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# Analysis of barriers caused by administrative, security and safety procedures in Pentathlon

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## Introduction

The current research paper is compiled in the PENTA project. PENTA is a cooperation and development project of five ports in the Baltic Sea: Stockholm, Helsinki, Tallinn, Turku and Naantali, so called Pentathlon ports. The project explores the alternatives of how these five ports together can face and better comprehend the challenges of today and in the future.

This study analyses main administrative, security and safety barriers that occur in maritime transport. The barriers of administrative, security and safety procedures in the ports are created by the clerks and often through the national and international legislation. The object of this research is the movement of goods and passengers between the ports which contains examination of procedures at the ports and between the ports (shipping lines). The objectives of this research paper are to study the operating processes of selected ports and in liner shipping in the European Union and to identify the main administrative, security and safety bottlenecks that hinder the efficient development of maritime transport. The most detailed overview in this paper is given on the results of questionnaires and interviews.

The current research focuses on liner shipping between the five ports. Since all companies and institutions that operate in the ports form a united port community, it is important to take into consideration the entire communities of these ports which include port authorities, stevedoring companies, shipping companies, freight forwarders, customs, border guards and other companies and institutions who are involved in the process of cargo and passenger transport by liner shipping between these ports.

The efficiency of maritime transport plays an important role in each of these ports as well as in the entire EU economy. Maritime transport is a complex field that is filled with a variety of international and national legislation and hence administrative, security and safety procedures, such as customs inspection, documents checks, health and veterinary control, etc. This paper aims to identify impacts of these legislations and procedures in the ports and maritime transport as a whole.

This paper is divided into five different chapters. First chapter describes the main research methods and materials that were used to assemble this paper. The main research methods were questionnaires which were distributed amongst actors in Estonia, Finland and Sweden in order to find out the administrative, security and safety barriers in each country. Another important sources of information were interviews, which were carried out directly or by using a phone. The basic materials used in the compilation of this paper were the results of questionnaires and interviews, publications, newspaper articles, material from the internet, etc.

Second chapter describes the main documents, studies and projects that are prepared on close subject across the EU. To summarize those documents and projects it can be concluded that complicated procedures in maritime transport are major obstacles to its development and in recent years the EU has addressed the problem. In order to facilitate maritime transport without barriers, a number of documents have been prepared in the EU.

Next chapter will give overview of the five specified ports – Stockholm, Helsinki, Tallinn, Turku and Naantali. All these ports are located at the shores of the Baltic Sea and they have

a significant role in the region. This chapter focuses on the characterization of the ports and major freight flows that pass through these ports.

Since this study focuses primarily on liner shipping, the next chapter will give overview of the main shipping lines between the above-mentioned ports. According to Helsinki Commission (2012) the Baltic Sea has some of the busiest shipping routes in the world. These ports are connected together with a number of different shipping lines which include both passengers and goods transport.

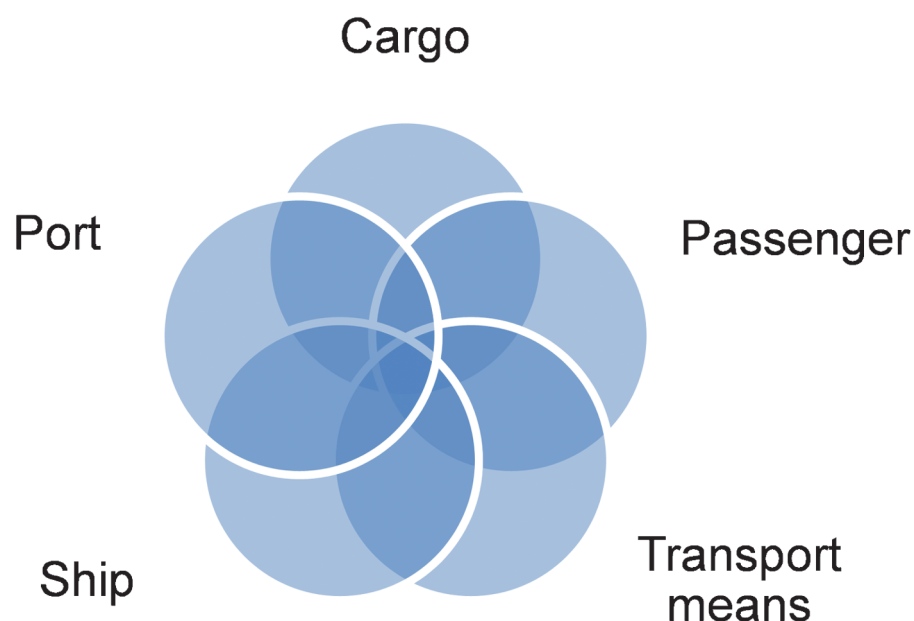
The results of research are given in the fifth chapter that consists of several subchapters. Each subchapter describes the main categories in which problems occur due to the questionnaire respondents, interviews and other used sources. The first subchapter gives an overview of the main administrative, security and safety barriers from a ship-owner's point of view. The major burdens are related to the EU's various conventions and regulations and their interpretations in different countries, implementation of the EU Sulphur Directive and its impact on maritime transport and different rules for the pilotage exemption. The following subchapters describe a variety of areas in which the administrative, security and safety barriers are represented.

The final chapter focuses on summary of this paper and gives some recommendations that would improve the current situation. In addition, there are added a sample of questionnaires in the end of the paper.

# 1 Research methods and materials

Previous researches have shown that shipping cargo by sea in the EU is more complex than shipping cargo by road to the same destination. Therefore finding safety, security and administrative barriers is vital in order to maintain and raise competitiveness of maritime transport in comparison with other transport modes.

Current research paper deals with very complex problem, with safety, security and administrative barriers in liner shipping between ports of Helsinki, Naantali, Stockholm, Tallinn and Turku. The issue is complicated as there are many levels in research matter (see Figure 1).

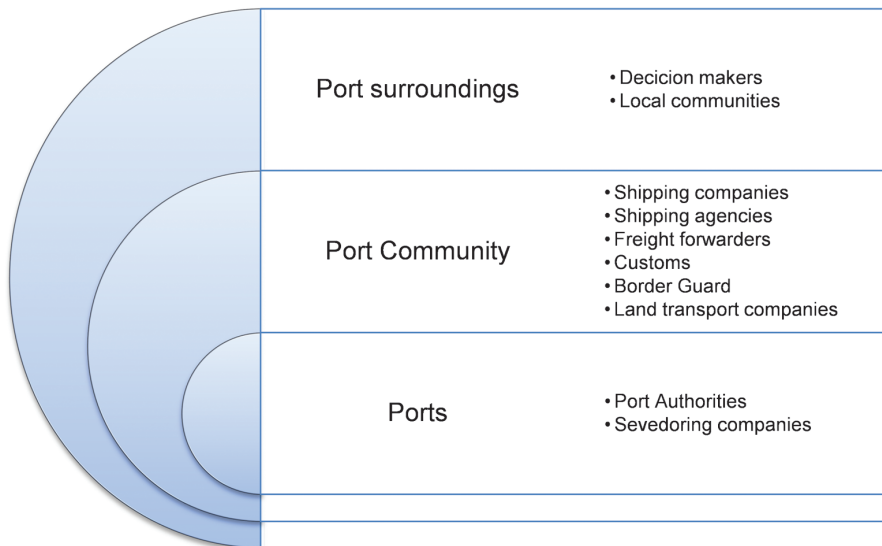


**Figure 1.** Different levels of research.

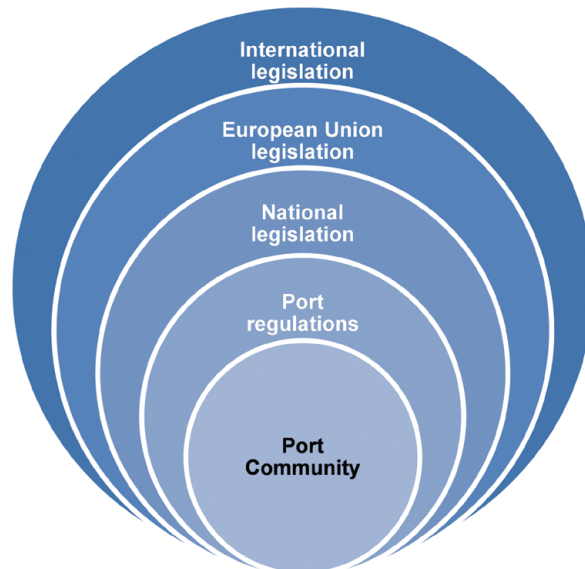
On each level there are specific problems of their own which generate the barriers in fluent cargo flow. To deal with procedures most of the actions are made and concentrated in ports or nearby. Therefore ports and port communities (see Figure 2 on page 8) have essential role in simplifying safety, security and administrative procedures.

Another aspect what must be kept in mind handling the issue is the different influences of legislative framework (Figure 3 on page 8). Some of the barriers created by legislation have more direct impact on cargo and passenger flows on micro level and other rules and regulations create barriers on macro level influencing the whole system. The latter ones are generally created by international (incl EU) level as the headmost are made on national level, though often derived from international and EU legislation. Good example of changes in cargo moving patterns in 2004 when Baltic States, Poland and others became members of the EU. When before that many shippers choose maritime transport route in sending cargo from Estonia to Western EU because there were less administrative barriers compared to land transport where you had to make at least 4 border crossing. Then after 2004 these barriers didn't exist anymore, so cargo shifted from maritime transport to land transport.

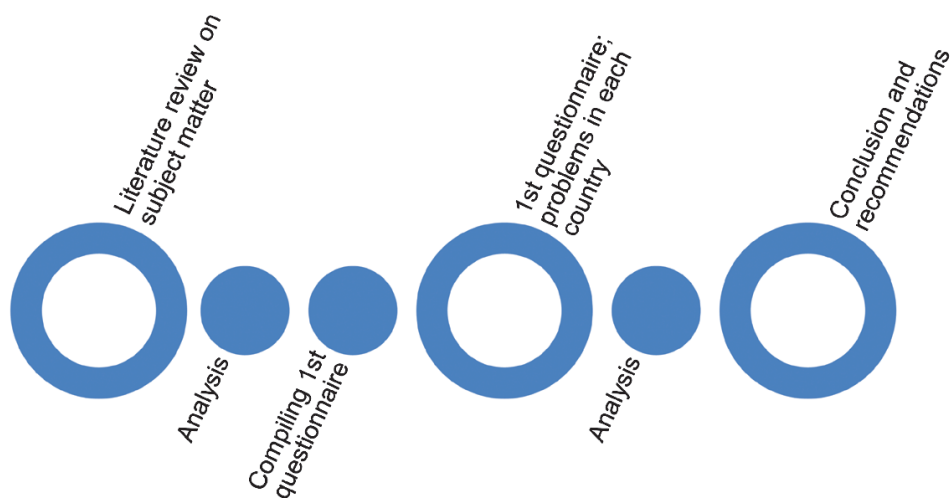




**Figure 2.** Relationship of port, port community and surroundings.



**Figure 3.** Legislative framework of port community.



**Figure 4.** Stages of research.

In order to find which problems should be dealt with the initial questionnaire was compiled based on the literature researched on the matter (see Figure 4) and additional interviews with actors. Questionnaire was distributed amongst actors in Estonia, Finland and Sweden to find which are the problems in each country. To gain more in depth understanding about the research matter additional interviews and consultations with actors were made during the whole course of research. After receiving replies to questionnaire, additional interviews were made in order to get clarification about some aspects raised from the results of the questionnaire.

Based on the results of analysed materials, answers on questionnaires and interviews conclusions and recommendations were made.

The readers may ask who are the actors, who are mentioned beforehand? In this paper by actors we mean companies and institutions who are involved in the process of cargo and passenger transport by liner shipping between ports of Helsinki, Naantali, Stockholm, Tallinn and Turku, who form port communities in these ports.

## 2 Literature Review: Maritime transport without barriers in the European Union perspective

Maritime transport has an important role in the EU economy. Sea transport constitutes ca 90% of the European Union’s external trade and ca 40% of internal trade. According to Eurostat (2012) maritime ports in the EU handled 3 641 million tons of seaborne goods in 2010. As Figure 5 illustrates below transport of goods through sea ports dropped significantly in 2009, but in 2010 the seaborne goods are increasing again. Figure 5 shows the gross weight of seaborne goods handled in EU (27 countries) ports (goods unloaded from vessels plus goods loaded onto vessels). Maritime transport is also an important employer- around 1.5 million people are occupied with work in the EU maritime industry.

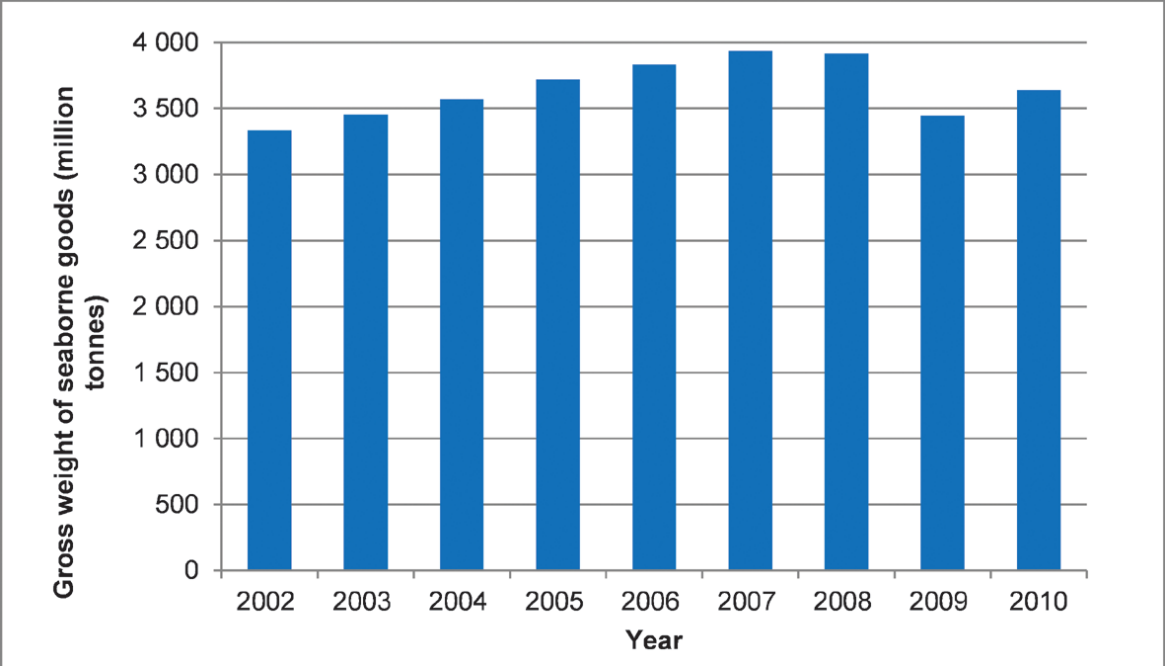


Figure 5. Sea transport of goods, the gross weight of seaborne goods handled in EU ports in 2002–2010. (Source: Eurostat 2012)

Maritime transport in the EU is an important, but also a complex field that is filled with a variety of administrative, security and safety procedures, such as customs inspection, documents checks, health and veterinary control etc. All these procedures hinder the efficient development of maritime transport. In order to facilitate maritime transport without barriers, several documents have been prepared in the EU.

Table 1 on page 10 presents the European Union’s main documents and projects, which are related to the reduction of barriers in maritime transport. From these documents and projects it can be concluded that complicated procedures in maritime transport are major obstacle to its development and in recent years the European Union has addressed the problem. Since 2004 twelve countries have joined the European Union and therefore the trade between

Member States has increased. Unlike rail and road transport, that have simplified bureaucracy between the Member States, administrative procedures of maritime transport have remained the same. Rising trade volumes in EU require advanced ports' procedures and constantly evolving technology allows offering it.

An integrated transport network of the European Union has been one of the main objectives in recent years. White Paper, adopted by the European Commission in March 2011, includes initiatives to build a competitive transport system that will increase mobility and remove major barriers in key areas. This document highlights the need to create a Single European Transport Area by eliminating all residual barriers between modes and national systems. This Area should ease the movements of citizens and freight, reduce costs and enhance the sustainability of the EU transport. Creating an integrated transport network is time consuming and difficult operation, while the EU is relatively young and the Member States have different bureaucratic approaches. In addition, diversity of the cultures, national languages, traditions and overall differences, make integration even more complicated.

Short sea shipping is an intermodal transport mode, which includes shipping between the ports of the European Union, and between European Union and nearby countries. Short sea shipping is an environmentally friendly transport mode and therefore it is necessary to promote it. In 2009 the European Commission presented the strategic goals and recommendations for the European maritime transport system up to 2018, which includes also a strategy to exploit the full potential of short-sea shipping and sea transport services for business and citizens in the EU. This document points out that one of the main priorities should be to establish a true 'European maritime transport space without barriers', removing unnecessary administrative barriers, duplicated cross-border controls, the lack of harmonized documents and all other factors that hamper the potential growth of short-sea shipping.

One priority of EU transport policy has been a modal shift of trade from road to the sea. To achieve this it is important to facilitate short sea shipping, because it has several advantages compared with road transport, for example, it is cheaper and has less negative impact on the environment. Furthermore, constantly growing volume of traffic on roads is a problem, which causes delays, air pollution, accidents, etc. Short sea shipping is the solution to reduce traffic congestion. Also it is often the only connection between the mainland and the islands and this makes it the vital part of society and the economy. Short sea shipping should be integrated in EU intermodal transport and logistics chains.

The administrative barriers in maritime transport have caused concern in most of the related parties. The Commission launched an open consultation on a "European maritime space without Barriers" reinforcing the internal market for intra-European maritime transport. Several interested parties from different institutions participated in these consultation questionnaires. A number of challenges and constraints were brought forth that hinder the effectiveness of administrative formalities in maritime transport. For example, high delays in order to carry out procedures in port and delay on vessel and/or on goods due to the controls, low degree of competitiveness of maritime transport against road transport, individual interpretation of EU regulations, electronic manifests not universally accepted, etc.

After the open consultation, the European Commission issued "Communication and action plan with a view to establishing a European maritime transport space without barriers". This action plan includes several legislative measures for reducing administrative burdens in maritime transport in Europe. The main initiatives and measures are shown in table 1 on page 12. The recommendation to simplify customs formalities for vessels transporting goods between EU ports is crucial. The main idea is to abolish administrative formalities for goods in free circulation (Community goods), which would mean that ships from another EU port transporting Community goods would not have to present a proof of Community status. This would

**Table 1.** Documents and projects related to the reduction of barriers in maritime transport.

<b>Documents and projects</b>	<b>Main initiatives and recommendation</b>	<b>Other information</b>
<p><b>Maritime Transport Strategy until 2018</b></p>	<p>Implement simplification measures to reduce the administrative burden on masters and senior officers on board ships</p> <hr/> <p>Establish a true ‘European maritime transport space without barriers’, removing unnecessary administrative barriers, duplicated cross-border controls, the lack of harmonized documents and all other factors that hamper the potential growth of short-sea shipping.</p> <hr/> <p>A reference framework should be established to enable the deployment of ‘e-Maritime’ services at European and global levels.</p>	<p>The strategic goals and recommendations for the European maritime transport system up to 2018, which identified key areas where action by the EU will strengthen the competitiveness of the sector while enhancing its environmental performance.</p>
<p><b>White Paper on Transport 2011</b></p>	<p>The European Maritime Transport Space without Barriers should be further developed into a “Blue Belt” of free maritime movement in and around Europe, and waterborne transport should be used to its full potential.</p> <hr/> <p>Integrate the use of monitoring tools by all relevant authorities, ensure the full interoperability between ICT systems in the waterborne sectors, guarantee the monitoring of vessels and freight (Blue Belt) and set up appropriate port facilities (“Blue Lanes”).</p> <hr/> <p>Establish a framework for the granting of Pilot Exemption Certificates in EU ports.</p> <hr/> <p>Develop SafeSeaNet into the core system for all relevant maritime information tools needed to support maritime safety and security and the protection of the marine environment from ship-source pollution.</p> <hr/> <p>Assess the feasibility of the creation of an EU register and EU flag for maritime and inland waterway transport.</p> <hr/> <p>Assess the feasibility of shared functions for coastguards in the EU, in particular to ensure maritime safety, security and environmental protection.</p>	<p>Roadmap to a Single European Transport Area - towards a competitive and resource efficient transport system. A strategic document, which includes 40 concrete initiatives for the next decade to build a competitive transport system that, will increase mobility, remove major barriers in key areas and fuel growth and employment. A Single European Transport Area should ease the movements of citizens and freight, reduce costs and enhance the sustainability of European transport.</p>
<p><b>Communication and action plan with a view to establishing a European maritime</b></p>	<p>Simplify customs formalities for vessels transporting goods between EU ports.</p> <hr/> <p>Rationalization of documents requested under different bodies of legislations.</p> <hr/> <p>Simplification of administrative formalities for vessels sailing between EU ports, but having a call in a third country or a free zone.</p> <hr/> <p>Enhanced electronic data transmission.</p> <hr/> <p>Establish “national administrative single windows” for port formalities.</p>	<p>European maritime transport space without barriers’ aim is to remove major administrative obstacles to the development of short sea shipping, which can help maintain the EU’s strong know-how in shipping in general and enable it to keep up its position as a key</p>

<b>transport space without barriers</b>	<p>Simplification of rules on carriage of dangerous goods by sea.</p> <hr/> <p>Co-ordination of administrative inspections with a view to shortening turnaround times.</p> <hr/> <p>Facilitate administrative communication.</p> <hr/> <p>Issuing of Pilot Exemption Certificates.</p>	player in the globalization of the economy.
<b>EU e-Maritime initiative</b>	The EU e-Maritime initiative aims to foster the use of advanced information technologies for working and doing business in the maritime transport sector.	
<b>The e-Freight project</b>	<p>Develop a standard framework for freight information exchange covering all modes.</p> <hr/> <p>Create a multimodal single transport document for goods.</p> <hr/> <p>Develop Single Window for administrative procedures in all modes.</p>	The e-Freight project is aimed to support strengthening of the internal market and competitiveness, improving regulation to create a more dynamic business environment and promoting sustainable development.
<b>The Blue Belt project</b>	Customs authorities will receive reliable information on the current and past voyages of blue ships. Ship-s masters and agents will benefit from faster processing of goods through Customs when arriving at port.	The aim of the Blue Belt pilot project is to explore new ways to promote and to facilitate environmental friendly Short Sea Shipping in the European Union by reducing the administrative burden for intra-Community trade

simplify the customs formalities, which would also require less time. In order to determine whether the ship visited only ports in the EU, high-level vessel monitoring systems should be implemented. Today, the use of highly developed technology is a competitive advantage in almost every area. However, the shipping industry is still using traditional paper documents and messages that are transmitted by fax or by radio. The European Commission (2009a) proposed to make electronic data transmission more efficient by creating “e-maritime” systems, as marked by the Commission in its White Paper on Transport Policy. With the aim of promoting the use of advanced information technologies in the maritime sector, the EU e-Maritime initiative has been created. The Commission organized an online consultation to obtain opinions on the subject from the public. According to ‘Summary report of the contributions received to the e-Maritime public online consultation’, there is a consensus that the EU e-Maritime initiative is important and worthwhile. The e-Maritime has a number of benefits, such as correct, timely available and adaptable data, enhanced security along sea borders and co-operation with security agencies, reliable platform to exchange data is valuable for safety and business processes, etc. The main issues with the e-Maritime are national legislations which impose different requirements on ports and ships, the level of investment in information systems, the lack

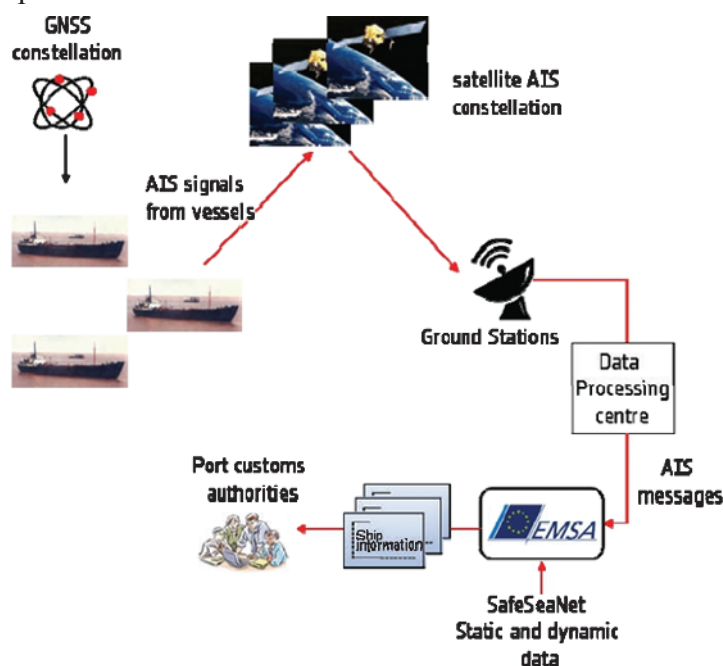
of harmonization and homogeneity that leads to different procedures in public administration and businesses in different Member States, etc.

