must be aware of its capacity utilisation. According to Styhre (2009) short sea operators have two options when managing their capacity: 1) the "Cut Peak" Strategy and 2) the "Never Say No" Strategy. With the "Cut Peak" Strategy the shipper has the advantage that the capacity utilisation is higher and the costs (fixed and variable) are therefore covered. This strategy is suitable for fields with high competition and variation in demands. However, this approach may result in the loss of goodwill and future orders from the customer (Styhre 2009). The "Never Say No" strategy allows the service level for the customer to increase based on the capacity buffer. A capacity increase can be achieved by the implementation of a second ship operating on a particular line. Another approach is to join alliances with other shipping lines. The capacity level to be reached is not necessarily covering the cost of the shipping line, rather increasing customer satisfaction. This strategy is suitable for time intensive cargo as well as long term relationships with customers (Styhre 2009). By considering the role of SSS within a supply chain, it is obvious that the "Never Say No" strategy is essential for the implementation of long-term agreements with customers. Due to the scope of the thesis this topic is not evaluated in depth as it would exceed the framework of the thesis.

5.4.2 Loading Units in SSS

The used loading unit within a supply chain is essential for the efficiency of the entire transport chain. Baindur and Viegas (2012) explain that one major challenge for the application of an intermodal transport chain is the implementation of standards of loading units. The challenge is to determine one loading unit which is preferred by all transport modes and involved customers. A relatively new type of loading unit is the 45-foot palette wide container. This container is five foot longer than the 40-foot container and therefore capable of carrying eight more pallets (Unifeeder 2013). The advantage of this transport unit is the perfect fit for trucks, although it should be noted that this transport unit is facing obstacles from EU legislations (EU 2006). In particular in the cross-border land sided transport modes, this type of container is facing bureaucracy burdens based on the fact that this container is 15 cm longer than allowed by legislations. The European Community of Shipowners' Association (2014) is therefore trying to foster the allowance of this loading unit and to abolish restrictions made by the legislations.

At the present time, the Institute of Shipping Economics and Logistics (ISL) is conducting a market research regarding the usage of 45-foot container (ISL 2014). Based on interviews as well as detailed analysis of secondary sources, the ISL found that the North Range is accounting for 86 % of the total container short sea shipping of the BSR. Table 4 shows the results of the research and the 45-foot container usage of 2012 within the BSR.

Table 4: Estimate of shortsea-land container traffic and use of 45' containers (ISL 2014)

	Total shortsea-land container traffic (thousand TEU)		45 foot container (thousand TEU)		45 foot container (thousand Units)	
Correlated Region	**North Range**	**South Baltic**	**North Range**	**South Baltic**	**North Range**	**South Baltic**
Russia	555	17	220	7	98	3
Finland	150	113	90	66	40	29
Sweden	383	56	115	17	51	7
Norway	95	0	57	0	25	0
Baltic States	115	15	60	4	27	2
Poland	45	-	30	-	13	-
Total	**1,344**	**200**	**572**	**93**	**254**	**42**

The main transports are flowing between the North Range ports and Russia whereas the trade relationship with the South Baltic is promising. The total numbers of 45-foot container which are being involved in the BSR is devoted to roughly 300,000 units. The 45-foot container additionally takes 43 % of all short sea shipping container transports when measuring in TEU.

Additionally ISL (2014) is making predictions regarding the future of the 45-foot container which are based on prognosis of country trade relationships with respect to container related trading goods. The trade forecasts are based on the IHS World Trade Service. Their prognosis can be seen in the following Table 5 and Table 6 for the years 2020 and 2030 respectively.

Table 5: Forecast (2020) of shortsea-land container traffic and use of 45' containers (ISL 2014)

	Total shortsea-land container traffic (thousand TEU)		45 foot container (thousand TEU)		45 foot container (thousand Units)	
Correlated Region	**North Range**	**South Baltic**	**North Range**	**South Baltic**	**North Range**	**South Baltic**
Russia	457	19	181	6	80	3
Finland	142	119	85	69	38	31
Sweden	346	52	104	16	46	7
Norway	82	0	49	0	22	0
Baltic States	109	17	57	5	25	2
Poland	50	-	34	-	15	-
Total	**1,186**	**206**	**509**	**95**	**226**	**42**
Change over 2012	**88%**	**103%**	**89%**	**102%**	**89%**	**102%**

Table 6: Forecast (2030) of shortsea-land container traffic and use of 45' containers (ISL 2014)

	Total shortsea-land container traffic (thousand TEU)		45 foot container (thousand TEU)		45 foot container (thousand Units)	
Correlated Region	**North Range**	**South Baltic**	**North Range**	**South Baltic**	**North Range**	**South Baltic**
Russia	454	21	180	8	80	4
Finland	162	153	97	89	43	40
Sweden	418	62	126	18	56	8
Norway	86	0	52	0	23	0
Baltic States	128	22	67	7	30	3
Poland	68	-	46	-	20	-
Total	**1,136**	**258**	**566**	**123**	**252**	**54**
Change over 2012	**98%**	**129%**	**99%**	**131%**	**99%**	**102%**

The anticipated growth also considers the new sulphur emission levels in 2015. Under normal considerations (not affected by the new sulphur restrictions), the ISL forecasts an annual average increase of 1.2 %, while the new sulphur emission limits are decreasing this forecast by about 10 %. It can be seen that the new regulations are affecting the container traffic within the BSR, and thus the usage of the 45-foot container, while in the South Baltic container trade, will slightly increase.

5.5 How to comply with the SECA-Directive

5.5.1 The Amount of SECA-Directive affected Ships

Malmqvist and Aldèn (2013) give in their report a small overview regarding the size of the problem. In 2010 there were 14.000 ships entering an SECA. Of this number of ships approximately 2.200 ships were only operating in an SECA and 2.600 ships were at least 50% of the time presents in this area. The Danish Sea Authority (2012) evaluated that within the BSR 500 million tons of cargo is transported, whereas the consumed fuel sums up to 3.3 million tons. This shows the dimension of the concerned part of the shipping industry which now has to adjust their ships with scrubbers, retrofit their ships for LNG or engine adjustments for the low sulphur or dual fuel options.

5.5.2 Possibilities of Mitigating Vessel Emissions

In this section the emissions of ships will be described and analysed. In the literature it is stated that the maritime transport is the most environmental friendly mode in terms of CO_2 emissions. The following section will further evaluate this as well as analyse other types of emissions and their impacts on the environment. Additionally, possible options to mitigate

emissions will be described. A more detailed analysis towards reduction of sulphur emissions will follow in the sections 5.5.3 to 5.5.7.

According to Eyring et al. (2005) there is huge potential for emission reduction based on technological improvements, alternative fuels and ship modifications. SO_x emissions from ships are contributing particularly to aerosol and are connected to the level of sulphur content of the fuel. Therefore the most effective measure to reduce this SO_x emission is the reduction of sulphur content in marine fuels. It is expected that this will result in a scarcity of low sulphur marine fuel connected with a premium price for this fuel. As it was already mentioned in the SECA-Directive itself, other solutions are also considered as possibilities (EU 2012). A special attention is also directed towards the scrubber technology which is considered as a cost-effective alternative (European Commission and Entec UK Limited 2005). The requirements of these scrubber systems are defined in the Annex 9 which was launched as a recommendation of the "Marine Environment Protection Committee" (2009). In these guidelines the emission level of different sulphur percentages within the fuel are measured, which are used as a performance level for the scrubber system. This technology is cleaning the emissions of the engines with the help of alkaline substances and a SO_2 reduction can be measured of 75-80%. Eyring et al. (2005) state for this process, seawater can be used as a cost-effective alternative due to its alkalinity characteristic. Tests have shown that an SO_2 reduction of 65% to 94% can be achieved. This system allows the usage of fuels having higher sulphur content, based on the same final emission of SO_2 in the exhaust. Diesel particulate filter systems in the exhaust stream would also allow a control of the particles. This option coupled with the installation of diesel oxidation catalyst system would support the reduction with an expected value 10-30% less particulate matter within the emission (Eyring et al. 2005).

Another possibility would be the usage of alternative types of fuels which can be used in marine services and have already been considered in an early era (National Research Council 1980). Fuels which are commonly used in the maritime transport industry are heavy residual oil (marine bunkers) which is a residual product of the refinement process of petroleum. However fuels which are derived from petroleum are considered as an equivalent alternative. One common type of fuel which is meeting the sulphur requirements of the SECA-Directive is the Marine Gasoline Oil (MGO). This type of fuel is round about 58% more expensive than the heavy residual oil (Bunkerworld 2014). This premium fuel is limiting the emission of SO_2 down to the required limit and is therefore

the suggested alternative for heavy bunker oils. Another option is the usage of bio-oils, such as palm oil, coconut oil, rapeseed oil, soya oil for small low power combustion engines for many years. There have been successful tests on land-based medium speed diesel engines. These bio diesels are derived from renewable lipid sources, offer potential to reduce the CO_2 emissions on a life cycle basis (including the CO_2 uptake during the growing process). This type of fuel is however only tested within land based modes and did not gain any commercial attention in the maritime transport modes.

In general, the effort towards new alternative types of fuels needs to consider the total fuel cycle analysis (TFCA). This involves the consideration of energy usage and emission from the extraction of the raw oil to the final use in the engine (Eyring et al. 2005). Each production stage in the fuel cycle includes activities which are producing greenhouse gas and other types of pollution. Following this approach Corbett and Winebrake (2008) created a model called "Total Energy & Emissions Analysis for Maritime Systems" (TEAMS) which is measuring the emission of the fuel from its extraction from the ground until the use in the vessel. This model also allows determining geographical core areas of the emission and therefore the evaluation of local environmental impacts or social conditions.

Emission reduction by ship system optimization which is not connected to the engines is another option. Hereby new technologies are addressing the propeller, the rudder or the hull in order to reduce the fuel consumption (Maeda et al. 1998). According to MARINTEK (2000) the energy-reduction potential and therefore the emission reduction potential of an optimized hull shape and a better propeller for a new ship are estimated to be up to 30%. As an example the innovative model design of propeller producers, such as Brunvoll, can be named which are successfully focusing on the environmental friendliness of their thrusters systems (Brunvoll 2014). As one of the most successful way to reduce the energy consumption and greenhouse gas emission of ships the optimization of the vessel speed and to adjust the ship routes to avoid heavy wind is named by Skjølsvik et al. (2000). In addition alternative power systems or the combination of those with the traditional ship energy sources can be named. The usage of fuel cells or renewable energies such as wind- or solar-energy is named as possibilities to reduce the emission of the ships even though the practical usage will be in the future.

According to Eyring et al. (2005) the emission control strategies for fleets have not been widely adopted based on the policy measures. These policies can be categorized into two

types of policies: 1) command-and-control approaches and 2) market-based or incentive based approaches. Command-and-control regulations achieve environmental management goals by setting particular standards for sources of pollutants. This type of measure is by setting up these limits/regulations cost-reductive measures (in form of fines) which give the maritime industry an incentive to comply with them. This command-and-control incentive can be divided into two categories. The technology-based standards specify exactly the method and sometimes also the equipment which has to be used to comply with the regulation. The other category, the performance-based standard, is setting control targets, while allowing some flexibility on how the target is achieved. The SECA-Directive for example leaves it open for the vessel operator to use low sulphur fuel or to use other approved technologies to reduce the SO_2 emission (Eyring et al. 2005).

The other category is the market based incentive policy, which are fostering both cost reduction and emission reducing innovations (Harrington and Morgenstern 2004). These policies are used for example by the EPA as a tool to provide financial means to motivate polluters to reduce the health and environmental risks stemming from their facilities, process or products. These incentives can range from pollution taxes and charges, to marketable permits and government subsidies – which foster the change of poor environmental behaviour. These economic incentives can also encourage polluters to control the pollution above and beyond the level of the requirements of the regulations and are fostering innovations. Market-based incentives can also provide environmental differentiations of fairway and port fees for ships that have a certain green status.

In summary the section has described that the emissions of maritime transports are a threat to the human health and needs to be limited. A number of technical possibilities were briefly described whereas the most advanced will be described in further sections.

5.5.3 Technological approach: Scrubber

The Scrubber technology has the advantage of not being a completely new technology but a conventional on land (Malmqvist and Aldèn 2013). MAN (2012) explains that in a scrubbing system the exhaust gas is led through an array of droplets (sweater/chemicals) which wash the sulphur out of the exhaust. Scrubbers can be installed on ships as retrofit on existing ships but also on new build ships. The first installation was completed already in 2008 and although the technology was very young and unexplored up to this point, test results have shown that the sulphur emission were reduced significantly, in alignment with the IMO regulations (Wärtsilä 2010). The conclusion of this project was that the marine

fresh water scrubbers were ready for a market introduction. Since then the scrubber producing industry organized themselves to an association called "Exhaust Gas Cleaning Systems Association" to promote and innovate jointly the scrubber technology (EGSCA 2009). The number of orders and installations on ships is increasing whereas a breakthrough of this technology did not happen yet (Malmqvist and Aldèn 2013).

According to the company "Det Norske Veritas" (DNV) the scrubber industry is maturing and offering reliable products on the market (DNV, 2011). However, among the ship owner is still the common opinion that scrubber systems need to be further developed to operate satisfactory. This is based on the lack of reference installations made yet. Scrubber manufacturers guarantee the functionality of their systems and compliance with the SECA regulation. This actually means in practice the sulphur emission after the cleaning the exhaust gas of the combustion process with heavy oil is complying with the new sulphur emission limits. There are two types of scrubber systems: Seawater- and Freshwater-Scrubbers. Both systems have the disadvantage of cargo capacity reduction based on the required amount of water pumps and water cleaning systems (Malmqvist and Aldèn 2013). The seawater scrubber systems also increases the fuel consumption of the ship about two to three percent, due to the usage of seawater systems which pump water from the sea into (and out of) the scrubber system where it is used to wash out the SO_2 sulphur oxides. The other type of scrubber uses a combination of freshwater and chemicals to clean the exhaust gases (Malmqvist and Aldèn 2013). In this system the freshwater which cleaned the exhaust from sulphur is cleaned by chemicals such as caustic soda, before entering the scrubber again. The resulting chemical sludge will be collected in disposed port facilities. Therefore extra tanks for the chemicals and the sludge will be needed for this system. The system is causing an extra fuel consumption by 0.5 – 1 % and extra cost for the chemicals by two percent of the fuel cost. The cost for the installation of a scrubber differs due to the factors of technology and complexity of the installation. An average freshwater scrubber system of the Wärtsila Company costs 300,000 €/Mega Watt (Wärtilsa 2013).

5.5.4 Alternative energy: LNG

According to Malmqvist and Aldèn (2013) the usage of natural gas in liquid form, called LNG (Liquefied Natural Gas) is one of the most attractive alternative to meet the requirements of the low sulphur directive. Natural gas is globally used as an energy source by industries, power plants for heating purposes. The natural gas is cooled down to -163 °C and is easier to transport and to deliver whereas also the energy content is

increasing (Malmqvist and Aldèn 2013). By using LNG as a marine fuel the sulphur emission is reduced down to zero. Additionally other emissions such as NO_x or CO_2 are reduced. The following figure shows the emission of common used fuel sources/alternatives (Baltic Transport Journal 2011):

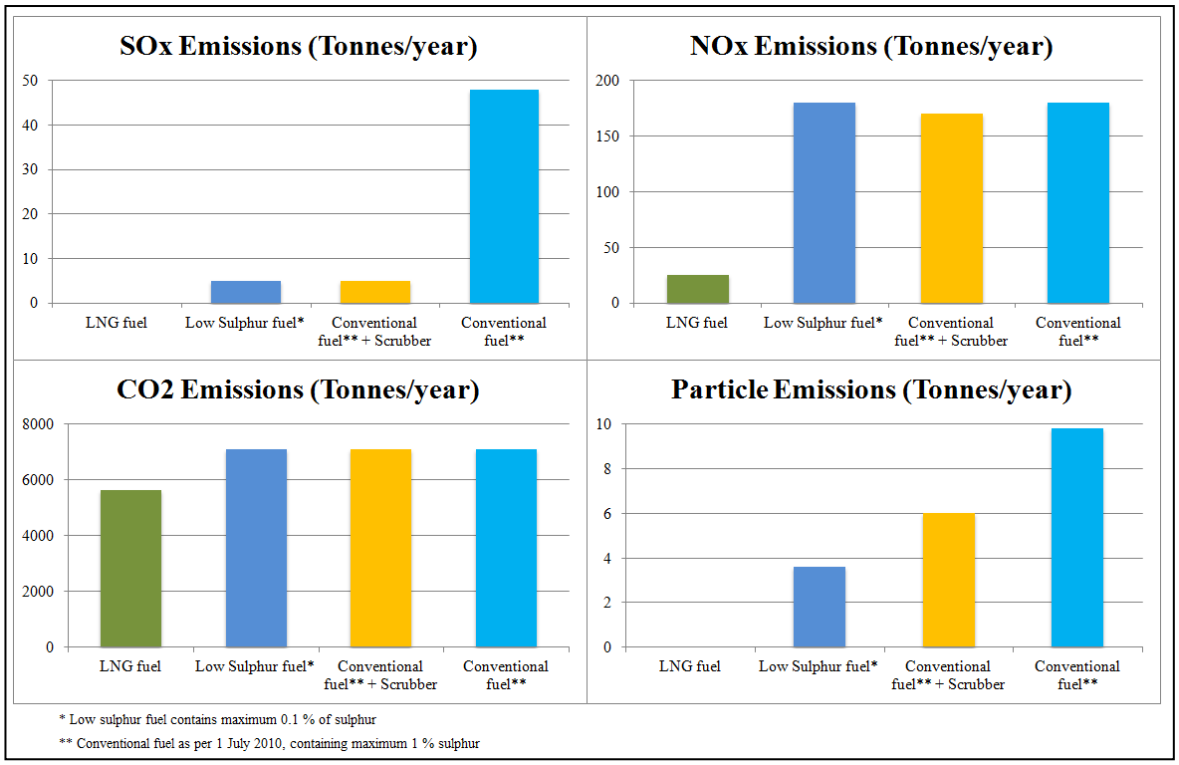


Figure 13: Emission for alternative marine fuel concepts (Baltic Transport Journal 2011)

According to the finding of the Baltic Transport Journal (2011) it can be seen that from all alternatives, LNG is the most environmentally friendly type of fuel with respect to all four types of emissions. The number of ships which were using LNG as a type of fuel in 2011 can be denoted to 350 ships globally according to the Baltic Transport Journal (2011). Based on resource richness, Norway is presently the only LNG producer in Europe and is a frontrunner in the usage of LNG in ships with an increasing fleet of 45 in 2012 (Marintek 2007). These ships are mainly newly built but it is also possible to convert a conventional engine to a dual-fuel engine running on both LNG and conventional fuel. The ship "Bit Viking" for example was the first ship which was converted from a conventional engine to a dual-fuel engine for HFO and LNG (Wärtsila 2014). This flexible solution allows ships to operate in areas where the availability of LNG is uncertain based on a lack of LNG infrastructure. The other alternative is the lean burn gas engine, which is an engine system only running on LNG and most suitable for ships which are operating in areas where the LNG bunkering stations are available, e.g. in Norway. This type of engine is less

complex to be installed on board and is suitable for regions where the LNG bunker infrastructure is advanced. Malmqvist and Aldèn (2013) point out that the reduction of space which could be used for cargo however is bigger than the one in case of the scrubber system. If the ship shall carry the same energy content as conventional heavy fuel the tank size needs to be doubled to the expense of cargo storage room. Therefore smaller tank sizes are considered a better solution, causing LNG engine systems to be expectedly used in new build ships instead of retrofitting. New built ships with LNG technology will cost about 10 – 15% more than conventional ships but have 35% lower operating cost during the first 10 years compared to the use of low sulphur fuel. Nottenbom and Wang (2013) assess the extra cost for the ship up to 20 – 25%.

The critical safety factor is also considered by Malmqvist and Aldèn (2013) who state that Norway has a long experience in LNG bunkering with over 50,000 bunkering operations during 2003 and 2010 without serious leakage. This diminishes the argument of leaking methane harming the environment. The description has shown that LNG appears to be a very good alternative for conventional fuel under economic and environmental aspects. Malmqvist and Aldèn (2013) are however stating that the shipping industry is still hesitating switching the energy supply. As one reason, the undeveloped LNG infrastructure within Europe is outlined. The following map shows the LNG infrastructure within the BSR:

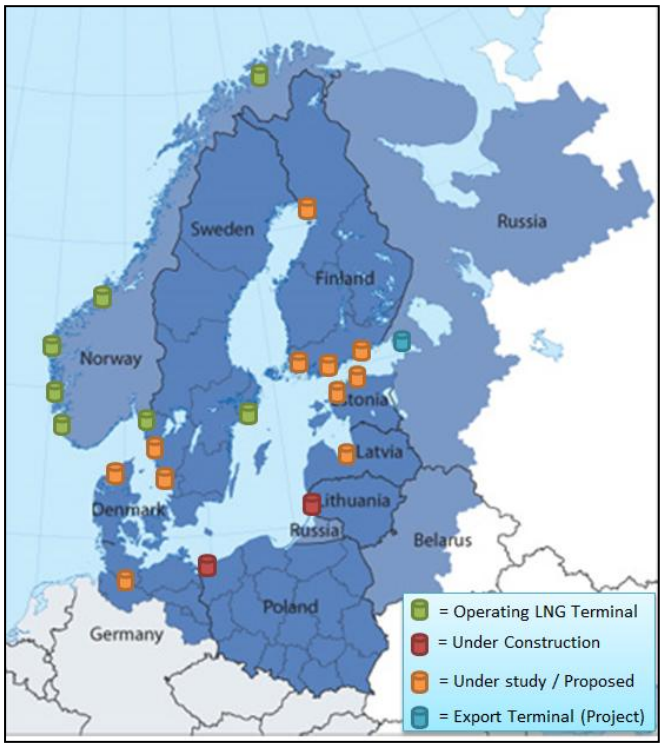


Figure 14: LNG infrastructure Baltic Sea (orientated on GIE 2014)

It can be seen that by far that not every main port within the BSR has an operating LNG terminal, yet while many ports are in the process of planning on building a terminal. The time horizon when the proposed terminals will be built varies from mid-2014 until 2019. Detailed information including operator and start-up date can be found on Gas LNG Europe (GIE 2014). It can be seen that Norway has the most advanced LNG infrastructure and is also the main distributor of LNG in the western part of the BSR. LNG is also becoming part of strategic alliances between ports. The port of Gothenburg started cooperation with the port of Rotterdam with the goal to offer bunkering LNG in both ports and thus be more attractive for shipping companies (EC 2013). Another example is the conglomerate of seven ports within the BSR who are working together in the EU Co-financed project "LNG in Baltic Sea Ports" with the goal of LNG terminal implementation in the port environment (LNG 2014). In this project the seven participating ports are sharing information and best practices and are trying to establish a tool box for ports which plan to implement LNG in their portfolio.

In summary, it can be stated that LNG is a very good alternative to the technical solution such as the scrubber or the usage of low sulphur fuel. However LNG only recently has gained the broad attention of the maritime business environment and it is unlikely that it will become the main solution to answer the SECA-Directive in the short run. But once the LNG infrastructure will be well developed and new ships will be built it, a substantial share of the fleet which is operating within the BSR will be running on LNG from 2020 onwards.

Nevertheless it has to be taken into account that LNG is a fossil fuel which is emitting a relatively high number of greenhouse gases. Therefore it is questionable if the usage of LNG is sustainable and will not be in the focus of future regulations. As a possible solution Malmqvist and Aldèn (2013) state that mixing LNG with liquefied bio gas (LBG) might be a possible solution. Considering the actual situation of limited volumes and therefore high prices of LBG this solution seems to be uneconomic. The safety factor of LNG also needs to special attention. LNG is harming the environment 20 times worse than ordinary CO_2 emissions. Therefore the number of LNG leaking from pipelines and fuelling terminals needs to be reduced to zero otherwise this solution is harming the environment worse than the emission of bunker oil in terms of CO_2.

5.5.5 Marine Gasoil (MGO)

The easiest way to comply with the regulation is the change from using HFO to Marine Gasoil (MGO) which has a sulphur content of 0.1 %. There are no certain investments required, which makes it very attractive at first sight (Malmqvist and Aldèn 2013). However the price difference between HFO and MGO is very substantial which will result in much higher fuel cost. MGO currently costs 325 $US more according to Bunkerworld (2014). Several studies try to predict the price difference of the fuels in 2015 (ISL 2010), whereas no prediction can be taken as reliable. Malmqvist and Aldèn (2013) also describe that it is an option to use a dual-fuel system of HFO and MGO, depending on operating in a SECA or not. This option seems to drop out in 2020 when the emission standards will be lowered on the global level.

5.5.6 Bio oil

Another alternative solution to answer the new directive is the usage of bio fuels (Malmqvist and Aldèn 2013). Based on an increasing awareness of greenhouse gas emissions this type of fuel gets more and more attention from transport modes on land and also water. Research of this fuel had started 20 years ago and is becoming commercialized with production plants in Europe. This type of fuel is already in use for heating installations, but requires an upgrade of the engine system when used as a fuel. The upgrading process for the ships is in this regard will be easier than for land transport vehicles based on the lower complexity of the system. Malmqvist and Aldèn (2013) state that the upgrading process is likely to be viable within a time frame of two to three years.

5.5.7 Alternative fuels

The usage of alternatives fuels which presently have not yet reached the commercial attention of the maritime shipping industry might be also an alternative. The usage of methanol as a marine fuel was tested in Gothenburg (Malmqvist and Aldèn 2013). The test included the usage of methanol as a fuel in a ship operating between Sweden and Finland. Therefore the diesel engine needed to be modified whereas the modification is much simpler than the modification to an LNG engine. As a result methanol is considered as an attractive alternative to LNG with lower cost for the infrastructure and engine conversion. The used methanol can be produced from fossil as well as renewable feedstock and is therefore very sustainable.

Another possibility is the usage of Hydrogen as a source of energy for ships. This technology which is based on fuel cells is still in the test status but prototypes are capable to supply the ship with energy, but not the propulsion. The needed hydrogen can be supplied by renewable feedstock such as wind parks, which actually waste produced energy, due to lack of ability to feed it in the grid. This energy can be used to produce Hydrogen as a sustainable type of fuel for ships. It is however questionable if the practical connection between wind parks and the production of Hydrogen can be done. Additionally the project of the commercial usage of fuel cells for ships is still in a very early stage and an implementation is not expected before 2020 (eships 2014).

5.6 The Shippers choice

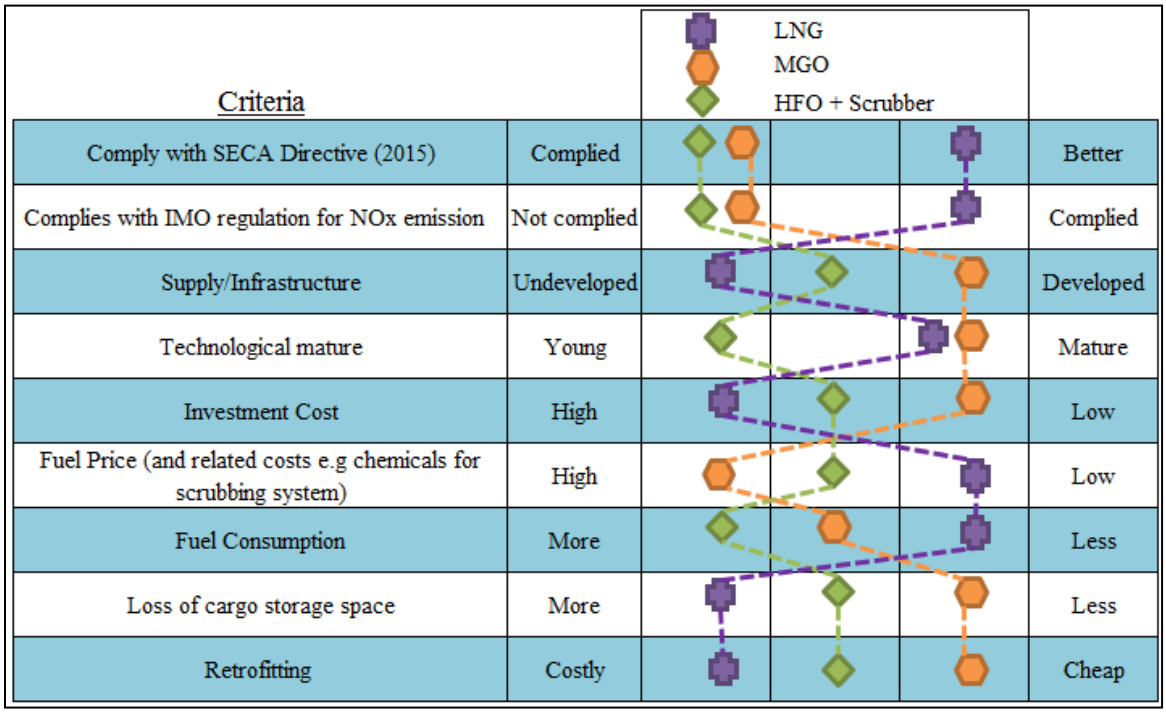
The evaluation of alternatives has shown that shippers actually have only three realistic opportunities to meet the emission restrictions of the SECA-Directive: 1) Usage of Low Sulphur Fuel (MGO), 2) Scrubber in combination of HFO or 3) Conversion to LNG. All other possibilities are considered as not suitable due to the degree of immatureness. Table 7 gives an overview of the pros and cons of each solution.

Table 7: Comparison MGO, HFO + Scrubber and LNG

	Pro	Contra
MGO	• No change in business processes	• Higher Price • Availability of fuel questionable
Scrubber + HFO	• Product availability • No change in business processes	• Ship design (loss of cargo volume) • Investment costs • Sludge management • Higher fuel consumption cost • Not feasible for every vessel
LNG	• Complying with IMO requirements of NO_x emission • Low emission of CO2 (when safe handling) • Low maintenance	• Ship design (loss of cargo volume) • Insufficient LNG bunkering infrastructure (status quo) • Investment cost • Safety aspect increase

Table 7 illustrates that each alternative has positive and negative aspects. This table, however, is only an enlistment of the facts while much information for decision making is lost. On the next page a more detailed overview is provided.

A more detailed overview is provided by the following illustration which includes a certain rating for criterions:



Criteria			
Comply with SECA Directive (2015)	Complied		Better
Complies with IMO regulation for NOx emission	Not complied		Complied
Supply/Infrastructure	Undeveloped		Developed
Technological mature	Young		Mature
Investment Cost	High		Low
Fuel Price (and related costs e.g chemicals for scrubbing system)	High		Low
Fuel Consumption	More		Less
Loss of cargo storage space	More		Less
Retrofitting	Costly		Cheap

Figure 15: Comparison of LNG, MGO and HFO + Scrubber including rating (orientated on Nottenbom and Wang 2013)

The template shows that the usage of MGO is the most uncomplicated way to comply with the new regulations due to its low investment cost. However, in the long run, the fuel price is not favouring this solution, in particular due to the lack of reliable predictions.

The Scrubber seems to be one solution which is requiring medium investment, but allows the usage of cheap fuel. According to Noottenboom and Wang (2013), however, many shipping companies are hesitating to implement this technology because of the lack of practical experience of this technology and resulting insecurity.

LNG seems to be a very good answer to the sulphur restrictions. Next to the high investment cost this technology is however lacking of reliable supply network. Hereby the business is facing the so called “chicken-and-egg” problem. This actually means that the shipping industry is demanding a reliable supply network, while the bunkering industries are demanding clear signs for demand (Nottenboom and Wang 2013). This dilemma however is getting into the focus of the European Commission which is fostering the implementation of LNG terminals. Additionally is LNG as a bunker fuel is technically relatively young which results in a number of supply insecurities and therefore price volatilities.

5.7 Effects on the Transport Mode SSS

In this section critical points of the SECA-Directive will be analysed. Therefore four paradoxes will be described, which will outline the negative effects of the SECA-Directive on the environment and the industry.

5.7.1 Paradox 1 – The modal Backshift

According to Malmqvist and Aldèn (2013), who described the impact of the SECA-Directive on the BSR and especially Sweden, the opponents argue that the sulphur emission problem is overestimated based on the high level of emission reduction from the industry and road transport which already took place. According to their point of view restrictions for emissions are therefore not necessary anymore. Furthermore is there also the argument existing, that the cost increase of sea transport will cause a modal backshift towards the road transport mode which eventually will result in a higher emission of CO_2 from this transport sector.

There are different predictions on how much the transport will shift. The Swedish Maritime Administration (2009) estimated an increase of rail transport by six percent and for road a five percent increase. Sweco (2012) however is stating that there will be an increase (+11 %) in rail transports but a decrease (-8 %) in road transport. The decrease of road transport results from the higher cost for diesel, which needs to be shared with the shipping industry. Furthermore the same report states that the sea transports will decrease by 21 % within the year 2015. A practical example is provided by DFDS (2014) which announced that a ferry service between Denmark and Britain needs to be shut down based on the new sulphur regulations. In this issue the new regulation is not the only factor contributing to the closure but also the strong competition by low cost airlines. It is very hard to predict this backshift based on the complex nature of the entire situation with many uncertain conditions. The bottom line is, however, that sea transport is the most environmentally friendly transport mode and therefore should be the most preferred mode. If this transport mode becomes less competitive based on higher cost, the emission of greenhouse gas will increase mainly because of the road transports.

Another more detailed description is provided by the Institute of Shipping Economics and Logistics (ISL 2010) which evaluated possible effects on the transport market in depth. It is necessary to state that all predictions which are made by different institutions are not 100 percent reliable and no one can predict the future. There are however, based on some models, possibilities to derive scenarios of effects of transport modes, oil prices and

changes in transport systems. The ISL (2010) is predicting a disproportional cost increase for shipping operations within an Emission Control Area, while the cost for operations outside of this area, including land transport modes, will decrease. The main concern of shippers, the distortion of the competition of this mode, seems to be legitimate. The ISL (2010) points out that this differentiation of cost burden will lead to a shift to land modes, or the reduction of maritime transport-distances, which will directly affect ports and vessel operators. Another effect which the regulation might have is the influence on the oil price and the connected fuel price.

5.7.1.1 The cargo shift

The ISL study (2010) made predictions of how the cargo might shift, given the case that the MGO price will be around 1,300 $US in 2015 (Actual Price (14.04.2014): 916 $US). Furthermore the focal point of the shift will be Germany and the connected Short Sea destinations in the Baltic Sea. The ISL hereby defines three types of Short Sea Shipping: 1) RoRo/Ferry, 2) Feeder transports and 3) inner European transport by sea in container (ISL 2010).

ISL (2010) considers for their predicted cargo shift the container/trailer traffic within the Baltic Sea. Based on values of 2008 and the assumption of moderate growth rates, a volume of 2.7 million trailers which are actually using the Ro-Ro maritime transport, were evaluated, which are under potential risk to shift from sea to land transport modes. According to the ISL (2010) around 600,000 units will directly shift from sea to land while the per cent loss of each region will vary.

The following graphic illustrates the trailer/truck shift from sea (RoRo/Ferry) to land which might develop according to ISL (2010):

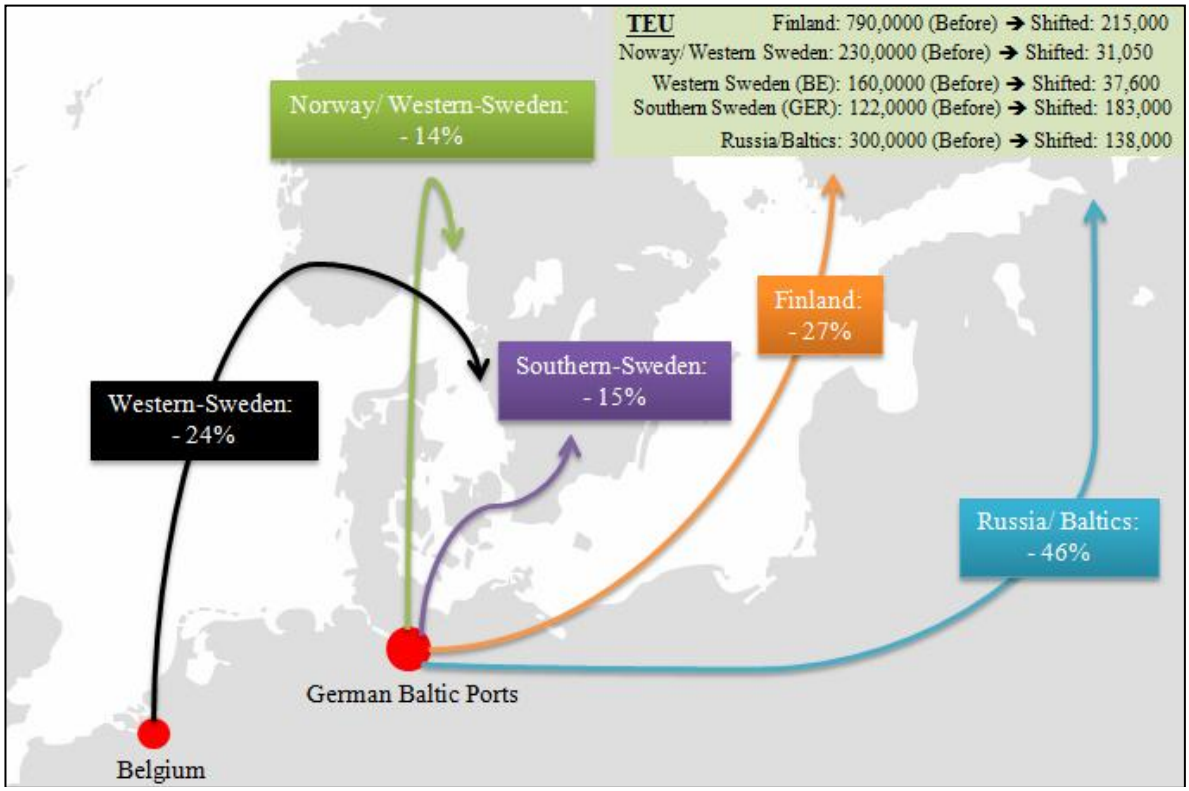


Figure 16: Cargo Shift percent from sea to land (orientated on ISL 2010)

The estimation shows that the shifts will primarily affect the connections going to the Baltics and Russia. This is possible based on the availability of land transport networks and the cheaper labour and fuel costs of hauliers of this market. Baindur and Viegas (2012) state that the average wage of a truck driver can differ up to eight times from one EU member state to another. Additionally the fact that fuel cost has a proportional high influence on the total cost of the total maritime cost the SECA-Directive will support the shift.

With respect to container shipping the ISL (2010) differentiates the effects for Short Sea land shipping and feeder services. This differentiation is necessary because forwarders, who are planning the transport outgoing from the manufacturer, are more likely to avoid the higher prices of the maritime transport, while feeder operators have the advantage that the container is already in the port. In summary the shifts, evaluated from the ISL (2010) can be seen in Table 8, whilst Hamburg is still the focal point of departing transports (e.g. Hamburg –Poland).

Table 8: Container Shift from Sea to Land - Feeder and Short Sea (ISL 2010)

	Traffic 2015 (1,000 TEU)			Shift 2015 in %			Shift 2015 (1,000 TEU)		
Market	**Feeder**	**Shortsea**	**Total**	**Feeder**	**Shortsea**	**Total**	**Feeder**	**Shortsea**	**Total**
Poland	865	75	941	27%	26%	27%	233	20	252
Lithuania/Latvia	448	51	499	16%	35%	18%	73	18	91
Russia/Finland/Estonia	2,202	461	2,663	1%	25%	5%	14	115	129
Norway	338	34	371	17%	27%	18%	57	9	66
Sweden	577	64	641	24%	31%	25%	138	20	158
Denmark	340	28	368	34%	33%	34%	117	9	126
Total Baltic Sea	**4,771**	**712**	**5483**	**13%**	**27%**	**15%**	**632**	**191**	**823**

The table illustrates that the container shift is mainly affecting the Short Sea traffics with 27%. According to ISL (2010) this is resulting from the detour the usage of ports would require. Therefore, the closer distances are significantly affected, but also to some extent container transports to Russia, Finland and the Baltics are affected due to the lower costs of the transports. The shift for Feeder transports will be around 13 %, while the total number of container shifted to the road with 632,000 units will be very significant (ISL 2010). In particular the smaller routes like Denmark will have a significant increase of the usage of the trucks. Longer distances such as Russia/Finland/Estonia might still have the cost advantage of the sea transports, which results in the negative impacts of feeder services via land mode being rather limited for this destination. ISL (2010) emphasizes that it is expected that feeder services from Hamburg to Sweden or Poland will be shut down or at least be replaced by smaller ships. Another trend which might occur is the increased usage of the rail as a transport mode for feeder. The fact that there is a limited additional capacity for rail transports and that there are still in track gauges etc. the shift onto road seems to be much more likely than onto rail.

5.7.1.2 The effect on the Ports

The effect on the ports can be derived from the foregoing description of the cargo shift. RoRo and ferry ports are facing the unfortunate outlook of losing 604,000 trailer/trucks which will not use the sea transport. However the ISL (2010) states that the Ferry/RoRo shipper will have the opportunity to gain some market share in the ultra-short distances due to land-sided congestion on competing routes. Furthermore Ferries/RoRo Shipper might be able to capture some market share from the long distant accompanied truck traffic. The total loss of container from the feeder/transhipment segment from German ports is estimated to be 820,000 TEU.

5.7.1.3 The Fuel Price

The ISL study is also forecasting the price for maritime fuels. It is out of question that predictions in this field are not very reliable, due to the volatility of the crude oil price. The predicted price is based on price developments for MGO and HFO and the observation of their difference. ISL (2010) gives a corridor of a lower and an upper limit. The lower price limit is price estimation when there is a normal demand for fuel. The upper limit is orientated on price developments which were observed after the crisis when the demand had rapidly increased. ISL (2010) is therefore predicting a corridor of 850 to 1,300 $US for MGO and 540 – 740 $US for HFO. This means that the price difference can be denoted to 70% to 86% or 310 to 560 $US per ton of fuel. In addition ISL (2010) states that the cost increase for a RoRo Ferry operating on a medium long route and using MGO instead of HFO can be range between 3.3 to 6.0 mio $US per year.

5.7.2 Paradox 2 – Longer transports replace shorter

Assuming that some industries which are based in the BSR are very sensible to transport costs, it is likely that the SECA-Directive will lead to market share loss for these particular companies (Malmqvist and Aldèn 2013). This is in particular the case for the timber industry in Sweden and Finland for which a change of transport mode is complex or inefficient, but sticking to the maritime transport will increase the cost of their products. The lost market share of these businesses will then be taken from other industries with longer transport distances, but fewer restrictions. For the wood industry the major competitors are located in South America. The major part of the transport route of these competitors, who will gain market share within Europe, is lying outside of a SECA which currently allow the usage of higher sulphur content in the fuel (3.5 %). This will result in an increase of SO_x and CO_2 emission. Therefore the harmful emissions are only shifted away from the SECA area to another place, while the overall goal of emission reduction is not achieved. The approach to counteract the SECA-Directive comes from the industry itself: For example Industrienyheter (2012) reported that a major Finnish company considers a relocation of their production facilities to central Europe in order to avoid the SECA related cost increase.

5.7.3 Paradox 3 – Surplus of high sulphur bunker oil (3.5%)

Based on the lower demand of high sulphur content oil (3.5%) the prices for this particular product will decrease. In particular when the global sulphur limits for ships will be lowered to 0.5% in 2015 or 2020, the surplus of heavy oil will increase on a global level.

Among the SECA critics there are concerns that nations, e.g. Japan, which are trying to switch from nuclear power to other energy sources, will use this cheap fuel in the transition time (Malmqvist and Aldèn 2013). Assuming that the gas exhaust cleaning of these power-plants is not efficient there is the risk that the SO_x emissions will be moved from the sea to the populated areas and therefore the overall goal of emission reduction will be not achieved.

5.7.4 Paradox 4 – Lowering SO_x emission might accelerate the CO_2 emission

Isomäki and Pettay (2011) argue in their report that the CO_2 emission and the connected global warming problematic are by far worse than the SO_x emission. In their paper they state that the usage of alternative fuels is bearing a big risk to increase the CO_2 emission. Namely they evaluated the case of LNG, where a leakage in the supply chain could cause an emission of methane which is 20 times worse for the global warming than the emission of ordinary greenhouse gas. Gilbert (2014) states that, by calculating of a total leakage of 4% of LNG p.a. the emission saving (7-15%) of the SECA-Directive will be undermined within five years. Furthermore they elaborated a theory where the sulphur emission are generating low clouds which are reflecting the sunlight and therefore mitigating the global warming. This theory has not been proven by the author but underlines that there are some environmental risks connected to the SECA-Directive. This paradox is also backed up by Gilbert (2014) who states that the production of low sulphur diesel is also emitting CO_2 based on the energy consumption of the fuel production processes. The technology of scrubber is also using a higher value of energy which results in a higher emission of CO_2.

6.0 Analysis of the Practical Perspective

In the following section the data which was collected in the interviews will be reviewed and analysed[3]. All interviews can be reviewed in the back of the thesis. The interviews were divided into two parts: 1) Short Sea Shipping in general and 2) Sulphur emission limits.

6.1 Short Sea Shipping

The interview questions which were related to Short Sea Shipping aimed to evaluate the strengths and weaknesses of this transport mode. Additionally it was tried to explore which role ports/terminals have in the promotion of SSS as well as the role of SSS in intermodal transport chains.