Another project which should help to promote the use of advanced information technologies in the transport sector is the e-Freight project (2012). The aim of this project is to develop a standard framework for freight information exchange covering all transport modes and all stakeholders, develop a single window (single access point) for administrative procedures in all modes, etc. This project is especially important for transport users (shippers), transport service providers, transport infrastructure providers and transport regulators.

One of the most important projects to remove administrative barriers in maritime transport is the Blue Belt pilot project, which is carried out by the European Maritime Safety Agency (EMSA). The aim of the Blue Belt pilot project is to explore new ways to promote and facilitate environmental friendly short sea shipping in the European Union by reducing the administrative burdens for intra-Community trade (EMSA 2011).

Currently, ships are using the Automatic Identification System (AIS), which is a short range coastal tracking system (around 40 nautical miles from the coast). The solution to extend the coverage beyond this limit, without any change in ships' equipment, is to use satellite detection of AIS signals. With this solution, AIS messages are collected from space using satellites, allowing a continuous tracking of the participating ships beyond the coastal region, with the possibility of worldwide coverage (European Space Agency 2011). Around 250 ships are participating in this project, they are being monitored via SafeSeaNet system and all their movements are being saved. Information about the movement of ships will be sent timely to customs authorities in the EU port. Through the Blue Belt project reliable information is given out to the custom authorities of the member states, such as ship current and past voyages, expected or actual arrival and departure times, previous and next ports of call, additional information on vessel behavior etc. All this information is necessary to allow customs authorities to prepare procedures. Figure 6 illustrates the Blue Belt concept.

In order the Blue Belt project to succeed, the cooperation between different parties is essential. For example, customs authorities should also need this continuous tracking opportunity as much as the other interested parties. The result of this project would be very important to the maritime transport.

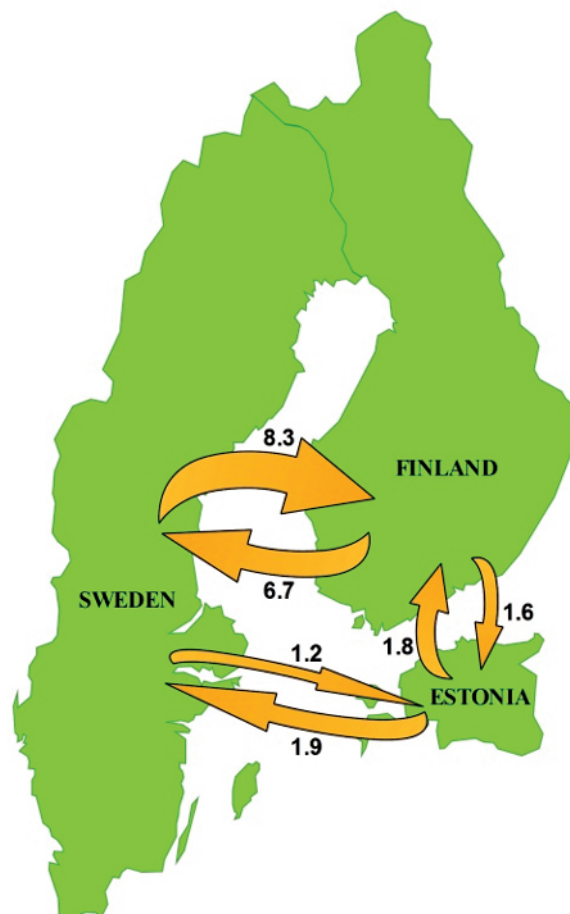


**Figure 6.** The Blue Belt concept. (Source: European Space Agency 2011)

### 3 Pentathlon – Ports of Stockholm, Helsinki, Tallinn, Turku and Naantali

This paper focuses on five ports, Stockholm, Helsinki, Tallinn, Turku and Naantali, so called Pentathlon ports. All these ports are located at the shores of the Baltic Sea and they have a significant role in the region. Relationships between the Pentathlon ports are either direct or indirect and therefore, it is important to define the nature of the ports and key statistics.

Sweden, Finland and Estonia have always been major trading partners and trade flows have formed an important part of national exports and import. Figure 7 illustrates foreign trade between Sweden, Finland and Estonia billions of euros in 2011. For Estonia, in 2010 Finland was the largest export market, accounting for 17% of Estonian total export, followed by Sweden with 15.6%. In 2011 these countries switched places and Sweden became the largest export market, accounting for 15.6% of Estonian total export, followed by Finland with 15%. In 2010 Estonian total export was 8.75 billion € and in 2011 it reached to 12 billion € (Statistics Estonia 2012)



**Figure 7.** Foreign trade between Sweden, Finland and Estonia in billions of euros in 2011.  
(Source: Statistics Estonia 2012; Finnish Customs 2012; Statistics Sweden 2012; authors )



Description of the ports allows defining possible safety, security and administrative barriers of the ports. Determining the main activities of the ports gives the opportunity to find out presumptive bottlenecks in the ports' daily work. For example, if the port serves principally liner ships, it is obvious that compulsory pilotage may become additional responsibility. Table 2 on page 18 presents the passenger and goods traffic in Penta ports in 2009 and 2010.

### **3.1 The Ports of Stockholm**

The Ports of Stockholm are located in the southeast of Sweden and it includes ports in Stockholm, Kapellskär and Nynäshamn.

The Port of Stockholm is situated in the capital of Sweden and it is one of the major ports in Scandinavia. The Port of Stockholm comprise a number of port areas, such as Värtahamnen, Frihamnen, Loudden, Stadsgården, Skeppsbron and other central quays. Värtahamnen, Frihamnen and Stadsgården have ferry services for goods and passengers travelling to and from Finland and the Baltic countries. Stadsgården and Skeppsbron are the points of arrival and departure for the regular scheduled cruise traffic to and from Mariehamn. In the summer Stadsgården, Skeppsbron and Frihamnen are the ports favoured by the international cruise liners. Frihamnen has one of the most important container terminals on the east coast. The port areas of Stockholm have also facilities for loading and unloading sand, cement and fuel pellets (Ports of Stockholm 2012).

The Port of Kapellskär is situated approximately 90 km north of Stockholm and it is an important port for passenger traffic and for the transport of goods to and from Finland, Åland, Russia and the Baltic countries. Kapellskär's predominant customer is FinnLink with traffic to Naantali. Other customers are Tallink Silja and Baltic Scandinavia Lines with traffic to Paldiski, as well as Viking Line with services to Mariehamn (Ports of Stockholm 2012).

The Port of Nynäshamn lies approximately 60 km south of Stockholm and it is a modern passenger and Ro-Ro port. The port has ferry traffic to and from central and southern Baltic ports. Other customers include Polferries with services to Gdansk and Scandlines with traffic to Ventspils. Nynäshamn is also the port of call for the larger international cruise liners that are not able to call into Stockholm (Ports of Stockholm 2012).

The number of ferry passengers travelling via Stockholm in 2010 was 9.1 million. The greatest relative increase was Tallink Silja traffic on the Stockholm–Riga route. Passenger volumes increased to almost 640 thousand, while total traffic to the Baltic countries increased 10 percent. Tallink Silja's Finland traffic gained 2 percent on the previous year. Total freight amounts in Stockholm in 2010 were just over 2.6 million metric tons. Traffic to Finland increased by just over 200 thousand metric tons, while traffic to the Baltic countries increased by 100 thousand metric tons (Ports of Stockholm 2010).

### **3.2 The Port of Helsinki**

The Port of Helsinki is located in south of Finland and it is the country's main port. The port of Helsinki operates in the centre of the capital (South Harbour and West Harbour) and Vuosaari Harbour.

The Vuosaari Harbour lies approximately 15 km east of the main port and it serves unitized cargo - cargo being shipped on trucks, trailers or in containers. The harbour was opened in 2008 and today it is the main cargo harbour of the Port of Helsinki, handling about 75% of total cargo volume for the port. The maximum annual capacity of the harbour is 1.2 million TEUs and 800,000 trucks and trailers (Port of Helsinki 2011).

Passenger traffic is mostly concentrated in the South Harbour and the West Harbour. The port has frequent, regularly scheduled connections from Helsinki to the ports on the Baltic Sea, the North Sea and the Atlantic. There are several daily connections to nearby ports, such as Tallinn and Stockholm and daily connections to Travemünde, Hamburg, Bremerhaven and Rotterdam. (Port of Helsinki 2012a).

In 2010, the number of passengers passing through the Port of Helsinki was 9.76 million and the goods traffic was 10.94 million tons (Finnish Port Association 2012).

### **3.3 The Port of Tallinn**

The Port of Tallinn is situated in Northern Estonia. The Port of Tallinn is the largest complex of cargo and passenger ports in Estonia and it consists of five constituent harbours, located at a distance from each other: Old City Harbour, Muuga Harbour, Paldiski South Harbour, Paljassaare Harbour and Saaremaa Harbour.

The Old City Harbour is located in the centre of Tallinn and it is the main passenger port of Estonia. The Old City Harbour serves primarily passenger and Ro-Ro ferries and cruise ships. A part of Old City Harbour is the Old City Marina, which provide mooring places for yachts, recreational and pleasure crafts. Regular lines round the year are Tallinn-Helsinki, Tallinn-Stockholm and Tallinn-St. Petersburg (Port of Tallinn 2012a).

The Muuga Harbour is located approximately 17 km east of Tallinn and it is the main cargo harbour of the Port of Tallinn, handling about 80% of total cargo volume for the port. The Muuga Harbour is specialized on handling transit origin goods. The majority of cargo loaded in Muuga Harbour includes crude oil and oil products, but the harbour also serves dry bulk (fertilizers, grain and coal), containers, general cargo and other types of cargo (Port of Tallinn 2012a).

The Paldiski South Harbour is located 45 km west of Tallinn and it is the Port of Tallinn's second cargo harbour. The main activity of the harbour is focused on the handling export and import cargo and transit cargo. The main cargoes are Ro-Ro cargo, general cargo, scrap metal, timber, peat and oil products (Port of Tallinn 2012a).

The Paljassaare Harbour is situated on Paljassaare Peninsula in Tallinn, approximately 6 km from the centre of the city. The Paljassaare Harbour is one of the most sheltered harbours in Estonia in terms of winds and waves. It is a cargo port, which primarily specializes in handling mixed cargo, coal and oil products, as well as timber and perishables (Port of Tallinn 2012a).

The Saaremaa Harbour is located in the north-western coast of the Saaremaa Island and it is specialized in passengers with recreational and pleasure crafts and cruise ships. The harbour has 2 quays available for vessels and a floating berth for small crafts (Port of Tallinn 2012a).

In 2010, the cargo volume passing through the harbours of the Port of Tallinn were 36.6 million tons. The majority of cargo volume was liquid cargo with 70%, dry bulk goods with 15%, Ro-Ro with 10% and containers with 4%. In 2010, the number of passengers passing through the harbours of the Port of Tallinn was 7.92 million and the majority of passengers were from the Tallinn-Helsinki line (Port of Tallinn 2010).

### 3.4 The Port of Turku

The Port of Turku lies within the city of Turku in the south-west of Finland, approximately 168 km from Helsinki, and it is the second most important port for general and unitized cargo in Finland after Helsinki. The port operates in different areas, Base port, Linnanaukko, Passenger Harbour, Pansio Harbour and in Free Zone and the Ovako area (Port of Turku 2012). Port of Turku is a municipal enterprise fully owned by the city of Turku (Rönty *et al* 2011).

The Port of Turku serves mainly Ro-Ro and passenger vessels and cruise ships, but also it has facilities for loading and unloading containers, general cargo and other types of cargo. The Port of Turku is the leading passenger harbour for Scandinavian traffic and number two in Finland measured by the total number of passengers. The most important maritime routes from the port go westward. Passenger traffic comprises ferry connections between Finland and Sweden and in addition there is a daily connection to Germany (Port of Turku 2012).

In 2010, the number of passengers passing through the Port of Turku was 3.01 million and the goods traffic was 2.96 million tons (Finnish Port Association 2012).

### 3.5 The Port of Naantali

The Port of Naantali is located in the south-west of Finland, approximately 180 km west of Helsinki. The port operates in two different areas, Kantasatama and Luonnonmaa. The port has several daily services to Scandinavia and Northern Europe, including a fast regular service connection to Kapellskär (Town of Naantali 2011).

The Port of Naantali is a municipal port and it is part of the city of Naantali. The port of Naantali is the fourth largest port for imports and seventh largest port for exports in Finland. The Port's main volumes derive from liquid and dry bulk materials and ferry goods. Based on the amount of the vessels, the port of Naantali is the fifth busiest port in Finland (Rönty *et al* 2011).

In 2010, the number of passengers passing through the Port of Naantali was 50 thousand and the goods traffic was 8.11 million tons (Finnish Port Association 2012).

**Table 2.** Passenger and goods traffic in Penta ports in 2009 and 2010. (Ports of Stockholm 2010, Port of Tallinn 2010, Finnish Port Association 2012).

	Passenger traffic (in thousands)		Goods traffic (in thousands tons)	
	2009	2010	2009	2010
<b>Stockholm</b>	12 123	12 159	5 338	6 245
<b>Tallinn</b>	7 260	7 920	31 600	36 000
<b>Helsinki</b>	9 011	9 758	9 770	10 940
<b>Turku</b>	3 068	3 014	2 721	2 956
<b>Naantali</b>	51	50	7 251	8 108

## 4 Liner shipping between Penta ports

In liner shipping ships sail regularly between the specified ports with announced timetable. Liner shipping comprises both passengers and goods transport. According to Helsinki Commission (2012) the Baltic Sea has some of the busiest shipping routes in the world. Figure 8 on page 20 presents the main shipping routes between Penta ports in the Baltic Sea.

Due to the number of passengers and operators, the busiest route is between Tallinn and Helsinki. This route is operated by four carriers - TallinkSilja, Viking Line, Eckerö Line and St. Peter Line. The distance between Helsinki and Tallinn is 48 nautical miles and ferries are sailing this route several times a day. According to the Port of Tallinn (2012b), approximately 85% of all passengers that visited the Port of Tallinn in 2011, were from the Tallinn-Helsinki line. The ship operators are using modern vessels, which guarantee a fast and convenient voyage from one city to another, and that makes this line very popular among tourists and businessmen. The main goods transported on the Tallinn-Helsinki route are unitized, which are shipped on trucks, trailers or in containers. The traffic between Tallinn and Helsinki is very intensive, as shown by growing passenger numbers over the years and the high competition between the ships operators.

Other very popular and highly crowded lines are Helsinki-Stockholm and Tallinn-Stockholm. These shipping lines include also the Port of Mariehamn, where the ships will stop for short-time. The distance between Helsinki and Stockholm is ca 240 nautical miles, which make the voyage duration about 16h. Helsinki-Stockholm line is operated by two carriers- TallinkSilja and Viking Line. Vessels in these lines are usually larger, since it is necessary to provide passengers with more attractions and entertainment.

The distance between Tallinn and Stockholm is ca 220 nautical miles and this line is operated by TallinkSilja. Shipping line Tallinn-Stockholm is used mainly by cruise passengers. According to the Port of Tallinn (2012b), approximately 12.5% of all passengers that visited the Port of Tallinn in 2011, were from the Tallinn-Stockholm line, which makes it the second largest shipping route in the Port of Tallinn. There are also a line between Paldiski South Harbour and Kapellskär, which is operated by TallinkSilja and DFDS Seaways. This line is mainly used to transport Ro-Ro goods and containers.

Between the Penta ports there are a number of different shipping lines. For example, between Stockholm and Turku are several daily connections, which are operated by TallinkSilja and Viking Line. Shipping line between Kapellskär and Naantali is operated by FinnLink and it has three departures daily. Another relatively new shipping line is St.Peterburg-Helsinki-Stockholm- Tallinn, which was opened in April 2011. This line connects three European ports with one foreign port and these circumstances can easily lead to new additional administrative barriers.

In addition to passenger shipping lines, there are also a lot of regular cargo lines between Penta ports. The Muuga Harbour has connections with the Port of Helsinki, which are operated by MSC, Tschudi Lines Baltic and Unifeeder Container Service, and these lines include also several other ports in the Baltic Sea. Regular cargo lines in the Baltic Sea consist mainly of container transport.

The Penta ports are connected together with a number of different shipping lines and that makes the occurrence of barriers more possible. It is essential to identify all barriers in operating the ports and shipping lines and to find solutions to avoid these problems.

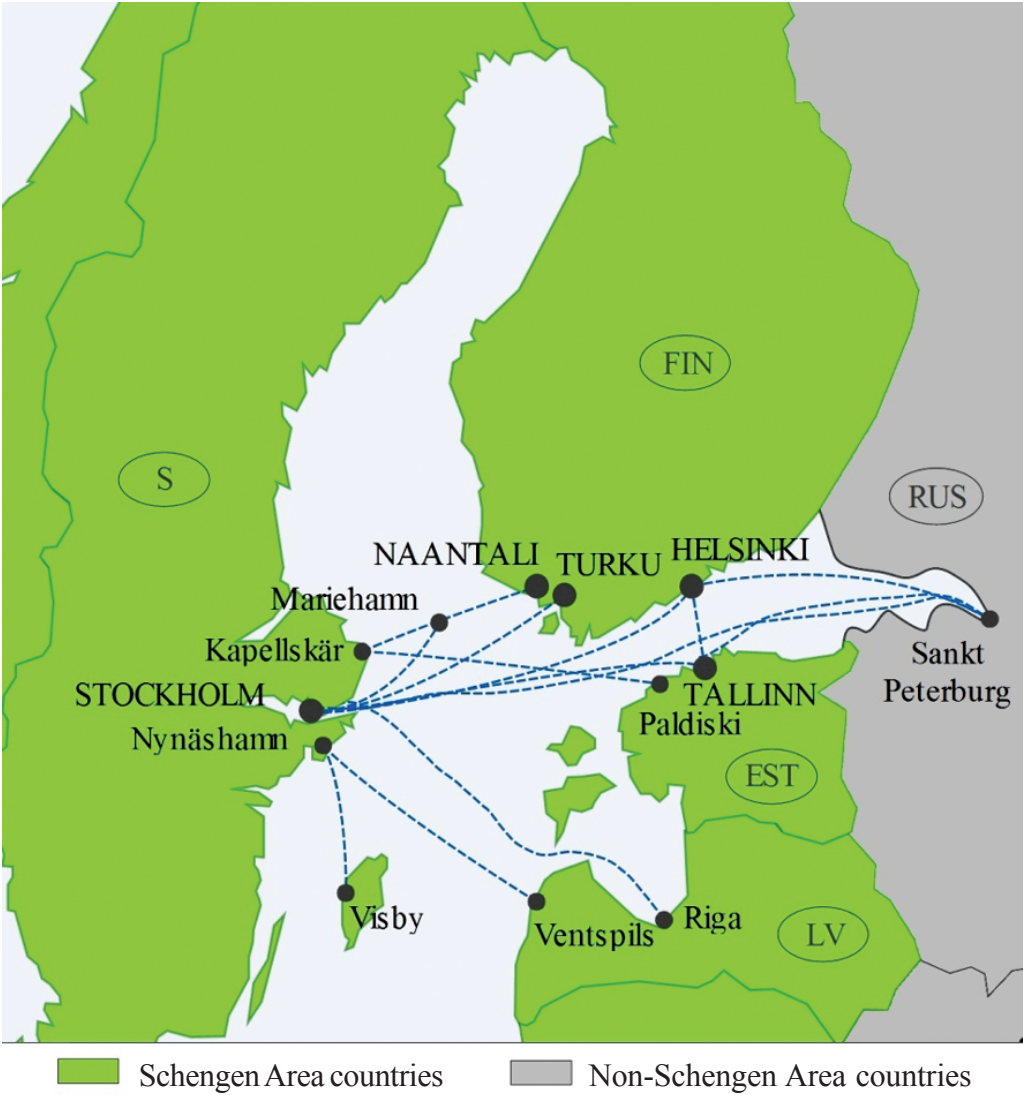


Figure 8. Main shipping routes between Penta ports in the Baltic Sea. (Created by the authors).

## 5 Results of research

In the current research, the main sources of information are the results of questionnaires and interviews, publications, newspaper articles, material from the internet, etc. The objective of this research was to study operating processes of Penta ports and identify the main administrative, security and safety barriers that hinder the efficient development of liner shipping between these ports.

In order to find bottlenecks in liner shipping between the Penta ports two questionnaires were made. The purpose of first questionnaire was to find which are the problems associated with

**Table 3.** Administrative, safety and security barriers according to the research by countries.

	Description of barriers	ESTONIA	FINLAND	SWEDEN
<b>Legal acts</b>	Number of legal acts	✓		
	Interpretations of legal acts	✓		
	Sulphur Directive	✓		
	Ballast Water Convention	✓		
	Inconsistencies in legal acts	✓		
<b>Pilotage</b>	Pilot service	✓	✓	
	Exemption from pilotage	✓		
<b>Customs service</b>	Complicated procedures	✓		✓
	Not user-friendly systems	✓		
	Information exchange	✓	✓	
	Competencies of actors	✓		
	IT-systems failure	✓	✓	✓
<b>Border Guard</b>	Inflexible customs acts	✓		
	Authenticity of Seaman's book	✓		
<b>IT-systems</b>	Definitions of visas	✓	✓	
	IT-systems failure	✓	✓	✓
<b>Dangerous goods</b>	Incompatibility of systems	✓		✓
	Non-harmonized regulations of dangerous goods markings		✓	
	Dangerous cargo without pre-notification		✓	
<b>Non-EU countries</b>	Competencies of actors	✓		
	Complicated procedures	✓	✓	
	Regulations for food			✓
	Recognition of documents	✓		
<b>Others</b>	Necessity of customs credit	✓		
	Handling of food waste			✓
	Unauthorized cargo in sealed carriers	✓		✓
	Quarantine rules			✓
	Need to provide different authorities with same reports	✓	✓	✓
	Lack of competent personnel	✓	✓	
	Lot of paper work			✓
	Non-acceptance of other countries laboratory food test results		✓	

safety, security and administrative procedures in liner shipping between ports of Tallinn, Helsinki, Stockholm, Turku and Naantali. The sample of the questionnaire is presented in annex 1. The first questionnaire was sent out in Estonia to 18 companies from those 5 ports and stevedoring companies, 2 shipping companies, 4 shipping agencies/forwarders and custom brokers, 5 logistics service providers, 2 authorities. From those 10 were replied. From Finland 5 replies were received to 1<sup>st</sup> questionnaire and from Sweden 2.

After analyzing answers to questionnaire follow-up questions were compiled. The questions were asked in form of short interviews from selected actors aimed to examine whether the respondents have had to deal with previously mentioned problems.

The results of research could be divided into eight major categories, which consist of subdivisions. The purpose of grouping the results is to find out what are the problematic areas of the Penta ports. Administrative, safety and security barriers according to the research by countries are presented in the table 3 on page 21. Each subdivision is showing the specific problem and barrier which was identified by the respondents of questionnaires or found out due to the other sources. These burdens are concrete examples of problems which have occurred in the ports. The checkmarks in the table 3 are showing that due to the research, these barriers exist in the specific country.

## **5.1 Administrative barriers from a ship-owner's point of view**

We can say that administrative barriers from a ship-owner's point of view are not directly influencing movement of cargo flows by liner ships but they might have bigger impact in longer term. Ship-owners are an important part of the port community and therefore, the barriers that occur in their work affect the entire port operations.

### **5.1.1 International and national legislation in shipping**

In general, shipping is well-regulated at the international level. There are number of organizations, who give out maritime related rules, conventions, codes, circular letters and other similar documents. For example International Maritime Organization, World Health Organization, International Labour Organization, European Commission, Maritime Administrations, etc. In compliance with Hinno (2011) there are about 50 IMO conventions, 30 IMO codes, 2500 IMO circular letters, 1700 IMO resolutions, thousands of pages of Classifications rules, a number of EU conventions and directives and many other documents that ship-owners must follow constantly. All these documents have been created for various reasons and they have different objectives. In addition, the existing documents are being changed and modified continuously. According to Hinno (2011), there are about 150 IMO Convention changes and modifications, that ship-owners must fulfill and take into account on the vessels until 2020 and 65 of them are retroactive and have to be implemented on existing ships.

A ship-owner, who is operating with ships under two or more flags at the same time, must take into account all different national interpretations of the rules and also be under supervision of various authorities and classifications. Each country is free to find suitable interpretations and implement them in their national legislation. This means that countries may rely on several factors when interpreting, such as politics, cultural background, community interests,

bureaucracy or economic interests. Therefore, interpretations may become very different in countries. Due to diversity in interpretations ship-owners sometimes have difficulties in applying all these rules on time, especially when regulations require major planning and investment. According to Hinno (2011) there are a lot of different interpretations and some examples are following below.

- The maintenance period of life rafts is 12 months or up to 17 months. Some flags require maintenance every 12 months; some do allow to do it every 17 months.
- One of the flag authorities have issued interpretation that master of the vessel is not the Owners representative.
- For classification purposes it is mandatory to use certified ME and AE spare parts. Some of Classification societies accept the certification from another IACS member, but some do not.
- Approval of ships Muster List. SOLAS Convention does not require such an approval, but one of classification societies has implemented the requirement into their rules.
- For continuous qualification and issuing of endorsement for officers certificate of competency, one of the states considers sufficient proven seagoing service, another requires refresher training.
- One state has defined that in respect of safety and emergency related functions, a crew-member has to prove regularly the ability to act. Another state has an opinion that ability to act during emergencies is proven if you could prove the continuous seagoing service.
- Ability to control firefighting operations is according to the interpretation of one of the flags qualification requirement for a chief engineer, according to the other flag it is a qualification requirement for all officers.
- One of the flags has requested crewing activities to be covered by ISO 9001 quality management system. According to international rules it is sufficient to have ISM Code compliant safety management system.
- In some harbours it is not allowed for crewmembers to secure, lash or unlash the cargo units, hence to fulfill crewmember contractual obligations and safety requirements.
- One state has defined the number of navigation watch team members; others say that it is for a ship-owner to decide.
- One state says that a chief engineer or a master cannot be part of navigation and engineering watch team; others do not have any restrictions.
- In one of the harbours it is mandatory to use of 4 tugboats for mooring operations even for the vessel with 4 ME (main engine) and 3 bow and stern thrusters, while others make only suggestion and leave it for a master to decide.

In conclusion, Hinno's (2011) recommendation was to unify the interpretation of the rules and to unify the implementation of the rules into national legislation, at least in the Baltic Sea Region. Another possibility would be to involve more practical knowledge to the lawmaking process in order to avoid the need of interpretations.

### **5.1.2 The EU Sulphur Directive**

Ships are one of the leading sources of sulphur dioxide (SO<sub>2</sub>) emissions in the European Union. (European Union 2007). To protect the environment and human health, the European Union has enforced the EU Sulphur Directive (Directive 1999/32/EC has been



amended by Directive 2005/33/EC), with the aim of setting the rules for fuel emission from the ships in the EU.

According to Directive 2005/33/EC of the European Parliament and of the Council of 6 July 2005 and the European Union (2007), the directive provides, in particular, for:

- Limiting to 1.5% by mass, from 11 August 2006, the sulphur content of marine fuels used by passenger vessels on regular services to or from any port in the Union in order to improve air quality and create sufficient demand to ensure an EU-wide supply of low-sulphur fuel.
- Limiting to 0.1% by mass, from 1 January 2010, the sulphur content of marine fuels used by ships on inland waterways and at berth in order to improve air quality around ports and inland waterways.
- By way of derogation to the abovementioned limits for fuel oil, allowing ships to use an approved emission abatement technology, provided that these ships continuously achieve emission reductions which are at least equivalent and that they thoroughly document that any waste streams discharged into enclosed ports and estuaries have no impact on ecosystems.

As stipulated in European Maritime Safety Agency report (2010) in October 2008 the International Maritime Organization (IMO) adopted a set of amendments to Annex VI of the MARPOL Convention as following: from 1 January 2012 the global sulphur cap will be reduced, first to 3.50% (from the current 4.50%) and then, subject to a feasibility review to be completed no later than 2018, progressively to 0.50 % from 1 January 2020 (or in 2025 at the latest). In „Sulphur Emission Control Areas? (SECAs), from 1 July 2010, the maximum sulphur limit has been reduced to 1.00%, (from 1.50%), while from 1 January 2015, the limit will be further reduced to 0.10%. Figure 9 presents the sulphur regulations for marine fuel.

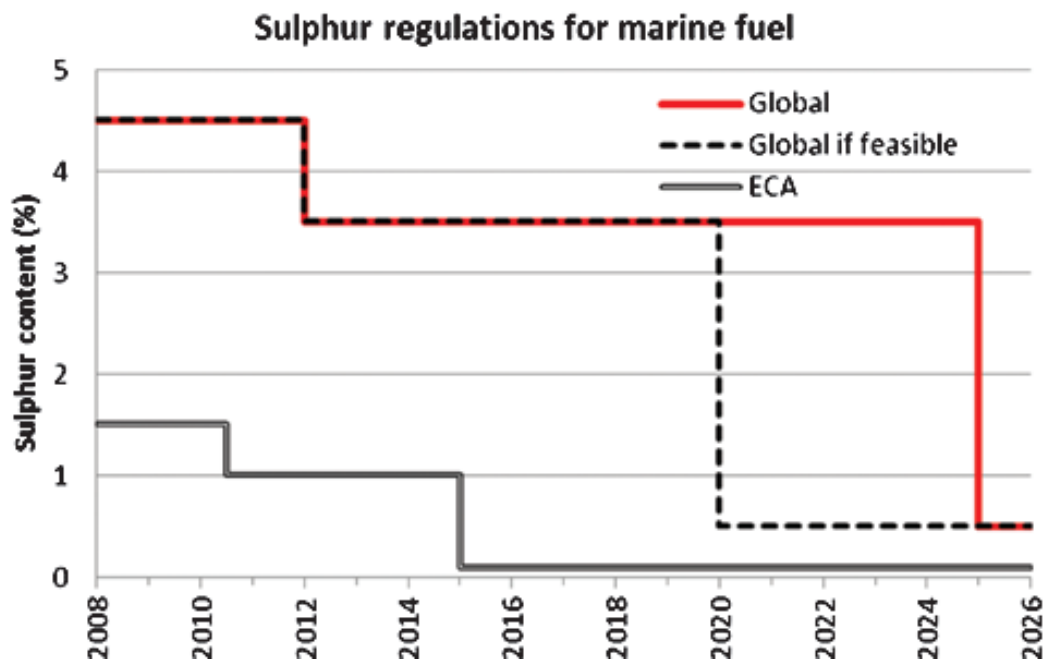


Figure 9. Sulphur regulations for marine fuel. (Kanto 2011)

### **5.1.2.1 The impact of the EU Sulphur directive on maritime transport**

The EU Sulphur Directive has caused much confusion among ship-owners, especially the 0.1% sulphur level in marine fuels. According to various studies (EMSA 2010), the most obvious effect of the requirement to lower the permitted sulphur level in marine fuels is an increased fuel price. If the price of fuel will be higher, cargo owners may prefer other types of transport and short sea shipping may be replaced with land-based transport modes. This may adversely affect the whole shipping in the European Union.

The increased cost of fuel would be caused primarily due to the fact that low sulphur fuel (MGO) today is more expensive (some 70-80%) than heavy fuel oil. The low sulphur fuel is a distillate product and to the costs involved in the desulphurization process (EMSA 2010). According to Dr. Tapani Stipa (2012), the freight rate would increase 25-40% (low-sulphur fuel) and when a ship has on-board scrubber installations the freight rate increase would probably be about 50% lower. In any case, this means the loss of clients to ship-owners and the preferred method of transport would be land-based.

Another problem is the possibility to use an emission abatement technology on ships. Appropriate example was given by Hinno (2011), if one having a vessel of 4 ME and 4 AE and 2 boilers, would put on top of the upper deck an exhaust gas scrubbers with total weight about 150-200 tons, then ship may not comply any more to the applicable stability requirements, main design and operational properties. Ship-owners will have to rebuild their vessels, which will take considerable time and investment.

The EU Sulphur Directive would be significant administrative barrier, which has been created intentionally, and it affects the whole shipping in the SECA. The Sulphur Directive is an international administrative ordinance that will force ship-owners to change their working activities. The directive would have the greatest impact on the competitiveness of the SECA, as the ship-owners do not have such strict rules in other parts of the world. Due to the high prices of transport, the owners of goods start to prefer to send their goods by using cheaper routes and as a consequence, the entire shipping in the SECA will be different, including the liner shipping between Penta ports. For example, cargo owners and passengers will start to use only the shortest sea routes, where the prices are not as high, and for longer trips they would be using either road transport or air transport. These changes would have a devastating effect to ??liner shipping in the SECA. All changes in shipping industry would have a direct impact on the ports as well. The ports also should have to build terminals for alternative fuels (such as LNG) and therefore, the EU Sulphur Directive is an important administrative barrier for the current research.

The impact of the EU Sulphur directive is widely speculated and general standpoint in maritime community is that the influence is negative on competitiveness and sustainability of shipping on SECA including the Baltic Sea.

### **5.1.3 The Ballast Water Convention**

The International Convention for the Control and Management of Ships' Ballast Water and Sediments was adopted on 13 February 2004 by the International Maritime Organization and the aim of this convention is to prevent the potentially devastating effects of the spread of harmful aquatic organisms carried by ships' ballast water from one region to another. The Convention will require all ships to implement a Ballast Water and Sediments Management Plan. All ships will have to carry a Ballast Water Record Book and will be required to carry

out ballast water management procedures to a given standard (International Maritime Organization 2011).

This convention has an important role in protecting the environment but it consists also a number of confusing regulations. For example, the International Convention for the Control and Management of Ships' Ballast Water and Sediments (2004) regulation B-E "Ballast Water exchange" provides that a ship conducting Ballast Water exchange to meet the standard in regulation D-1 shall:

- whenever possible, conduct such Ballast Water exchange at least 200 nautical miles from the nearest land and in water at least 200 metres in depth, taking into account the Guidelines developed by the Organization;
- in cases where the ship is unable to conduct Ballast Water exchange, such Ballast Water exchange shall be conducted taking into account the Guidelines and as far from the nearest land as possible, and in all cases at least 50 nautical miles from the nearest land and in water at least 200 metres in depth.

Appropriate example about the possible interpretation of the regulation was given by Hinno (2011). Theoretically, a ship travelling from Helsinki to Stockholm in order to carry out Ballast water exchanges should take a trip to the place in the Baltic Sea, where the water depth is more than 200 meters. Figure 10 shows a possible new route for the ship. Red line is a route before convention, blue one is a route once the convention will be enforced.



**Figure 10.** New route due to the Ballast Water convention. (Hinno 2011)

#### 5.1.4 Exemption from pilotage

Compulsory pilotage of ships is imposed in many territorial waters. A pilot knows the local water and helps maneuver a ship into or out of the port. In short sea shipping pilotage is sometimes unnecessary as the master of a ship is sailing the same fairways repeatedly. In most of the EU Member States legislations provide the possibility of some form of exemption from pilotage, either in the form of exemptions in the regulations for compulsory pilotage or in the form of issue of Pilotage Exemption Certificates. A Pilotage Exemption Certificate may be granted to the vessel's master or mate, when they fulfill certain criteria showing a capacity to safely manage a vessel in the waters in question (European Commission 2011b).

Each EU Member State has a right to make their own pilotage exemption rules. Due to diversity in pilotage exemption rules, ship-owners have to follow all different regulations and rules, if they want to have a Pilotage Exemption Certificate. Hinno (2011) pointed out some differences between the EU Member States regulations:

- In order to get a pilot exemption certificate in one of the states, number of mandatory training trips with a pilot on board is not defined, and it is allowed to use person with pilotage exemption certificate for training.
- Another state with less complicated pilotage area has a requirement of 30 mandatory pilotages with a pilot on board.
- Another one has a requirement of 10 mandatory pilotages with a pilot on board.
- Another one- no exemptions at all, pilotage is always mandatory.

The differences between the pilotage exemption rules have caused a number of administrative barriers to the ship-owners. For example, when the use of a pilot is mandatory and there is no way to get a Pilotage Exemption Certificate, a vessel must pass through pilotage procedures which take time and induce higher costs. Some EU Member States have regulations that shipmaster who do not speak a country's native language could not obtain a Pilotage Exemption Certificate.

As many of the EU Member States have imposed complicated rules for pilotage exemption, the European Commission has given out "Communication and action plan with a view to establishing a European maritime transport space without barriers". This document invites the EU Member States to create more uniform and easier regulations for pilotage exemption. When the EU Member States would follow these recommendations, administrative barriers from the pilotage exemption could decrease consistently. Chapter 5 "Action Plan" sub-section 5.3.3 provides (European Commission 2009a):

- Member States are invited to create a regulatory framework which would permit easier pilotage exemptions.
- This regulatory framework should allow shipmasters who do not speak the country's native language to obtain pilotage exemptions. The solution will be a simplification of the existing regulations, allowing all operators carrying frequent shipping services to apply for Pilot Exemption Certificate's in a much easier way.
- The conditions required for obtaining a Pilot Exemption Certificate should be reasonable and should not contain elements of protectionism. A change in the characteristics of the service should not require a master to give evidence for all aspects of qualification and examination for a Pilot Exemption Certificate.
- The measure would induce lower costs for Short Sea Shipping operators and faster turn-around times of vessels in ports. The action required to put this recommendation into effect should be taken at national level and coordinated among national authorities.

Table 4 on page 28 presents the Pilot Exemption Certificate differences in Estonia, Finland and Sweden. This table is composed using primarily materials that were available in the internet. In Estonia, the purpose of compulsory pilotage of ships is conducted in the inland maritime waters and in the vicinity of ports, in the water areas of ports and between ports to ensure the safe navigation of ships (Maritime Safety Act, §54). Ships whose master, or passenger ships whose master and chief mate have passed the examination for navigation without a pilot and who hold a permit of free pilotage have an exemption from compulsory pilotage (Maritime Safety Act, §57).

A ship-owner has the right to apply from the Estonian Maritime Administration for a permit of free pilotage to be granted to the master or chief mate of a passenger ship who, in that capacity, has visited the port in question on at least ten occasions during the preceding twelve months using pilotage services, or to the master of a cargo vessel who, in that capacity, has visited the port in question on at least ten occasions during the preceding twelve months using pilotage services. A permit of free pilotage is valid only in port where the examination for

navigation without a pilot is taken. In order to obtain a permit of free pilotage, the master or chief mate has to perform the pilot exemption exam. Pilotage exemption exam is organized by the Estonian Maritime Administration. The exam consists of theoretical and practical part and it has to be performed in Estonian. A permit of free pilotage is valid for five years (Maritime Safety Act, §57<sup>1</sup>).

In Finland, the Pilotage Exemption Certificates (PECs) are granted for specific fairways and specific vessels. Both the master of the vessel and the officers of the navigational watch may apply for a PEC. However, if a vessel is to be exempted from the requirement to use a pilot, the master must have a PEC. Training requirements comprise 10 voyages in the fairway in both directions if a cargo vessel PEC is applied for and 30 voyages in both directions if a passenger vessel PEC is applied for. The PEC exam comprises a blank chart exam, a written exam and a simulator exam. The exam can be taken in Finnish or Swedish. It may also be done in English if the compulsory pilotage area concerned is located in the sea area between Kristiinankaupunki and Hamina (Finnish Transport Safety Agency 2012).

In Sweden, as a general principle the use of pilot is compulsory in the Swedish internal waters. The use of pilot depends on the size of the vessel and the type of cargo it is carrying. In the larger ports in Sweden there are designated pilotage fairways and in these fairways, specific rules for e.g. vessel dimensions determine whether or not a pilotage is compulsory. The master

**Table 4.** Pilot Exemption Certificate differences in Estonia, Finland and Sweden.

	<b>Estonia</b>	<b>Finland</b>	<b>Sweden</b>
<b>A Certificate is valid only for concrete port/area/fairway</b>	Yes	Yes	Yes
<b>A Certificate is valid only for concrete ship</b>	No	Yes	No
<b>Validity of the Certificate</b>	5 years	5 years	3 years
<b>Examination</b>	Theoretical and practical	Theoretical and practical	Theoretical and practical
<b>Required voyages with the use of pilot</b>	Passenger vessel: 10 voyages during twelve months Cargo vessel: 10 voyages during twelve months	Passenger vessel: 30 voyages during twelve months Cargo vessel: 10 voyages during twelve months	Not specified <sup>1</sup>
<b>The language of Exam</b>	Estonian	Finnish, Swedish, English <sup>2</sup>	Swedish, English
<b>The organizer of the Exam</b>	Estonian Maritime Administration	Finnish Transport Safety Agency	Swedish Transport Agency

<sup>1</sup> Swedish legislation does not specify the number of required voyages with the use of pilot before receiving the Pilotage Exemption Certificates.

<sup>2</sup> The language of Exam may be English if the compulsory pilotage area concerned is located in the sea area between Kristiinankaupunki and Hamina.

of the vessel and other signed-on deck officer, who is holding a Certificate of Competency valid as master on the concerned vessel in Near Coastal Trade can obtain a Pilot Exemption Certificate, which is valid for a designated pilotage fairway or other areas. In order to obtain the PEC, the master has to perform theoretical and practical examinations which can be taken in Swedish or English. The PEC is valid for normal period of three years (Swedish Transport Agency 2011).

## 5.2 Customs procedures

The European Union has a unified economic area, which is based on the purpose of free movement of goods, however, in maritime transport the clearance of goods is a complicated process. In order to transport RO-RO goods through the EU countries and to the third countries, a number of different procedures (made by the EU) are required to perform. Documentation of such procedures has a significant role in the movement of goods.

The customs declaration is a procedure, where a person (for example the receiver of goods/ shipper, agent, etc.) shows in the given form and order a wish to address the goods to the customs procedure. Customs declaration may be presented by a person, who brought the goods to the customs territory, or a person, who is responsible for oncoming transporting (may be direct agent or a customs agent).

The customs procedure is an applicable procedure; activities with goods:

- allowing into a free circulation
- transit
- customs stowing
- inside conditioning
- conditioning under the customs control
- temporary importing
- outside conditioning
- export

For a long time, the customs declaration was presented in paper documents, but nowadays the forming of these documents is done electronically. Information on the paper documents are accepted only as an exception, for example data processing system or in cases of electronic failures, if the interruption had lasted at least for 30 minutes. Presenting the declaration on paper, SAD-form is required to use, and it has to contain certain essential data for customs procedure and it also must be signed by the presenter. One copy of the declaration with additional documents is conserved by the customs.

One of the EU main claims is to use an electronic customs declarations form, since it simplifies the movement and exchange of information between countries. Since the 1<sup>st</sup> August 2007 the electronic customs clearance system has been introduced and imposed in all countries of the EU. Due to the EU requirements, Estonia implemented the data processing system named Complex. This system was put to use on the 1<sup>st</sup> May 2006 and it was created by local IT-specialists under correspondent EU EDI's systems' rules and claims and emanated from the European Commission e-customs vision and perennial strategic plan MASP. Complex is a free accessible web-based customs declaration conditioning system which has many advantages, such as it can be used with every computer that has internet connection at any time. Tax

and Customs Board mends and modernizes the system currently, according to the EU electronic system's progress. The system owns also a unique injure construction- a number of supporting and helping systems has been added to Complex, such as ETT, enterprisers registering and identifying system (EORI), exports control system (ECS), license handling and collateral system. Also it allows non-monetary commitment system to forward reports to Tax and Customs Board electronically.

Applying Complex system, it is possible to present to the customs:

- final/ completely filled customs declarations
- simplified customs declarations and addition declarations
- incomplete customs declarations and missing addition declarations
- travelers declarations
- CAP advance note and CAP export's customs declarations
- presented customs declarations changing and deleting applications before releasing the goods
- store's memos

If the goods do not need to be declared, then it will be automatically declared to the customs and released without establishing the declaration. For example, goods which value and/or amount are below the static bias, goods which do not surpass tax-free border standard or prohibitions and denies do not broaden on the goods.

According to the customs declaration, every declaration has its own insignia- for example export's custom declaration's insignia is "EX". St. Peters Line clients use EU territory transit declarations (insignia "T1" and "T2") and TIR-notepad for the export of goods. In case of those declaration types, it is very important that car drivers would arrive on time and would pass border crossing points, because before that, if they pull over the declaration's status, the declarant of St. Peters Line cannot form data in the electronic data processing system.

### **5.2.1 The main barriers of customs procedures**

The main bottlenecks of customs procedures are non-harmonized IT systems that prevent fast and quality transmission of information between countries. It also means that a customer must enter the information multiple times in different locations, for example, in the port of departure and arrival. The need for multiple data entry may also be related to poor exchange of information between the ports. There is also a problem with paper documents, which are still in use some of the countries outside of the EU. Customs procedures with third countries' goods are much more time consuming and it would also affect the rest of the work of the ports.

Since such countries usually do not use an electronic information exchange system, it is obvious that the interchange of reliable and quality information is difficult and it may cause security problems.