6.1.1 Strengths of SSS

The most frequently named strength of SSS in front of other transport modes was the capability of carrying big amounts of cargo (Malmqvist 2014; ISL 2014; BUSS 2014, Psaraftis 2014; SPC 2014). This is not only related to container, but also to other types of cargo such as the mentioned paper industry in Sweden. Additionally, the freight rate paid per ton is relatively low compared to other transport modes, which makes this transport mode perfect for low value, but voluminous goods (Malmqvist 2014; Psaraftis 2014; SPC 2014). The other named strength is that SSS is bridging gaps between locations on the shortest way, which is particular the case in Scandinavia where the geographical situation is creating an obstacle for effective land transport modes (Malmqvist, 2014). Under environmental aspects it was confirmed that the SSS is the transport mode with the lowest CO_2 emissions per ton/km (BUSS 2014; Psaraftis 214; VDR 2014).

6.1.2 Weaknesses of SSS

There was no common answer to the question of the major weakness of SSS. The lack of flexibility was named as a big disadvantage compared the road transport (Malmqvist 2014). Related to this point the burden of pre-carriage was also mentioned which makes the SSS less flexible on the one hand and in addition also less economical (ISL 2014; SPC 2014). SPC (2014) also mentions that pre- and post-carriage are offering space for dysfunctions within the transport chain.

[3] *Methodological Note: The references which are given in this part are related to the interviews which can be reviewed in the back of the thesis.*

The other weakness is connected to the increased handling costs which occur by using SSS due to port charges, administrative burden and costly equipment (ISL 2014; SPC 2014). These administrative burden where described by Psaraftis (2014) as the biggest challenge, especially when it comes to the competitive situation with the truck. While a truck has no "breaks" in terms of cargo handling, the cargo handled by the sea mode is facing many lifts which involves many participants which results in cost and time (Malmqvist 2014; ISL 2014; SPC 2014; VDR 2014). The involvement of many participants is also increasing the complexity of the transport chain which makes the implementation less attractive (SPC 2014).

Furthermore the frequency of SSS in comparison of the truck was named. While the truck can literally depart every hour based on the high density of truck operators, the density of shipping departures is limited (Malmqvist, 2014). The lack of alliances has also been confirmed by one interview partner who mentioned that there is still a competitive attitude against each other, which is not favouring the cooperation between these transport modes (ISL 2014). Another big weakness which was confirmed some by respondents was the lack of innovation within the shipping industry (Malmqvist 2014; ISL 2014; HPA 2014; Psaraftis 2014). VDR (2014) as well as SPC (2014) disagree with the statements and describe the shipping industry as very innovative. The shipping industry is so far the only transport industry which implements international standards, namely SEEMP and EEDI (VDR 2014).

Additionally the shipping market has evolved from a "port-to-port" transport service to a "door-to-door" service (SPC 2014). Furthermore technical innovations such as the grey box and reefer transports are illustrating the innovation potential. The shipping industry was described as "reactive" (ISL 2014) instead of proactive. Psaraftis (2014) explains that the short sea shipping lines have not been very innovative in their strategically network planning, while this will probably change with the implementation of the Directive. An interesting problem connected to the weaknesses of SSS is provided by SPC (2014) who states that SSS is lacking of data transparency. Shipping lines are often providing inconsistent or not reliable data on their homepages which demands a higher effort to organize a transport including SSS (SPC 2014).

6.1.3 Role of Ports and Terminals

Nearly all participants named the role of the terminal operator as crucial (ISL 2014; Malmqvist 2014; SPC 2014). The adaptation of the specific needs of SSS is one of the main challenges for terminal operators, whereas this is often not the case (Malmqvist 2014). Many terminal operators serving both deep sea vessels and SSS, prefer deep sea vessels as customers, based on the higher quantities they are carry (ISL 2014, SPC 2014; VDR 2014). There are however also other examples, where terminal operators make agreements with large SSS operators (e.g. Unifeeder and Eurogate; ISL 2014). Additionally Malmqvist (2014) described the port as acting as an intermediary connecting the customer market (manufacturing industry, freight forwarder) with the transport supplier, the SSS industry. Psaraftis (2014) described the port as the interface between sea and land transports, which needs to be streamlined in order to be competitive. This streamlining cannot be achieved with the involvement of ports alone, rather it must involve authorities on a national or international level, based on the fact that many elements of decisions are out of the sphere of power of the port operator (Psaraftis 2014). BUSS (2014) stated the implementation of security standards such as the "International Ship and Port Facility Security Code" do not make it possible to reign in administrative burdens. Although this security standard is internationally valid there are different ways of permutation, whereas some ports have found more practical approaches than others (BUSS 2014).

6.1.4 45' foot container

Opinions regarding the usage of the 45-foot container varied between the respondents. Many respondents did not have a good understanding of this specific topic, but considered the usage as challenging (Malmqvist 2014; Psaraftis 2014). This was also confirmed by experts investigating usage (ISL 2014). The challenge of this type of container is that the mixture of 40- and 45-foot containers result in capacity loss for the shipper. The same situation occurs within the terminals where special storage places are needed for this type, making storage more costly (ISL 2014). The problem of storage capacity loss, however, was not confirmed by the terminal operator (BUSS 2014). Furthermore BUSS (2014) states that there is no problem with loss in storage capacity. This fact will probably change for the terminals which, due to serving deep sea vessels, have a very lean container storage habit (BUSS 2014).

Many freight forwarders do not consider the 45-foot container due to its lack of availability. This is in particular the case when the loading point is far from a port, thus the density and variation of containers is not that high (ISL 2014). Another problem is related to the habits of the costumer or haulier, whom always prefer trailer flexibility that can be loaded sideways due to its curtain (ISL 2014). Considering transnational transports, in particular outside of the EU, the usage of 45-foot container also faces an administrative burden of uncertainty due to the scarcity of use and the lack of knowledge by administrations e.g. the police (ISL 2014). BUSS (2014) considers the 45-foot container as the only possibility to compete in the long run with the ordinary truck trailer, due to the fact that most manufacturing companies organize their transport activities with full trailer sizes.

6.2 Sulphur restrictions

The questions related to this topic attempted to provide an understanding of the general opinion towards the new emission limitations (SECA-Directive). Furthermore they look to explain the impacts that may occur as well as their mitigated. Additionally, one specific question aims to explore the situation and attitude towards EU subsidies. Each interview partner had a different depth of focus, concentrating on a specific background.

6.2.1 SECA Directive

The general opinion of participants regarding the SECA Directive was that the regulation of sulphur oxide emission is necessary (ISL 2014; Malmqvist 2014; BUSS 2014; Psaraftis 2014; HPA, 2014). The Directive becomes even more reasonable when the shipping activities are close to urban area. This is the situation in the port of Hamburg (HPA 2014). However, the critical evaluation of the topic brought up some weaknesses of the Directive: 1) the actual economic situation of the maritime industry (ISL 2014) and 2) the lack of communication between legislative authorities and affected industries (Malmqvist 2014; Interviewee #9 2014). According to Malmqvist (2014) the problem of communication lies in the different planning horizons of shipping lines (short-term) versus the one of the EU (long-term). While the EU is planning long term, which had been the case with the restrictions of sulphur emissions, shipping lines are reacting to specific challenges at hand (Malmqvist 2014; ISL 2014). Interviewee #9 (2014) also described a lack of communication between the EU and the Finnish Shipping industry, making it surprising that the all parts of the legislation passed and will be fully implemented. This was also confirmed by the HPA (2014) which stated the shipping industry had been hoping

for a postponement. Psaraftis (2014), a member of an expert group giving recommendations to the EU to preserve the competitiveness of SSS, stated that the EU is not happy with the implementation of the new regulation under these circumstances but is unable to postpone it. A postponement would not be possible due to the involvement of other nations such as Russia or the United States (Psaraftis 2014). Another problem of the Directive is connected with the process of how the implementation is constructed (Bodewig 2014; VDR 2014; SPC 2014). The missing transition time between the setup of the limitations and the enforcement of the limitations is seen as problematic (Bodewig 2014; VDR 2014; SPC 2014). VDR (2014) explained that ship owners have a dilemma when it comes to investments in older ships which are not reasonable under economic considerations. As a better example Bodewig (2014) and SPC (2014) name the implementation of the double hull legislation for vessels which occurred in two steps: Firstly it has been mandatory for new built ships and in a second step it became mandatory for existing ships. Psaraftis (2014) states the problem with the new Directive is coming from the structure of the organizations which are realizing it: The lack of communication between the departments dealing with the reduction of SO_x, NO_x or CO_2 makes it difficult to foresee the effects on other emissions.

6.2.2 Transport Market Shifts

The majority of the respondents are expecting a market shift within the transport market from sea to land (ISL 2014; Psaraftis 2014; Bodewig 2014). Other respondents, such as Interviewee #9 (2014) stated that modal backshift will not occur in Finnland based on a lack of alternatives. Malmquvist (2014) also brought attention to the idea that the modal backshift will not take place, to a large extent, in Sweden. The raw material industry and paper industry cannot easily switch their transport mode due to the large volume of the transported goods. The increasing number of legislation addressing the characteristics for the road transport within the EU is also hindering a modal backshift (BUSS, 2014). Psaraftis (2014) said the EU is currently aware of the possibility of a partial modal backshift and therefore forms a group of experts who are supposed to find and suggest possibilities to avoid the occurrence of this backshift.

6.2.3 Technical Reaction to the new Emission Limits

Among all respondents there was a surprising unanimity regarding what will happen in January 2015. The reaction of the shipping lines will be the usage of MGO based on the lack of investment possibilities for other fuels or technologies (ISL 2014; Malmqvist 2014). The key point here is the low charter rates caused by the overcapacity on the shipping market (ISL 2014; VDA 2014). Shipping companies like Unifeeder or Teamlines are chartering vessel capacity from ship owners at a very low fare due to the surplus of available capacity (ISL 2014). Therefore the economic situation of ship owners is bad and the willingness to invest is low. According to Malmqvist (2014) the scrubber technology up until now has not been a suitable solution for ships based on the fact that the technology is still in its infancy. This could change in the long run when the global limits of sulphur emission are lowered and the technology will be more mature (Malmqvist 2014). The third option, Liquefied Natural Gas (LNG), was named as a suitable option in the long run, but is depends on the development of the infrastructure (ISL 2014; Malmqvist 2014).

According to ISL (2014) and also the HPA (2014) the "chicken or egg" problem is still an obstacle within the LNG infrastructure development. The shipping industry will, after passing the trough of the crisis, signalize in form of their new ship orders whether LNG is considered a good option for fuel (ISL 2014). The HPA (2014) is actively fostering a LNG infrastructure in the port of Hamburg, however it is currently facing obstacles. Based on the fact that the HPA cannot make this type of investments independently, it is dependent on partners from the bunker-industry. For these partners, however, it is an economical decision to invest which relies on clear signs of future demand. Malmqvist (2014) refers to the successful usage of this type of fuel in the Norwegian shipping industry as an indicator for future usage. In contrast, Interviewee #9 (2014) stated that the usage of LNG is, in the short term, very unlikely, even when a new wave of ship orders is made. The reason Interviewee #9 (2014) considers this as an unlikely alternative, is due to the availability of LNG infrastructure on a global scale. Investments in this type of fuel would bind the ship to the areas where LNG infrastructure exists and would not allow flexible selection of operation areas.

Another effect the SECA-Directive could have is that it may foster innovations in terms of technical or managerial improvements within the shipping market. Malmqvist (2014) and Psaraftis (2014) mention that companies are beginning to reassess their capacity planning

and are becoming more flexible. This flexibility allows them to improve their capacity, for example return trips from Germany to Sweden. Another example is provided by STENA Lines, which is buying other shipping lines (Scandlines) to improve their logistic portfolio. Malmqvist (2014) states that it can be expected that the shipping market will change. Those shipping lines that are innovative in terms of logistical and technical approaches will remain within the market while others may drop out.

6.2.4 State Aid/ Subsidies

All respondents agreed in the fact that the usage of MGO (or other types of fuels) will bring a cost increase of the transport mode sea and will therefore shift more cargo to the road (ISL 2014; Malmqvist 2014; VDR 2014; Bodewig 2014; SPC 2014). This fact stands in contrast to the EU plans to strengthen the competition of shipping. All respondents agree that subsidies from the EU on a national level would help to mitigate this modal backshift. However, among the respondents there are different opinions in which form this state aid can be provided in order to secure sustainable help.

Malmqvist (2014) says, state aids in general are related to challenges. As an example, Malmqvist (2014) named the circumstances of Sweden not offering any state aid, while the Finnish government is offering state aid to retrofit ships (reference: LVM 2013). As a result the ship registrations of ships operating under the Swedish flag are decreasing while the numbers of other states are increasing. This is however not only related to state aid but also the different tax structure of countries within the EU (Malmqvist 2014). Therefore a skewness of market structures might be present within the shipping industry. In contrast to this opinion stands the Finnish point of view. Interviewee #9 (2014) stated that the volume of 30 mio. € will not be able to create a skew within the market. Furthermore, the EU is very well structured to foresee such a development and would intervene if necessary (Interviewee #9 2014; HPA 2014). According to Interviewee #9 (2014) state aid in form of retrofitting or subvention of certain transport routes would not be sustainable. A better way would be the adequate support in form of taxation of fuels such as MGO. This would mitigate the cost increase for the shipper. The HPA (2014) considers EU granted funds as an adequate possibility of state aid. According to the HPA (2014), this state aid would help to overcome the chicken-or-egg problem of LNG, because there would be retrofitted LNG ships on the market, the signs for a demand would be clear and the motivation of LNG bunkering companies to invest would occur. Another approach is suggested by Bodewig (2014). According to him the best way would have been financial support for research

projects in the field of new technologies and innovations (Bodewig 2014). This would have helped to be prepared those involved for the new regulations and could have been used as a communication channel from the EU to the shipping industry. Psaraftis (2014) also mentions the suggestion of higher taxation for truck transports in order to keep the balance between the transport modes, while he also adds that this is not a sustainable solution.

6.2.5 Effects on the Industry

Malmqvist (2014), who is in particular experienced in the effects of legislations to network structures, mentions interesting effects of the legislation on the Swedish paper industry. For this industry the sea transport mode is essential and a cost increase of this mode is connected to reassessment of investments in manufacturing locations. Malmqvist (2014) clarifies that the SECA-Directive is not the only variable affecting such decisions, but that higher transport costs are not favouring the Baltic Sea Region as a manufacturing location. The risky situation in this case is that if a manufacturing plant closes down, it will likely never reopen, rather move to other parts of the world, putting an essential number of jobs at risk (Malmqvist 2014). Interviewee #9 (2014) predicted that the Finnish paper industry will be negatively affected by the Directive. The problematic situation, especially for the industries located in remote northern areas, is that SSS is their only opportunity to export. The already harsh competition within the paper market, for example, becomes even more dramatic due to the increase of transport costs (Interviewee #9, 2014). This is also confirmed by Psaraftis (2014) who stated the SECA-Directive is no longer a topic solely for the maritime industry but the manufacturing industry as well.

6.2.6 Other Problems

Another unsolved problem is the utilization of heavy fuel oil (ISL 2014). Heavy fuel oil is a waste product occurring during the refining processes in substantial amounts. Presently the shipping industry is the largest user of this type of fuel and is therefore in a way contributing to its waste management (ISL 2014). Until now there is no set plan for an appropriate waste management of this fuel. This may not be a problem in regards to the new limits in the SECA, but will increase when the global emission limits are lowered. Another problem is connected to the local focus of the SECA-Directive (Bodewig 2014). While the new legislation only affects the transport within Northern Europe, the

Mediterranean Sea is not affected. This may shift the cargo volume from the ports located in Northern Europe to Southern Europe (Bodewig 2014; HPA 2014).

6.3 SWOT Analysis

In order to determine an adequate strategy for the maritime industry to mitigate negative effects, it is recommended to arrange the collected data into a firm order. Literature (Drews and Hillebrand 2007; Scheuch 2007) name the SWOT analysis as a useful tool to arrange a data set connected to a certain organisation or market. This analysis divides data into four categories: 1) Strength, 2) Weaknesses, 3) Opportunities and 4) Threats. The Strengths and Weaknesses imply the internal factors of the focal market. The other two categories, Opportunities and Threats, address the external factors which the market is exposed to. This type of analysis is useful for this thesis, based on the former evaluation of the internal and external influencing factors of the market.

According to Drews and Hillebrand (2007) to have a successful and reliable SWOT analysis, it is essential to be aware of the following rules:

6.3.1 Determine focus of SWOT analysis

This rule is essential to border the focal point of the SWOT analysis. The following SWOT analysis focuses on the SSS market including shipping lines and ship operators. Although the SSS market is influenced by many surrounding market factors, the major influential factors need to be determined and formulated from the right point-of-view.

6.3.2 In depth analysis

Based on the idea that a SWOT analysis is a rather simple tool to describe a complex situation, it needs to be ensured that the analysis was done on an appropriate detailed level. In order to provide valid facts and aspects within the SWOT analysis the facts are based on practical as well as theoretical inputs. Within this analysis the elements from the two data sources are marked with an (L) for the literature review and a (P) when the source is the interview with participants from the practice. In many cases the literature and the response from the practice conform whereas in some cases they complement one another.

6.3.3 Appropriate level of Details

The SWOT analysis needs to be done on an adequate level of details and should leave the descriptive level. All factors which are listed in the following analysis can be found within the thesis in a more detailed level, either in the literature or interview analysis. This procedure allowed the detection of inconsistencies within the literature or the interviews.

6.3.4 Criteria weight

When creating a SWOT analysis, it is necessary to be aware of the weight of the individual factors. Some weaknesses of SSS have, for example, different weight as a named strength. Therefore it is necessary to be aware of a particular rating within the listing. Strength and weaknesses also need to be analysed in the right context, whereas in the following analysis the strength and weaknesses in front of other transport modes, as well as market conditions will be listed.

For the Short Sea Shipping market in the Baltic Sea the SWOT analysis can be illustrated like Table 9. *(Source of the stated fact is demonstrated by L= Literature and P= Practice.)*

Table 9: SWOT Analysis "Short Sea Shipping in the Baltic Sea Region"

Internal, actual analysis	
Strength	**Weaknesses**
- Environmental friendly e.g. CO_2 emission per ton/km (L/P) - Capable of carrying large goods (L/P) - No liability of land sided infrastructure (L/P) - Easing congestion on land (L/P) - Increasing demand of containerized goods (L) - Good accessibility to remote areas (L) - Often shortest connection (P)	- Lack of flexibility (L/P) - Intensive cargo handling (L/P) - Innovations often reactive (L/P) - Lack of collaboration (L/P) - High level of administration (L/P) - High break-even capacity (L/P) - Low frequency (P) - Low reliability: departure & arrival times (L)
Opportunities	**Threats**
- Promotion of SSS by EU (L/P) - Available spare capacity in shipping sector (L) - Intermodal thinking by ports (L/P) - Congestion on land transport modes (L/P) - Plan to decrease administrative burden (L) - Taxation scheme for trucks (L) - New technical innovations in engine/fuel area (L/P) - Specific industry is dependent on SSS (P) - Innovations in cargo handling e.g. 45’ container (L/P)	- Sulphur emission limits (L/P) - Cost increase for transport (L/P) - Demand for investments (L/P) - Modal backshift (L/P) - Unequal treatment of state aid (L/P) - Administrative problems for 45’ foot container (L/P) - Uncertainty about fuel-supply, - prices and - developments (L/P)
External, potential analysis	

7.0 Discussion of Strategic Assessment

In the next step the foregoing SWOT analysis can be used for developing strategies. The SWOT matrix which has been evaluated previously will be extended on four strategy fields, whereas each strategy is individual tailored to the given interplay between Strength-Opportunities, Strength-Threats, Weaknesses-Opportunities and Weaknesses-Threats.

Table 10 is illustrating this procedure and the individual strategies are described, which will be evaluated in the following.

Table 10: Derived Strategies for Short Sea Shipping in the Baltic Sea Region

	Strength • Environmental Friendly e.g. low CO2 emission per ton/km • Capable of carrying large goods • No liability of land sided infrastructure • Easing congestion on land • Increasing demand of containerized goods • Good accessibility to remote areas • Often shortest connection	**Weaknesses** • Lack of Flexibility • Intensive Cargo handling • Innovations often reactive • Lack of Collaboration • High level of administration • High break-even capacity • Low Frequency of departures • Low reliability: Departure & Arrival times (Unpunctual)
Opportunities • Promotion of SSS by EU • Available Spare Capacity in shipping sector • Intermodal thinking by ports • Congestion on land transport modes • Plan to decrease administrative burden • Taxation scheme for trucks • New technical innovations in engine/fuel area • Specific industry is dependent on SSS • Innovations in cargo handling e.g. 45' containers	**Strategies to make use of Opportunities through Strengths** - Increase involvement in EU projects - Active collaboration with manufacturing industries - Increase marketing effort (Environmental friendly, Easing congestion) - Use competitive advantage over land sided modes to win customer loyalty - Use high demand for transports to build alliances and increase service quality	**Strategies to make use of Opportunities to minimize Weaknesses** - Foster innovations to decrease administrative burden (EU & National) - Foster Innovations (technically & strategically) - Increase flexibility and frequency through innovative strategies ("door to door") - Increase Collaboration with terminal operator - Increase Collaboration with land modes (45' foot containers) - Increase reliability of arrival times (Service level)
Threats • Sulphur emission limits • Cost increase for transport • Demand for Investments • Modal backshift • Unequal treatment of state aid • Administrative challenges for 45' foot container • Uncertainty about fuel-supply, -prices and -developments	**Strategies to prevent Threats through Strengths** - Lobbying towards the EC for funds for investments - Alliances with other operator to meet customer needs - Long term agreements with customer to secure investment - Approach EC to reduce administrative burden for 45' containers - Be both: Substitute and complement of other transport modes	**Strategies to minimize the potential dangers lying in sectors where Weaknesses meet Threats** - Increase communication with ports, terminal operators, EU and IMO - Hedge risk trough long term contracts - Increase flexibility to gain new market shares and achieve break-even capacity

7.1.1 Strategies to make use of Opportunities through Strengths

The strategies named within this field consider the internal strength with the external opportunities that are offered by the external market. SSS is the most environmentally friendly transport mode when CO_2 emissions are taken into account. Furthermore, it contributes to the overall EU goal to shift cargo from the congested road to the sea. Therefore the EU offers funds within a wide range of EU projects where Short Sea Shipping companies can actively participate. In the year 2014 the EU launched a programme called "Horizon 2020" with an available funding of 80 billion Euros. This project is actively searching for participants from practice to foster projects which aim towards sustainability. The active participation in such projects is recommended to increase the participation in research networks, as well as benefit from EU support to increase the competitiveness of SSS.

The characteristics of certain goods such as raw materials, wood and paper, especially from Finland and Sweden rely on the transport mode SSS. Therefore an intensive collaboration with these industries is crucial. The capability of SSS to carry large amount of goods to a low price gives SSS a competitive edge. The active collaboration between the shipping companies and industrial companies can also be fostered by port authorities. Examples from Sweden have shown that the role of the port as an intermediary between shipping lines and manufacturing industries is beneficial for all involved partners. Results of the cooperation can be for example the agreement of fixed schedule times or fixed cargo volumes. This is connected to an increased marketing effort which should be aspired.

SSS has the competitive edge in environmentally friendliness and not burdening the road infrastructure. Many decision makers in terms of transport choice have often experienced congested roads and it is likely that a higher marketing effort would also increase the demand for SSS. Additionally many companies start campaigns for a "greener" and environmentally friendly image. Therefore the shipping industry can, by actively approaching these companies, support their initiatives. Developments like the measurement of the CO_2 footprint of products favouring the transport mode of SSS and a higher marketing effort would create a win-win situation for both sides. Hereby a main focus should be put on long-term agreements with customers in order to mitigate future uncertainty from both sides. The goal should be to gain strong customer loyalty which can be achieved by using the competitive assets of SSS to meet the customer needs.

Industries located in remote areas need a reliable transport connection to customer and supplier markets. To this point SSS should adjust its strategic management to create a fruitful cooperation. Economic forecasts as well as practical research predict a strong growth of international cargo flows, while land sided infrastructure is already on its limit of capacity. Therefore SSS should try to gain as much cargo as possible from the increasing demand. Shipping companies should think about the transport mode at a whole and should promote it. Alliances might be a possibility to attract higher volumes of cargo and allow long-term agreements with industry based on higher availability of cargo capacity. The goal should be to become an integrated transport mode within the supply chain of the company. Capacity utilisation strategies like the aforementioned "Never Say No" strategy can help to increase customer loyalty and improve the relationship between customer and the shipping companies. This needs to be done under careful economic considerations, where the establishment of a long-term cooperation plays a crucial role.

7.1.2 Strategies to make use of Opportunities to minimize Weaknesses

A frequently named weakness of the SSS is the administrative burden within terminals. This administration is increasing costs due to the involvement of labour and results in waiting times for the vessels. The analysis of the interviews has shown that the EU is fostering projects to decrease the administrative burden. The SSS actors should actively participate in such projects in order to communicate their needs and interests. Technical innovations from the IT field in particular can help to decrease this burden. SSS should actively participate within the design process of IT systems like the "National Single Window" project to ensure that such innovations match their needs. The EU is actively fostering innovations in the field of SSS and thus participation within these projects brings internal advantages as well as it increases the competitiveness amongst other transport modes. Additionally, new innovations have evolved within the SSS industry in terms of alternative fuels.

These technical innovations are to some extent still immature and not 100 percent reliable. SSS operators and vessel owners should actively look for possibilities to invest in new types of engines. The literature has stated that the willingness for innovations is giving actors a competitive edge. There are obstacles to overcome such as the availability of investment during the present crisis. As a possible solution, ship owner should cooperate with ship charterer to create a strategic long-term plan for their investment. Long-term

contracts would help to illustrate economical perspectives in front of credit providing institutions and thus are a solution to solve the investment squeeze. In summary there are new technologies on the market which need a certain degree of investment. Strategic partnerships with customers might be a possibility to share the burden of this required investment.

In the literature as well as in practice, SSS has the negative reputation of being inflexible. This is based on its dependency on ports as well as other transport modes. Compared to the truck the mode SSS is lacking of flexibility. Therefore SSS needs to increase its flexibility on the one hand and decrease the complexity on the other. The goal of every SSS operator should be the implementation of a "door-to-door" service for their end customers. This requires the implementation of an intermodal transport chain. (An intermodal transport chain has many actors of different individual companies which need to be coordinated among the whole supply chain. Other than the multimodal chain, where several transports belong to the same company are used.) The coordination of interfaces should be organized by a focal company. The operating line is in charge of deciding whether it wants to participate within the intermodal chain as a pure forwarder or actively approach end customer and be the "one face to the customer" thus the organizer of the intermodal chain. Both options (see Appendix 3) require increased flexibility and likely a higher frequency.

The review of the literature has shown that SSS is lacking of service thinking and reliability. The transport mode should evolve from a pure transporter to a service orientated transport mode which knows the needs of its customers. The development of service standards in form of KPIs might be a possibility to increase the service thinking within the SSS operations. With the ambitious goal to increase the service level, SSS operators would also be forced to increase their collaboration with other actors within the transport chain. The fruitful collaboration within terminals would help to identify inefficiencies within the interface "port" and would result in a competitive edge for SSS operator. Frequency is also an essential factor within the provision of a good service level. The literature review regarding SSS in the context of supply chains describes supply chain integration requires an adequate number of frequencies in terms of departure and arrival. SSS operators should try to implement an appropriate number of frequencies in order to fulfil the requirements of the customer e.g. the producing industry. The collaboration with land modes, especially the truck, is also crucial for a development towards a more advanced and integrated transport mode.

Within practice as well the literature the 45-foot container is presented as a cargo unit possessing the ability to carry more cargo than the 40-foot container and is additionally using the full capacity of a trailer. The analysis has shown that shipping companies and terminal operators are to some extent not pleased with the measurement of this container due to possible loss of cargo capacity on the ships or storage capacities on land respectively. When considering the transport chain (see Appendix 3) it is possible to obtain that the decision making entity is the customer, whilst the "power" (in terms of deciding the transport unit) of a SSS operator within the intermodal transport chain is not very high. Moreover the analysis has shown that the industry, thus the customer, favours a 45-foot container because of the common practice to calculate transport units in trailer sizes. Customer driven SSS operators such as Unifeeder and Teamlines have already adapted to the needs of their customers and are actively promoting this type of transport unit. The promotion and usage of the 45-foot container creates a number of challenges for SSS operators and also other members of the intermodal transport chains. These SSS operators need to ensure that the cargo handling equipment used in ports is able to handle this relatively exotic type of container. Additionally it needs to be secured that the 45-foot container is regionally available. The implementation of a "grey box" which is not labelled from one particular operating company but appears neutral could be one solution. This would increase the availability of the particular container and would foster the implementation and usage of this unit. The result would be a better cooperation between land-sided modes and the SSS operator and additionally would diminish the weakness, "lack of cooperation." Institutions such as the SPC can then act as an intermediate gathering the needs and expectations of all partners among the transport chain.

7.1.3 Strategies to prevent Threats through Strengths

The biggest external threat for the SSS market, the main topic within this thesis, is the limitation of sulphur emission within emission controlled areas. The literature has shown that there are three possibilities to comply: Usage of MGO, implementation of Scrubber systems or the retrofit to the usage of LNG. The two latter options require a substantial investment on behalf of the shipping operators. The analysis has shown that due to the crisis, the ability to burden such an investment alone is not present. Therefore SSS needs to use its strengths and macro-economic importance within Europe and needs to lobby for financial aid from the EU. The EU is willing to promote this transport mode and is therefore likely to provide funds for the investments. For transition time in particular, state

aid from the EU would help to ease the negative impacts. Another option would be state aid on a national level. In Finland, for example, the federal government organized with the approval of the EU state aid to retrofit ships. Federal governments should be aware of the importance of their maritime shipping sector and need to evaluate the impacts of a cost increase of transports of this sector. In Finland SSS has a very high importance within the transport modes making is reasonable to provide state aid. The important challenge for the EU in communication with the federal governments is to ensure that no market shift occurs due to imbalanced provision of national state aid and that the state aid is sustainable.

Another imminent threat is the so-called modal backshift from sea to road caused by a cost increase of the sea transport mode due to the higher fuel prices or the amortization of investment cost. This modal backshift needs to be prevented to the extent as possible. Therefore SSS must differentiate their offered service and alignment so that the customer is convenient and willing to pay a higher price. This is one main role that may play to the environmental friendliness of this transport mode, as was previously mentioned. SSS operators should not only serve the pure transport but also serve the customer some kind of a green label for their transport chain and thus underline their sustainable efforts. This would bind the customer to them even though the price is increasing.

SSS should extent their offer of transport, for example, offering more reliable services or offer extended services such as the supervision and organisation of the whole intermodal transport chain. The cooperation with other shipping lines is also an option to increase the service level in order to mitigate the negative effects. The overall goal to win new and maintain old customers should be a top priority. SSS should take the role as a substitute for other transports as well as compliment them. This requires a fundamental customer driven thinking, focusing on the whole transport chain instead of individual actors. The alliance with other transport modes has to be seen as value-generating instead of a competitive attitude.

The external challenge for an intermodal transport chain considering the 45-foot container as the cargo unit is the administrative obstacle on EU level. Transport associations need to increase the acceptance of the 45-foot container on an international level in order to decrease the administrative burden. As an important argument the environmental friendliness of this type can be pointed out due to its capability to carry more cargo while using the same energy input.

7.1.4 Strategies to minimize the potential dangers lying in sectors where Weaknesses meet Threats

The SSS sector within the EU has the reputation to be rather passive and non-communicative towards changes and innovations. The involvement in EU projects for example demands the insight into practices which are connected to the possibility of losing competitiveness. In order to mitigate the negative impact of the new sulphur limits SSS operators should actively seek the dialogue with the EU and the IMO and illustrate their situation. It is therefore recommended to act as a single entity towards these institutions. Additionally the single entity approach would help to combine the experience of needs and interests and help to establish standards within the industry. These standards would help to increase efficiency towards terminals as well as find opportunities for all actors within the market to mitigate the impact of threats, namely the new sulphur emission limits. The communication between the companies has to be structured and transparent to avoid inconsistence with antitrust laws.

Additionally it is recommended to create mechanism for hedging the risk in the market. In practice this could mean for ship owner spreading the risk connected to technological innovations within the fleet. Although it is more efficient to focus investments towards one technological approach with regard to economies of scale, it is recommended to spread investments. Thus the operators will not be dependent on one type of engine or fuel. Furthermore is it reasonable to make long-term contracts with fuel suppliers if possible. The SSS operators are forced to gamble and predict future fuel market developments which are nearly impossible to predict.

As previously mentioned it is also recommended to secure risk of investment through long term contracts with customers. The analysis has shown that the actual contract habit within the shipping industry is not characterized by long-term thinking. Therefore it may be suitable to approach the end customer directly and thus negotiate long-term contracts with them. This might demand a certain kind of flexibility and rethinking of strategic orientation. An increased flexibility would also allow companies to reach the break-even capacity within their operations. In summary it is recommended for the SSS market to act more pro-active and to focus interests. These interests can then be represented in a concentrated form and thus the communication towards the EU would be more efficient.

7.2 Recommendations other SSS stakeholder

The aforementioned choice of the "Unit of Analysis" (see Figure 3) is based on the fact that it is necessary not only to analyse the Short Sea Shipping market but also to analyse relationships with other stakeholders. After having developed strategies and recommendations for the SSS market, it is also advisable to evaluate recommendations for other stakeholder in order to complete the framework of the thesis. Therefore the following section will evaluate recommendations for the stakeholder: 1) Manufacturing Industry, 2) Port Authorities, 3) Terminal Operator, 4) Land-sided modes and 4) the EU & Federal Governments. The recommendations will aim to increase the competitiveness of the transport mode SSS and to mitigate possible negative effects of the new sulphur emission regulation coming into force in 2015.

7.2.1 Manufacturing Industry

Many manufacturing industries are reviewing their production-operations and –strategies with the aim towards more sustainability and environmentally friendly practices. The choice of transport mode is mostly based on established habits within the transport department. New phenomena such as the CO_2 footprint are also taking into account transport emissions. Therefore it is recommended for industrial companies to reconsider their transport strategy. As a first step it is recommended to approach institutions like the SPC which have broad market knowledge and offer information services free-of-charge. The SPC may suggest a full container transport or the usage of RoRo ferries. Another approach would be the direct contact to SSS operators which will develop together with the industry company suitable transport solutions including the sea mode. Industry companies should be aware of higher prices for a transport strategy including a sea leg, where they are not only purchasing the pure transport but a "green label" for their product or company. A complex transport network is also providing the company with a competitive edge due to the usage of new innovative transport modes.

7.2.2 Port authorities

The role and the involvement of port authorities differs from port to port, whereas we assume for the following recommendations that the port is organized as a landlord model and thus the port authority leases the land to terminal operator in the form of long-term contracts. The port authority is responsible for the maintenance and provision of adequate infrastructure. The major challenge for port authorities is to create an infrastructure which

meets the needs of SSS. In this context the new regulation on sulphur emission plays an important role, in particular when it comes to the alternative fuel LNG.

The port authorities need to ensure that within the port infrastructure it is possible to bunker LNG. SSS will consider the availability of LNG in their strategic network plan. Therefore the ability to provide LNG is not only important for SSS but, is also a factor which gives the port a competitive edge over other ports. Building alliances with other ports is also recommended, so that shipping lines can consider these alliances in their shipping loop. The analysis has shown that the construction of LNG infrastructure is challenging for some port authorities due to the core activities of these authorities. Port authorities, however, should build a fruitful framework for companies to invest in their port and provide LNG. Additionally it needs to be checked on behalf from the port authorities how to deal with the toxic waste created by scrubbing system as this might also be a future concern.

The literature review as well the practical analysis has shown that SSS is requiring pre- and post-carriage. Consequently the hinterland connection from and to the port is of vital importance. Port authorities need to be aware of the cargo volume handled in the port and evolving infrastructure requirements. For SSS, a decisive factor is the speed of cargo handling within the port, thus it is important that the cargo which was brought from SSS is easily accessible by trucks. The development of a “dry port” in the hinterland might be one approach which is supporting the SSS transport mode. In this model, cargo, which is designated for the hinterland, gets directly shipped out to a “dry port” in the hinterland where trucks can pick it up and thus continue the transport chain. This would mitigate congestions within the port where deep sea cargo as well as SSS cargo are handled. Another advantage of this model is the closeness to the customer, when the pre-carriage is not required from the port itself, rather a central point within the country. The “dry port” model is quite challenging for port authorities, but has proofed itself in the practice; consequently it is a recommended solution to advance the hinterland connection.

7.2.3 Terminal Operator

The analysis of the interviews has shown that a major disadvantage of SSS compared to other modes is occurring in the interfaces of sea-to-land transport modes, namely the terminals. In the terminals, SSS is facing a high administrative burden and a cost intensive cargo handling. Consequently in this interface SSS is losing a competitive edge towards other transport modes. It is recommended for terminal operator to meet the requirements of

SSS operators and to actively foster initiatives to diminish inefficiencies. The analysis has shown that the reduction of administrative burden is not in the sphere of power of terminals operator. Therefore it is recommended to evaluate ways and procedures which reduce inefficiencies without violating legislation. These innovations are likely to come in the form of e-solutions such as e-invoice, e-manifest or e-seaway bills. An active involvement in pilot projects is recommended to emphasize a pro-active behaviour. Terminals which are serving deep sea vessels as well as short sea vessels are often too much focused on deep sea customers. Consequently the needs of SSS are falling behind. Many innovations focusing on SSS can be used to establish efficient solutions for deep sea cargo handling as well.

Additional services for SSS vessels, for example maintenance work, waste management or other complementary services, are possibilities to support SSS. The practical analysis has shown that terminal operators are to some extent critical to the usage of the 45-foot container due to the disturbance of the storage system which mainly consists of 20- and 40-foot containers. In order to support the intermodal fit of the sea transport it is recommended to support the usage of this transport unit. Therefore extra charges should be avoided and adequate cargo handling equipment should be available in any terminal. In summary it is recommended to create a fruitful cooperation with SSS operators and be innovative in new ways to meet the required needs. The main obstacle for SSS, the administrative burden, should be approached and innovations to reduce them should be fostered.

7.2.4 Land sided transport modes

The dependency of SSS on other transport modes has been described analysed and confirmed by the literature and by the practice. The dependency is based on the required pre- and post-carriage from and to the port facilities. For many ports, in particular within the BSR the truck is dominant for these transports. The main goal for land-sided modes should be the creation of a smooth and reliable transfer of cargo. Technological innovations are also in this field available, but still immature. Technologies transferring cargo availability information to the trucking company are to be preferred to diminish waiting times. An active participation in projects fostering this innovation is recommended.

The land-sided modes, especially the truck, need to reconsider their attitude towards the SSS transport mode and need to implement a cooperative instead of a competitive attitude.

In particular the trucking industry needs to be aware of the fact that a further increase of cargo on the street is not desirable and will also harm the acceptance of this transport mode. Consequently land-sided transport modes should shift towards more complex intermodal transport chains, which have a long lasting and more sustainable perspective.

7.2.5 European Union and federal governments

Based on the critical literature review of the role of the EU the interviews were aimed to explore this role further with practical input. The position of the EU towards the maritime sector is ambiguous. On the one hand the EU is trying to promote the maritime transport mode whereas on the other hand new regulations which will evoke controversial developments are implemented by the same institution. It is not possible, and not preferred, to postpone the implementation although the shipping industry is restoring itself from a crisis. The analysis has shown that the implementation process has not been well planned.

A shipping market like the one in the BSR is not homogenous, but characterized by many different types of vessels and ages of vessels. Therefore the new regulation cannot be answered in a general initiative but need to be evaluated for each individual case. Based on the analysis of the interviews it is recommended to implement a transition time in the implementation procedure. The EU should adapt the new sulphur regulation limits to vessels which have an engine younger than a particular date e.g. the year 2000. To prevent shipping lines and owner from shifting their older ships in the SECA to bypass the new regulation, the EU can create a snap-shot of the present vessel situation of the BSR. This method would help ship owner to handle the burden of investment in a better and more sustainable way. The implementation of the double hull legislation can be used as a reference model for a good implementation process.

Another recommendation is to apply monetary support through the provision of subsidies. The provision of subsidies is a challenging topic because they need to be a) equal and b) sustainable. It is a matter of fact that only a few ship owners currently have the ability to burden the investment without subsidies. The result is that most vessels will operate with MGO, which is the alternative with the lowest degree of innovation. The goal of the EU should be to create an innovative environment for the shipping sector and thus foster investments in ships towards the usage of scrubber systems or LNG engines. One possible solution would be to provide financial aid for retrofitting. In order to provide an equal treatment the operative distribution should be organized by the federal governments of

each state and strict requirements should be set up by the EU. The size of the fund should be coupled to the number and size of the enlisted ships for each country, which are operating up to a certain degree of their time (e.g. >70%) in the SECA. This would also support the construction of the LNG infrastructure within Europe. When bunker providing companies would see a clear demand for LNG, based on a certain number of retrofitted ships, their willingness to invest in LNG terminals would grow. Therefore the general attitude of the maritime industry including stakeholders like port authorities, ship owners and experts is positive towards subsidies in a structured and controlled way.

One major challenge for the EU should also be the reduction of administrative burdens of cargo handling. In this regard, SSS is losing a competitive edge against other transport modes. Therefore the EU needs to increase its influence on national legislations to decrease burden of custom procedures. For new EU member countries within the BSR in particular, the custom procedures are to some extent still present. It is a well-known fact within the maritime business environment that customs authorities are very powerful and try to maintain this power. Therefore the dialogue with federal governments needs to be intensified to reduce custom procedures with regard to intra-European cargo handled in ports.

Another topic in need of attention from the EU is the usage of the 45-foot container. In this field the EU has to approach the federal governments of each member country with the goal to abolish administrative burdens connected to the road usage of this type of container. In the present situation there is an inconsistency in the permission of the container. It is recommended to implement EU-wide regulations for the usage of the container. This might also include Russia, to increase the acceptance of this transport unit outside of the EU.

7.3 Summary

The evaluation of strategies and recommendation has shown that SSS is interacting and is dependent on many influencing factors which are sometimes out of the range of influence of SSS. SSS operators need to be aware of the fact that goals such as increased efficiency or higher flexibility are requiring the cooperation with other business partners. There are certain dependencies within the market and it crucial to identify them. The main focus of SSS should be on the customer. Identifying the needs of the entity “customer” is allowing the development of requirements towards other stakeholder. A higher focus on service has to be evaluated due to the attested lack of service level of SSS towards the customer. In

order to increase the service level, the shipping industry can improve its own operations and strategies. There are however weaknesses which need to be improved within the relationship to other crucial business partners, institutions and authorities. The challenge therefore is to identify the needs of the customer and translate it into requirements towards the described entities. This dependency can be illustrated as follows:

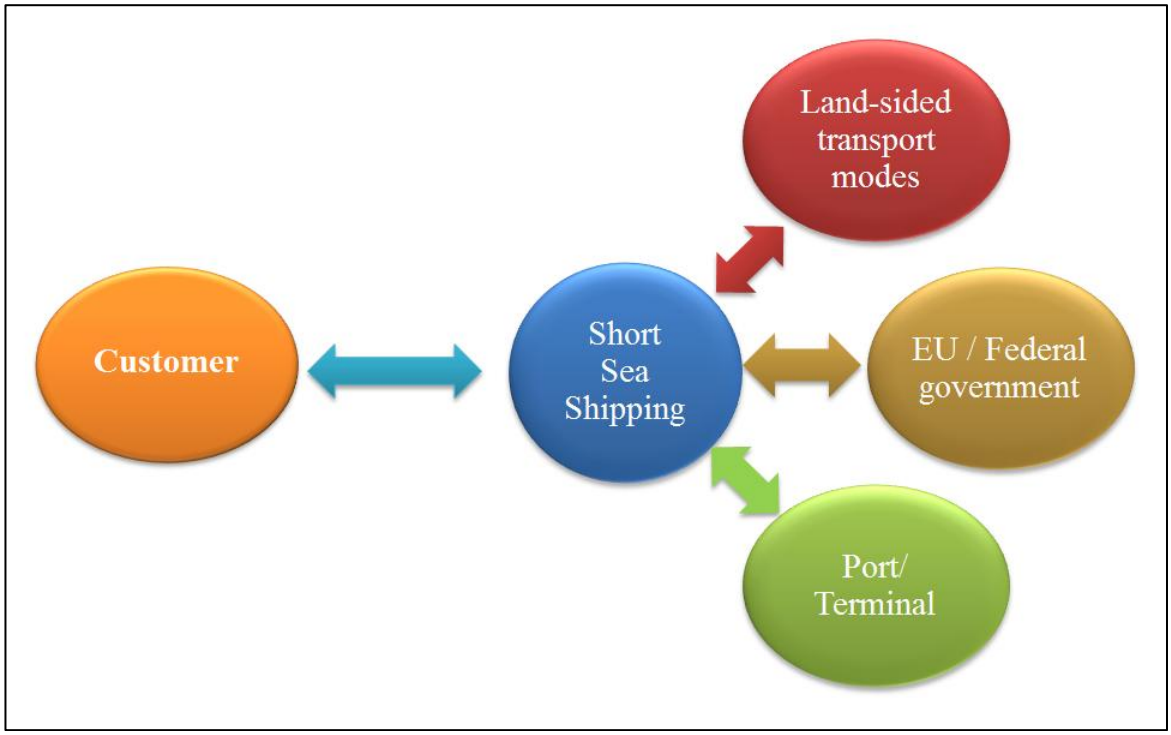


Figure 17: Dependency of Short Sea Shipping

The suggested recommendations and improvements are challenging under normal circumstances but become even more urgent under consideration of the upcoming sulphur emission levels. The shipping sector is now facing the new regulations, creating big challenges most likely burden the customer relationship due to higher prices. Therefore, this disturbing factor needs to be compensated with a higher service level, which can be achieved by new strategic orientation. This new orientation, however, requires collaboration through all stakeholders as it is described (7.1-7.2) and illustrated above.