Barriers of customs work may also be related non-user-friendly procedures. Often, these procedures are complex-structured and difficult to understand. The users of customs procedures may lack of sufficient competence which reflected in particular in incorrectly completed documents. Such problems show that unnecessarily complicated procedures cause additional obstacles that hinder the efficient movement of goods. Also, it is important to the customs to have back-up systems which guarantee the declaration of goods at any time.

## 5.3 Border Guard

According to the research there are administrative, safety and security barriers also in the border guards' work. This paper examines the activities of the ports which are located in the Schengen area where the work of border guards is usually simplified, but despite of this, these ports are often visited by the ships from others countries as well and then the work of border guard is essential. Border guard service is an important part of the port community and the barriers, which are related to it, impede also the rest of the port's work.

One issue that came out from the research is that the border guard has often problem with the Seamen's Books. Every seaman has to own a paper format document called the Seaman's Book, which contains the information related to the seafarer. In general, there are no limitations for working on vessels which are bearing the flag of the EU's Member States. This means that citizens of third countries may also work in the Baltic Sea Region. Since there is no internationally accepted format for Seaman's Book, the border guard has often hard time to recognize whether the document is authentic or not and allowing a seaman with fake document to the land can cause serious problems. This situation could lead to a number of administrative, safety and security problems.

Another issue is caused by the visas of cruise passengers from third countries. A problem with definition of Schengen visas has arisen. The Finnish Border Guard (2012) reported that there has been misunderstanding with the visas of St Peter Line's passengers. Since the vessel of St. Peter Line departure from non-Schengen area's country, the border guards have difficulty knowing how to properly mark the visas.

The Finnish Border Guard has asked from the European Commission for an explanation and the answer was to treat all vessels that are coming from outside the Schengen area as a foreign ships.

## 5.4 IT-systems used in maritime transport

IT sector is developing rapidly and these developments are affecting the maritime sector as well. Though the current IT systems are making communication with authorities a lot easier, there are still some issues which make the usage of IT-systems complicated.

Estonia has different systems in communication with authorities (customs, port authority etc.), but there is no maritime single window system just yet. The system Estportnet is in development stage. In Finland exist single maritime window system called the Portnet and in Sweden there is also ship reporting system. Estonian Customs are using Complex system and Finnish Customs are using AEO (Authorized Economic Operators status) and e-Customs (electronic Customs).

The main issue with IT-systems that stood out from the replies of the questionnaire was the distrust of systems. From replies came out that when IT-system crashes the only alternative in handling formalities with customs is on paper. Another respondent stated that if the customs IT-systems have collapsed for some reason, all traffic of freight stands. According to the owners of the IT-systems, there is a back-up system in place if any breakdown occurs, but the customers are still complaining that malfunctions of the systems occur too often. This is an alarming problem in the transportation of freight, which prevents the efficient movement of goods through the ports in the EU.



Another problem with the IT-systems that came out from the responses is the incompatibility of different systems. The customers, for example shipping companies, complain that they are obliged to provide several different authorities with the same reports and data. The users have to enter the same information multiple times into different systems and it requires a lot of resources and time. Therefore, the shipping companies are enforced to hire shipbrokers to take care of this administration.

IT systems have evolved very rapidly which has led to another barrier in the movement of goods- the competency of actors. IT programs are often very complex and require higher computer skills from the users. Incorrectly executed and faulty documentations are often the main obstacle that prevents the fluent movement of goods through the ports. The users will often lack the competence to use complex IT systems and learning courses may also be insufficient for the users. This problem mainly concerned competency in communication with authorities.

On the other hand, this leads to the new issue that came out from the questionnaire responses. IT-systems' users often complain that the systems are not user friendly, especially the whole customs system which was build up in such way which supports more comfort of customs authority. This may also cause the previous problem- for users the systems and procedures are too complicated and the results of this problem are invalid documentations.

## **5.5 Dangerous goods**

In general, dangerous goods have always received special attention in maritime transport. These are goods with high-risk that may endanger human health and the environment and to mitigate the potential risk the International Maritime Dangerous Goods (IMDG) Code was developed. The IMDG Code was developed as a uniform international code for the transport of dangerous goods by sea covering such matters as packing, container traffic and stowage, with particular reference to the segregation of incompatible substances (IMO 2011).

The transport of dangerous goods involves a number of administrative procedures which are necessary for the safe trade. In transportation of dangerous goods, the main problems arise due to the lack of understanding of what the rules require. It is important to follow all the regulations and verify that the cargo is properly classified, packaged, labeled and secured. The questionnaire brought out the problem where the actors do not have sufficient competence to deal with dangerous goods and therefore, failures impede the effective movement of goods.

Another problem with the dangerous goods that came out from the responses is the dangerous cargo without appropriate pre-notification. According to Tallink Grupp a reservations for a vehicle loaded with dangerous goods must be made with Cargo Booking well in advance. When making the reservations, the most important data are the Proper Shipping Name, UN number, class, subsidiary risk (if applicable) and packaging group of the goods being shipped. A cargo without required data cannot be shipped and inquiry of this information causes unnecessary delays and barriers.

The placement of dangerous goods is also important for the ports. In accordance with the requirements of a particular cargo, dangerous goods must be stored separately from other goods. In compliance with Tallink Grupp, dangerous goods may not be stored within the

Tallink Silja port area and vehicles/cargo units must be picked up/dropped off at the port on the same morning/evening that the shipment is to take place. According to the Port of Helsinki (2012), no cargo units containing dangerous goods may be stored in the passenger port and such units must be transported onward without delay (max. 4 hours).

Methods to alleviate the barriers arising from the transport of dangerous goods have also been developed within the EU. The European Commission (2009a) suggested simplifying the rules on carriage of dangerous goods by sea. They stated that the regulations on dangerous goods are less favourable for sea transport than for road transport and one solution will be to simplify the regulations on dangerous goods for RORO vessels carrying trucks.

## **5.6 Non-European Union countries**

According to the research, high barriers have caused by the trade with the third countries. Although these issues are not directly influencing the movement of cargo flows in liner ships between Penta ports but they have a large impact on the overall work of the ports.

The main problem with non-EU goods is more complicated procedures compared with EU goods. Third countries require a different number of documents, which depend on the countries' legislation and requirements. A significant barrier to the survey respondents was the third countries regulations for food. The laws of third countries are also amended very often and usually the changes would not be published with adequate advance notice to other countries. The multiplicity of required documents and constantly changing regulations make the trade with non-EU countries very complicated.

The research brought out the fact that the customs procedures are more complicated in the third countries and the failures occur usually their side. The respondents of questionnaires are not satisfied with IT-systems which are used in the third countries and the user-friendliness of these systems is also questionable. A third countries' enterprises may use different documentation forms, which may lead to non-recognition of documents in the EU ports and this causes barriers to the movement of goods.

There are more administrative barriers in trade with the third countries and they all affect the work of Penta ports. These problems are part of the ports work and the number of problems that were pointed out shows us that these problems are affecting the ports daily work constantly and they must be resolved.

## **5.7 Other results**

The research brought out several barriers and obstacles that hinder the efficient movement of goods through the ports in the EU. The respondents of questionnaires pointed out precisely these problems which they have encountered in their daily work.

According to the respondents, very bureaucratic procedures are handling of food waste and quarantine rules, for example during the bird flu. Barriers can be caused by sealed carriers,

which tend to have unauthorized cargo more often than open carriers. Some respondents complained that many of the barriers are created by the incompetent personnel of the ports. In addition, respondents pointed out specific examples of which have hampered their work. They highlighted one case where food test results from German laboratory were not accepted by other authority of the EU and the country wanted to make their own tests. In general, many of the respondents thought that transport of goods through the ports include too much paper work. Those highlighted examples show that problems occur in many different fields in daily work of the ports.

## 5.8 Results by countries

Usually, the administrative, security and safety barriers of different countries are not the same. Several respondents of questionnaires brought forth the fact that those barriers depend especially on the state and the current national and international legislation. It was also pointed out that conditions are different in different ports. According to one respondent, in Sweden the most ports are owned by the municipality or private companies, and in Finland there are also no longer state owned ports (Rönty *et al* 2011), while in rest of the Europe, including Estonia, there are ports that are owned by the state.

There are many factors which are affecting the occurrence of barriers in daily work of the ports, for example national legislation, the ownership of the ports, ports management models, etc.

Administrative, safety and security barriers according to research by countries are given in table 3. The main barriers that occurred in the Estonian ports were related to custom service and barriers from the ship-owners' point of view. Also, the issues with pilotage, border guard service and non-EU countries have a significant role in the activities of Estonian ports. The main barriers in the Finnish ports are related to dangerous goods, pilotage and other problems. The least but the most detailed problems were related to the ports in Sweden. The main barriers that were common to the all interviewed ports were the problems with the non-EU countries and IT-systems.

## Conclusion and Recommendations

The objective of this research was to study operating processes of Penta ports and to identify the main administrative, security and safety bottlenecks that hinder the efficient development of maritime transport. Although the aim of this paper was to focus on five ports- Stockholm, Helsinki, Tallinn, Turku and Naantali, it was important to take into consideration the whole situation of the countries since the administrative, security and safety barriers are general and they depend on the state and the current national and international legislation. In order to find out which problems occur in Estonia, Finland and Sweden, the questionnaires were compiled and distributed amongst actors. In this research paper the entire port community was studied which includes port authorities, stevedoring companies, shipping companies, freight forwarders, customs, border guards, etc.

Looking at the world trade, the importance of containers has grown rapidly. Transporting containers from one continent to another is an excellent example of worldwide liner shipping. Coming down to more local level cargo carried by liner shipping is changing from containers to other intermodal cargo carrying options. Other intermodal options like trailers, swap bodies which are using more ro-ro technology. In addition to cargo, passengers also are using liner shipping services.

The Baltic Sea creates due to its natural shape great possibilities for liner shipping and according to the Helsinki Commission, it is one of the busiest seas of the world by means of shipping activity. At the same time it must not be forgotten that liner shipping in the Baltic Sea competes fiercely with other transport modes like road transport over cargo flows. Though the sea transport is more environmentally friendly and cheaper than others, its speed is the weak point.

Taken into account aforementioned and due to importance of liner shipping in trade between Estonia, Finland and Sweden and also for the Baltic Sea region generally it is vital that sea transport maintains its competitiveness and sustainability.

As current research paper shows there are many factors which present barriers for liner shipping. Ship-owners have a prominent role in liner shipping and port communities and therefore the barriers that overshadow their activities have a major impact on the ports as well. Burdens that are influencing ship-owners are mostly related to the national and international legal acts. There are number of organizations (such as IMO, EU, state, etc), who give out maritime related rules, conventions, codes and other similar documents. Shipping companies have to spend a lot of resources to work them through. The authorities of different countries can interpret acts differently and these interpretations may contradict each other. Therefore, one recommendation is to enhance the cooperation between authorities and to make the legislation commonly understandable for all authorities.

Another major barrier for the ship-owners would be the EU Sulphur Directive, which leads to an increase in fuel prices and hence in freight prices also. The most likely outcome of the directive is the loss of competitiveness in the SECA including the Baltic Sea. The Ballast Water Convention requires ship-owners to change their shipping routes in order to carry out Ballast water exchanges.

Since each EU Member State has a right to make their own pilotage exemption rules, the differences between them have caused administrative barriers to the ship-owners. For exam-

ple, when the use of a pilot is mandatory and there is no way to get a Pilotage Exemption Certificate, a vessel must pass through pilotage procedures which would take time and induce higher costs. The recommendation for that is to create a regulatory framework which would permit easier pilotage exemptions and allow shipmasters who do not speak the country's native language to obtain pilotage exemptions.

Although the European Union has a unified economic area, in maritime transport the customs procedures are complicated processes which have caused a lot of administrative barriers to the interested parties. The main bottleneck of declaring goods in customs are non-harmonized IT- systems that prevent fast and quality transmission of information between countries, which often means that a customer have to enter the information multiple times. The recommendation is to harmonize IT-systems and make the procedures more user-friendly and easily understandable.

The research brought out a number of different administrative, security and safety barriers which are affecting the EU's ports daily work. An issue with the Seamen's Books is pointed out as a barrier in the work of border guards. A border guard has often hard time to recognize whether a document is authentic or not and allowing a seaman with a fake document to the land can cause serious problems. The recommendation is to unify forms of the Seamen's Books and to create databases from which can be checked the existence of documents. Many respondents were dissatisfied with the IT-systems used in ports and the recommendation is to develop a solid IT-system which minimizes failures. In addition, it might be necessary to raise the awareness of dangerous goods declaration. Cargoes without required information are causing unnecessary delays and barriers in operation of the ports. The administrative barriers in trade with the third countries are not directly influencing the movement of cargo flows in liner shipping between Penta ports but the number of problems that were pointed out shows us that these barriers have a large impact on the overall work of the ports.

It can be concluded from this research that administrative, security and safety barriers of different countries are not the same. Those barriers depend especially on the state and the current national and international legislation and since the conditions are different in different ports, the barriers may vary widely. The main barriers in the Estonian ports were related to custom service and barriers from the ship-owners' point of view. The main barriers in the Finnish ports are related to dangerous goods, pilotage and other problems. The least but the most detailed problems were related to the ports in Sweden. The main barriers that were common to the all interviewed ports were the problems with the non-EU countries and IT-systems.

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## Questionnaire to find out barriers related to safety, security and administrative procedures in ports

Current questionnaire is compiled by Estonian Maritime Academy in the framework of Interreg IVa program PENTA project. In the project there are five ports, Tallinn, Stockholm, Naantali, Turku and Helsinki involved. Project partners are Centre for Maritime Studies of University of Turku and TFK Transport Research Institute Stockholm.

Questionnaire is compiled to find what kind of bottlenecks related to safety, security and administrative procedures there are in cargo transport through EU ports. Special attention is turned to cargo transport in liner shipping between EU ports (especially between ports involved Penta project). At the same time we are thankful if You describe problems which are not directly connected with these ports nor liner shipping or problems which are connected in cargo transport between EU and non EU ports.

1. Which kind of organization do You represent? Mark with cross or specify if other.

✦ Public administration

ministry		veterinary		Maritime administration	
customs		phytosanitary		Other (please elaborate)	

✦ Transport company

Transport mode:

sea		road			
railroad		air		combined	

Company type:

shipowner		carrier		Other (please elaborate)	
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✦ Port/Port services

Port authority		Warehousing	
Stevedoring company		Other (please elaborate)	

✦ Cargo owner/ shipper etc

Cargo owner		Producer	
Shipper		Other (please elaborate)	

⚡ Agencies, forwarders

Shipping agency		Forwarder	
Customs broker		Other (please elaborate)	

⚡ Other (please elaborate) .....

2. Please describe to what extent Your organizations activity involves dealing with security, safety and administrative procedures in ports during transportation of goods by sea?
3. Does the extent of the volume of procedures depend on type and characteristics of the cargo? Please elaborate.
4. What organizations are in charge of these procedures or with whom You have to deal with to clarify these procedures?
5. Which safety, security and administrative procedures figure the biggest barriers in transporting cargo by sea inside of EU? ... in liner shipping inside of EU?
6. Which procedures could be abolished, simplified or reduced? What would be the positive effect of that?
7. Which negative effects could be in abolishing, simplifying or reducing procedures?
8. What cargo and what procedures in ports have caused delay in supply chain?

Cargoes	Delay, h				
	=1	1-6	6-12	12-24	>24
Standard goods					
Dangerous goods					
Phytosanitary goods					
Animal origin					
Other (please specify)					
Procedures	=1	1-6	6-12	12-24	>24
1. Voyage reporting services: territorial waters entrance or departure					
2. Port navigational services (e.g Pilotage)					
3. Customs formalities					
4. Border controls					
5. Phytosanitary controls					
6. Products of animal origin/live animals					

7. Dangerous goods					
8. Collection of data on ships and goods					
9. Maritime declaration of Health					
10. Collection of port dues					
11. Procedures in termnals					
12. Other (please specify)					

9. Is it possible to simplify or replace some procedures using modern technology solutions (tracking, RFID, EDI etc)? Are there any other possibilities?
10. Would You like to bring some concrete samples where safety, security or administrative procedures in ports have obstruct the fluent movement of cargo in supply chain.
11. Do You have any comments or do You have something to add in connection of re-researched matter?
12. Has IT system breakdown caused any problems or delays in cargo movement in supply chain? Has IT system breakdown caused any problems in following safety, security and administrative procedures? If possible, please elaborate.

Estonian Maritime Academy  
Research and Development Centre

# Analysis of influence of coming requirements of security, safety and administrative procedures in Pentathlon

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## **Abstract**

The current research paper has been written on the subject “Analysis of influence of coming requirements of security, safety and administrative procedures in Pentathlon,„. This paper is compiled under the PENTA project which is cooperation and development project of five ports in the Baltic Sea Region: Stockholm, Helsinki, Tallinn, Turku and Naantali.

The main objective of the research is to examine the coming requirements of security, safety and administrative procedures and analyse how these requirements may affect activities and economies of the ports. In order to find out coming requirements for the ports international and national legislation were researched and analysed. The main method used to identify possible impacts of the requirements was questionnaires which were carried out in the ports. In addition, previously compiled researches in the area were analysed and interviews with other interested parties were carried out.

The analysis shows that several coming regulations have a strong impact on the ports. As a result of the analysis recommendations are given to the ports and other related parties in order to help to adapt to the coming requirements and changes to maintain the competitiveness of the ports and the BSR region.

**Keywords:** Penta ports, coming requirements, national and international legislations, impacts, recommendations.

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## Introduction

Ports are closely linked in their activities to national and international legislations. Ports' daily work and overall economic conditions are highly influenced by new regulations issued by various institutions. Both national and international legislation are frequently amended with new regulations and acts and the ports are obliged to follow new requirements constantly. The ports are required to comply with various laws and requirements, which may often determine the potential activities and opportunities for the ports.

The current study was compiled to analyse the main coming requirements of security, safety and administrative procedures and their influences on the ports' activities and economy. The research focused on five ports in the Baltic Sea Region- Stockholm, Helsinki, Tallinn, Turku and Naantali- the Penta ports (so called Pentathlon) and the coming regulations that are affecting the activities of these ports. Since security, safety and administrative procedures have important part of the ports' operations, the current study focuses especially on these requirements that are related to these procedures.

The aim of this research was to examine the coming requirements of security, safety and administrative procedures that may affect the activities and economy of the ports and to analyse the impacts of these requirements on the ports. In order to find out coming requirements and their impacts on the ports, several different methods for research and analysis were used. The coming requirements can be found in national and international legislations and the principal method used of ascertaining the impacts of the requirements was questionnaires that were carried out in the ports. In addition, previously compiled researches in the area were analysed and interviews with other related parties were also carried out in order to find out the impacts of the requirements for them.

The coming requirements are different IMO's, EU's and local laws, regulations and other documentation that may significantly affect the ports' activities or economy. The coming requirements mean international or national legislations, that come into force in the near future and which the ports and other related parties are required to comply and which will influence, directly or indirectly, the ports' operations or economy.

The object of this research was the communities of the Penta ports (although the paper of the research often contains only the word *ports*). Port' community is formed from the companies which are usually operating in the ports territories, such as shipping companies, shipping agencies, freight forwarders, customs, etc., and whose activities are related to the ports (Estonian Maritime Academy 2012). In addition, the current study examines the impacts of coming requirements on trade flows and maritime transport, as the changes in these areas will have a strong impact on the ports. These changes may cause barriers to the ports' activities and security, safety and administrative procedures in the ports.

The most detailed overview in this paper is given on the results of research. All results are presented according to the theme of the new regulation. In order to help the communities of the ports and other associated parties to adapt to the new coming regulations, the study gives also recommendations based on the research findings. All recommendations are given according to the findings and contain no subjective views.

This paper is divided into three basic chapters.



The first chapter describes the main research methods and materials that were used to assemble this paper. The main research method was questionnaires which were carried out in the ports in order to find out the impacts of the requirements on the ports.

The results of research are given in the second chapter that consists of several subchapters. Each subchapter describes the main coming regulations that may have major impact on the ports. The first subchapter gives an overview of the sulphur oxide emissions standards and the impacts of these requirements. The second subchapter describes the nitrogen oxide emissions standards and the possible future developments. The following subchapters describe a variety of coming regulations that have impacts on the ports.

The final chapter focuses on the recommendations that would help the ports and other related parties to adapt to the coming regulations. Recommendations are given in the tabular form with short overview of the theme. In addition, sample of questionnaires are added in the end of the paper.

# 1 Research methods and materials

The current research paper deals with national and international legislations and analyses coming requirements of security, safety and administrative procedures in Pentathlon. There are a lot of different legislations that are affecting the ports daily work constantly. The aim was to determine the impacts of the coming requirements on the ports. Ports are closely related to the local surroundings and their economic situation may influence it, and consequently the entire country. In order to find out which requirements would influence the ports the most, variety of research technics and methods were used.

Questionnaires were the main research method used in the current study. The questionnaires were targeted primarily at the Penta ports and the aim of the questionnaires was to find out are the ports ready for the new coming requirements of security, safety and administrative procedures in Pentathlon and how these requirements may influence the ports' activities and economy. Special attention is paid to the IMO's and EU's requirements that are coming into force in the near future.

The questionnaire was divided into four sections; each section contained questions about a specific topic. The four sections were selected due to IMO's and EU's regulations that might influence the ports current situations the most. The four sections were: sulphur regulations (in SECA coming into force in 2015), co-operation in IT field, Schengen rules related to the third countries and port workers competence.

The second important method used in this study was interviews. Since a number of other related parties are active in the ports, it was important to find out the impacts of the coming requirements on these parties as well. In this regard, several interviews were carried out with the relevant parties. The aim of the interviews was to find out the influence of the coming requirements on different relevant parties and thereby to analyse the possible consequences for the ports. Interviews were carried out mostly with ship-owners, customs and border guards.

Several problems and issues covered in this research paper have been previously studied in the EU and therefore one resource materials used in this study were a variety of previously prepared studies. The research of different studies allowed identifying various results and analysing the effects of the problems and issues to the ports as well.

The analysis of coming requirements of security, safety and administrative procedures in Pentathlon and the identification of their impacts on the ports were a complex issue and required a number of different research methods. The current topic has been studied from different points of view and therefore the methods used to research various aspects have been carefully selected.

## 2 Results of research

The aim of this research paper was to analyse the coming requirements of security, safety and administrative procedures and their influence on the Penta ports' activities and economy. The following are the results of the research, expressed in terms of IMO, the European Union, ports and other related parties. All results are based on questionnaires, interviews and analysis of materials and other research methods used.

The results of the research are divided into categories based on the theme of the issue. The beginning of each subject describes briefly the origin of the requirement and brings out different standpoints and views of the parties according to the research. Each sub-chapter concludes by analysing the possible consequences and impacts of the requirements to the ports and providing recommendations to the ports and other relevant parties in order to help them to adapt to the new possible situation.

### 2.1 Sulphur Oxide emissions standards

Sulphur oxide ( $\text{SO}_x$ ) is considered to be environmentally harmful substance which damages the environment and human health and therefore, strict regulations aim to reduce its release into the atmosphere. In order to decrease  $\text{SO}_x$  emissions, several regulations have been developed in global level and in the EU level.

Since vessels are considered to be one of the major sources of  $\text{SO}_x$ , the regulations of  $\text{SO}_x$  emissions would have a major impact on the ports and the entire maritime sector. The ports are closely linked to the shipping activities and major changes in the shipping field can significantly change the economic performance of the ports.