8.0 Conclusion and Further Research

8.1 Conclusion

The elaboration has shown that Short Sea Shipping is a vital transport mode within the transport environment of the Baltic Sea Region. The BSR is a growing market making this transport mode unavoidable. Nevertheless the evaluation has also shown that this transport mode can be substituted by land-sided transport modes, stressing the land-sided infrastructure even more. Important industrial sectors based in the BSR and even complete national economies are dependent on this transport mode.

Within the majority of the industries, however SSS is not the first choice of transport mode due to higher administrative burden, lack of flexibility or the complexity of intermodal transport chains linked to it. Consequently the short sea shipping transport mode is currently below its potential. This fact paired with the increasing demand for cargo transport results in a congested land infrastructure.

The EU is approaching this problem with promotion initiatives for SSS. Conversely, the EU is also implementing environmental restrictions in 2015 which will most likely force the sector to charge higher prices due to higher fuel or investment costs.

A number of possible answers have been named and analysed while only three alternatives are realistic in the present situation: Liquefied Natural Gas, Scrubber system and Marine Gas Oil. The tenor of the analysis is that in the beginning of 2015 most shipping operators will use Marine Gas Oil. The most innovative type of fuel is Liquid Natural Gas which was also described as a future type of ship engine. Until now the LNG infrastructure is not comprehensive, which is, next to the high investment costs, an additional obstacle causing ship operators to hesitating switching to LNG. This problematic situation of supply and demand, the classical “chicken-or-egg” problem was addressed in a form appealing to the EU so that the EU might help funding the LNG retrofitting of vessels to overcome the problem.

A scenario which is predicted by the literature as well as practice is the modal backshift from sea to land. This backshift is eminent and probably inevitable for certain transport routes, in particular for the shorter distances. It is nearly impossible to predict to what extent this backshift will take place. Within the thesis one scenario is presented, which predicts cargo shifts for short distance, intra-European transports. RoRo-transports in particular will experience a model backshift of up to 46% for certain connections. The intra-European maritime trade and feeder transports are also affected, whilst the distance is decisive for the impact.

This thesis has outlined the challenges as well as opportunities for the maritime transport mode in the Baltic Sea Region. These are confronted by the internal strength and weaknesses of this transport mode. Strategies were developed which aim to increase the competitiveness of Short Sea Shipping. There are various strategies suggested while the most important recommendation is the higher customer focus. Due to the fact that the transport mode SSS is part of an intermodal transport chain, it is facing a higher complexity and thus depends on the interplay with business partners. Consequently a higher customer focus is demanding the collaboration with the other business partners, whereas the terminal as the intersection of sea to land was determined as most significant. One major challenge is the reduction of administrative burden which SSS is facing. This is mainly in the sphere of power of the EU or the federal government. It is recommended to foster the implementation of international administrative standards which meet the practical requirements of the Short Sea Shipping transport mode.

Furthermore the usage of the 45-foot container has been evaluated. This type of container is especially suitable for intermodal container transports and eases the cooperation between sea- and land-sided transport modes.

Additionally it was concluded that the implementation process of the SECA-Directive chosen by the EU is not meeting the requirements of the shipping market where older and newer ships are operating. Thus a transition time which is differing between older and newer ships is recommended, which would still follow the goal of a cleaner maritime transport mode but would take to some extent burden away from the ship owner, which is however not likely to happen.

8.2 Further Research

The thesis worked to evaluate the present situation of Short Sea Shipping with an outlook to 2015. Currently there is a great deal of movement surrounding this issue and the EU is looking for ways to implement the new regulations smoothly. Further research may help to evaluate possibilities for a smooth transition process, including a detailed shipping market review. Further research should also address the effect of the new regulations on a) the fuel prices and b) the modal backshift. This thesis described development based forecasts, whereas a detailed analysis of cause and effect on the base of actual data would bring additional value, especially in anticipation of global emission regulations. Furthermore research focusing on the administrative burden in terminals is recommended to identify potential opportunities to decrease these burdens. A particular focus on IT solutions is recommended to meet the future trends of global e-solutions.

9.0 List of References

ACL (2014) *Amber Coast Logistic - Results and Recomendations*, Available at: http://www.ambercoastlogistics.eu/sites/default/files/final_brochure_fin_lores_dplseiten.pdf [Accessed: 05.02.2014]

Baindur, D. and Viegas, J.M. (2012) *Success factors developing viable Motorways of the Sea projects in Europe*, Logistic Research, Nr. 4, pp. 137-145.

Baird, A.J. (2007) *The economics of motorways of the sea*. Maritime Policy & Management, Vol. 34, pp. 287 – 310.

Baltic Container Handbook 2012/2013 – a quiet arms race - (2013) *Shipping Lines*, Baltic sp. z.o.o: Gdynia (Poland)

Baltic Sea Region (2014) *Country Specific Information*. Available at: http://eu.baltic.net/Country_Specific_Information.1397.html [Accessed: 13.03.2014]

Baltic Transport Journal (2011) *The best solution is LNG*, Available at: http://cleantech.cnss.no/wp-content/uploads/2011/11/LNG-articles-Baltic-Transport-Journal-October-2011.pdf [Accessed: 10.04.2014]

Brunvoll (2014) *RIM DRIVEN THRUSTERS (RDT)*, Available at: http://www.brunvoll.no/product/the-complete-thruster-system/products--1093 [Accessed: 31.03.2014]

Bunkerworld (2014) *Prices – Singapore*, Available: http://www.bunkerworld.com/prices/ [Accessed: 14.04.2014]

Cooper, D.R. and Schindler, P.S. (2008) *Business Research Methods*, 10th edition, New York: McGraw-Hill International Edition.

Corbett, J. and Fischbeck, S. (1997) *Emissions from ships*, Science 278 (5339),pp. 823–824.

Corbett, J.J. and Winebrake, J.J. (2008) *Emissions tradeoffs among alternate marine fuels: total fuel cycle analysis of residual oil, marine gas oil and marine diesel oil*. Journal of the Air and Waste Management Association 58 (4), pp. 538–542.

Crilley J, Dean CJ.Short (1992) *Short Sea shipping and the world cargo carrying fleet - a statistical summary*. Proceedings from the First European Research RoundTable Conference on Short Sea Shipping, 26–27 November. London: Technical University Delft, Lloyds of London Press, 1993.p.1–21.

Danielis, R., Marcucci, E., and Rotaris, L. (2005) *Logistics managers' stated preferences for freight service attributes*. Transportation Research Part E: Logistics and Transportation Review, 41(3), 201–215.

Danish Maritime Authority (2012) *'North European LNG Infrastructure Project'*, Available at: http://www.dma.dk/themes/LNGinfrastructureproject/Documents/Final%20Report/LNG_Full_report_Mgg_2012_04_02_1.pdf, [Accessed: 04.04.2014]

DFDS (2014) *New sulphur rules cause closure of the Harwich-Esbjerg ferry route*, Available at: http://www.dfdsgroup.com/News/Latest/20140429/ [Accessed: 12.05.2014]

DNV (2010) *Greener Shipping in the Baltic Sea*, Available at: http://cleantech.cnss.no/wp-content/uploads/2011/05/2010-DNV-Greener-Shipping-in-the-Baltic-Sea.pdf [Accessed: 04.04.2014]

Donnelly A. and Mazieres J. (2000) *Short sea shipping: a viable alternative to overland transport*, http://www.amrie.org/docs/shortsea.htm , [Accessed: 9.06.2000]

Drews, G. and Hillebrand, N. (2007) *Lexikon der Projektmanagement-Methoden*, Haufe Verlag: München.

ECMT (2001) *Short Sea Shipping in Europe, European Conference of Ministers of Transport*.

ECMT (2002) *Key Issues for Transport Beyond 2000*: Introductory Reports and Summary of Discussions: 15th International Symposium on Theory and Practice in Transport, European Conference of Ministers of Transport.

EGSCA (2009) *Objectives*, Available at: http://egcsa.com/code-of-conduct.php [Accessed: 04.04.2014]

Eships (2014) *Concept fuel cells* Available at: http://e4ships.de/Concept-Fuel-Cell.html [Accessed: 12.04.2014]

Esty D. (1994) *The challenges of going green*. Harvard Business Review;72(4):37–50.

EU (2006) *Commission staff working document on the continuous carriage of 45' containers in national road transport*, Available at: http://ec.europa.eu/transport/modes/road/doc/sec(2006)1581.pdf [Accessed: 22.04.2014]

EU (2010) *EUROPE 2020 - A strategy for smart, sustainable and inclusive growth*, Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:2020:FIN:EN:PDF [Accessed: 26.03.2014]

EU (2011) *EUROPE White Paper on transport: Roadmap to a single european transport area — towards a competitive and resource-efficient transport system*, Available at: http://ec.europa.eu/transport/themes/strategies/doc/2011_white_paper/white-paper-illustrated-brochure_en.pdf [Accessed: 26.03.2014]

EU (2012) *Directive 2012/33/EU of the European Parliament and the Council of 21 November 2012 amending Council Directive 1999/32/EC as regards the sulphur content of marine fuels*, Official Journal of the European Union, L 327/1.

EU(2013) *EU transport in figures – Statistical Pocketbook 2013*, Luxembourg: Publications Office of the European Union.

European Comission (2013) *LNG Rotterdam Gothenburg*, Available at: http://inea.ec.europa.eu/download/project_fiches/multi_country/fichenew_2012eu21003p_final.pdf [Accessed: 25.04.2014]

European Commission and ENTEC UK Limited (2002) *Quantification of Emissions from Ships Associated with Ship Movements between Ports in the European Community*, European Commission. DG ENV.C1, Rue de la Loi, 200, B-1049: Brussels, Belgium.

European Community of Shipowners' Association (2014) *Maritime community calls for a more judicious approach on the circulation of 45-foot containers*, Available at: http://ec.europa.eu/transport/modes/road/doc/sec(2006)1581.pdf [Accessed: 22.04.2014]

Eurostat (2012) *Energy Consumption per Sector* , available at: http://epp.eurostat.ec.europa.eu/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=tsdpc320&language=de [Accessed: 13.03.2014]

Eurostat (2013) Eurostats *Pocket Book - Energy, transport and environment indicators*, Available at: http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-DK-13-001/EN/KS-DK-13-001-EN.PDF [Accessed: 13.03.2014]

Eyring V. , Isaksen I., Berntsen T., Collins W., Corbett J., Endresen O., Grainger R., Moldanova J., Schlager H. and Stevenson D. (2010) *Transport impacts on atmosphere and climate: Shipping*, Atmospheric Environment, Vol. 44, pp. 4735–4771.

Feo, M., Espino, R., and Garcı´a, L. (2011) *An stated preference analysis of Spanish freight forwarders modal choice on the South-West Europe motorway of the sea*, Transport Policy, 18(1), 60–67.

GCR (2014*) The Global Competitiveness Report 2013 – 2014*, Available at: http://www.weforum.org/reports/global-competitiveness-report-2013-2014 [Accessed: 03.02.2014]

GIE (2014) *LNG Map*, Available at: http://www.gie.eu/index.php/maps-data/lng-map [Accessed: 09.04.2014]

Gill, J. and Johnson, P. (2010) *Research Methods for Managers*, 4th edition, London: Sage.

Glen, D. and Marlow, P. (2009) *Maritime Statistics: a new forum for Practitioners*, Maritime Policy & Management, Vol. 36, Nr. 2, pp. 185-195.

Haralambides, H.E. (2004) *Determinants of Price and Price Stability in Liner Shipping, Workshop on the Industrial Organization of Shipping and Ports*, National University of Singapore; 5–6 March 2004, Singapore.

Harrington, W. and Morgenstern, R.D. (2004) *Choosing environmental policy: comparing instruments and outcomes in the United States and Europe*, In: Harrington, Winston, Morgenstern, Richard D., Sterner, Thomas (Eds.). *Resources for the Future*, Washington, DC, p. 283.

Hjelle, H. M., and Fridell, E. (2010, July) *When is short sea shipping enviromentally competitive?*, Paper presented at 2010 Annual Conference of the International Association of Maritime Economists (IAME), Lisbon.

Howi, I., B. and Eidhammer, O. (2013) *Future logistics solutions in Norway*, TØI Report 1152/2013, Oslo.

Hsua, W.K., Show-Hui S. Huang, S.S. and Yu H. (2009) *Shipper behavior to use EC services in liner shipping*, Int. J. Production Economics, Vol. 122, pp.56–66.

IMO (2014a) *Particularly Sensitive Sea Area (PSSA)*, Available at: http://www.imo.org/OurWork/Environment/PollutionPrevention/PSSAs/Pages/Default.aspx [Accessed: 01.04.2014]

IMO (2014b) *Sulphur oxides (SOx) – Regulation 14*, Available at: http://www.imo.org/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Sulphur-oxides-%28SOx%29-%E2%80%93-Regulation-14.aspx [Accessed: 27.03.2014]

Industrinyheter (2012) *UPM hotar flytta produktion*, Available at: http://www.industrinyheter.se/2012/09/upm-hotar-flytta-produktion [Accessed: 03.04.2014]

ISL (2010) *Reducing the sulphur content of shipping fuels further to 0.1 % in the North Sea and Baltic Sea in 2015: Consequences for shipping in this shipping area*, Available at: http://www.schonescheepvaart.nl/downloads/rapporten/doc_1361789167.pdf [Accessed: 14.04.2014]

ISL (2014) *Short Sea Shipping in the Baltic Sea Region: Freight volumes and the potential of 45' containers*; An Interreg IV B Baltic Sea Region –TransBaltic Extension project, [Not yet available, probably end of June, 2014 on: http://www.ladec.fi/en/ladec/international-projects/transbaltic-extension]

Islam, S., Leinberg, P. and Nahar, R. (2011) *Sustainable Aspects of Short Sea Shipping: A Case Study of Europe*, Interdisciplinary Journal of Contemporary Research Business, Vol. 2, Nr.9, pp. 428-445.

Isomäki, Risto and Pettay, Esko (2011) *SHIPS, SULPHUR and CLIMATE - Is it a good time to Reduce the Sulphur Emissions from Shipping*, Atmosmare, Available at: http://www.schonescheepvaart.nl/downloads/rapporten/doc_1362492069.pdf [Accessed: 03.04.2014]

Leinbach, T. R. and Capineri, C. (2007) *Globalized Freight Transport: Intermodality, Ecommerce*, Logistics, And Sustainability (Transport Economics, Management and Policy.), Edward Elgar Publishing.

Levander K. (1992) *The potential for fast ships in European freight transport*.Proceedings from the First European Research Round- Table Conference on Short Sea Shipping, 26–27 November 1992. London: Technical University Delft, Lloyds of London Press, pp.22–39.

Librairie (2014) *Emission Control Areas*, Available at: http://librairie.immateriel.fr/baw/9789264096820/images/e9789264096820_i0025.jpg [Accessed: 05.02.2014]

LNG (2014) *LNG in Baltic Sea Ports – About the Project*, Available at: http://lnginbalticseaports.com/en/about [Accessed: 12.04.2014]

Lu, C. (2003) *The impact of carrier service attributes on shipper–carrier partnering relationships: A shipper's perspective*, Transportation Research Part E: Logistics and Transportation Review, 39(5), 399–415.

LVM (2013) *EU approves Finland's investment aid to sulphur scrubbers*, Available at: http://www.lvm.fi/pressreleases/4138694/eu-approves-finland-s-investment-aid-to-sulphur-scrubbers [Accessed: 28.04.2014]

Maeda, K., Matsuhita, H., Kanaoka, H. and Suetsugu, T. (1998) *Reduction methods of NOx emissions from ships*, Bulletin of the Marine Engineering Society in Japan 26, 1.

Malmqvist, G. and Aldèn, B. (2013) *SULPHUR REGULATION IN THE BALTIC SEA – SCENARIOS FOR THE MID NORDIC REGION – THREATS AND OPPORTUNITIES*, Midnordic Green Transport Corridor,EU Baltic Sea Project: North East Cargo Link II, WP4, Activity 4.3.

MAN (2012) *Costs and Benefits of LNG as Ship Fuel for Container Vessels*, Available at: http://www.mandieselturbo.com/files/news/filesof17541/5510-00122-0ppr_low.pdf [Accessed: 12.04.2014]

Marine Environment Protection Committee (2009) *2009 GUIDELINES FOR EXHAUST GAS CLEANING SYSTEMS*, Available at: http://cleantech.cnss.no/wp-content/uploads/2011/05/2009-MEPC-RESOLUTION-MEPC.184-59-1.pdf , [Accessed: 31.03.2014]

Marintek (2007)*Sa kan bunkring av LNG underlättas- Exemplett Norge*, Available at: http://www.energigas.se/Aktuellt/Kalendarium/~/media/Files/www_energigas_se/Aktuellt/VaraSeminarier/1202HallbaraTransporter/11_Dag_Stenersen_HallbaraTransporter7feb.ashx [Accessed: 10.04.2014]

McKinnon, A. C. (2007) *Decoupling of road freight transport and economic growth trends in the UK: An exploratory analysis*, Transport Reviews: A Transnational Transdisciplinary Journal, 27(1), 37–64.

Medda, F. and Trujillo, L. (2010) *Short-sea shipping: an analysis of its determinants*, Maritime Policy Management, Vol. 37, No. 3, pp. 285-303.

Morales-Fusco, P., Saurı´, S., and Lago, A. (2012) *Potential freight distribution improvements using motorways of the sea*, Journal of Transport Geography, 24(0), 1–11.

National Research Council (1980) *U.S. Commission on Sociotechnical Systems, and Maritime Transportation Research Board, Alternative Fuels for Maritime Use*, National Academy of Sciences, Washington, D.C, 191 pp.

Nottenbom, T. and Wang, S. (2013*) LNG as a ship fuel: perspectives and challenges*, Porttechnology, Edition Nr. 60.

Paixao, A.C. and Marlow, P.B. (2002) *Strength and weaknesses of short sea shipping*, Marine Policy 26, pp. 167-178.

Peeters C., Verbeke A., Declercg E. and Wijnolst N. (1995) *Chapter II. Analysis of competitive position of short sea shipping. A methodology and empirical applications, Analysis of the competitive position of short sea shipping.Developmen t of policy measures.The corridor study*, Delft: Delft University Press. p.II. 13–37.

Peeters, C., Verbeke, A., Declercq, E. and Wijnolst, N. (1995) *Chapter I. Identification and analysis of existing intra-European traffic for each relevant category of goods and transport corridor. In Analysis of the competitive position of short sea shipping. Development of policy measures,* The corridor study (pp. 1–62). Delft: Delft University Press.

Periakis, A. N., and Denisis, A. (2008) *A survey of short sea shipping and its prospects in the USA,* Maritime Policy and Management, 35(6), 591–614.

Psarafti (2011) *The role of ports in Short Sea Shipping*, Marine Technology and Engineering, Nr. 7, pp. 1429-1437.

Rojon, I. and Dieperink, C. (2014) *Blowin in the wind? Drivers and barriers for the uptake of wind propulsion in international shipping,* Energy Policy, Nr. 67, pp. 394-402.

Saurı´, S., and Spuch, B. (2009, January) *Long-run marginal cost in the Ro-Ro industry,* Paper presented at the 88th TRB annual meeting, Washington, DC.

Scheuch, F. (2007) *Marketing,* 6th edit., Vahlen: München.

Skjølsvik, K.O., Andersen, A.B., Corbett, J.J. and Skjelvik, J.M. (2000) *Study of Greenhouse Gas Emissions from Ships. MEPC 45/8 Report to International Maritime Organization on the Outcome of the IMO Study on Greenhouse Gas Emissions fromShips,* MARINTEK Sintef Group, Carnegie Mellon University, Center for Economic Analysis, and Det Norske Veritas, Trondheim, Norway.

Stopford, M. (2009) *Maritime Economics*, Routledge: New York.

Strauss, A. and Corbin, J. (1998) *Basic of qualitative Research*, 2nd edition, London: Sage.

Styhre, L. (2009) *Strategies for capacity utilisation in short sea shipping*, Maritime Economics and Logistics, Vol. 11, pp. 418-437.

Swahn, M. (2006) *Decoupling för att minska transportlogistikens negativa miljöpåverken - Från teori till verklighet, NATURVÅRDSVERKET,* Sustainable Logistics Management

SWECO Energuide AB (2012), *Effekter av svaveldirektivet - En rapport till Svenskt Näringsliv,* Augusti 2012'.

Swedish Maritime Organisation (2009) *CONSEQUENCES OF THE IMO'S NEW MARINE FUEL SULPHUR REGULATIONS,* Norrköping.

The European Commission (1998) *CODISS ARTFcomparison of documentation in short sea shipping and road transport,* Available at: http://europa.eu.int/en/comm/dg07/maritime/sss/studies/codissart/codissart.htm [Accessed: 17.04.2000]

Thorpe, R. and Holt, R. (2008) *The Sage Dictionary of Qualitative Management Research*, London: Sage.

Transparency International (2013) *CORRUPTION PERCEPTIONS INDEX* 2013, Available at: http://cpi.transparency.org/cpi2013/results/ [Accessed: 25.03.2014]

Unifeeder (2013) *Our 45' HC pallet-wide container carries five more feet of Northern Europe*, Available at: http://www.unifeeder.com/C125702600606908/sysOakFil/Corporate%20material%20pdf-%2045%20HCPW%20container%20brochure%20January%202013/$File/45%20container_January%202013.pdf [Accessed: 22.04.2014]

Worldbank (2012) *Connecting to Compete*, Available at: http://siteresources.worldbank.org/TRADE/Resources/239070-1336654966193/LPI_2012_final.pdf [Accessed: 25.03.2014]

Worldbank (2014) *Connecting to Compete*, Available at: http://lpi.worldbank.org/sites/default/files/LPI_Report_2014.pdfQ [Accessed: 25.03.2014]

Wärtsila (2013) *Wärtsila Cooperation*, Available at: www.wartsila.com%2Ffile%2FWartsila%2F1278527621485a1267106724867-Scrubber_presentation.pdf&ei=6DpFU6eIA8TKsgaI8oDADg&usg=AFQjCNEDQ00FkxMRtxXxvV8siYRbOa12Mg&sig2=i4gq-9QBnHgQy45_-kBMtw&bvm=bv.64507335,d.Yms [Accessed: 09.04.2014]

Wärtsila (2014) *Bit Viking*, Available at: http://www.wartsila.com/en/references/bit-viking [Accessed: 10.04.2014]

Wärtsilä (2010) *EXHAUST GAS SCRUBBER INSTALLED ONBOARD MT "SUULA"*, Available at: http://www.wartsila.com/file/Wartsila/1278517851584a1267106724867-Wartsila-Scrubber-Test-Report-_final_2.pdfc [Accessed: 04.04.2014]

Yin, R. (2009) *Case Study Research. Design and Methods*, Available at: http://www.hampp-ejournals.de/hampp-verlag-services/get?file=/frei/ZfP_1_2012_93 [Accessed: 04.04.2014]

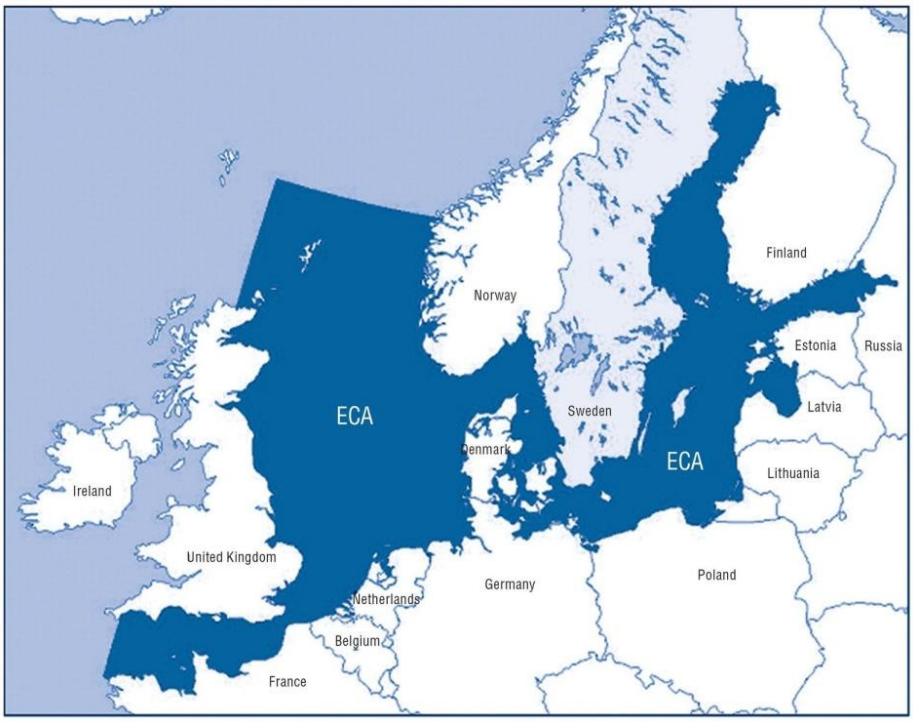
Appendix

Appendix 1: Freight Transport by mode

EU-27 Mode Transport performance in billion ton-km						
	Road	%	Rail	%	Sea	%
2010	1.756	49,3%	391	11,0%	1.415	39,7%
2011	1.734	48,7%	420	11,8%	1.408	39,5%
Development 2010 - 2011	-22	-1,3%	29	6,9%	-7	-0,5%

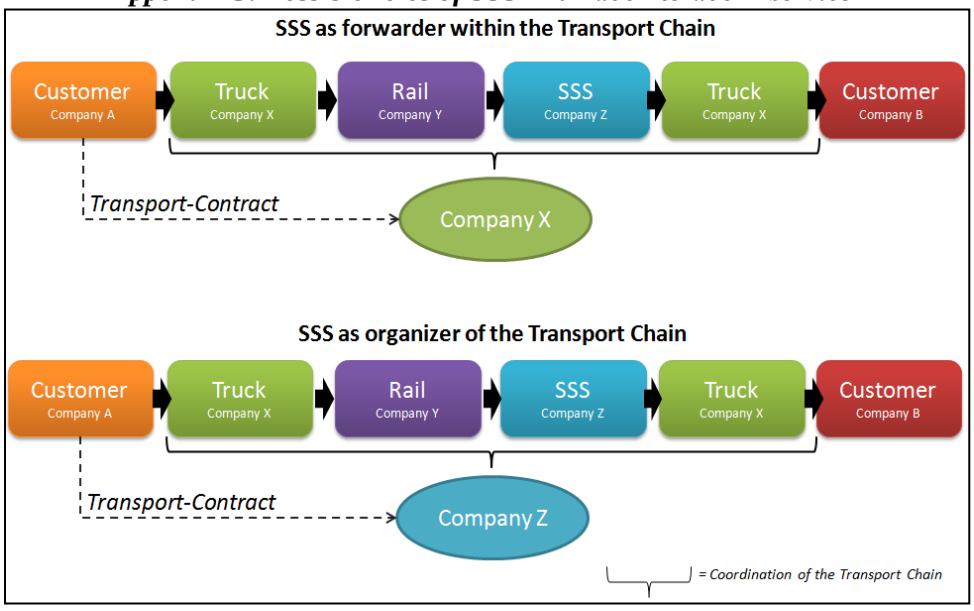
(Source: EU 2013)

Appendix 2: Emission Control Areas Europe



(Source: Librairie, 2014)

Appendix 3: Possible roles of SSS in a "door-to-door" service



Source: Own Creation

Molde University College

Interview Guide

Short Sea Shipping

1. What are the major **strength** / **weakness** of Short Sea Shipping in your opinion?
2. How can the collaboration between the maritime transport mode and the land sided transport modes be improved?
3. Is there a lack of strategic alliances between members of the land modes and sea modes?
4. What kind of role does the port play in the promotion of Short Sea Shipping?
5. Do you consider the 45' foot container (as a perfect fit for trailers) as a possibility to increase collaboration between maritime and land-sided transports? (What challenges might occur?)
6. What should be done in order to strengthen Short Sea Shipping? At the industry and policy level (national and EU)?

SECA Directive

7. What is your general opinion of the SECA Directive?
8. Do you think the SECA Directive is complying with the global goal of CO_2 emission reduction?
9. How do you rate the SECA Directive in the context of the plan of the EU to shift more cargo from the land to the sea, based on the cost increase?
10. How do you rate the possibility of "State aid" from member states for the transition time? (Problems of imbalanced state subsidies?)
11. Is the SECA-Directive fostering innovations to make the maritime transport mode/port business more competitive?
12. Which possibility is most likely for shippers from your point of view? LNG, MGO or Scrubber Technology? Why?
13. What would you suggest as a possibility to counteract negative effects of the SECA-Directive?
14. Which impact do you expect the SECA-Directive to have on the maritime industry?
15. Who do you think will be most affected by the SECA-Directive (positive & negative)?
16. What do you expect from the a) ports and b) governmental institutions for the near future? (What would you recommend them to mitigate negative impacts?)

ISL 2014 - Transcript of interview

Molde University College

Interview with Michael Tasto

Focal institution: Institute of Shipping Economics and Logistics (Link)

Respondent:
Michael Tasto
Date: 24 April 2014

I: Interviewer
R: Respondent (interviewee)

I: Mr. Tasto, please tell me about your professional relationship with the maritime industry and the related short sea shipping topic.

R: I am working as a researcher and analyst in the think-tank "Institute of Shipping Economics and Logistics" (ISL) which focuses on research, consulting and knowledge transfer within the maritime industry. Additionally I contributed to the study "Reducing the sulphur content of shipping fuels further to 0.1 % in the North Sea and Baltic Sea in 2015: Consequences for shipping in this shipping area" in 2009, which analyzed the effects of the new sulphur limits of shipping fuel.

I: Before we talk about the particular SECA-Directive let us talk about short sea shipping (SSS) in general. What do you consider as a major strength of this transport mode?

R: The biggest strength which SSS has is the relatively low CO_2 emission per ton/km. The transport mode is, with regard to this type of emission, the environmental friendliest transport mode. The other big strength is the capacity this mode is capable to carry. SSS is definitely easing the congestion situation of the road by carrying huge amounts of cargo.

I: On the other hand: what are the major weaknesses of this mode?

R: Using the ship is always connected to a high administrative and operative effort. The cargo handling when using the SSS mode is relatively costly due to terminal charges, costly equipment and administrative burden.

Another big weakness is the burden of the pre-carriage. SSS is requiring a pre-carriage to the port which is mostly done by a land transport mode. The organizer of the whole transport chain is always considering if it makes sense to switch to another mode, such as a ship, or just to continue with the transport mode of the pre-carriage. Here we need to set limits: The pre-carriage needs to be set into contrast to the whole voyage. If the pre-carriage amounts only a small part of the total voyage this weakness is minimized. But the bottom line is that the pre-carriage might make the usage of SSS less attractive from an economic point of view.

I: You mentioned that the pre-carriage is often done by land side transport modes such as trucks. Do you think that there is a lack of collaboration between the maritime transport modes and the land sided?

R: I do not see myself in the position to comment on this as an expert but what I heard from several presentations and involvement in projects it seems, that there is still competition between these transport modes. For SSS, trucks are a direct competitor who are "stealing" their cargo and vice versa. Therefore I would assume that there is a lack of collaboration between these transport modes.

I: The other weakness you mentioned was the relatively high effort connected to the cargo handling. What do you think is the role of the terminals in order to promote SSS?

R: The role of the terminals for SSS is crucial. But from my experience with ports within the North Range I would have to say that it seems that terminal operators are not too keen on promoting SSS. This is based on economical considerations: Imagine your terminal is handling 85% deep sea cargo and only 15% is cargo from SSS. It is only natural that you would always treat deep sea lines and related feeder volumes preferred. An interesting approach was made by one of the biggest player within the SSS market Unifeeder who implemented a strategic alliance with Eurogate and consolidated all their port calls on this terminal.

However this is only the situation in the ports of the north range. It might be a different story, when considering ports in the Baltic Sea, where every container handled is aimed for the hinterland.

I: One problem within the supply chain literature analyzing intermodal transport chains is the lack of a common loading unit. Do you think that the 45' foot container might be an option for a common loading unit? As it is some kind of a "perfect fit" unit for all transport modes.

R: In a recent study we analyzed the role of the 45' foot container within the SSS market. Surprisingly for us was that the 45' foot container is more frequently used as we expected after looking at statistics. This results from a lack of consistence which means that the authorities often count this type as 40' foot container. Furthermore the 45' container is requiring a certain amount of flexibility from the shipping liner and often causes capacity losses on inadequate vessels and is therefore not always promoted by shipping lines.

I: What is the attitude of port operators and hinterland transport operators towards the 45' foot container?

R: The port operators are to a certain degree facing the same problem as the vessel operators: based on the unusual measurements of the container they need to provide special storage places, which they in return sometimes charge extra to the shipper. The shippers are often facing the problem of regional availability of 45' container, which is less common than the 40' container. Considering the 45' container in direct competition to the trailer it needs to be stated that the hauler prefers the trailer based on its loading flexibility from the side due to its curtain. Furthermore the 45' container is facing different national legislations which bureaucratically burden the usage. In summary the usage of the 45' might be an option, but it is facing challenges in both hinterland and maritime transport.

I: Let us now consider the sulphur limits of fuel. What is your general opinion of the SECA-Directive?

R: From my point of view the limitation of sulphur emission is a desirable thought. There are statistics which are show the fatalities which can be related to sulphur emission and these numbers are alarming. However in a market environment which is already suffering from a severe overcapacity, this legislation was discussed very emotionally. But from my point of view it is a necessary step.

I: What do you think will be the reaction of the maritime industry, namely the shipping lines?

R: When we analyzed the market within the scope of our study in 2009 there were not many likely viable alternatives to shipping industry other than using gasoil instead of bunker fuel – also we have not been asked to review alternatives in greater depth as a timely implementation of e.g. an LNG bunkering infrastructure seemed unlikely and technological solutions to the issue were still in their infancies. Therefore we just considered the impact of using MGO and related to this, the possible price development of this fuel. In my opinion most Baltic Sea container shipping companies and ferries will use MGO in the beginning of the 2015 in order to meet the new requirements.

I: So why is there no investment in retrofitting done today, when there are other possibilities such as Scrubber or LNG?

R: The problematic situation lies hereby in the low charter rates. Shipping companies such as TeamLines or Unifeeder are simply chartering available vessels from non-operating ship-owners. Due to the overcapacity plaguing the industry basically since autumn 2008, these charter are so low, that the economical situation of ship owners did not allow for big investment decisions.

I: What will be the impact of the usage of MGO?

R: The main impact of the usage of MGO will be higher voyage costs and in turn higher per item prices for both container as well as trailer transport. Our study has indicated that this will likely result in a modal shift from sea to land. This cargo shift will predominantly affect gateway cargo and to a smaller extend also transshipment cargo. For example the transshipment cargo from Hamburg to St. Petersburg will nearly not shift at all even in extreme fuel price scenarios, based on the high extra cost connected to a transport by road.

I: The maritime transport mode is getting more expensive, the economical situation is bad. Would state aid be an option to mitigate negative effects?

R: In my opinion this would make sense. The shift of cargo from sea to land is standing in contrast the goal of the EU to shift cargo from road to sea. State aid could help to re-increase the competitiveness of the sea transport after 2015.

I: How do you rate alternative type of alternative fuels such as LNG in the future?

R: I think the pace of development of the LNG infrastructure is decisive. Until now the infrastructure is still underdeveloped and what we are facing here is the "chicken or egg" problem between ship owners and port operators who want to see commitments from the other side before committing themselves to (costly) investments. Currently, the container shipping industry is still in the trough stage of a shipping cycle. It will be interesting to see where investors are placing "their bets" once earnings of this sector pick up and capital is available. Until now the local limitations the LNG availability are an obstacle for the usage.

I: Within the academic literature the maritime industry was characterized as "not innovative" in terms of engine and fuel. What do you think?

R: I would agree with this statement. The maritime industry has the habit of being very reactive instead of proactive, or in other terms innovative. Innovations such as "slow steaming" were a reaction to high fuel prices. Therefore the maritime industry is traditionally more led by economical incentives or political directives than other industries.

I: As you have appropriate examined, the SECA-Directive can be seen as a challenge which is necessary under environmental considerations. Is the approach of banning HFO fully coherently planned by the legislators?

R: As I said before, limiting the sulphur emissions is generally a desirable idea. However during the study it became evident that some related issues are not yet solved. The heavy fuel oil is a waste product of the refining process. It will occur anyhow and now we are having the situation that ships are using it as a fuel. But what will happen with it when there is no longer a demand for it? How to use, handle or store the extra heavy fuel? This is also a question which should be considered.

- End –

Malmqvist, 2014 - Transcript of interview

Molde University College

Interview with Gustav Malmqvist
Focal institution: MIDEK, AB
(Link)

Respondent:
Gustav Malmqvist

Date: 16 April 2014

I: Interviewer
R: Respondent (interviewee)

I: Mr. Malmqvist, please tell me about your relationship to the related Short Sea Shipping and SECA-Directive topic.

R: My educational background is Economy and ICT. When I decided to leave a position as ICT director, in which I also came into contact with EU strategies and policies I got a position as International director for the County Council of Västernorrland. In this I also was a part of the team of Mid Sweden European Office in Brussels. During this work I gained fundamental knowledge about EU legislations and related processes in the field of transport, among others. Since 2010 I am working as a consultant for EU projects in the field of transport and greening of transports. Hereby my expertise is the interaction of new legislations on industrial-and transport-networks.

I: In your report "Sulphur regulation in the Baltic Sea" you mention the importance of the sea transport mode, mainly Short Sea Shipping (SSS), for the Swedish industry. What do you consider as a major strength of this transport mode?

R: The first and most important strength of SSS is the capacity factor. SSS is capable of transporting large volumes of cargo which other land-sided modes are not capable of. For some industries within Sweden this transport mode is inevitable, for example for the paper and wood industry which works with large volumes.

Related to this, the next advantage is the low cargo fair per ton. The industry relies on the low transportation cost, per ton, of this mode. The third advantage is the bridging of a gap between two locations. In Norway, Finland and Sweden SSS is often the mode which is using the shortest distance based on the geographical conditions on land of the countries.

I: On the other hand: Where are the major weaknesses of this transport mode?

R: The major disadvantage of this mode is the lack of flexibility: When a customer wants to ship a palette of good (100 kg) to Molde, he will give it to DHL or Schenker. These forwarders will most likely not consider the sea mode for this short distance and low volume, but will use their own transport network.

I: So why SSS is often not considered in transport networks within Europe or looses in direct comparison to other modes?

R: The problem lies within the nature of SSS. The break even capacity of ships is very high which customer often cannot fulfill. The other reason is that contracts with shipping lines are demanding a longer preparation than for example trucking companies which can just be called if demand is present. Another weakness is the lack of frequency of SSS. While the road transport can be used frequently, the density of shipping departures is limited.

The other major weakness is the time consuming intermodal change: The loading and unloading procedures in ports are often very time-consuming. Additionally the bureaucracy which is connected to custom procedures, port security and other issues are creating obstacles why forwarders hesitate to use this transport mode.

I: You mentioned interesting strength and weaknesses. Let us now shift to the SECA-Directive. What is your general opinion of the Directive, the limitation of sulphur in fuel to 0,1 % in 2015?

R: In my opinion this Directive is absolutely necessary. But it was communicated too late.

I: I am sorry, but the IMO regulation and the connected EU decisions were made in 1999 and amended in 2005. The Emission Control Area Baltic Sea was implemented in 2006. Is this not enough time?

R: That is true, but there was a lack of public interest and therefore of adequate communication between the IMO, EU-member states and the affected market actors. For example, when we wrote the paper "Sulphur regulation in the Baltic Sea" in 2013 there were still many people within the SSS business who were not aware of what will happen and what challenges they will face in 2015. But this is not based on ignorance of the SSS actors. What is happening here is the clash of two different philosophies: On the one side, the long term orientations of the IMO and EU and on the other the rather short sighted view of the shipping industry. For example: If a shipping line is not making profit on a particular service, it will close down the service within two weeks. Normally shipping lines are not thinking long ahead, but focus on actual challenges.

I: So what do you think is the effect of the Directive on the SSS-market?

R: The SECA-Directive will cause higher prices for the shipper which they will pass on to the customer. The customer will then reconsider the use of this transport mode.

I: So let us stick to the customer. You named as one big customer the industry in Sweden. What effect will the Directive have for them?

R: The industry is more or less directly affected by the Directive. The worst case would be the relocation of productions or the shutdown of them. The Finnish paper producer UPM for example reconsidered its production facilities and put a major focus on central Europe. Just to clarify this issue: The Directive is not the only reason which is affecting such decisions. But it is however true, that the increased cost of transportation caused by the new Directive is considered in investment decisions and is not directly favoring the Baltic Sea Region as a location.

I: So how do you consider the possibility of state aid in this regard?

R: In Sweden the shippers rated the lack of communication as very negative and asked the politicians for financial support. This was denied by the politicians, with reference to the long preparation time the shipper had to react. In Finland for example the government is offering state aid for the retrofitting of ships, to use of alternative fuels or exhaust gas cleaning, to meet the requirements of the new directive. The Swedish shippers, supported by the manufacturing industry and universities, asked the government for lower fairway fees which was denied. One reason for the government's reluctance of lowering the fairway fees is that the fees comprise 75% of the budget for the Swedish Maritime Administration.

The Swedish government however is also increasing the railway fees, which is not related to the SECA-Directive, but can have the effect of limiting the likely modal back-shift from sea to train or road.

I: You mentioned the Finnish state aid model against the Swedish one. Do you see any problem coming up related to the different approaches?

R: As we already mentioned in our report there is the possibility of skewing the market conditions. In Sweden for example we can see a drastic decrease of ships sailing under the Swedish flag. Many ships prefer other countries due to lower taxes. The state aid of Finland is quite remarkable: The Finnish government is providing state aid for retrofitting ships to comply with the new directive. Interesting hereby is that one of the major players in this retrofitting industry, Wärtsilä, is a Finnish company. However it is also true that the SSS is vital for the Finnish industry which makes state aid in this field comprehensible.

I: Stepping back: The literature states that SSS was never known to be very innovative and no environmental improvements took place. Do you agree with this statement?

R: This is absolutely correct. Therefore many people think that the SECA-Directive can be seen as a positive development. SSS rested very long on its image to be the most environmental friendly transport mode considering the emission per ton/km. Therefore there was no necessity for improvements. However the improvements or innovations are not limited to technical issues. Shipping companies which were going fully loaded from northern Sweden to Germany could very well be empty or half empty on the way back. Suddenly rethinking processes have started, whilst the effort to be fully loaded on the way back increased heavily. This example shows that shipping lines may open themselves to be more flexible. Another example comes from STENA Lines. The company sees in the Directive and the actual low margins a challenge to improve themselves. Therefore they took over another shipping line (Scandlines) to improve their logistic efficiency. Furthermore STENA Lines has started to test methanol as fuel, which allows them to use already existing bunker infrastructure, whilst the main focus by others is on LNG or Scrubbers.

I: So what would you recommend short sea shipping lines with regard to the Directive?

R: The SECA-Directive will pove the market: The shippers who are innovative and open for new ways of thinking will succeed while others will drop out of the market. The switch to other fuels is necessary in the long run, but also improvements of capacity utilization. Shipping companies should consider alliances to improve their logistic efficiency.

I: And what do you expect from ports? Can they help to promote sea transports and therefore mitigate negative effects?

R: Ports play a very big role in sea transports. It is crucial that ports adapt to the new requirements of the shippers. A result of the directive there may be bigger but fewer ships in the Baltic Sea, which means that ports need to make the loading and unloading of ships and the terminal operations, more efficient and less time consuming. This will help to promote SSS and make this mode more attractive. Hereby it is however important to involve the right companies or authorities. Depending on the organizational structure of the port it might be necessary to involve private terminal operator in these processes. The improved processes within the port need to compensate as good as possible the negative impacts of the SECA-Directive.

Ports in Sweden are organized in different ways. Many ports have a marketing department which is actively approaching industrial companies and promoting sea transports. This

requires the collaboration of shipping companies. Therefore the port is acting as an intermediary who can actively connect the supply and demand side.

I: What is your opinion about what will happen within the shipping market? Will most shippers use MGO, Scrubber or LNG?

R: I think that the majority of shippers will use MGO in the short run, based on the hesitation of broad investments in this field. Especially with respect to older ships where an investment in new fuelled engines is unreasonable, the usage of MGO is most likely. Some ship owners may also consider the relocation of their ships out of the SECA area where the usage of high sulphur fuel is still allowed.

I consider the usage of scrubbers as not an option in the short run. The technology on ships is not very mature and also the costs of this technology are too high. This technology might be interesting in 2025 when there are global sulphur limitations and the technology is more sophisticated.

The usage of LNG is depending on the infrastructure and the connected availability of LNG as maritime fuel. I consider this type of fuel in the long run as the best opportunity, but the infrastructure needs to be evolved. The fact that LNG is already successfully used in the Norwegian shipping industry is showing the success of this fuel type.