$\text{SO}_x$  content of marine fuel oils are regulated on the international levels by the IMO and the EU. The IMO is regulating  $\text{SO}_x$  emission with the MARPOL Annex VI, regulation 14 which is setting limits to all marine fuel oils. The EU has introduced the first  $\text{SO}_x$  emissions requirements by the directive 2005/33/EC and the new sulphur directive is currently in the approval process.

MARPOL, the International Convention for the Prevention of Pollution from Ships, is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. It was adopted on 2 November 1973 at IMO and it has been updated by amendments through the years (IMO, 2011a). The MARPOL 73/78 Annex VI is regulations for the prevention of air pollution from ships and it entered into force 19 May 2005. Annex VI sets limits on sulphur oxide and nitrogen oxide emissions from ship exhausts and prohibits deliberate emissions of ozone depleting substances and designated emission control areas set more stringent standards for  $\text{SO}_x$ , nitrogen oxide ( $\text{NO}_x$ ) and particulate matter (IMO, 2011a). The MARPOL 73/78 Annex VI applies to all ships, fixed and floating drilling rigs and other platforms, but the certification requirements are depending on size of the vessel and when it is constructed (DNV, 2009).

The MARPOL Annex VI, regulation 14 is setting limits on the sulphur oxide (SO<sub>x</sub>) content of marine fuel oils. The limitations in sulphur content apply to all fuel oils (heavy fuel oils, marine diesel oils and gas oils) and regardless of use on board (i.e. in combustion engines, boilers, gas turbines, etc.) (DNV 2009). The limits are divided into two groups- outside a Sulphur Emission Control Area (SECA) and inside an SECA. The fuel oil limits of sulphur content outside and inside SECA are shown in table 1.

**Table 1.** The MARPOL Annex VI regulations 14.1

<b>Outside an SECA established to limit SO<sub>x</sub> and particulate matter emissions</b>	<b>Inside an SECA established to limit SO<sub>x</sub> and particulate matter emissions</b>
4.50% m/m prior to 1 January 2012	1.50% m/m prior to 1 July 2010
3.50% m/m on and after 1 January 2012	1.00% m/m on and after 1 July 2010
0.50% m/m on and after 1 January 2020*	0.10% m/m on and after 1 January 2015

\* depending on the outcome of a review, to be concluded in 2018, as to the availability of the required fuel oil, this date could be deferred to 1 January 2025.

Stricter limits are established for the SECA areas all over the world. Kristensen (2010) brought out the facts why the stringent SO<sub>x</sub> emission limit in SECA may be necessary. Since most of the PM is SO<sub>x</sub> when the sulphur content in the fuel is high. High sulphur content constitutes a health threat in port areas and close to the coast and PM cannot be removed by filters when the sulphur content is above 0.1%.

In the MARPOL Annex VI, regulation 14, the global limit of SO<sub>x</sub> emission is determined 0.50% m/m on and after 1 January 2020. This date could be deferred as the review of the standard set forth shall be completed by 2018 to determine the ability of fuel oil. The review will take into account the global market supply and demand for fuel oil to comply with the regulation that exist at the time that the review is conducted, an analysis of the trends in fuel oil markets and any other relevant issue. The parties may decide whether it is possible for ships to comply with the date. If a decision is taken that it is not possible for ships to comply, then the standard will become effective on 1 January 2025 (DNV 2009).

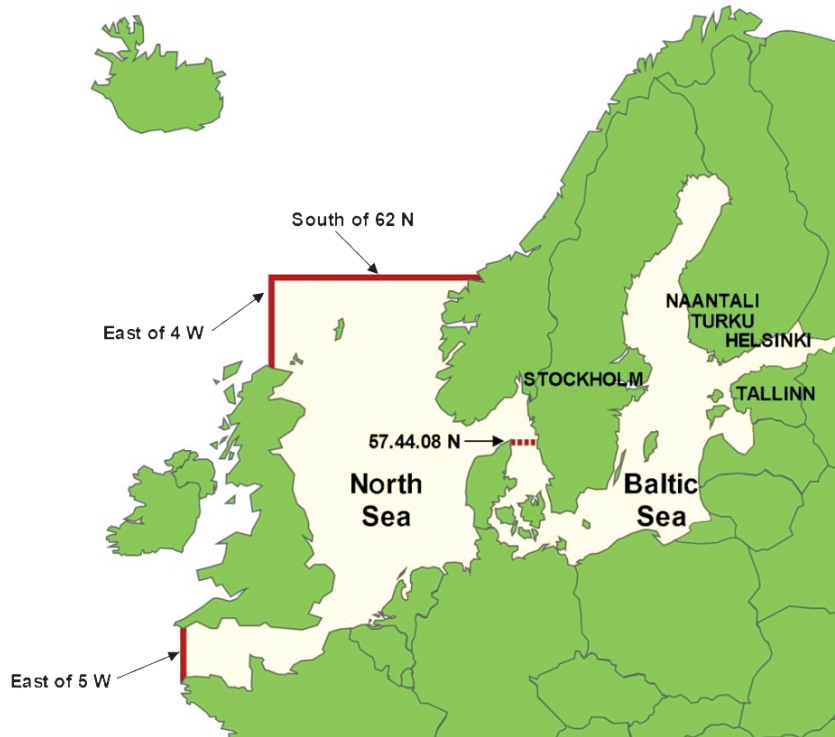
The MARPOL Annex VI, regulation 14 gives also an option of using any fitting material, appliance or apparatus to be fitted in a ship or other procedures, alternative fuel oils, or compliance methods used as an alternative in order to meet the regulation standards (DNV 2009). The main options will be alternative fuels and an exhaust gas cleaning system used on board vessels.

Ships using separate fuel oils to comply with the regulation and entering or leaving SECA should carry a written procedure showing how the fuel oil change-over is to be done. The volume of low sulphur fuel oils in each tank as well as the date, time, and position of the ship when any fuel-oil-change-over operation is completed prior to the entry into SECA or commenced after exit from such an area, should be recorded in a ship's log-book (DNV 2009).

The EU is also setting limits to the sulphur content in marine fuels. The first limits for the sulphur content in marine fuels were introduced by the EU directive 2005/33/EC (amending directive 1999/32/EC). This directive set standards to all liquid fuels derived from petroleum and used by ships operating in the Member States' territorial waters, e.g. a 1.5% sulphur content limit by mass, from 11 August 2006, in marine fuels used by vessels in the Baltic Sea, and from 11 August 2007 for vessels in the North Sea and the English Channel, in order to reduce acidification and improve air quality; a 1.5% sulphur content limit by mass, from

11 August 2006, in fuels used by passenger vessels on regular services to or from any port in the Union in order to improve air quality and create sufficient demand to ensure an EU-wide supply of low-sulphur fuel; a 0.1% sulphur content limit by mass, from 1 January 2010, in marine fuels used by ships on inland waterways and at berth (European Union 2007).

The first Sulphur Emission Control Area came into force in May 2006 and the North Sea and English Channel SECA entered into force in August 2007. Vessels entering the SECA area will need to change the SO<sub>x</sub> emissions from fuel. The Sulphur Emission Control Area is shown in figure 1.



**Figure 1.** Europe's Sulphur Emission Control Area (created by the authors).

During the last years, the EU has been preparing a new sulphur directive in connection with MARPOL Annex VI. On 3 May 2012 the Council and the European Parliament reached a provisional agreement regarding the directive amending directive 1999/32/EC as regards the sulphur content of marine fuels. The key elements of the agreement are (European Union 2012):

- the limits for the sulphur content of marine fuels used in designated SO<sub>2</sub> Emission Control Areas (SECAs)<sup>1</sup> will be 1% until 31 December 2014 and 0.1% as from 1 January 2015;
- the IMO standard of 0,5 % for sulphur limits outside SECAs will be mandatory in EU waters by 2020 (also valid for passenger ships operating outside SECAs with the current regime of 1,5 % which applies until that date);
- member states may provide support to operators in accordance with the applicable state aid rules if such aid measures are deemed to be compatible with the treaty;
- penalties must be set by member states in implementing the directive, possible fines should at least be equivalent of the benefits deriving from the infringements to the provisions of the directive.

The new sulphur legislation was agreed by the European Parliament 9<sup>th</sup> September 2012 when it passed the first reading by 606 votes to 55, with 3 abstentions. The legislation includes rules

for general sulphur limit for fuels in European seas which will fall from 3.5% to 0.5% by 2020, after MEPs insisted on deleting provisions that would have allowed the deadline to be postponed by five years. Fuel used in the Europe's SECAs (see figure 1) will need to meet the new international standard of 0.1% by 2015. The limits can be met by using cleaner or alternative fuels or technology, such as scrubbers. In addition, as part of its review of air quality legislation, the legislation asks the Commission to consider extending the stricter SECA limits to all EU territorial waters, i.e. within 12 nautical miles of the coastline (European Parliament 2012).

### 2.1.1 Possible impacts

Analysing coming regulations, it is important to look at all parties whom it concerns. The regulations of SO<sub>x</sub> emissions are affecting the whole maritime sector and therefore the current study is focusing on the impacts for the entire maritime community, special attention is paid to the communities of Penta ports.

The SO<sub>x</sub> limits are providing strict requirements especially for ship-owners and ships, but at the same time, these requirements could also have a major impact on the Penta ports' activities and economy. It is important to emphasize the strong connections between ships and the ports and the interdependence between their activities and economic welfare. The SO<sub>x</sub> emission requirements may lead to major barriers in security, safety and administrative procedures in the Penta ports.

The most obvious effect of the requirement to lower the permitted sulphur level in marine fuels to 0.1% in 2015 is an increased fuel price (EMSA 2010). The rise of fuel price will be due to increased demand for the low sulphur fuel (MGO). According to the study issued by the Swedish Maritime Administration (2009) the increase in the fuel costs could be about 50-55% in 2015, assuming an unchanged crude oil price. For vessels that mostly transport cargoes between the ports within SECA, the increase in the fuel costs may amount to around 70%.

According to the Swedish Maritime Administration (2009), the price trend for crude oil until 2015 is influenced by a series of different factors, e.g.:

- Supply of crude oil
- Demand
- Development of alternative fuels
- Energy effectivisation
- Geopolitical developments

The fuel price increase would raise the transport rates of maritime goods. According to the Swedish Maritime Administration (2009) the total freight transport costs are expected to rise by between 2% and 7%, the costs for transportation by sea can be expected to rise by between 25 and 40% as a consequence of the more expensive fuel and the effect per transported ton of freight will be an increase of 2-10 euro.

The increased freight prices would influence not only maritime sector, all other sectors will also be affected, especially those that have large-scale import and/or export. Table 2 on page 54 shows the percentage increase in costs compared with the present price for certain types of freight as a consequence of the fuel price increase on the changeover to more low-sulphur fuel.

**Table 2.** The percentage increase in costs compared with the present price for certain types of freight as a consequence of the fuel price increase on the changeover to more low-sulphur fuel (source: Swedish Maritime Administration 2009).

Freight type	Sulphur content		
	1.0%	0.5%	0.1%
Container	4-13%	8-18%	44-51%
Oil	3-8%	5-11%	28-32%
Paper (roll)	3-10%	6-14%	35-40%
Timber	3-10%	6-14%	35-40%
Freight tonne bulk carrier	4-11%	7-15%	39-44%
Steel products	3-10%	6-14%	35-40%

As the freight prices will be increased, cargo-owners might choose alternatives trade routes to deliver their goods. The increased maritime transport costs may lead to decreased number of ship-visits in the ports which would impede the development and economic performance of the ports.

A major issue with the SO<sub>x</sub> requirement is the availability of fuel with the required sulphur content. There is not enough heavy fuel oil with a sulphur content of no more than 0.5% to meet the needs of all maritime traffic in the Baltic Sea, North Sea and English Channel and the switch to fuel with a maximum sulphur content of 0.1% leads to the growth in demand for the low sulphur fuel. The availability of the low sulphur fuel may become questionable, especially when the light fuels start to be used worldwide; the oil industry will have to increase its refining capacity considerably (Kalli et al. 2009). Insufficient quantities of required fuel may lead to increased costs of cargo shipment which can cause a shift in trade flows in order to avoid the increased price in maritime transport. This would result in decreased trade flows in the ports and have a devastating impact of the economic performance of the ports.

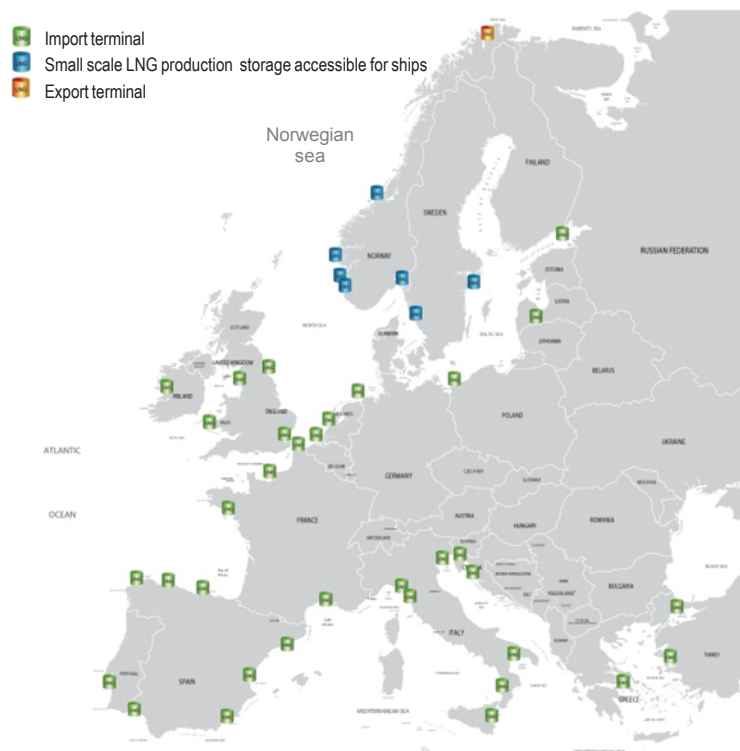
There is also possibility to achieve the required levels of sulphur content in marine fuel is the use of alternative fuels (e.g. liquefied natural gas (LNG), bio-fuels). According to EMSA (2010) LNG provides a basically complete reduction of SO<sub>x</sub> and PM and some 90% reduction of NO<sub>x</sub>, it produces no sludge and there is no visible smoke. In addition, operating on LNG does not affect the speed or otherwise the operational qualities of the ship, though it does involve some additional technical and operational complexities, which necessitate special training for the crew members.

Stenhede (2012) has brought out alternatives to the heavy fuel oil in order to reduce sulphur emissions levels in marine fuels:

- MGO Marine Gas Oil, (Diesel)
- LNG Liquefied Natural Gas
- Methanol
- Ethanol/glycerol
- DME Di-Methyl-Ether
- Synthetic Diesel (Gas To Liquid, Coal To Liquid)
- FFME Free-Fatty-Methyl-Ester e.g. Bio diesel
- Bio oils e.g. Palm oil

The main problem with the use of LNG within the SECA is the availability of LNG. As figure 2 illustrates, there are a number of LNG import terminals in the EU, so according to EMSA (2010) the problem is not primarily related to lack of LNG in the ports. The more immediate problem for ship-owners is that LNG is not generally available for bunkering to ships, not even in the import terminals, the storage, handling and distribution of LNG is directed at the land-based uses.

Although there are a number of projects for developing the LNG bunkering infrastructure for ships around the Baltic Sea and North Sea, the ports may not be ready to offer LNG to ships in 2015 when the 0.1% sulphur requirement will entry into force. LNG is more suitable for the Short Sea ships, Ro-Ro's and ferries, because it takes more space on the board of the ship, compared to traditional oil, and in order not to take the additional space from the goods, it is necessary to load LNG to ships more frequently.



**Figure 2.** LNG availability in Europe (source: DNV 2011b).

In addition, the use of LNG in ships is causing a lot of administrative procedures as well. According to EMSA (2010), IMO is creating guidelines on safety for gas-fuelled installations in ships and the International Code of Safety for Gas-fuelled Ships (IGF Code) by 2014. The IMO rules do not cover bunkering on land, installations in ports or the actual bunkering operations by ships and barges. These matters are still subject to national and local rules and authorities which may vary largely and may represent significant barriers to rapid progress in development. All this may be causing a lot of new administrative, safety and security procedures in the Penta ports.

Since LNG might lead to new issues, there is still a possibility to use other alternative fuels. For example, according to Stenhede (2012), methanol is a multi-source and multi-purpose fuel which necessary infrastructure and safety are similar to ethanol. Methanol is in a liquid form and it does not need pressure tanks. Methanol does not generate sulphur and particle matters emission. However, it is toxic and very corrosive, so it can harm the environment and



ships. There are lots of possibilities to reduce sulphur emissions levels in marine fuel using alternative fuels.

The possibility to reduce the Sulphur emission levels from the vessels' fuel using alternative fuels (e.g. LNG), leads to new issue- the ports should be ready to offer alternative fuels to vessels in 2015. According to the results of the research, the ports hope to be ready in time. It brings out the suspicion that some of the ports may not be ready in time and since there is no possibility to delay the requirement these ports may suffer under the economic downfall and decline in reputation. Nevertheless, the ports are making great efforts to maintain their competitiveness and to meet the demands of the shipping industry. For example, first LNG fuelled ship started on route between Turku-Stockholm at the beginning of 2013, which will be bunkered in Stockholm, where LNG is already available. The ports hope that they are able to respond to the demands together with the bunker business on deadline.

Changes in fuels in maritime transport will bring out one of the main concerns with the Sulphur emissions requirement- the amount of investment required from the ports. Due to the results of the research it can be stated, that it is certain that the ports are obliged make some investments to the infrastructure and technical equipment in order to ensure that in 2015, ships will be able to visit the ports continuously and receive necessary services. According to the questionnaires there will be different kind of investments related to either LNG infrastructure or scrubber waste reception facilities.

The MARPOL Annex VI and the EU Directive 2005/33/EC allow ship-owners to use sulphur abatement technologies to achieve the required level of sulphur emissions in marine fuels. The installation and use of sulphur abatement technologies as sulphur scrubbers reveal a number of problems to ship-owners and therefore, it also influences the activities and economy of the ports.

Scrubbers can be installed on new ships and existing ships. The installation of scrubbers is more complicated on existing ships, because many vessels are not suitable for scrubbers, for example, its size and weight can significantly affect the stability of the ship and therefore it might be necessary to rebuild the ship. Reconstruction of a ship is an expensive activity which may lead to vessels leaving the SECA area to work somewhere else and thereby can cause a decrease of cargo handling volumes in the SECA ports.

Another problem caused by sulphur scrubbers are scrubbers' residues. According to Kalli et al. (2009) sulphur scrubber wash waters are pumped into the sea through separate purification plants, where the oil (hydrocarbons) and other impurities are separated. The separated sludge is similar to that from the engine room and can thus be left in the port and the ports will therefore have to prepare to receive sulphur scrubber waste from ships. The ports will receive an additional task to accept scrubber residues from ships.

In addition, scrubber residues should also be treated as hazardous waste which means that the ports must be prepared to receive and store them according to the requirements which causes also safety procedures in the ports. This can lead to adding additional charges to freight transport by sea, which might have negative effect on the ports as cargo owners may opt for a cheaper mode of transport.

Since there are different kinds of scrubber solutions, the ports have hard time choose what kind of scrubber waste reception facilities to build. As the majority of the ports are operating as *landlord*-type ports, the investments to LNG infrastructure will be made by LNG suppliers and terminals. The investments to the infrastructure and technical equipment at the ports are inevitable in cooperation with shipping industry.

Receiving scrubber residues is a confusing issue, because it has several open questions. Since there are a number of different solutions to use scrubber residues, the questionnaires brought out that the ports have to have a continuing dialogs with the shipping companies in order to

prepare to receive the possible scrubber residues. If the scrubber residues will be pumped onshore together with sludge/oily waste water, the reception is possible already now at the ports (scrubber residues will increase the amount around 10%). But when other solutions will be used, the ports have hard time to make these possible to use. The ports have also additional administrative procedures, while the scrubber residues fee will be included in the waste fee. In addition, the results of the research brought out the fact that some ports have no information on this topic, especially about the requirements and rules in handling these residues.

#### **2.1.1.1 Modal shift**

The sulphur content requirements may cause a modal shift which may lead to loss of competitiveness in the SECA compared to other areas of Europe. According to ISL (2010) due to SO<sub>x</sub> requirements, operating ships in SECAs will become disproportionately more expensive and in the SECAs, this could give the rise to a shift of cargoes currently transported by ship onto land transport, or routes with a much lower proportion of sea miles, which will affect shipping companies as well as the ports. In addition, the ISL study (2010) brings out that estimated shifts primarily affect the routes to Russia and into the Baltic, since there are parallel land routes available for these routes and these are already a competitive threat to sea shipping. This will affect shipping companies as well as the Penta ports, which will lose handling volumes and therefore income.

According to the questionnaires, the ports are expecting that the ferry traffic will be reduced, especially along the coast and transport chain will change back to shorter sea routes. Also long-distance routes in Baltic Sea would suffer due this requirement. However, some ports may also increase their cargo turnover. In addition, the starting period since 1<sup>st</sup> January 2015 might slow down the maritime traffic, thus effecting sales of port services.

According to Swedish Maritime Administration study (2009) a transfer of maritime freight transport from Sweden's east coast to west coast will take place. For ship-operators, with the assumed costs, it will also be advantageous to wholly avoid the SECA, i.e. to choose Norway's port instead of the ports in Sweden. This means, that the port of Stockholm, which is one of the Penta ports, might lose handling volumes. The ISL study (2010) brings out that the medium-length to long routes will suffer significantly from the new SECA regulations, and that the proportion of sea transport in the whole transport service will decline. The shifts from sea transport to pure land transport are a result of a significant rise in sea transport costs caused by the use of fuel with 0.1 % sulphur content.

#### **2.1.1.2 Other impacts**

Also important impact of the Sulphur emissions limits is the social impact. Ports are major employers in the local areas and the loss of competitiveness of the ports might affect the entire region. The SO<sub>x</sub> emissions limits might have devastating effect on some of the ports and when the port is suffering under the economic pressure, people might lose their jobs, and it may be detrimental to the overall economy of the surrounding area.

SO<sub>x</sub> emission limit are majorly influencing the ports, which are having also doubts concerning this requirement. According to the results of the research, there are a number of different opinions and standpoints related to the Sulphur emissions limits. The general opinion is that this requirement was implemented with too short transferal time and it should have an opportunity to delay it.

Another important issue related to the Sulphur emissions requirement is the need of monitor the fuel emissions levels from the vessels. Since the requirement is very tough to meet, it is important to control if the vessels are in compliance with the requirement. As the port is not the competent authority to check the emission levels, the monitoring of the sulphur content of fuel in ships is the responsibility of Port State Control. According to Swedish Maritime Administration study (2009) the only way to clarify on which fuel the vessel is operating on this occasion is through Port State Control. Controls take place through a ship inspector (Port State Control Officer) checking the bunker fuel receipt and the data in the ship's engine room log and oil record book where information on position and exact time for change of fuel as well as which bunker tankers were used must be entered.

The overall standpoint of the ports and other related parties is that the EU Sulphur Directive should be postponed for at least five years. The standpoint of ports and other related parties is that the Sulphur emissions requirement is issue for the whole maritime community around the Baltic Sea. In practice, these regulations should cover 100% countries around SECA and every vessel entering, while all exceptions are destroying the rules of competition in the EU and the world.