I: Is there any technological possibility how to reduce the "break" (e.g. waiting times, extra handling) within the transport chain where SSS is involved?

R: There are interesting test on technologies supported by the EU e.g in the project MonaLisa (www.monalisaproject.eu). Hereby GPS is used to track and trace shipments. In an optimal situation the truck would just arrive when the container is available and therefore the storage and waiting would be minimized. This projects are however very difficult to implement, due to the involvement of many players.

I: A more operational approach might be the usage of 45' foot container, which is representing a perfect fit for trailer and rail. How do you consider this transport unit with regard to a better collaboration between sea and land transport modes?

R: I have occasionally been involved in discussions in Brussels about this and need to say that I am not an expert in this field. But what I see hereby is the problematic situation for the shipper. The mixture of 40' foot and 45' container might result in a problematic situation when loading containers with different size. Nevertheless I think the bigger container is a good opportunity for the market to increase the capacity within the unit loaded and it might smooth the collaboration of sea and land-sided modes.

I: What do you think the future will bring for the Baltic Sea Region with regard to SSS and SECA?

R: The impacts of the Directive are not easy to predict. In my opinion it will be interesting to see which threat we are actually pointing out are over exaggerated while other effects which we or the EU might not have considered might have a much bigger impact. From my point of view it is however critical to rate that the Swedish government is not providing any subsidies to the shipping industry. There will be a transport cost increase that is inevitable, but this cost increase will be borne by the end customer, which is in the Baltic Sea large parts of the Swedish and Finnish industry e.g. wood and paper plants. And one thing is for sure: If a production plant is shut down, it will be never opened again. The production will move to other parts of the world.

- End -

BUSS, 2014 - Transcript of interview

Molde University College

Interview with Andreas Göttsche
Focal institution: BUSS Ross Terminal GmbH & Co. KG
(Link)

Respondent:
Andreas Göttsche

Date: 29 April 2014

I: Interviewer
R: Respondent (interviewee)

I: Mr. Göttsche, please tell me about your professional relationship to the maritime industry and the related short sea shipping topic.

R: My career started in 1977 with an apprenticeship at Hamburg Süd. After graduation I was working for DFDS Seaways and responsible for the Ferry Coordination. In the end I have been office manager in the port of Cuxhaven. From there I went to a small coaster company operator and later on to the BUSS port group where I am now responsible for sales and customer service. Therefore I am glad to say, that I know both sides: the shipping- and the terminal side.

I: As you have been involved a lot into this business, what do you consider as a major strength of the transport mode Short Sea Shipping (SSS) against other transport modes?

R: That question is not easy to answer, because there are different types of SSS whereas each one has its own characteristics. But if you would like to generalize it, I think the environmental friendliness of the transport mode is a major strength. Also other strengths like the capability of carrying bigger capacities or bulky cargo makes this transport mode competitive. Furthermore this mode is shifting huge amounts of cargo from road to the sea and is consequently preventing congestions, but also easing the liability of the land sided infrastructure.

I: On the other hand: What kind of weaknesses does this transport mode have against other transport modes?

R: Hereby I think the lack of flexibility in terms of frequency can be named. Therefore I would like to distinguish between Ro-Ro ferries and Lo-Lo container ships. While the frequency of ferries is quite good, there is still room for improvement in the frequency of container ships operating for example between Hamburg and St. Petersburg. The lack of frequency is resulting in a lack of flexibility for the customer of this transport mode.

I: What can terminal operator do to support the competitiveness of this transport mode in front of other modes?

R: As you probably know the administrative burdens of the shipping industry are still very high. The problem hereby is that governmental regulations on national or international level such as the “International Ship and Port Facility Security” (ISPS) Code are creating obstacles in the implementation of easier handling procedures. From BUSS

point of view we would like to reduce the bureaucracy and administrative burden to a minimum, but we are facing legislative limitations. Remarkable hereby is that within the terminal environment on an international level there are different standards even though all ports are operating within the EU. Please do not understand me wrong: Regulations like the ISPS code are necessary and reasonable, but there are some examples within the EU where these regulations are implemented more practically than here in Germany.

I: What else can a terminal operator do to support SSS?

R: Terminal operator can for example offer associated services such as container repair services, small maintenance work on ships or waste management, or for example sanitary facilities (showers, toilets, restrooms, etc) for truck drivers. This would help to decrease inefficiencies for the shipper, based on the one-stop approach.

I: According to the SECA-Directive it might be an option for Terminal operator to act supportive for shipping lines. Can you imagine any procedures or services which might support SSS?

R: From my point of view the SECA-Directive is addressing the bunker industry and port authority instead of terminal operator. In the long run however it might be an option to provide technical services to them as well as bunker options. This would also increase the customer relationship between the terminal operator and the shipping line.

I: Stepping back to SSS and the competitive situation. How do you consider the 45' foot container within this context?

R: The 45' foot container is a very good innovation to remain competitive towards the land mode, namely truck. This type of container equals the unit size of a trailer and is therefore directly competing with this transport mode. Especially in the field of SSS this type of container is very effective based on one reason: The SSS is serving European markets, thus it is used by manufacturers who are producing for these markets. For these manufacturers when they are located in Europe the calculation base for transports is mainly the capacity of a trailer. Therefore the size of a 45' foot container is competitive for this transport mode.

I: Even though the container is used by the shipping lines it was stated that terminal operator are often facing challenges with this mode due to loss of storage capacity when mixing this type and for example 40' container. Would you confirm this?

R: I cannot confirm this. In our BUSS terminal we are not facing such a problem. It might be true, that for deep sea container terminals this is creating challenges. We from BUSS are calculating for example the price of a container measured in TEU. Therefore the 45' foot container is calculated with the factor of 2.25 TEU. The BUSS port group is seeing a positive trend in the usage of 45' foot container and are supporting this trend in order to support the competitiveness of the transport mode SSS.

- End-

Bodewig, 2014 - Transcript of interview

Molde University College

Interview with Kurt Bodewig /
Focal institution: European- TEN-T – Coordinator
(Link)

Respondent:
Prof. Dr. Kurt Bodewig (Former Federal Minister of Transportation and Infrastructure)

Date: 24 April 2014

I: Interviewer
R: Respondent (interviewee)

I: Mr. Bodewig, please tell me about your professional relationship to the maritime industry and the related short sea shipping topic.

R: My personal relationship to the maritime sector, especially to the Baltic Sea, is founded on several former professions and functions. From 2000 until 2002 I have been Federal Minister of Transport and Infrastructure in Germany. Since 2003 I am chairman of the Baltic Sea Forum which is a non-governmental organization dealing with economical and environmental affairs within the Baltic Sea. Additionally I have been nominated as a Maritime Ambassador of the European Union (in 2007) as well as TEN-T Coordinator for the Baltic-Adriatic Corridor (2014).

I: The SECA-Directive is actually a very hot topic within the maritime industry. What is your general opinion of the topic?

R: A limitation of sulphur emission was an absolute necessary step with respect to environmental aspects. There are however challenges which the European commission and the maritime industry need to overcome. One major problem of this directive is that it is a very complex topic which needs to be implemented in a very short time. The lack of transition time in this issue is one very challenging point. As one example can be named the double hull ship design for tanker which became mandatory. Hereby it was, in the first step, mandatory for new built ships and then in a second step it became mandatory in form of retrofitting for older ships. This implementation procedure allowed some kind of transition time for the ship owners and did not have that serious impact on the industry. This transition time is missing for the new emission limits and is therefore causing many problems for the industry.

I also would like to point out that the shipping industry was also a bit careless in this regard. While we from the Baltic Sea Forum already got active in 2009 and launched events to make aware of the problem, the response of the shipping industry was reluctant. However hereby, it needs to be considered that the shipping industry was in a crisis, so no one planned long ahead.

Another problem which is related to the emission control areas is the restriction on sulphur limits in the Northern- and Baltic Sea while the Mediterranean Sea is not affected. This imbalance might cause some cargo shifts, whereas this problem will be solved in the coming years when the Mediterranean Sea becomes also an emission control area.

I: You mentioned the complex impacts on the market on the other one hand and the short time horizon on the other hand. Is it not possible to postpone the implementation?

R: The problem is that many member states of the EU are involved in the implementation as well as other countries such as Russia and the USA. A postponement would result in a number of time consuming renegotiations which will be hindered by a strong environmental lobby. Therefore a postponement is practically impossible.

I: Most critical voices regarding the SECA-Directive are predicting a modal backshift from sea to land? What is your opinion towards this issue?

R: From my point of view this is a reasonable thought and the European commission needs to do everything what is necessary to prevent this. The number of former policies and initiatives implemented by the EU to foster sea transport would be worthless if the new legislation would shift transport from the sea to the road.

I: What do you think about state aid in this context? Is state aid a possibility to prevent this backshift?

R: State aid is always a difficult topic. In my opinion state aid, such as subvention for fuel, will not be manageable. The required volume for such an aid would not be possible to burden at least from the EU. State aid on a national level, such as supporting retrofitting would be an option. In my opinion the best solution would have been EU supported research programs which would have fostered innovations in the technical field.

I: You mentioned technical solutions. What is your opinion about Scrubber and LNG?

R: It is rather hard to predict which technology will be used in the future. Both and other solutions show good results in practice but in the end will the market decide which technology will be the future or will be exist parallel. The Baltic Sea Forum has founded the annual Baltic Clean Maritime Award to force technical and social innovations.

I: What do you consider hereby as the main challenge for the EU or the maritime Industry?

R: What everyone should be aware of is that the SECA-Directive will come and there will be challenges related to the implementation. In the past, the maritime industry, hereby especially the shipping industry, used a lot of energy to prevent the implementation of the new legislation. This energy could have been used in research to mitigate negative effects. However, the maritime industry needs to search the communication with the EU and needs to build strategic alliances with all involved partners on the sea side and land side. Hereby the EU and the maritime industry have the same goal: The prevention of a modal backshift and this can only be achieved together. An open communication and cooperation within this field is crucial to achieve this goal.

- End -

Psaraftis, 2014 -Transcript of interview

Molde University College

Interview with Harilaos N. Psaraftis
Focal institution: Technical University of Denmark
(Link)

Respondent:
Harilaos N. Psaraftis

Date: 05 May 2014

I: Interviewer
R: Respondent (interviewee)

I: Mr. Psaraftis, please tell me about your professional relationship to the maritime industry and the related short sea shipping topic.

R: Presently I am a professor at the Danish Technical University in the Department of Transport. Before that I was a professor at the National Technical University Athens in the department of Naval Architecture and Marine Engineering. Additionally I have been a faculty member at the Massachusetts Institute of Technology in the Departmentof ocean engineering. Between my academic careers I have also been working as the CEO of the port of Piraeus from 1996 to 2002. Therefore I can look back on a research career for the maritime area of some 35 years, whereas Short Sea Shipping (SSS) got into my focus based on involvement in particular EU projects such as the Concerted Action on SSS (1995-2000) and more recently the "Super Green Project" (2010-2013).

I: As you have been involved by the research side as well in the practical side of maritime transport with a focus on SSS. What do you consider as a major strength of this transport mode?

R: The major strength which I would consider is its potential to shift cargo from the congested land networks to the sea, which has a lot spare capacity. The potential to be environmental friendliest mode considering the emissions per ton/km is next to the lower unit cost a connected strength. Unfortunately this transport mode has not exploited its potential as much as it could base on several obstacles which SSS is facing.

I: You mention obstacles in this point. What is a major weakness of SSS?

R: SSS is facing many barriers which result in weaknesses of this transport mode. In my consideration there are many small obstacles which are not favoring this transport mode. The main problem is resulting within the sea-to-land interface, namely the ports. In port SSS is facing many administrative burdens which are time and cost consuming. This is making SSS less attractive in comparison to the land transport modes. Considering a transport between for instance Spain and the Netherlands, the obstacle of having to go by two ports and their related administrative procedures will make this transport mode less effective. Another obstacle will come in form of the sulphur Directive in SECAs which will lead to a cost increase and thus will mitigate the competitive edge of lower unit costs.

I: You mention the ports as some kind of bottlenecks due to the connected administrative burden and other factors. Do you think there is a lack of collaboration between SSS and port operators such as terminals?

R: This cannot be generalized and has to be evaluated from port to port. But the administrative burden I mentioned previously is usually not in the sphere of control of the port operators. These are governmental regulations managed by the EU or on a national level which create this burden and it is their duty to remove this burden. The EU tried to streamline this processes whereas the overall success is still absent. It is no wonder that a truck from Madrid to Hamburg is chosen over a SSS service when the customs procedures which the sea transport would face are not present. Considering the pre-carriage effort and possible connected bottlenecks within the ports, the SSS is losing its competitive edge.

I: Let us now move over to the connected, and already mentioned, SECA-Directive. What is your general opinion about that Directive?

R: In my opinion the intention of the Directive is very good and it is desirable to make the maritime industry more sustainable. However, the legislators did not consider all side effects of this legislation which makes a critical review of the directive comprehensible.

I: Side effects? What do you think will happen? What will be the effect of the SECA-Directive?

R: In my opinion the SECA-Directive will cause a cost increase. This will result for some shipping lines that some routes will not be profitable anymore and they will shut down the service. The route is then replaced, if possible, by land sided modes, most likely truck. Then we have the so called modal backshift which stands in contrast to the EU policy objectives. As a result not only the maritime industry but also other industries such as manufacturing which rely on this transport mode, are putting pressure on the EU to do something to alleviate the situation. I was recently invited to participate in an expert group which deals with the competitiveness of SSS under the SECA-Directive. We are a subgroup of the "The European Sustainable Shipping Forum" (ESSF) and are asked to evaluate recommendations for the EU to preserve the competitiveness of the SSS transport mode.

I: So there is some movement within the EU regarding this topic. What do you think the EU can do? Provide subsidies to affected industries?

R: Yes the pressure on the EU is increasing and the critical voices on the Directive are getting louder, especially under consideration of the present crisis. State aid or EU subsidies are a difficult topic. The legal framework needs to be checked individually therefore. Another approach would be to put higher taxes on road transports, which might be suitable but in my opinion is not a likely solution for the problem, as it is politically a very hot option.

I: How do you consider the danger of shifting the market with state aid? When one company might get subsidies while the others do not?

R: This is a very challenging topic. It is possible to see these critical voices with many initiatives started by the EU namely Marco Polo. The EU needs to be aware of the power they are using in form of subsidies and needs to use these subsidies thoughtfully.

I: What is your opinion about how to answer the new legislation, technical and maybe on a strategically level?

R: I think all technology approaches have their advantages and can be implemented. The Danish ferry company DFDS is considering scrubbers as the best solution for their fleet. But also the usage LNG or MGO are reasonable and comprehensible. On the strategic level consolidation of routes might be an opportunity to increase the load factor and to reach the high break even capacity.

I: Do you consider strategic alliances as one opportunity to achieve the required break even capacity?

R: Yes. From my point of view strategic alliances are one opportunity to remain competitive. The SSS market was in the past a bit reluctant to alliances, based on several reasons. The SSS industry can orientate themselves on the example of the deep sea shipper who are more open for alliances.

I: In the literature it is stated that the SSS industry is lacking of innovations in terms of engine or modern market strategies which might make them more competitive. Would you agree to with this statement?

R: There are studies which confirmed this statement. A paper dealt with the age of ships which are employed in SSS. The average age of the SSS fleet is very high, this is not favoring the SSS as a transport mode. And this paper was published before the crisis which shows that it is not the impact of the crisis which is hindering the renewal of ships. Therefore I would confirm that statement that SSS is not the most innovative type of transport mode in technical and strategically terms for examples network optimization.

I: You have explained very well possible impacts of the SECA-Directive and the challenges which will occur. You are also involved in an EU project which will deal with these impacts. What is in general your opinion about the future developments?

R: The SECA-Directive will come into force into 2015 and will bring changes which are difficult to predict. The missing considerations of side effects are the major challenge of the Directive. The organizational structure of the EU and the IMO respectively is causing this problem: The organizations are divided into some kind of departments where one department is dealing with the reduction of NO_x, the other with SO_x and yet another with CO_2 emissions. The problem is that these departments are lacking of communication, so that the solutions of the one department are not considering the effects onto the other departments. This is causing problems with the reasonable implementation.

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HPA, 2014-Transcript of interview

Molde University College

Interview with Lutz Birke
Focal institution: Hamburg Port Authority
(Link)

Respondent:
Lutz Birke

Date: 24 April 2014

I: Interviewer
R: Respondent (interviewee)

I: Mr. Birke, please tell me about your professional relationship to the maritime industry and the related short sea shipping topic.

R: I am working at the Hamburg Port Authority (HPA), which is the responsible institution for the port infrastructure of Hamburg. Within the HPA I am the director of the Port Strategy department which is divided into the parts: Port strategy, Development of port infrastructure and Environmental affairs.

I: The topic number one, which is currently discussed within the maritime industry, is the lowering of Sulphur emissions in the control areas. What is your opinion about the SECA-Directive?

R: From my point of view the reduction of sulphur emissions is necessary and reasonable. Especially when the maritime industry is so close to urban area like it is in Hamburg or other ports within the ECA. There are however also some problems connected to this legislation. From my point of view the unequal treatment of the SECA regulations of northern Europe compared to southern Europe is a critical point.

I: Many respondents are claiming that the new legislation is hitting the shipping industry in the middle of the crisis and therefore the legislation is seen as problematic. What is your point of view on that?

R: It is true that the shipping industry is in the middle of a crisis and that trends are developing sidewise and not upwards. But there are always economical fluctuations within a market. From my point of view it is not a reason to postpone the implementation, even though if it would be possible.

I: Connected to this point: The shipping industry is in a way surprised about the implementation. Can you comprehend that?

R: That is partly true. The shipping industry knew long enough about the plans of the implementation. Then the financial crisis and the connected economical collapse within the shipping industry happened. There was suddenly a common understanding within the shipping industry that the legislation will be postponed and the EU cannot implement it under the current circumstances. The shipping industry gambled in a way.

This is totally comprehensible: The new legislation is demanding investments which go into millions. These investments mean deep economical cuts into the already bad economical situation of the ship owners. I would have expected that the European Union or the Federal or State Government would have given subsidies to this industry.

I*: You mention state subventions in this context: Do you think state aid would be an appropriate option to help to comply with the directive? How do your rate the problem of market shift if there will be an unequal offer of state aid?*

R: I do not think that the EU would tolerate state aid in such a form that it would shift market shares. But in general I think state aid would be suitable to support the shipping lines. Hereby I think especially about the EU money which is spent for the TEN-T corridors. The EU is granting a two-digit billion amount of money. If they would offer one billion of this funding for the shipping industry, the implementation would be more smoothly.

I: How is the HPA in particular preparing for the new legislation?

R: The HPA is just the landlord of the port of Hamburg and therefore the involvements are limited. We can just create the framework for developments within the port, but for example we will not invest directly in a new terminal due to the fact that this is not our core business. However we are fostering developments in the field of LNG infrastructure. Therefore we are actively bringing together representatives from the industry, authorities and ministries to foster the construction of a LNG terminal here in the port of Hamburg. The goal is to build a LNG terminal which is able to operate in 2015 or beginning 2016 supported by EU funds if this is possible, to offer this type of fuel in Hamburg to support the sustainability of the sea transport mode.

I: Thus the HPA is preparing for LNG? How do you consider the other alternatives which can be used to comply with the Directive?

R: From our point of view all technologies have their advantages and disadvantages and we are expecting the usage of a mixture within the shipping industry. We from the HPA are however concentrating in this regard on LNG, due to the fact that there is no infrastructure so far, while MGO is already available. In my opinion LNG is a very strong alternative, because it can be used for two transport-modes, the maritime and the land side.

I: In the literature the availability of LNG is also described as a factor which gives the port a competitive edge. Would you agree with that?

R: Yes, this is absolutely true. Therefore we from the HPA put a concrete focus on this technology and are fostering the development of the infrastructure. We consider the availability of this technology as an asset for the port.

I: Sorry if I ask offensivly here, but when this technology has such a competitive asset, why is there not already a LNG terminal in Hamburg?

R: Hereby we are facing a complex situation. As I explained before the HPA do not invest money as other port authorities do. We need to attract partners from the industry and make it attractive for them to invest in our port. With “Bonim-Linde” we have a strong

partner from the gas industry who is willing to invest into a LNG terminal in the Port of Hamburg. But these are economical considerations. It is the so called “chicken or egg” problem. The representatives want to see a considerable demand for the new technology before investing, which is totally comprehensible. Based on the fact that the shipping market is currently not clearly showing this demand, industrial companies are hesitating to do the investment.

I: Do you see any possibility to overcome this “chicken-or-egg” problem?

R: This problem is not easy to be overcome with regard to the current situation. If the shipping industry would not be in a crisis, there would be better signs which would show where the maritime industry is developing to. In my opinion the EU could help hereby. If the EU would grant funding for retrofitting, for example, to LNG we would have immediately a sign for future demand and the process of LNG infrastructure development would be accelereted.

I: As you have described in detail, the SECA-Directive is not only a crucial factor for the shipping industry but also for the ports. What is your general opinion about the port of Hamburg for the future?

R: The port of Hamburg is the most important transshipment port for the Baltic Sea and has therefore a close connection to all shipping activities happening within this SECA. For the port of Hamburg it becomes therefore decisive to meet the upcoming needs of the shipping industry, but also having in mind the health of the urban population. Hereby we are thinking about our responsibility and competitiveness as a port but also to mitigate the negative effects for the shipping industry.

- END -

SPC-Transcript of interview

Molde University College

Interview with Lasse Pipoh
Focal institution: Short Sea Shipping Promotion Centre (SPC) (Link)

Respondent:
Lasse Pipoh

Date: 08 May 2014

I: Interviewer
R: Responder (Interviewee)

I: Mr. Pipoh, please tell me about your professional relationship to the maritime industry and the related short sea shipping topic.

R: I am working as a consultant at the German Short Sea Shipping promotion center (SPC). The SPC is organized as a public-private partnership and is co-financed by the public sector and offers free of charge services with regards to identify potentials for modal shift actions from road to sea. My main task within this center is to inform and acquire companies for short sea shipping and inland shipping.

I: You mention the word "inform" in this context. Why is there a necessity to provide information to companies? And what kind of companies do you approach?

R: The companies I approach are all along the transport chain. Trucking companies, stevedoring companies, freight forwarder and also manufacturing companies. The reason why there is to some extent the necessity to promote shipping as a transport mode is based on the lack of knowledge and information on the side of some companies. In particular in the southern regions of Germany the maritime transport mode is not very common and unknown, which we try to change. Often companies are comparing waterway transports with trucks because it seems to be the only possibility to transport their goods. SPC however tries to promote the water transport with all its advantages about other modes. In general we try to complement with other modes instead of competing with them.

I: Related to this point: What do you tell your clients, what is the major advantage of this transport mode over other transport modes?