## **2.1.2 Recommendations**

Sulphur emissions requirements may have different impacts on maritime community and in order to find solutions, it is important to manage the risks. According to several studies sulphur emissions requirements may cause modal shift from sea to land and this may decrease the competitiveness of the BSR. To avoid this, concerned parties should identify transnational corridors in the BSR where the effect of this regulation would be the greatest. Also it is important to make investments in the selected transnational transport corridors, which are crucial to maintain the competitiveness of the BSR (TransBaltic 2012).

Sulphur emissions requirements are influencing the whole maritime communities in the world, but the most affected are the SECAs, including the BSR. In order to maintain the competitiveness of the BSR, most relevant groups of interest operating in the BSR (e.g. port authorities, cargo owners, road/rail/maritime transport operators etc.) should work together (TransBaltic 2012).

Ports are also majorly affected by the sulphur emission requirements. In order to maintain their competitiveness, the ports should be prepared to make investments in infrastructure. The changes in infrastructure may be necessary because ship-owners may choose to start use some of the alternative fuels and the ports should be ready to offer those. In addition, the ports should work together with fuel suppliers and providers to investigate the need to make investment in alternative fuel facilities.

Ship-owners, who are the most affected group, should carefully choose which technology to use in existing ships. There are a number of technologies and methods to meet the sulphur requirements and ship-owners may have time to choose the best possible way. All methods

are analysed by several different studies and the right choice depends on several different factors. Also ship-owners should carefully choose the fuel and engine type, when purchasing new vessels.

Ship-owners have the possibility to choose how they want to meet the new standards. They may choose to use the alternative fuels or install an exhaust cleaning systems to their vessel. The latter places a new procedure to the port to carry out. Since receiving scrubber residues might need new receiving systems the ports should be ready to receive scrubber residues from ships in time and if necessary make more investments. In addition, since scrubber residues might be handled as hazardous waste, the ports should work together with third parties to organize the handling.

Several different studies have been recognizing the risk of modal shift from sea to land due to the increase fuel price. This situation may have devastating impact on sea transport and seaports. To avoid this situation, logistics companies should plan new routes for cargo flows in order to maintain the competitiveness of BSR ports.

Sulphur emission standards may lead to building new ships or rebuilding the existing ones. This would give a lot of work to shipbuilding and repair companies, who should be ready to rebuild existing vessels. They should stock up themselves with plenty of material and equipment to meet the possible demand. Another field that may win from the future situation is the science and research. This field have the possibility to invent new solutions and technologies in order to help maritime community to adapt to the future situation.

EU should find financial aid packages to support the implementation of the regulation. Also, National Governments should support maritime enterprises to implement the regulation. In addition, all concerning parties agree that inside EU, the requirements for SO<sub>x</sub> emissions should be identical in order to maintain equal economic conditions of competition.

Sulphur emissions requirements are affecting the entire maritime sector and these recommendations are only the basic ones. Since the regulations are influencing different parties differently, each party should find suitable solutions in order to adapt the coming regulation. At the same time, in terms of the BSR, it is important that the related parties should find ways to work to together to maintain and increase the competitiveness of the entire region.

## 2.2 Nitrogen Oxide emissions standards

In the MARPOL 73/78 Annex VI, the control of NO<sub>x</sub> emissions is implemented in new ships engines. Regulation 13 of Annex VI concerns NO<sub>x</sub> emission from diesel engines. The control is divided into different levels (tiers) and limits are depending of the engine's rated speed (DNV, 2009), see table 3 on page 60.

Tier I is aimed for diesel engines installed on ships constructed from 1<sup>st</sup> January 2000 to 1 January 2011 allowable emissions of total weighted NO<sub>x</sub> depending on engine speed,  $n$ , are 17.0 g/kWh when  $n$  is less than 130 rpm,  $45.0 \times n (-0.2)$  g/kWh when  $n$  is 130 or more but less than 2000 rpm, 9.8 g/kWh when  $n$  is 2000 rpm or more.

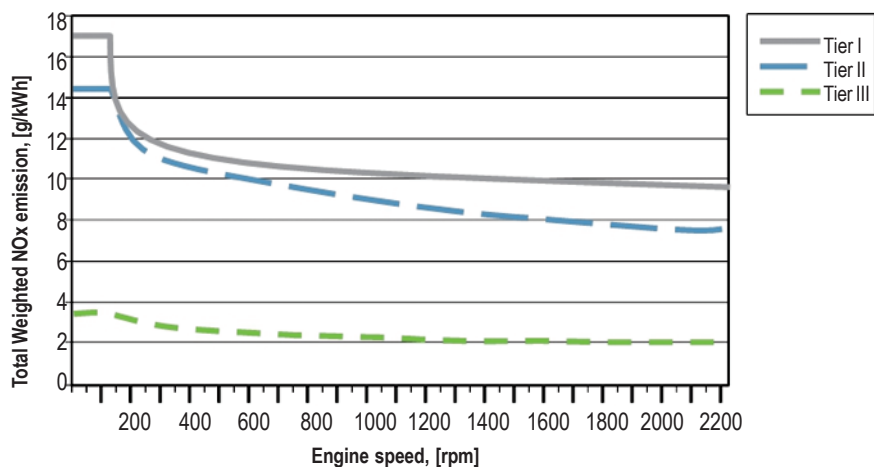
Tier II is aimed for diesel engines installed on ships constructed on or after 1<sup>st</sup> January 2011 allowable emissions of total weighted NO<sub>x</sub> depending on engine speed,  $n$ , are 14.4 g/kWh when  $n$  is less than 130 rpm,  $44.0 \times n (-0.23)$  g/kWh when  $n$  is 130 or more but less than 2000 rpm, 7.7 g/kWh when  $n$  is 2000 rpm or more.

**Table 3.** NO<sub>x</sub> emission limits (source: Rozmarynowska, 2012).

Tier	Date	NO <sub>x</sub> limit (g/kWh)		
		n < 130rpm	130rpm ≤ n < 2000rpm	n ≥ 2000rpm
Tier I	2000	17,0	45*n <sup>-0,2</sup>	9,8
Tier II	2011	14,4	44*n <sup>-0,23</sup>	7,7
Tier III*	2016	3,4	9*n <sup>-0,2</sup>	1,96

\* Tier III ships constructed on or after 1 January 2016 will have additional limitations when operating in an Emission Control Area.

Tier III is aimed for ships constructed on or after 1<sup>st</sup> January 2016 will have additional limitations when operating in an Emission Control Area (ECA). For Tier III ships operating in the NO<sub>x</sub> ECAs the allowable emissions of total weighted NO<sub>x</sub> depending on engine speed, n, are 3.4 g/kWh when n is less than 130 rpm, 9.0 × n<sup>(-0.2)</sup> g/kWh when n is 130 or more but less than 2000 rpm, 2.0 g/kWh when n is 2000 rpm or more (DNV 2009). Figure 3 shows the MARPOL Annex VI, regulation 13 different tiers' limits of NO<sub>x</sub> emissions from diesel engines (DNV 2009).



**Figure 3.** MARPOL Annex VI, Regulation 13: NO<sub>x</sub> emissions from diesel engines (source: DNV 2009).

The emission value for a diesel engine is to be determined in accordance with the NO<sub>x</sub> Technical Code 2008 in the case of Tier II and Tier III limits (IMO 2011c). IMO gave out the Technical Code on Control of Emission of Nitrogen Oxides from Marine Diesel Engines in 2008 with the purpose to provide mandatory procedures for the testing, survey and certification of marine diesel engines which will enable engine manufacturers, ship-owners and Administrations to ensure that all applicable marine diesel engines comply with the relevant limiting emission values of NO<sub>x</sub> as specified within regulation 13 of Annex VI (IMO 2008). In addition to these basic regulations, regulation 13 includes a variety of further restrictions and requirements.

In order to meet the MARPOL Annex VI Tier III NO<sub>x</sub> emission standards, the ship-owners are required to adopt new technologies. Currently, two basic technologies are available to meet the regulation- selective catalytic reduction (SCR) and gas engine and fuel conversion (Kalli et al. 2010). SCR is an exhaust gas after treatment technology which has a NO<sub>x</sub> abatement capability of more than 80 % and it has to be installed separately for each engine of a ship. Gas engine and fuel conversion are methods that in principle means the use of liquefied

natural gas (LNG) as fuel. LNG as a fuel produces NO<sub>x</sub> emissions much less than use of diesel fuels and therefore complies with the Tier III. Even if the technology is already available there are major challenges in the infrastructure of fuel delivery to ships (Kalli et al. 2010).

In addition to previous techniques, engine manufacturers are constantly developing new technologies which prove to be more economical than SCR. However, the present experience indicates that to comply with Tier III it must be a combination of several different methods (Kalli et al. 2010):

- High pressure turbocharger (TC) sys. (2-stage) (ca. NO<sub>x</sub> -40 %)
- Low NO<sub>x</sub> combustion tuning (ca. NO<sub>x</sub> -10 %)
- EGR system (ca. NO<sub>x</sub> -60 %)
- Charge air humidification (ca. NO<sub>x</sub> -40 %)
- Water Fuel Emulsion (ca. NO<sub>x</sub> -25 %)
- Direct Water Injection (ca. NO<sub>x</sub> -50 %)

The most important future development for the ship-owners is the fact that every new technology adds additional costs. With 10% interest rate for the SCR investment, abatement of one ton of NO<sub>x</sub> will cost 787–4 699 Euros depending on the type of a ship and the method of calculation and the average cost is about 1.316–1.843 Euros per ton NO<sub>x</sub> (Kalli et al. 2010). For ship-owners, these new coming NO<sub>x</sub> standards will add several obstacles that will hamper shipping business in the Baltic Sea area. Ship-owners should choose carefully between different methods to meet the standards.

Not only ship-owners will be affected by the new coming NO<sub>x</sub> emission standards, also ports and other related parties will feel the impacts. According to the Kalli et al. (2010) designation of the Baltic Sea as a NECA (Nitrogen Emission Control Area), would increase the freight rates of shipping. Due to the use of Tier III NO<sub>x</sub> emission reduction equipment (SCR) an increase of 2–4.6 % in freight rates of new ships depending on vessel type is possible and the highest rise of costs will be on large and fast container vessels.

Table 4 presents an estimated percentage rise in freight rates of new vessels due to the use of Tier III NO<sub>x</sub> emission reduction equipment. Small container vessels are < 1 000 TEU, medium 1 000 - 3 500 TEU and large > 3 500 TEU. Small general dry cargo vessels are < 6 000 DWT, medium 6 000 - 18 000 DWT and large > 18 000 DWT. Small dry bulk vessels are < 30 000 DWT, medium 30 000 - 60 000 DWT and large > 60 000 DWT. Small oil tankers are < 20 000 DWT, medium 20 000 - 60 000 DWT and large > 60 000 DWT. Small Ro-Ro and RoPax vessels are < 5 000 DWT, medium 5 000 - 10 000 DWT and large > 10 000 DWT (Kalli et al. 2010).

**Table 4.** Estimated percentage rise in freight rates of new vessels due to the use of Tier III NO<sub>x</sub> emission reduction equipment (source: Kalli et al. 2010)

Ship type	Size category Small	Size category Medium	Size category Large
<b>Container vessel</b>	2.8 %	4.2 %	4.6 %
<b>General dry cargo vessel</b>	2.4 %	3.6 %	3.7 %
<b>Dry bulk vessel</b>	3.4 %	3.3 %	3.2 %
<b>Oil tanker</b>	2.0 %	3.1 %	3.4 %
<b>Ro-Ro and RoPax vessel</b>	3.1 %	3.3 %	3.4 %

The increased freight rates might lead to some modal shift in the BSR. According to Kalli et al. (2010) the modal shifts will vary significantly between different routes and price projections and the potential for modal shift caused solely by the NO<sub>x</sub> regulations will most probably be very small.

Due to the increased freight rates and possible modal shift, the ports of the BSR will also be affected by the NO<sub>x</sub> emissions standards. The increased freight rate may lead to decrease in the quantities of goods at ports, as cargo owners may decide to use other transport corridors. Decreased quantities of goods and modal shift from sea to land transport will have negative impacts on the ports as well as the entire maritime sector.

In order to adapt the new regulation, it is important to identify transnational corridors in the BSR where impacts of the regulation would be the greatest and all related parties should work together to maintain the competitiveness of the BSR. Ship-owners should choose between different solutions to meet the standards. Also, science and research institutions should find innovative new fuels, engines and exhaust gases emission reducing system.

## 2.3 Co-operation in IT-field

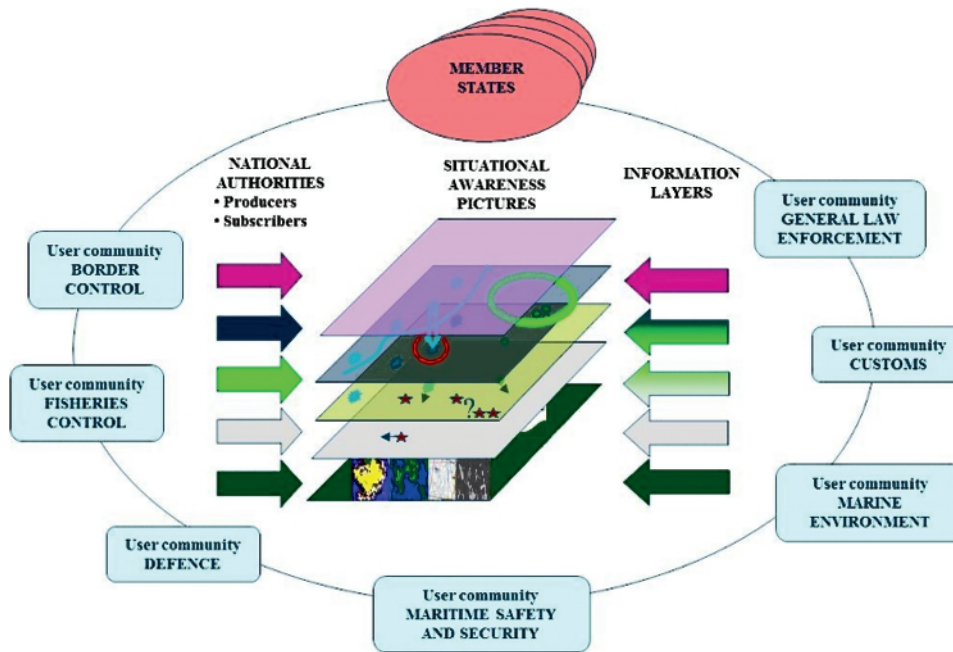
Nowadays IT-sector is developing rapidly and the changes are influencing also the ports' sector. According to Estonian Maritime Academy (2012), IT-systems used in maritime transport are creating different barriers caused by administrative, security and safety procedures with these systems.

At present there is no specific regulation that would establish requirements for the ports' IT-systems. The ports may independently choose which programs and systems they use. Although, The EU has decided to quietly move towards common standards, such as maritime single window system, but no specific requirements are established. This unregulated field has been causing several barriers in ports' activities.

However, there have been small steps towards a common information sharing system. The European Commission (2012a) has launched a draft roadmap "Integrated Maritime Surveillance: a Common Information Sharing Environment for the European Union maritime domain" which provides public authorities interested or active in maritime surveillance at the EU, regional and national level with means to exchange information and data across borders and across sectors to understand effectively activities and events at sea. The integration of the maritime surveillance as one of the important strands of the Integrated Maritime Policy will combat threats, detect vulnerabilities and illegal activities and increase knowledge. It will ensure safer, more secure and cleaner seas and boost sustainable economic growth through efficiency gains (European Commission 2012a). Figure 4 presents an example of Common Information Sharing Environment.

The study of the Estonian Maritime Academy (2012) brought out that the main issue with IT-systems is the distrust of the systems. If one IT-system crashes the only alternative in handling formalities with customs is on paper. This would take time and would create lot of confusion. Another problem with the IT-systems is the incompatibility of different systems. The customers, for example shipping companies, complain that they are obliged to provide several different authorities with the same reports and data. The users have to enter the same information multiple times into different systems and it requires a lot of resources and time (Estonian Maritime Academy 2012).

### Example of Common Information Sharing Environment ('CISE')



**Figure 4.** Example of Common Information Sharing Environment (source: European Commission 2012a).

The current study researched IT-field related problems, in order to find out the current situation of IT-systems and how the possibility to create different systems are affecting the ports' operations. According to the results of the questionnaires, ports are using different IT-systems. Most IT-systems which were named, was different from the other ports. There was only one common IT-system, which was named by several respondents- AIS. These results show that difference between IT-systems and their incompatibility may cause problems and lead to unnecessary delays. All BSR transport corridors should have standardized IT platforms which would make the region more competitive.

Although, the results of the questionnaires showed that the IT-systems alone are not causing a lot of problems, except that some systems do not have any kind of checking of data quality, the main problem is that every port has its own system and they are not compatible. In addition, IT systems used in the ports should be more reliable and reserved and these should be user-friendly and easy to learn.

Another problem is that there is no financing and supporting program for the ports to create overall IT-system for all EU ports. It is very expensive and time consuming to set up and test the information exchange between two parties. Therefore, implementation of the future EU Maritime Common Information Sharing Environment should require minimum costs for the user. In addition, the current study researched how willingly the ports would agree to connect their IT-systems to the future EU Maritime Common Information Sharing Environment. The questionnaires brought out that the future EU Maritime Common Information Sharing Environment should be easy to use and it should bring benefits to all participants.



## **2.4 Schengen regulation**

Schengen area's regulations concerning to short time visas of cruise passengers from third countries are causing a lot of confusion. The study of Estonian Maritime Academy (2012) brought out that there has been misunderstanding with the visas of St Peter Line's passengers. Since the vessel of St. Peter Line departure from non-Schengen area's country, the border guards have difficulty knowing how to properly mark the visas. According to the research border controls must be carried out according Schengen regulations and the most important regulation is the Schengen Borders Code.

This ambiguous regulation is causing administrative, safety and security barriers which lead to additional administrative procedures and may cause delays in border controls. The current study researched how this requirement is affecting the work of Penta ports. The study showed that only three Penta ports are relates to this issue- Stockholm, Tallinn and Helsinki. This requirement does not affect other ports.

The main problem with this requirement is the delays in border control. According to the research, starting from April 2012, a full passport control has been made obligatory (inward and outward clearance) in every port during the cruise voyage from third countries. The impact of this requirement is major to the cruise business. This situation has a negative impact on the cruise clients and going forward will undoubtedly discourage more potential customers in the Baltic cruise business. In addition, negative financial impact might affect all ports and stakeholders involved, including local participating cities and their economies due to a decline in amount of visitors.

This requirement is causing unequal conditions to the cruise business in Baltic Sea region since for example, in Mediterranean Sea area, this requirement does not apply to cruise passengers from the third countries. In order to find solution to this issue, the questionnaires brought out, that EU authorities should change the passport control at each Schengen call ports, and revert to the condition where passport controls were carried out when entering the first Schengen port (Helsinki) and when exiting the last Schengen port (Tallinn).

Although, port authorities cannot influence the border guards' work, it is important that border guards and ports should work more together in implementing new technical solutions and enough manpower to increase throughput in border control to avoid queues in border control. Also, it is possible to avoid delays in border control due to simplifying the procedures or regulations.

## **2.5 Competence management in port community**

Human resources are the most important resources to work with in order to ensure the competitiveness of the ports. Investment in human resources and securing so called social sustainability is essential for the ports to satisfy the demand for qualified labour and stay competitive (TransBaltic 2012).

Growing demand for labour flexibility in port-related logistics, growing intensity of cargo handling, more and more use of ICT in port operations and the international regulations and standards (e.g. the EU/ILO/IMO) are requiring ports to think more about employees competence management in ports communities (TransBaltic 2012). Competence management in port communities is an important activity, although today, ports are allowed to choose their employees accordance with their own standards and requirements.

In order to provide an opportunity to standardize the skill levels of employees, the European Parliament and Council have adopted the European Qualifications Framework (EQF) on 23 April 2008. The EQF acts as a translation device to make national qualifications more readable across Europe, promoting workers' and learners' mobility between countries and facilitating their lifelong learning. The aim of the EQF is to relate different countries' national qualifications systems to a common European reference framework. Individuals and employers will be able to use the EQF to better understand and compare the qualifications levels of different countries and different education and training systems (European Commission 2012b).

The EQF contains eight levels describing what an employer knows, understands and is able to do. Levels of national qualifications will be related to one of the reference levels of the EQF. This will enable a much easier comparison between national qualifications and may facilitate the recognition of qualifications when people move to another country (European Commission 2012b).

Today, all BSR seaports are regulating their employers' competence individually, with little transnational compatibility (TransBaltic 2012). This has led to a situation where each port has employees with different level of competencies. In some BSR countries qualification and training in the field of port and logistics are still in the phase of adjustment to the European standards, with low demand for standardised services and a primary need to integrate the EQF into the national legislation (TransBaltic 2012).

According to the results of the research, in general the ports are not worried about the competencies of their employees. The ports are saying that every person who is working at their port have competencies correspond to the job. At the same time, the ports acknowledge that some workers have to be "multi skilled" and move between different assignments and they have different competencies.

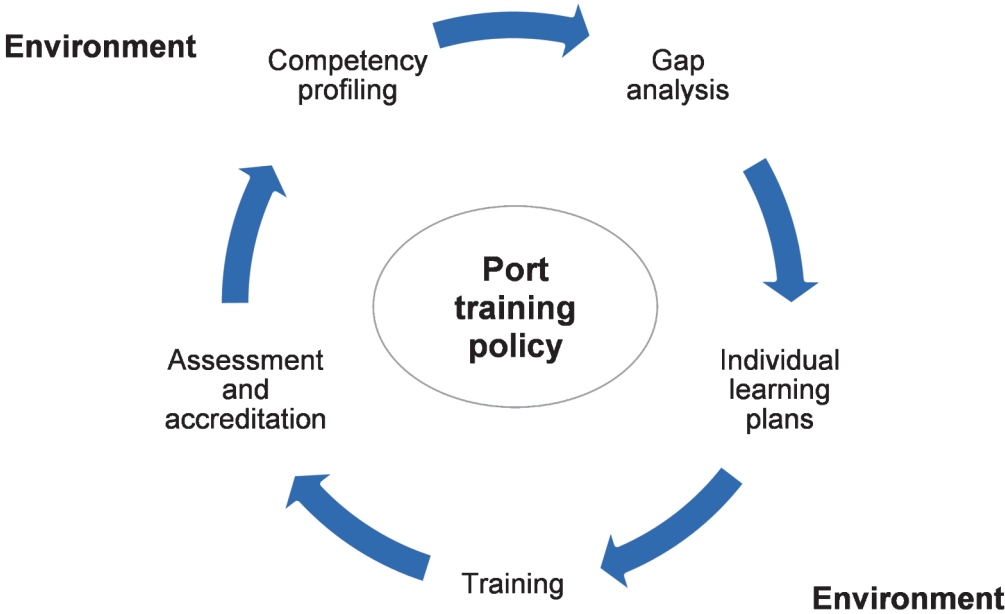
The current study researched, should the port workers have common standard of competence levels within the EU. The overall trend was that the ports are relatively sceptical about the idea. Some ports do not consider it is necessary to harmonize the requirements of their workers with the EQF. The results brought out the fact that ports are too different from each other and it is very hard to require the same levels of competence from all ports.

On the other hand, the EQF system in ports would give to employees the opportunity to raise their skill and knowledge levels. In addition, if a worker has a professional certificate, which is accepted by the other EU countries, it is possible better flow of workers (including the knowledge and skills).