R: One major advantage of SSS is the availability of capacity. The limits of cargo space are relatively high especially when considering that we have a crisis and the level of capacity usage is low. Thus we have a low level of capacity usage on the sea while the land sided infrastructure is congested.

I: On the other hand: What do you consider as a major weakness of the transport mode SSS?

R: The transport mode SSS requires an intensive cargo handling with very complex cargo equipment. The cargo handling costs are therefore higher compared to other

unimodal transport modes. Moreover SSS requires a pre- and post-carriage due to the involvement of a port. This creates more space for dysfunctions among the transport chain and it also increases the complexity of the transport chain due to the involvement of many actors. Many companies which are facing the decision to choose the specific transport mode avoid SSS due to the complexity this transport chain has with the high number of intersections.

I: What can be done to improve the reputation of SSS and to promote this type of transport mode?

R: A general problem hereby is the lack of information transparency among SSS market participants. The data bases the short sea shipping lines are providing on their internet pages are rather inconsistent as well as not reliable. Assuming a forwarder would like to organize a transport including the mode SSS, the effort to gather adequate data is not competitive against other transport modes. Therefore SSS companies should improve the transparency of these data bases in cooperation with port authorities and terminal operators.

I: You mention port authorities and terminal operator in this context. What is their role in the promotion process?

R: The problematic situation SSS often faces in ports, where deep sea vessels as well as SSS vessels are served, is that terminal operator are sometimes favoring the large deep sea vessels over SSS vessels. This results in waiting times for SSS vessels and thus higher costs. The approach we are suggesting is a dedicated SSS terminal which is only serving SSS vessels. The next step would then be the reduction of administration within these terminals, which is also hindering the competitiveness of this transport mode.

I: What could be done on behalf of the EU or the federal government to strengthen the position of SSS within the transport market?

R: As a first step we suggest that the administrative institutions are supporting the enhancement of market transparency. This could be the implementation of a sailing list. A promotion centre on a national level would be also a good initiative which should be adapted by every country.

I: Let us now switch to the topic sulphur emission limits, frankly speaking the SECA-Directive. What is your general opinion about this topic?

R: The SPC is completely supporting legislations which are supporting the environmental friendliness of the maritime transport mode. There are however some connected challenges with the implementation. Hereby I would like to refer to the case study conducted by the European Shortsea Network called “ESN- Way Forward SECA report”. From our side the increase of cost and the burden of required investment to comply with the regulation is the main challenge. Additionally the lack of transition time is also problematic.

I: You mention transition time in this regard. What do you think would be a better solution for an implementation procedure?

R: From our point of view the equal treatment of all ships, in terms of age, is not suitable. Investments in older ships are not reasonable under economical considerations whereas we would suggest making the lower sulphur emissions a mandatory for newer ships instead of older ships. This would allow a moratorium for older ships. Moreover we would have welcome subsidies from the EU or the federal government for the transition time. This state aid should focus on retrofitting of ships. Under the current situation the goal of the EU to shift cargo from the road to sea will not be achieved.

I: Which role do you think will the industry play in the process of implementation?

R: We heard from the industry that the choice of transport is actually very price sensitive. An increase of transport cost of about 7% will lead to a reconsideration of the transport strategy. We heard from industry members that they are already checking for alternatives as they want to be prepared in case the implementation impacts the transport costs.

I: What will happen in 2015? What are your predictions?

R: What we are expecting is a cost increase of the shipping mode. The extent of this increase is not predictable due to many unknown factors. We expect that the majority of shipping lines will use MGO in the beginning of 2015. The early usage of LNG or the Scrubber technology is not very likely based on the lack of investment ability and also lack of infrastructure.

I: How do you rate the innovation potential, technical and strategically, of the shipping industry? In the literature, SSS has the image of being not very innovative.

R: With regard to strategically innovations I think SSS is good positioned. SSS is always flexible reacting to market changes. Economical growth of region can easily be handled by SSS. Furthermore the pure "port-to-port" service of SSS has evolved to a "door-to-door" service which is illustrating the strategically development of this mode. The next step would be the integration of SSS into complex production systems such as Just in Time, which will be the next step. On the technical side I think the development of reefer transports and the implementation of the "grey box" is showing that there is innovation within the market. Therefore I think that the image of "being not innovative" is not reflecting the actual situation of the transport mode.

I: You have described us the role of SSS within the transport chain and challenges of the SECA-Directive. What do you think will the future bring for SSS?

R: We think that SSS has a bright future. The demand for transports is steadily increasing and the predictions are forecasting a high growth. We consider SSS as the only transport mode which can ease the congestion on the streets and the land sided infrastructure. However we need to increase the transparency of the transport mode and need to actively approach the EU to increase the market share of this transport mode in a structured way. Hereby we would like to emphasize that SSS is not trying to substitute other transport modes but to complement sustainable transport chains.

- End-

VDR-Transcript of interview

Molde University College

Interview with Lorena Bücklers and Christof Schwaner
Focal institution: German Shipowners' Association
(Link)

Respondent:
- Lorena Bücklers
- Christof Schwaner

Date: 24 April 2014

I: Interviewer
B: Lorena Bücklers (interviewee)
S: Chistof Schwaner (interviewee)

I: Mrs. Bücklers, please tell me about your professional relationship to the maritime industry and the related short sea shipping topic.

B: Presently I am the Director of Economics and Maritime Logistics at the "German Shipowners' Association" (VDR) in Hamburg. The goal of the association is to represent the common business and social policy interests of German shipping companies towards governmental institutions on a national and international level. Hereby we pursue the objective to enhance the competitiveness of German shipping incl. shipowners active in short sea shipping. One main topic of my work is to analyze the port- and waterway-environment under consideration of shipping companies needs as well as their general framework incl. SSS and to represent their position.

I: You mention as one part of the group you represent, are ship owners which are operating within the field of Short Sea Shipping (SSS). What do you consider as a major strength of SSS?

B: The major strength of this transport mode is without any doubt the environmental friendliness. The CO_2 emission per ton/km is lowest for this transport mode. Furthermore the sea transport is easing the congestion of the infrastructure on the land side. If we believe the recent traffic predictions from the "Federal Ministry of Transport and Digital Infrastructure" the demand for transport will increase in the following years. The land sided infrastructure is already on its limit and therefore SSS is the transport mode which can help to ease this congestion. The advantage over a deep sea carrier is the flexibility and capability to call small ports, which is particular essential for the Baltic Sea.

I: On the other hand. What do you consider as weaknesses of this transport mode?

B: The weather is a weakness of SSS in connection with port operations. While a strong storm is probably not stopping a truck these weather conditions might be a problem for SSS. Port operations have to stop under certain conditions which could result in a delay

in transport. What is more, the administrative burdens for SSS are much higher than for other transport modes, especially the truck. These administrative burdens are especially connected to custom procedures, even though it is intra-European cargo. The problem hereby is that when a SSS-vessel is leaving the territorial water of the EU which is 12 sea miles from the mainland, the cargo officially left the EU and therefore custom procedures need to be applied even though no port outside of the EU was called. This administrative rule is resulting in a disadvantage towards other transport modes.

I: In the literature it is stated that the cooperation between land sided modes and the maritime transports such as SSS is not very advanced. Do you think there is a lack of collaboration between these modes?

B: I do not think it is right to say that there is no collaboration. There are many service liners which are offering door-to-door services for customers. This would not be possible if there would not be any cooperation.

I: Do you see any space for improvements within this collaboration?

B: The improvements need to take place on an operational level whereas the needs and interests of both partners need to be matched. Here, the efficient information flow is essential to guarantee smooth transport operations. All major stakeholders have to be involved, including terminals.

I: As you mention in this context the port environment and terminal operator. What do you think is their role in the promotion for SSS?

B: When focusing on ports under the consideration of SSS the first thing which is essential is the geographical location. The port of Hamburg for example is an excellent port for transition cargo. Hamburg is offering the consolidation of feeder cargo for deep sea vessels and can act as a hub for the Baltic Sea. Therefore the first important factor which is promoting SSS is the geographical location. There is a strong correlation between deep sea cargo and short sea shipping especially when SSS is hereby used to serve a particular market. However the terminal operators also need to be prepared for this correlation. In the actual situation there are some challenges for SSS, especially when the port is serving both; deep sea vessels and SSS. Often deep sea vessels have a better standing towards the terminal operator due to the high volume they bring into the port. This results in longer waiting times for SSS-vessels and therefore higher costs.

I: So what can terminal operator do to support the transport mode SSS?

B: Terminal operators should offer a quick and efficient service for SSS while charging a good price-performance ratio. Additionally, terminal operator should also be involved in the processes which aims to mitigate the administrative burden for SSS when possible. There are some EU initiatives towards this namely “National Single Window”. Presently this is more a general idea of information sharing platform but it might evolve into an opportunity for terminal operator to improve on the administrative burden.

I: How do you consider the usage of 45-foot container to improve the collaboration between SSS and the land sided modes?

R: The usage of this type of container is current practice, however connected to some challenges when it comes to land transport. 45-foot container transport relies on trucks that are longer than the standard truck length. The circulation of these trucks is today subject to heavy administrative formalities, especially if the transport operations are not limited within one Member State but are cross-border. This in turn limits the circulation of 45-foot containers, a loading unit that is used extensively in short sea shipping. Administrative formalities act as a choking point by not allowing a 45-foot container that has been transported by sea to continue its journey unhindered on Europe's road network and reach its final destination. Currently, the EU commission is working on an legislative proposal to remedy this situation. This initiative could bring improvements if the road-leg circulations are linked to deep-sea or short sea transport.

I: In detail you have described now the role of SSS within the maritime environment. How would you describe the future of this transport mode in Europe?

B: We are looking positive into the future for the maritime industry. The prognoses are showing an increasing demand for global transports and shipping is essential contributing to the fulfilment of this demand. An essential role hereby plays the EU. In their sphere of power is the reduction of administrative burden and also other promotion aspects. We see clear signs that the EU has a strong interest in the promotion of the maritime transports based on the congested infrastructure. The challenge for us is now to actively contribute to EU decisions and to represent the German ship owners and their interests.

I: As we have now heard detailed the evaluation of SSS, I would like to come to the new regulation of sulphur limits. Therefore Mr. Schwaner, please tell me about your professional relationship to the maritime industry and the related short sea shipping topic.

S: I am the press officer of the German Shipowners' Association and deal with all inquiries related to public relations. As you may imagine the new regulation on sulphur emissions is currently a hot topic both within the public debate and our membership. Therefore I am able to answer your questions. I am representing the German shipowners opinion in this topic, whereas I would also like to refer to the ISL study "Reducing the sulphur content of shipping fuels further to 0.1 % in the North Sea and Baltic Sea in 2015: Consequences for shipping in this shipping area" which was commissioned by the "German Shipowners' Association" and the "Zentralverband der deutschen Seehafenbetriebe e. V.".

I: I would be very interest what the German ship owners general opinion is about the new upcoming regulation.

S: The problematic situation with this regulation is the form of the implementation. The shipping industry is operating worldwide and while the new regulation applies only for certain areas. You need to consider that the vast majority of German shipowners lend their vessels to liner companies like Hapag-Lloyd, MSC or CMA CGM. These shipowners manage ships that operate globally – and are now forced to comply with a regulation implemented in a particular region. This represents a big challenge for them combined with the high costs of possible retrofitting. Please do not understand us wrong, the VDR is absolutely favoring environmental friendliness but what we are critically question is the

way how the shipping industry is affected in an unbalanced way. Sustainable shipping has not only to take into account the environment but also economic aspects.

I: What could be improved in the implementation process?

S: Based on the fact that shipping is an international business, it is crucial that regulation is affecting every market player in the same way. We need a level playing field otherwise some competitors – not being affected by regulation – have a comparative advantage in the market. Depending on the single case, investments, to comply with the new regulations, in older ships might not reasonable for ship owners under economic aspects. The introduction of the new sulphur limits worldwide from 3.5 to 0.5 percent by 2020 affects every shipping company in the same way and the additional costs for cleaner fuel can be forwarded to the customers.

I: In this context you mention the necessity for investments. So from your point it is necessary to invest to comply with the initiative?

S: Shipowners basically have three alternatives to comply with the SECA regulation: using MGO, LNG or the Scrubber technology. The two latter ones require significant investments on board. As the shipping crisis lasts for already six years and banks are withdrawing from financing ships, shipping companies have only very limited modes of financing new investments. Therefore the vast majority of German ship owners will use MGO which is 50 percent more expensive then HFO. Only for relatively new ships operating mainly in the SECA, a retrofit – LNG or scrubber – could be a solution.

I: Is it only the lack of investment which is favoring the usage of MGO? Or are there other circumstances?

S: What we are facing here is a complex situation between shipowner, charter companies and the cargo owner or shipper who is actually buying the transport service. When we consider the relationship between shipowner and charterer like for example MSC we have a cost driven relationship, whereas MSC wants to have a low price to charter the ship. When the shipowner would do an investment to retrofit its vessel for LNG usage or to buy a LNG-powered ship with a dual-fuel motor, the company needs a longer charter for its ship then we see today to re-finance the investment. In addition, you cannot predict price developments. The charterer is paying the fuel for ships, which might make retrofitting to LNG reasonable and attractive for charterer due to lower fuel prices for LNG than MGO – today about 20 to 30 percent. Based on the fact that there is until now no market price for LNG these predictions and scenarios are not reliable. Long-term charter agreements could facilitate shipowners' investments in LNG technology.

I: You mentioned the role of the cargo owner or shipper who is finally buying the cargo space on the ship. What is his role within this triangle?

S: If a company producing sport shoes for example is willing to cover the additional costs for greener transport, then of course shipping can provide that. Until now we are having a very price sensitive competition within the shipping market which creates a big obstacle for investments. If a shipowner invests into green technology and receives

no reward from the cargo owners demanding transport services, the company will not be able to compete in the market.

I: Do you think state aid could help to foster retrofitting in this regard?

S: The VDR is lobbying towards state aid from the federal government as well as within the framework of the European Sustainable Shipping Forum (ESSF) of the European Commission. Financial support for green shipping is crucial to help the shipping industry comply with the SECA standards and to remain competitive within the transport environment.

I: So without any state aid you are expecting a modal backshift?

S: With reference to the study we commissioned at the ISL we are expecting a modal backshift. The only unknown is hereby how this modal backshift will occur and to what extent. This backshift is however standing in contrast to the EU goal to shift cargo from land to the sea.

I: In the literature the shipping industry is described as not very innovative with regard to technical improvements. What is your opinion about this statement?

S: The shipping industry is the only global industry which has established internationally binding standards to foster ship efficiency and reduce shipping industry's impact on the environment. In 2013, the industry implemented the "Energy Efficiency Design Index" (EEDI) which demands continuous improvements in ship efficiency for new-buildings. In addition, the mandatory "Ship Energy Efficiency Management Plan" (SEEMP) for all existing ships reduces the energy consumption and enhances efficiency in ship's operations. These two initiatives lead to significant reductions in the emission of greenhouse gases. Many further measures are undertaken to improve efficiency and reduce the impact on climate and marine environment, such as innovative ship design, optimized motors, complex software solutions for routing and trimming or ballast water management systems to prevent invasive species from travelling around the globe. The shipping industry supports regulation on an international level by the International Maritime Organization.

I: What do you think can ports do in order to mitigate negative effects of the new limits?

S: One main challenge for ports will be to be prepared for the needs of shipping companies with respect to new types of fuel, especially LNG. The European Commission suggested to implement an appropriate infrastructure for LNG bunker stations in harbors of the Trans-European Transport Network. Unfortunately, the European Council decided to leave that goal to the member states. We suggest that the German government supports the German ports to foster the construction of LNG bunker stations in order to provide a suitable infrastructure. This is a prerequisite for shipping to use LNG. Furthermore it needs to be considered that some scrubbers also produce toxic waste which needs appropriate waste management facilities at the ports.

I: After describing and discussing details of the topic SECA Directive, what is your outlook for the shipping industry with respect to the Directive?

S: The SECA Directive is challenging the already suffering industry and we need a joint effort of both industry and government to mitigate negative effects. One main focus should be put on the LNG infrastructure which has potential to be the fuel of the future for the shipping industry. The main goal of all administrative institutions national or international should be to shift cargo from the land to the sea in order to ease the already overloaded and congested land infrastructure.

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Interviewee #9-Transcript of interview

Molde University College

Focal institution: "Maritime Consultant Company"

Respondent:
Interviewee #9

Date: 28 April 2014

I: Interviewer
R: Respondent (interviewee)

I: Please tell me about your professional relationship to the maritime industry and the related short sea shipping topic.

R: Since 1995 I am working as a consultant at a global consultant company which is working in the maritime field. Hereby I got frequently into contact with the maritime industry for example terminal operators or stevedoring companies in Finland. Recently, I have been working for a major port in Finland as a consultant and take care of port involvement in EU projects.

I: What is the role of maritime transports for a country like Finland?

R: The importance of short sea shipping (SSS) for Finland is very high. Even though geographically this statement is not true, but practically Finland is an Island. The exporting industry is completely dependent on the sea transport mode while only a fraction of our exports is organized by land sided modes, mainly to Russia. Considering domestic trade, there can be seen a major role of land sided modes, especially the trucking mode.

I: Is this high dependency on SSS resulting in a good cooperation between land sided transport modes and maritime transports?

R: There is indeed a good cooperation between actors within the transport chain. The dependency on the maritime land mode is allowing a long-term planning horizon. Therefore the freight forwarders such as DHL have long-term agreements with the operating shipping lines with pre-booking habits.

I: And how is the role of the ports in this relationship?

R: In general ports are also very supportive towards the short sea shipping industry. In Finland ports do not have the "conflict" between deep sea vessels and SSS. Therefore the cooperation between terminal operators and SSS is good. There are, however, some controversial opinions as usual in business partnerships but in general the cooperation is good.

I: What do you think about the usage of 45' foot container as a loading unit which decreases disparities between the transport modes and might replace the usage of trailer?

R: From my point of view the usage of 45' foot container is a good alternative to the trailer. The capacity utilization of Ro-Ro- or RoPax-ships is by far less than the for one Lo-Lo ships. Therefore the emission advantage of the sea transport is getting lost. The

usage of 45’ container as a competitor to trailer would therefore be suitable but needs to be accepted by frequent users such as DHL.

I: Let us now go to the SECA-Directive. What is your general opinion about the limitations of the sulphur emission?

R: Generally speaking, the limitations of sulphur are necessary, but it is however implemented in a very sensitive time for the shipping industry. Industrial associations are surprised that the Directive passed all instances and will now be implemented. The Finnish Lobby-work in Brussels did not succeed and I had the feeling that they were a bit lost doing this lobby work. This is particular surprisingly due to the fact that the European Commission is very open and communicative in this regard.

I: You mentioned Industry Associations. Why is there a particular interest on behalf industry associations for a legislation which is affecting the maritime industry, mainly liner operator?

R: As I explained before, the shipping industry is vital for the Finnish exporting industry. This is namely sawn timber, paper- and cardboard-industry. The locations in northern Finland, let’s say Oulu, are in a way remote area and the transport distance via sea is very long but also the density of services is low. If the transport costs will now increase, this production location will be in danger to be closed down. Hereby we need to clarify that this is not only due to the legislation but also market conditions and other factors. However transport costs have a specific weight in these remote areas and should be considered.

I: So you are predicting an increase in price of the maritime transport mode?

R: Yes, absolutely. The question hereby is only, how much. In my opinion most shipping lines will use MGO from January 2015. This will result in higher costs but the remarkable issue hereby is that no one can predict the increased cost. If someone is calculating cost based on actual prices of e.g. “bunkerworld” this calculations will be invalid. The problem we are facing here is there is no market for MGO yet. We have the supply on the one side, but no demand on the other side. The price of MGO has not balanced out between supply and demand, which makes predictions in all regards (effects on industry, transport cost etc.) very difficult.

I: The fuel costs will increase. The total transport cost will increase consequently. How do you consider state aid in this regard? Finland is one country which is already offering state aid (Volume 30 mio. €) for retrofitting.

R: I need to say I am not very deep into this topic. But from my point of view state aid is always a problematic topic. I do not think that state aid for retrofitting the vessels or subsidizing certain transport routes is the best form, because it is not sustainable. From my point of view a good trigger for state aid would be the taxation of the new fuel. If state aid would help to create a good supply situation of MGO and would subsidies the MGO price, this would help to mitigate negative effects.

I: A Swedish respondent, who has been interviewed before, mentioned the danger of market shifts due to unequal state aid within the EU. Do you consider this as well as problem?

R: From my point of view I think that the European Commission is pretty well structured in this regard and will be aware of this. Furthermore I think that a state aid volume of 30 mio. € is not able to shift market conditions, just to pick up your example. However I think it should be considered that for some countries, e.g. Finland, the maritime industry is vital and cannot be easily replaced by other transport modes. Therefore the desire for state aid might be more comprehensible.

I: As you have mentioned before, you consider the usage of MGO as the option which will be used most likely beginning 2015. Why not scrubber or LNG?

R: From my point of view the scrubber technology is not mature enough to be used in the short run. This might be an option for the future when this technology has proven itself in the practice. The usage of LNG is, in my opinion, far in the future. The technology and its bunker infrastructure are from the actual point of view not sophisticated enough.

I: LNG has already proven itself within the Norwegian shipping industry and the LNG infrastructure within the Baltic Sea is also increasing. Is this not building a solid base that new ships can be equipped with LNG engines?

R: That might be an option. But if we are stepping into the feet of ship owners, who are deciding which type of fuel to use in the future, would you prefer the type of fuel which binds you to a certain operation area such as the Baltic Sea? Is it not more likely that you want to remain flexible with regard to the area of operation and therefore try to use the most common type of fuel/engine? It will be interesting to see how the coming ship orders will be, and when this orders will be. What I see hereby as a challenge or the biggest threat for the transport market, that the usage of MGO will be so costly that only vessels which were retrofitted in forms or scrubber remain competitive. Then we would have some kind of monopolistic situation within the market, which is not desirable.

I: In the literature the SSS sector is often described as not very innovative. Do you agree with this statement?

R: Partly. I think that SSS is innovative in this regard, that for example shipping costs strongly decreased in the past. Shipping operations, for example the implementation of container, were innovative in terms of cargo handling procedures. It is however true, that the improvements with regard to the emissions are not that obvious, where shipping lines mainly relied on their reputation of being the CO_2 friendliest transport mode.

I: You outlined very well the impacts of the sulphur emission regulations which are connected to certain challenges. What is your expectation in general for the future of the maritime industry?

R: There are so many discussions going on about impacts and effects whereas I am not predicting a modal backshift from sea to land for Finland based on our geographical situation. The industry is relying on this transport mode. What I see as a major challenge for the industry is that the market conditions as, they are presently active, remain. The fuel supply needs to be coordinated so that there is no monopolistic situation of MGO suppliers in some regions so that the market situation becomes disadvantageous for some market participants.

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