In order to maintain and enhance the competitiveness of BSR's ports, it is important that the ports acknowledge the need to standardize port workers' training systems in the EU level. In 2011, the ILO (International Labour Organization) issued "ILO Guidelines on training in the port sector", which aim was to present a competency-based framework for port worker training methods designed to:

- protect and promote health and safety in ports;
- improve the skills development of port workers and enhance their professional status and welfare;
- secure the greatest possible social and economic advantages from advanced methods of cargo handling and other port operations;
- improve cargo handling efficiency and enhance the quality of service to port clients;
- protect the natural environment in and around the port area, promote decent work and sustainable jobs in ports.

These Guidelines apply to all workers involved in cargo handling in ports and on board vessels, regardless of their employment status (e.g. permanent or casual), job category (e.g. general port workers or specialized equipment operator), experience, years of service or existing levels of skill (ILO 2011). The Guidelines introduces a generic model for competency-based training in the port sector (see figure 5), which states that every organization employing port workers should have a training policy and port training policy provides a guide as to the “what” and the “why” questions that might arise in port worker training in a given context (ILO 2011).



**Figure 5.** Framework for competency-based training in the port sector (source: ILO 2011).

According to the ILO (2011) the competency-based training cycle begins with “competency profiling” that contains defining the competencies required to perform a particular task and combining or packaging these competencies to create recognized qualifications that meet the needs and aspirations of the workforce, the requirements of the employer and the demands of the customer. Once a competency profile has been established for all the different jobs in the port, a “gap analysis” can be undertaken to identify any training deficiencies. By mapping the worker’s individual competency profile onto a competency profile, which lists all the jobs in the port and identifies the job the worker currently occupies, it is possible to rectify any outstanding gaps by means of an “individual learning plan”. Final activity is assessment and accreditation (ILO 2011).

According to the TransBaltic (2012), today, the competences of workers in BSR seaports not matching global demands for labour flexibility. Since, the EQF and competency-based training are the certain future trends, the ports should considering implementing professional standards that are compatible with the EQF and competency-based training into their system. Since demands and supply of labour force are changing trends, it is important to make a comparative review of the existing standards in the BSR ports- to estimate future demand for labour force (TransBaltic 2012).

Diversity of standards in port-logistics qualifications around the BSR is high (TransBaltic 2012). It is important to standardize the port workers competence levels and an important part of implementing the EQF into the systems is national authorities. They should establish

professional standards that are compatible with the EQF. National authorities should introduce the competence standards in port logistics qualifications for all companies and increase state funding for development of competence management systems in ports (TransBaltic 2012).

Ports need appropriate physical and human resources to deliver effective training. For example, well-qualified and highly motivated trainers can make a significant difference to the quality of port worker training, as can modern training facilities such as crane simulators. High-quality training materials are also a key ingredient of effective training (ILO 2011).

Today, the ports are quite sceptical about the idea of EQF and competency-based training. In order to maintain and enhance the region's competitiveness a cooperative approach among the ports, variety of different stakeholders, including employers, unions, educational authorities, training institutions, etc. are essential.

## 2.6 Ballast water directive

Port communities, as important factors in environmental aspects, are often influenced by environmental legislation. From environmental experts' point of view, ballast water represents a major threat to the marine environment and ecosystem. The ballast water that is loaded by ships to stabilise them often contains organisms, e.g. small fishes, benthic organisms or plankton, or pathogenic bacteria, which are released into the environment when the ballast water is discharged. With continued growth of shipping traffic, the probability increases that such organisms survive the transport in ballast water. In this way, numerous invasive alien species have already established populations (Bundesamt für Seeschifffahrt und Hydrographie 2012).

In 2004, IMO adopted the International Convention for the Control and Management of Ships' Ballast Water and Sediments. The Convention will enter into force 12 months after it has been ratified by 30 states representing 35 percent of the world's merchant shipping tonnage (DNV 2012).

The Ballast Water Management (BWM) Convention requires (DNV 2012):

- A ship-specific Ballast Water Management Plan approved by the Administration on board
- A Ballast Water Record Book on board
- Ballast water exchange (Regulation D-1)
- An approved ballast water treatment system (Regulation D-2)
- An International Ballast Water Management Certificate.

The BWM Convention enters into force, from 2016 onwards for existing vessels and from 2011/2012 onwards for new builds (see figure 6 on page 68). It is likely that this standard will require the on-board installation of BWTS, but in theory the standard may also be met with other BWM measures; e.g. improved BWE, port reception facilities (David et al. 2008).

As required by IMO BWE should be undertaken at least 200 nautical miles from the nearest land and in water depths of at least 200 m. If this is impossible, then BWE should be undertaken as far from the nearest land as possible, and in all cases at least 50 nautical

Minimum requirements of the BWM Convention when it will enter into force										
Ship Keel laying	Ship Ballast Water Capacity BWC	2009	2010	2011	2012	2013	2014	2015	2016	2017
Before 2009	1.500 ≤ BWC ≤ 5.000	Ballast Water Exchange	Ballast Water Exchange	Ballast Water Exchange	Ballast Water Exchange	Ballast Water Exchange	Ballast Water Treatment	Ballast Water Treatment	Ballast Water Treatment	Ballast Water Treatment
	BWC < 1.500; BWC > 5.000	Ballast Water Exchange	Ballast Water Exchange	Ballast Water Exchange	Ballast Water Exchange	Ballast Water Exchange	Ballast Water Treatment	Ballast Water Treatment	Ballast Water Treatment	Ballast Water Treatment
2009	BWC < 5.000	Ballast Water Exchange	Ballast Water Exchange	(1)	Ballast Water Treatment	Ballast Water Treatment	Ballast Water Treatment	Ballast Water Treatment	Ballast Water Treatment	Ballast Water Treatment
	BWC ≥ 5.000	Ballast Water Exchange	Ballast Water Exchange	Ballast Water Exchange	Ballast Water Exchange	Ballast Water Exchange	Ballast Water Exchange	Ballast Water Exchange	Ballast Water Exchange	Ballast Water Exchange
2010 - 2011	BWC < 5.000	Ballast Water Treatment	Ballast Water Treatment	Ballast Water Treatment	Ballast Water Treatment	Ballast Water Treatment	Ballast Water Treatment	Ballast Water Treatment	Ballast Water Treatment	Ballast Water Treatment
	BWC ≥ 5.000	Ballast Water Exchange	Ballast Water Exchange	Ballast Water Exchange	Ballast Water Exchange	Ballast Water Exchange	Ballast Water Exchange	Ballast Water Exchange	Ballast Water Exchange	Ballast Water Exchange
2012	All BWC	Ballast Water Treatment	Ballast Water Treatment	Ballast Water Treatment	Ballast Water Treatment	Ballast Water Treatment	Ballast Water Treatment	Ballast Water Treatment	Ballast Water Treatment	Ballast Water Treatment
<b>Legenda</b>		Note:								
Ballast Water Exchange	(1) ships constructed in 2009 and with a ballast water capacity of less than 5000 cubic meters are not required to comply with Ballast Water Treatment (D-2 standard) until their second annual survey, but no later than 31 December 2011.									
Ballast Water Treatment										

Figure 6. Implementation table of BWM convention (source: Gaggero 2010).

miles from the nearest land and in water at least 200 m in depth (see figure 7) (David et al. 2008).

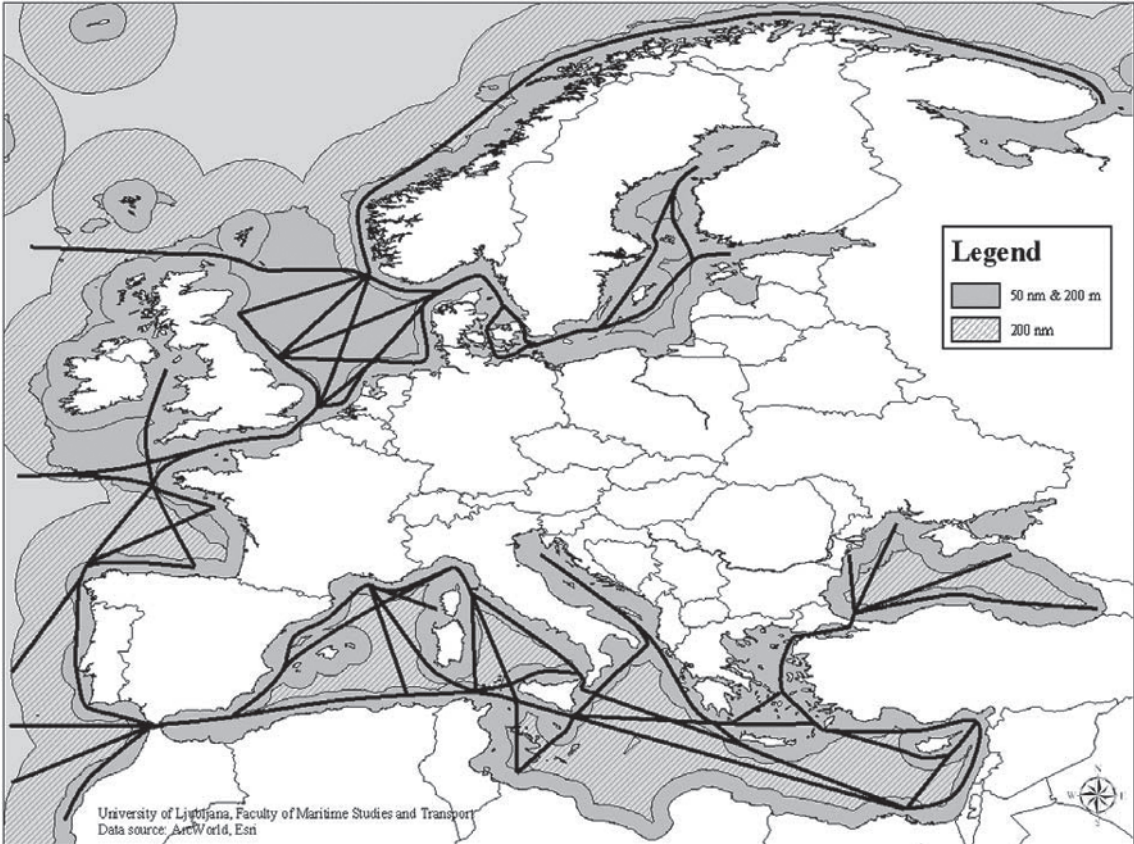


Figure 7. The seas surrounding the EU with the 50 nautical miles and 200 m depth limit shown in dark grey, and light grey shaded the 200 nautical miles limit. The black lines show the main shipping routes (source: David et al. 2008).

In order to meet the new standards, ship-owners are required to invest in their ships and they should choose carefully between varieties of technologies to use their ships. Research and science field have been developing different possibilities to choose from. Table 5 presents different technologies for ballast water treatment systems.

**Table 5.** Different technologies for ballast water treatment systems (source: DNV 2012)

<b>Solution</b>	<b>Pros</b>	<b>Cons</b>
<b>Filters</b>	Self-cleaning Easy installation Easy maintenance	Reduced efficiency in high sediments waters Flow rate reduction Pressure drop
<b>UV</b>	Efficient Easy installation Minimal safety issues Independent of salinity	Reduced efficiency in high sediments waters High power consumption Two-way treatment
<b>Electrolysts</b>	On-board disinfection Efficient One-way treatment	Reduced efficiency in water with low salinity High power consumption Uses hydrogen Corrosion
<b>Cavitation</b>	Efficient Independent of salinity	Pressure drop
<b>Chemical injection</b>	Low cost One-way treatment Easy installation	Safety Storage Corrosion
<b>Ozonation</b>	Efficient Independent of salinity One-way treatment	Corrosion Safety
<b>De-oxygenation</b>	Corrosion Easy installation	Lower efficiency Maintenance of IG system Holding time High fuel cost of producing IG

Like any other use of new technology, ballast water treatment systems require additional costs from ship-owners and make the whole process more expensive. The impact of this regulation is increased costs. This process would include different costs (Gaggero 2010):

- Cost of the ballast water treatment system;
- Increase of costs due to more powerful diesel generator;
- Increase of costs due to more powerful ballast water pumps/electric engine;
- Re-design costs.

As this requirement adds additional costs to ship-owners, it will influence the ports activities as well. According to David et al. (2008), one way to meet the new standards is to place port reception facilities at the ports. This solution will add new administrative procedures in ports daily work. In addition, all new costs will have negative impact on ship-owners businesses which are the most important part of every ports work. Ports should find ways to meet the needs of ship owners.

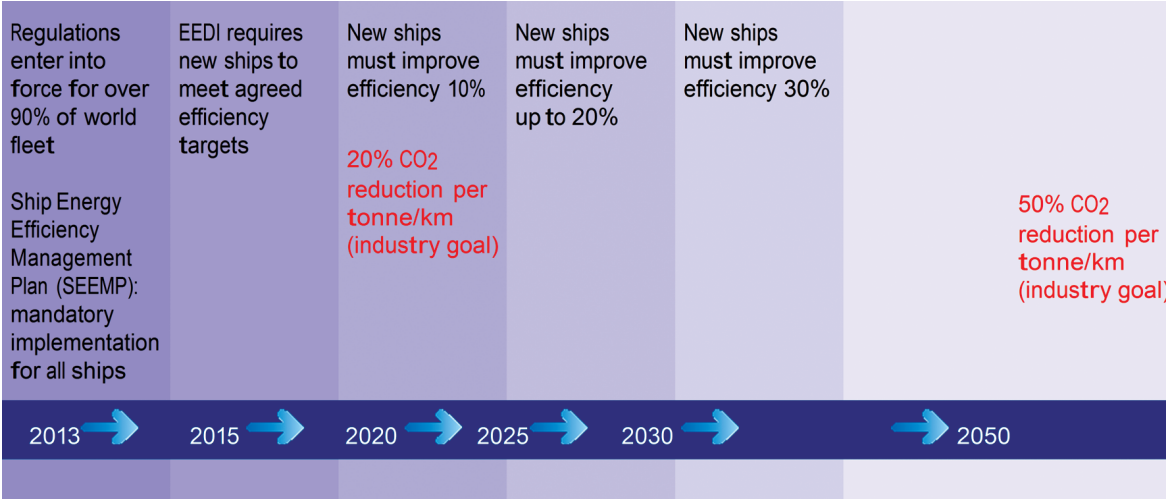
From a biological perspective it does not at all make sense if one state implements the BWM measures to avoid species introductions when a neighbouring state ignores this problem, since after introduction species may migrate by their natural means and eventually reach neighbouring jurisdictions (David et al. 2008). It is important that all countries would implement BWM measures, as regional different BWM approaches would complicate shipping (David et al. 2008).

In order to adapt with the regulation, ship-owners should find effective methods to meet the standard. Also, close cooperation should be established with the various bodies developing BWM measures in Europe to assist in the harmonization of BWM requirements all over Europe and consideration should be given toward the participation/involvement of non-EU states that are neighbouring European seas (David et al. 2008).

### 2.7 Carbon Dioxide emissions limits

Reduction of the greenhouse gas CO<sub>2</sub> is one of the key goals which the global maritime industry has set itself (Hamburg Messe 2012). The first CO<sub>2</sub> regulations were adopted by IMO in July 2011. Governments at IMO agreed a comprehensive package of technical regulations for reducing shipping’s CO<sub>2</sub> emissions which will enter into force in January 2013 (ICS 2012).

IMO’s work on measures to enhance ships’ energy efficiency and thereby control and reduce greenhouse gas emissions includes the Energy Efficiency Design Index (EEDI) and Ship Energy Efficiency Management Plan (SEEMP). The adopted regulations allow flag states to postpone the implementation of the EEDI by up to four years (DNV 2011b). Figure 8 shows IMO agreement on technical regulations will reduce ships’ CO<sub>2</sub> (MARPOL Annex VI, Chapter 4 adopted July 2011).



**Figure 8.** IMO agreement on technical regulations will reduce ships’ CO<sub>2</sub> (MARPOL Annex VI, Chapter 4 adopted July 2011) (source: ICS 2012).

The EEDI is a mathematical formula that provides a specific energy-efficiency figure for an individual ship design, expressed in grams of CO<sub>2</sub> per ship’s capacity-mile. A smaller EEDI value means a more energy-efficient ship design. The EEDI applies to new builds only. The new builds are (DNV 2011a):

- For which the building contract is placed on or after 1 January 2013.
- In the absence of a building contract, the keel of which is laid or which is at a similar stage of construction on or after 1 July 2013; or
- The delivery of which is on or after 1 July 2015.

The regulation differentiates between ship types which are required to calculate an Attained EEDI and those that must have an Attained EEDI below a certain Required EEDI (DNV 2011a).

The SEEMP provides a management plan approach for monitoring ship and fleet efficiency performance over time. The SEEMP will be mandatory for all vessels over 400 GT that are covered by MARPOL Annex VI, and the entry into force date is the same as for the EEDI - 1 January 2013. All ships will be required to hold a SEEMP on board at the time of their first MARPOL IAPP certificate renewal or intermediary survey after 1 January 2013. This will then form the basis for issuing the new mandatory International Energy Efficiency Certificate (IEEC) (DNV 2011a).

A number of guidelines are going to be developed during the next few years (DNV 2011a):

- July 2013 – MEPC 65: Guidelines for CO<sub>2</sub> abatement technologies
- March 2014 – MEPC 66: Guidelines for calculation of EEDI for Ro-Ro, passenger, diesel-electric and hybrid propulsion ships

In addition, another CO<sub>2</sub> emissions reduction requirement comes from the overall pressure from the EU and IMO institutions to reduce greenhouse gas (GHG) from all transport modes. In order to achieve the reduction, one possibility is to use shore-side electricity systems in the ports. Shore-side electricity systems are effective solutions to reduce CO<sub>2</sub> emissions from berthed ships, but these require a major investment from the ports to the infrastructure that they could offer the shore power to the ships. Many ports do not have the necessary finances to invest and the pay-back period may be too long. Another problem with the use shore-side electricity systems is the unstandardized systems that cause confusion among related parties. The systems in the port and the system on the boards of the ship have to fit together. Finally, every new technology requires new investment from the ship-owners and ports and this may reflect in the transports costs and raise the overall prices which lead decrease in maritime transport and have negative effect on the ports' economies.

In order to adapt the CO<sub>2</sub> emissions standards and maintain the competitiveness at the same time, the ports should consider the need of available shore-side electricity on the quays. On the higher level, the legislators should give out guidelines to help the ship-owners and other related parties to adapt the requirements. Also, the legislators should determine the certain standards to the shore-side electricity systems in order to avoid confusion among related parties. The ship-owners should carefully choose the new technologies in their vessels to meet the new standards. In addition, science and research institutions should invent new solutions in order to help maritime community to adapt to the new regulations.

## **2.8 Maritime surveillance systems- AIS**

Complex administrative procedures are one of the major barriers to the ports. As ports' communities consist of several different institutions, the ship-owners are often required to go through complicated procedures when entering and leaving the port. In order to make the information exchange easier and faster between ships and authorities, the IMO adopted reg-



ulation 19 of SOLAS Chapter V - Carriage requirements for ship borne navigational systems and equipment - sets out navigational equipment to be carried on board ships, according to ship type. In 2000, IMO adopted a requirement (as part of a revised new chapter V) for all ships to carry automatic identification systems (AISs) capable of providing information about the ship to other ships and to coastal authorities automatically (IMO 2011d).

The automatic identification system (AIS) is autonomous and continuous vessel identification and monitoring system used for maritime safety and security which allows vessels to electronically exchange with other nearby ships and authorities ashore the vessel identification data, position, course and speed (European Commission 2012c). The IMO regulation requires that AIS shall (IMO 2011d):

- provide information - including the ship's identity, type, position, course, speed, navigational status and other safety-related information - automatically to appropriately equipped shore stations, other ships and aircraft;
- receive automatically such information from similarly fitted ships;
- monitor and track ships;
- exchange data with shore-based facilities.

The IMO regulation 19 of SOLAS is already in force for all major types of ships in the EU, except fishing vessels. According to the European Commission (2012c), the EU fishing vessels will gradually need to be equipped with AIS transmitters:

- As from 31 May 2012: all vessels above 24 m
- As from 31 May 2013: all vessels above 18 m
- 31 May 2014: all vessels above 15 m.

The European Maritime Safety Agency (EMSA) had launched a "Blue Belt" project in May 2011. The long term objective of the "Blue Belt" concept is to create a European maritime transport space without barriers, where ships are able to operate freely with a minimum of administrative formalities, irrespective of their flag. The "Blue Belt" was complemented by "Blue Lanes" which refer to administrative, technological or physical facilitations granted by ports and customs authorities to ensure swift processing of goods in free circulation in the EU (EMSA 2012). The project was launched in cooperation with the Member States' authorities.

The Blue Belt project provides ship notification reports to customs authorities, with the aim of supporting customs by providing information about the voyages of vessels engaged in intra-EU trade. The notification reports are generated automatically by a specific module of the Community vessel monitoring system, SafeSeaNet (SSN), and delivered to the relevant customs authority two hours before a ships estimated arrival. The project monitored 253 vessels (the "Blue Ships"), which participated in the project on a voluntary basis (EMSA 2012).

The ship notification reports, delivered to the customs authorities, composed of attachments (EMSA 2012):

- the voyage report containing information about the vessel, its recent ports of call and the last voyage details;
- a screen shot indicating the Blue Belt ship track toward the destination port, plotted on a nautical chart.

According to the EMSA evaluation report (2012), generally the blue belt notification report was received on time though in some cases it arrived slightly before the arrival or in few cases too late in respect of the actual ship's arrival and there were around 26,000 calls from Blue ships at EU ports during the operational phase (5 May – 2 November 2011). The evaluation report (2012) stated that the project did not lead to simplifications in customs procedures for

ships sailing between EU ports as the current legal framework has remained unchanged. But nevertheless numbers of suggestions were made to improve the concept. For example, to improve the automated information integration with other existing (national or other) systems and to include cargo information; to extend the service to include all vessels trading in the EU; to enhance the information about vessel voyages (EMSA 2012).

In summary, the AIS and Blue Belt concept have made the information exchange between relevant parties easier and faster, but in order to speed up processes at port level the changes in the customs procedures have to be made. The ports and other related parties should work more together to maintain and increase the competitiveness of ports.

## **2.9 Sanitary and veterinary regulations**

In general, a number of different acts are regulating the sanitary and veterinary cargo trade between the EU countries and the third countries. The Penta ports have many trading routes between the third countries and according to the Estonian Maritime Academy (2012) the trade with the third countries have been causing a number of barriers to the ports.

The non-EU goods have more complicated procedures, for example, the third countries regulations for food. The multiplicities of required documents and constantly changing regulations have been causing a lot of barriers in the work of Penta ports (Estonian Maritime Academy 2012). In order to avoid delays and unnecessary work in the ports, the ports and the representatives of third countries should work more together to guarantee a continuous flow of goods and work efficiency of ports.

Although, all regulations concerning sanitary and veterinary cargo trade between the EU ports have been issued and the movement of cargo should be unhampered, still there are few cases where inside EU the cargo flows through ports have barriers. The Estonian Maritime Academy (2012) brought out one example where food test results from German laboratory were not accepted by other authority of the EU and the country wanted to make their own tests. Such situations decrease the speed of port operations and the overall competitiveness of the ports.

The sanitary and veterinary cargo trade between the EU countries and the third countries and even inside the EU requires lot of paper work and time. All these procedures should be simpler and carried out faster. Inside the EU all laboratory tests should be standardized and the ports should have more knowledge about the tests they accept and do not. Trading with the third countries is an important part of the Penta ports' work and in order to maintain the competitiveness the procedures should be more standardized and the co-operation between parties should be more effective.

## **2.10 Comparative analysis of port dues**

### **Estonia**

Port of Tallinn has stable tariffs, although number of discounts provided to different type of ships depends on number of calls. Port of Tallinn is 100% state enterprise, therefore number of state regulations and acts are limiting their activity. Specialty is that cargo related charges

(cargo dues) are for ship owners rather low; the main payer of cargo dues is port operator (stevedoring company).

Fairway Dues regulations were renewed recently, new system of tariffs will take effect very soon. The government intended to renew these tariffs already in last year, but great number of owners, expeditors, port operators and other companies concerned protested very strongly against.

Therefore the tariffs have been changed several times. Now the new regulations will be in force as from 1 of July 2013. No one is completely satisfied, but kind of compromise was founded. In general, state income on new fairway dues will increase some 20 million • annually. Of course, there is the danger to lose some cargo flow and (cruise) passengers.

## **Finland**

In Finland all the ship dues and charges are based on net tonnage (NT), not on gross tonnage (GT). Finnish Act on Fairway Dues stipulates that „For the purposes of this Act: passenger ship means a ship that may carry at least 120 passengers but is not a cruise ship or a high-speed craft;...“

Therefore, practically Ro-Pax ships with Pax-number under 120 are considered as cargo vessels. The level of fairway dues is depending on the ship type and ice class.

Helsinki port tariffs have also the same specialty: there are two categories of vessel charges – mostly cargo carrying vessels or mostly passengers carrying vessels. The Ro-Pax types are carrying mostly cargo. These specialties are understandable as Helsinki is the main passenger and ferry port of Finland. Port of Turku and Port of Naantali tariffs have lower level of ship-related charges than Helsinki. All Finnish ports have considerably high cargo related charges (compared to Tallinn).

## **Sweden**

The Swedish fairway dues are divided in two parts, one fee is based on the cargo quantity shipped and one fee is based on vessels gross tonnage. Furthermore there is an environmental differentiation built into the fairway due system.

Since 1<sup>st</sup> of April 2008 following regulations apply:

- On CARGO

Fairway due on cargo loaded or discharged SEK 3.05 / MT or unit, except for low value cargoes such as sand, stone, gravel etc. SEK 0.80 / MT.

- On VESSELS GT and emission (SO<sub>x</sub>, NO<sub>x</sub>)

The fairway dues are applicable on all vessels except those on voyage between Brofjorden/ Gothenburg and the lake Vanern ports.

GT-based dues are debited only once if cargo to be discharged/loaded at more than one Swedish port or carried both ways. Max 2 times per calendar month and 24 times per calendar year. Ship owners are responsible for payment of both cargo and ship related fairway dues. Stockholm harbor dues are more complicated than others.

## **Comparison**

In order to compare the port dues in PENTA ports we should approach on basis of the same vessel. For these purpose 3 different scenarios were created using interactive excel table with 3 vessel types (see table 6).

**Table 6.** Three scenarios for comparing the port dues in PENTA ports.

	<b>1 Scenario</b>	<b>2 Scenario</b>	<b>3 Scenario</b>
<b>Type</b>	Ro-Ro	Ro-Pax	Ro-Ro
<b>Gross tonnage GT</b>	6 040	14 297	24 688
<b>Net Tonnage NT</b>	1 812	4 290	7 407
<b>Ro-Ro Cargo capacity (lane meters)</b>	780	1100	3000
<b>Passenger capacity</b>	12 PAX (in drivers' cabins)	100 PAX (in drivers' cabins)	12 PAX (in drivers' cabins)
<b>Ice class</b>	I A	I A	I A
<b>Cargo (average per call, Ro-Ro units)</b>	56 units	80 units	210 units
<b>Drivers</b>	20 pax in & out	40 pax in & out	20 pax in & out
<b>Number of calls to each port</b>	150	150	150

Cargo is chosen to be standard Ro-Ro cargo flow: trailers, lorries, truck + trailer and other wheeled units. The payload of each unit is approximately 17 tons. The ships are calling theoretically to each port 3 times per week, i.e. making 150 calls per year.

The ship port dues and charges are divided into three main groups:

1. Ship related charges
2. Cargo related charges
3. Fairway dues

All three countries have different approaches to these official tariffs, but anyhow it is possible to compare if we take all three groups in total. No other expenses (pilotage, tugboats etc.) are taken into account.

For a conclusion it can be said that the ports Turku, Naantali and Tallinn although with different systems, the total port dues and charges per call have a small difference and the ports Stockholm and Helsinki have the highest total per call. However, for a vessel visiting Port of Tallinn the average total per call depends more on the vessels' size than in the other ports. As the cargo related calculations are hard to believe very exact, please consider these figures as directing only. The tables 7 below are calculated on the year basis and as average figures for one call. Under scenario 2 the Ro-Pax ship is considered passenger vessel (having passenger certificate), two others are cargo ships. It makes big difference in Port of Tallinn.

**Table 7.** Comparative analysis of port dues in case of 1<sup>st</sup> scenario, Ro-Ro vessel GT 6040.

<b>In case of 1<sup>st</sup> scenario</b>	<b>Tallinn</b>	<b>Helsinki</b>	<b>Naantali</b>	<b>Turku</b>	<b>Stockholm</b>
<b>Port charges</b>	1 478	1 008	867	711	1 030
<b>Cargo dues</b>	252	1 848	1 680	1 680	3 407
<b>Fairway dues</b>	121	293	293	293	340
<b>Total per call</b>	<b>1 850</b>	<b>3 148</b>	<b>2 839</b>	<b>2 684</b>	<b>3 777</b>

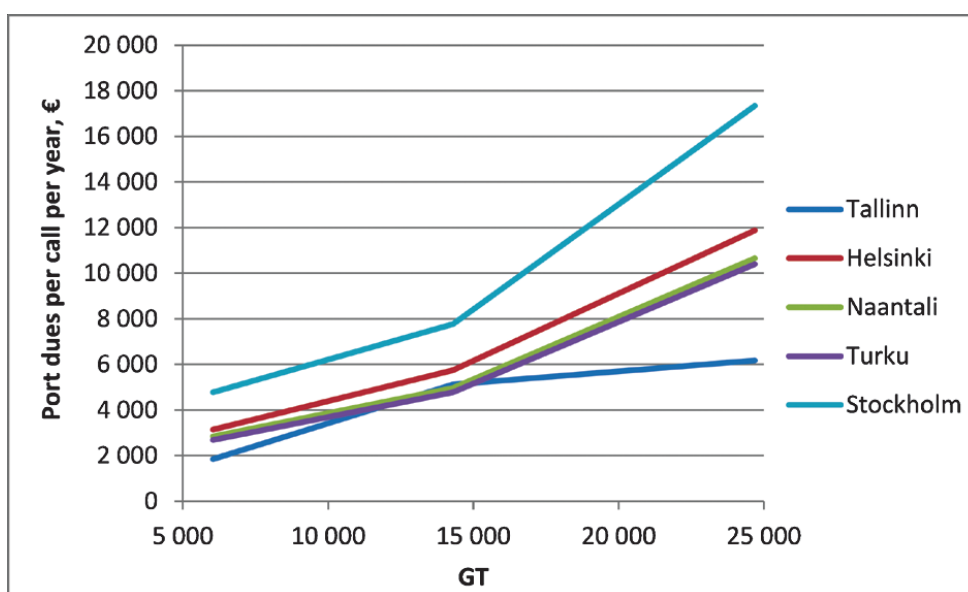
**Table 8.** Comparative analysis of port dues in case of 2<sup>nd</sup> scenario, Ro-Pax vessel GT 14297.

In case of 2 <sup>nd</sup> scenario	Tallinn	Helsinki	Naantali	Turku	Stockholm
Port charges	3 048	2 414	1 879	1 684	2 151
Cargo dues	360	2 640	2 400	2 400	4 837
Fairway dues	1 716	693	693	693	786
<b>Total per call</b>	<b>5 123</b>	<b>5 747</b>	<b>4 972</b>	<b>4 777</b>	<b>7 774</b>

**Table 9.** Comparative analysis of port dues in case of 3<sup>rd</sup> scenario, Ro-Ro vessel GT 24688.

In case of 3 <sup>rd</sup> scenario	Tallinn	Helsinki	Naantali	Turku	Stockholm
Port charges	4 731	3 760	3 162	2 907	3 266
Cargo dues	945	6 930	6 300	6 300	12 698
Fairway dues	494	1 196	1 196	1 196	1 384
<b>Total per call</b>	<b>6 170</b>	<b>11 886</b>	<b>10 658</b>	<b>10 403</b>	<b>17 347</b>

\*All charges and dues are in euros, Stockholm port charges are converted into euro at the rate of Eesti Pank 1 euro = 8.7083 SEK



**Figure 9.** Changes in port dues based on the ship size (GT).

## Recommendations

The current chapter contains recommendations to the relevant parties concerning all above mentioned coming requirements. The recommendations are given in a tabular form. The table is divided in nine sections, each describing the topic of coming requirements. Each section of the table includes five subsections which describes briefly the background of the subjects, brings out the main impacts of the regulation, highlights the main parties to whom the topic may concern, defines the main region where the theme is the most topical and finally gives the recommendations to the relevant parties how to adapt the coming requirements.

**Table 10.** Recommendations to the ports and other related parties based on the study.

1. Sulphur Oxide emissions standards	
<b>Background</b>	<ul style="list-style-type: none"> <li>• The MARPOL Annex VI regulation 14 sets limits on the SO<sub>x</sub> content of marine fuel oils.</li> <li>• EU Sulphur directive (Directive 1999/32/EC amended by Directive 2005/33/EC) sets also standards for the sulphur content in marine fuels.</li> <li>• Inside the SECA the limit of SO<sub>x</sub> content in marine fuel is 0.10% m/m on and after 1 January 2015.</li> <li>• The global limit of SO<sub>x</sub> emission is determined 0.50% m/m on and after 1 January 2020 (date could be deferred to 1 January 2025).</li> <li>• An option of using any fitting material, appliance or apparatus to be fitted in a ship or other procedures, alternative fuel oils, or compliance methods used as an alternative in order to meet the regulation standards.</li> </ul>
<b>Impact</b>	<ul style="list-style-type: none"> <li>• An increased fuel price due to sharply increased demand for the low sulphur fuel.</li> <li>• Low availability of fuel with the required sulphur content.</li> <li>• Technical problems in installing scrubbers on existing ships.</li> <li>• Ports are required to receive scrubbers' residues, which will increase port fees.</li> <li>• Third parties must establish residues processing chemical plant factories.</li> <li>• Low availability of alternative fuels (e.g. LNG) in ports.</li> <li>• Operating ships in SECAs will become disproportionately more expensive.</li> </ul>

	<ul style="list-style-type: none"> <li>• Rise to a shift of cargoes currently transported by ship onto land transport.</li> <li>• Transport chain will change to shorter sea routes.</li> <li>• The competitiveness of the SECA area will decrease.</li> <li>• The increased use of other potential transport corridors in order to avoid the SECA area.</li> <li>• Such programmes like TEN-T and Motorways of the Sea might changes completely.</li> </ul>
<b>To whom it may concern (TWIMC)</b>	<ul style="list-style-type: none"> <li>• EU institutions</li> <li>• Public administration (national/regional/local)</li> <li>• Port authorities</li> <li>• Port community</li> <li>• Fuel suppliers and providers</li> <li>• Ship-owners</li> <li>• Logistic companies</li> <li>• Industries- shipbuilding and ship repair factories</li> <li>• Science and research institutions</li> </ul>
<b>Region</b>	<ul style="list-style-type: none"> <li>• SECA area</li> <li>• EU</li> </ul>
<b>Recommendations</b>	<ul style="list-style-type: none"> <li>• Identify transnational corridors in the BSR where effect of this regulation would be the greatest, to whom in concerns.</li> <li>• Make investments on EU level in the selected transnational transport corridors, which are crucial in order to maintain the competitiveness of the BSR.</li> <li>• Most relevant groups of interest operating in the BSR (e.g. port authorities, cargo owners, road/rail/maritime transport operators etc.) should work together in order to maintain the competitiveness of the BSR.</li> <li>• EU should find financial aid packages to support the implementation of the regulation.</li> <li>• National Governments should support maritime enterprises to implement the regulation.</li> <li>• Inside EU, the requirements for SO<sub>x</sub> emissions should be identical in order to maintain equal economic conditions of competition.</li> <li>• Ports should plan to make investments in infrastructure for bunkering of new fuels and SO<sub>x</sub> waste reception.</li> <li>• Ports should work together with fuel suppliers and providers to investigate the need to make investment in alternative fuel facilities.</li> <li>• Ports should be ready to receive scrubber residues from ships and work together with third parties to organize the handling of scrubber residues.</li> </ul>

- Ship-owners should carefully choose the fuel and engine type, when purchasing new vessels.
- Ship-owners should carefully choose which technology to use in existing ships.
- Logistics companies should calculate and plan new routes for cargo flows in order to maintain their competitiveness.
- Industries, in particular shipbuilding and ship repair factories should be ready to rebuild existing vessels.
- Science and research institutions should invent new solutions in order to help maritime community to adapt to the new situation.

## 2. Nitrogen Oxide emissions standards

### Background

- The MARPOL 73/78 Annex VI regulation 13 sets limits NO<sub>x</sub> emission from diesel engines.
- The control of NO<sub>x</sub> emissions is implemented in new ships engines.
- The limits are depending of the engine's rated speed.
- The NO<sub>x</sub> Technical Code 2008 specifies the requirements for testing, survey and certification of marine diesel engines.
- The basic regulations include a variety of further restrictions and requirements.

### Impact

- Ship-owners are required to adopt new technologies.
- The use of new technology adds additional costs to ship-owners.
- Designation of the Baltic Sea as a NECA would increase the freight rates of shipping.
- The increased freight rates might lead to some modal shift in the BSR.
- Decreased quantities of goods and modal shift from sea to land transport will have negative impacts on the ports as well as the entire maritime sector

### To whom it may concern (TWIMC)

- EU institutions
- Port authorities
- Port community
- Ship-owners
- Science and research institutions

### Region

- BSR
- NECA
- EU

- Ship-owners should choose carefully between different methods to meet the standards.



## Recommendations

- Identify transnational corridors in the BSR where effect of this regulation would be the greatest.
- All related parties should work together to maintain the competitiveness of the BSR.
- The ports should find ways to improve their competitiveness, for example lower port dues.
- Science and research institutions should find innovative new fuels, engines and exhaust gases emission reducing system.

## 3. Co-operation in IT-field

### Background

- No specific regulation that would establish requirements for the ports' IT-systems.
- Diversity of standards in electronic communication.
- The ports are allowed to choose independently which tools and systems they use.
- The EU has decided to move towards common standards, such as maritime single window system.
- A draft roadmap "Integrated Maritime Surveillance: a Common Information Sharing Environment for the European Union maritime domain".
- Ports are using different IT-systems and tools from each other.
- IT systems and tools are not compatible.
- Some IT-systems used in ports have no option for checking the data quality.
- Many failures in IT-systems.
- In case of IT-system failures, an alternative system is typically absent.
- Often IT-systems GUI are not user-friendly.
- No financing and supporting program for the ports community to create common EU IT-system.

### Impact

- Lack of trust in different IT-systems.
- Customers are obliged to provide several different authorities with the same reports and data and enter the same information multiple times into different systems.
- Wasting of time and resources for entering data into different systems.
- Decrease the reliability of the data due to diversity of standards in electronic communication.
- Users have hard time to learn how to use IT-systems due to poor GUI.
- Weaker competitiveness of ports compared to those EU ports that have common IT platforms.

<b>To whom it may concern (TWIMC)</b>	<ul style="list-style-type: none"> <li>• EU institutions</li> <li>• Public administration (national/regional/local)</li> <li>• IT enterprises/organisations</li> <li>• IT software companies</li> <li>• Port authorities</li> <li>• Port community</li> </ul>
<b>Region</b>	<ul style="list-style-type: none"> <li>• EU</li> <li>• BSR</li> </ul>
<b>Recommendations</b>	<ul style="list-style-type: none"> <li>• The BSR transnational transport corridors should have standardized IT platforms recommended by EU.</li> <li>• IT systems should be reserved to obtain higher reliability.</li> <li>• The future EU Maritime Common Information Sharing Environment should be easy to use.</li> <li>• The future EU Maritime Common Information Sharing Environment should require minimum implementation costs for the user.</li> <li>• The future EU Maritime Common Information Sharing Environment should bring benefits to all participants.</li> <li>• IT-systems should have user-friendly and easy to learn Maritime Single Window GUI.</li> </ul>
<b>4. Schengen regulation</b>	
<b>Background</b>	<ul style="list-style-type: none"> <li>• Schengen regulations concerning to short-time visas of cruise passengers from third countries are causing misunderstanding.</li> <li>• Border guards have difficulty knowing how to properly mark the short-time visas.</li> <li>• A full passport control has been made obligatory (inward and outward clearance) in every port during the cruise voyage from third countries.</li> </ul>
<b>Impact</b>	<ul style="list-style-type: none"> <li>• This regulation has led to delays in border controls.</li> <li>• The current situation has a negative impact on the cruise business and clients.</li> <li>• It will discourage more potential customers in the Baltic cruise business.</li> <li>• Negative financial impact might affect all ports and stakeholders involved, including local participating cities and their economies due to a decline in amount of visitors.</li> </ul>
<b>To whom it may concern (TWIMC)</b>	<ul style="list-style-type: none"> <li>• EU authorities</li> <li>• Port authorities</li> <li>• Border Guard</li> </ul>

<b>Region</b>	<ul style="list-style-type: none"> <li>• Schengen area</li> <li>• EU</li> </ul>
<b>Recommendations</b>	<ul style="list-style-type: none"> <li>• EU should change the passport control at each Schengen call ports, and revert to the condition where passport controls were carried out when entering the first Schengen port and when exiting the last Schengen port.</li> <li>• Border guards and port authorities should work more together and have enough resources.</li> <li>• Implement new technical solutions and enough manpower to increase throughput in border control to avoid queues in border control.</li> <li>• Simplify procedures or regulations to avoid delays in border control.</li> </ul>

## 5. Competence management in port community

<b>Background</b>	<ul style="list-style-type: none"> <li>• Investment in human resources and securing so called social sustainability is essential for ports to satisfy the demand for qualified labour and stay competitive.</li> <li>• Growing demand for labour flexibility in port-related logistics, growing intensity of cargo handling, more and more use of ICT in port operations and the international regulations and standards (e.g. the EU/ILO/IMO) are requiring ports to think more about employees competence management in ports communities.</li> <li>• In order to provide an opportunity to standardize the skill levels of employees, the European Parliament and Council have adopted the European Qualifications Framework (EQF).</li> <li>• All BSR seaports are regulating their employers' competence individually, with little transnational compatibility</li> </ul>
<b>Impact</b>	<ul style="list-style-type: none"> <li>• Diversity of standards in port-logistics qualifications around the BSR.</li> <li>• Ports have employees with different level of competencies.</li> <li>• In some BSR countries qualification and training in the field of port and logistics are still in the phase of adjustment to the European standards, with low demand for standardized services and a primary need to integrate the EQF into the national legislation.</li> <li>• Ports are not worried about the competencies of their employees.</li> <li>• Some workers have to be “multi skilled” and move between different assignments and they have different competencies.</li> <li>• Some ports do not consider it is necessary to harmonize the requirements of their workers with the EQF.</li> </ul>

<b>To whom it may concern (TWIMC)</b>	<ul style="list-style-type: none"> <li>• EU institutions</li> <li>• Public administration (national/regional/local)</li> <li>• Port authorities</li> <li>• Port communities</li> <li>• Port workers' associations</li> <li>• Universities (maritime)</li> </ul>
<b>Region</b>	<ul style="list-style-type: none"> <li>• BSR</li> <li>• EU</li> </ul>
<b>Recommendations</b>	<ul style="list-style-type: none"> <li>• Authorities should make a comparative review of the existing standards in the BSR ports- to estimate future demand for labour force.</li> <li>• National authorities should introduce minimum standards in port logistics qualifications for all companies.</li> <li>• National authorities should establish professional standards that are compatible with the EQF.</li> <li>• National authorities should increase state funding for development of competence management systems in ports.</li> <li>• Ports should consider implementing professional standards that are compatible with the EQF and competency-based training into their system.</li> <li>• Ports, variety of different stakeholders, including employers, unions, educational authorities, training institutions, etc. should work together to maintain and enhance the competitiveness of BSR.</li> </ul>
<b>6. Ballast water directive</b>	
<b>Background</b>	<ul style="list-style-type: none"> <li>• From environmental experts' point of view, ballast water represents a major threat to the marine environment and ecosystem.</li> <li>• IMO adopted the International Convention for the Control and Management of Ships' Ballast Water and Sediments.</li> <li>• The BWM Convention enters into force, from 2016 onwards for existing vessels and from 2011/2012 onwards for new builds.</li> <li>• As required by IMO BWE should be undertaken at least 200 nautical miles from the nearest land and in water depths of at least 200 m.</li> </ul>
<b>Impact</b>	<ul style="list-style-type: none"> <li>• Ship-owners are required to use on-board installation of BWTS or other BWM measures.</li> <li>• Ports may be required to invest new port reception facilities.</li> <li>• The regulation adds additional costs to ship-owners (such as ballast water treatment systems, more powerful diesel generator, more powerful ballast water pumps/electric engine, re-design costs).</li> </ul>

	<ul style="list-style-type: none"> <li>Regional different BWM approaches would complicate shipping.</li> </ul>
<b>To whom it may concern (TWIMC)</b>	<ul style="list-style-type: none"> <li>EU institutions</li> <li>Public administration (national/regional/local)</li> <li>Port community</li> <li>Ship-owners</li> <li>Industries- shipbuilding and ship repair factories</li> <li>Science and research institutions</li> </ul>
<b>Region</b>	<ul style="list-style-type: none"> <li>BSR</li> <li>EU</li> </ul>
<b>Recommendations</b>	<ul style="list-style-type: none"> <li>Close cooperation should be established with the various bodies developing BWM measures in Europe to assist in the harmonization of BWM requirements all over Europe.</li> <li>Consideration should be given toward the participation/involvement of non-EU states that are neighbouring European seas.</li> <li>All countries should implement BWM measures.</li> <li>Ballast water reception should be implemented in ports.</li> <li>Ship-owners should find effective methods to meet the standard.</li> </ul>

## 7. Carbon Dioxide emissions standards

<b>Background</b>	<ul style="list-style-type: none"> <li>Reduction of the greenhouse gas CO<sub>2</sub> is one of the key goals which the global maritime industry has set itself.</li> <li>The first CO<sub>2</sub> regulations were adopted by IMO in July 2011.</li> <li>Governments at IMO agreed a comprehensive package of technical regulations for reducing shipping's CO<sub>2</sub> emissions which will enter into force in January 2013.</li> <li>The adopted regulations allow flag states to postpone the implementation of the EEDI by up to four years.</li> </ul>
<b>Impact</b>	<ul style="list-style-type: none"> <li>Ship-owners are required to find new ways to meet the emissions standards.</li> <li>Ship-owners are required to invest new technology on board of vessels.</li> <li>Ports are required to invest in the infrastructure to maintain the competitiveness.</li> <li>New investments may lead to overall raise in maritime transport costs.</li> </ul>
	<ul style="list-style-type: none"> <li>EU institutions</li> <li>Public administration (national/regional/local)</li> </ul>

<b>To whom it may concern (TWIMC)</b>	<ul style="list-style-type: none"> <li>• Port community</li> <li>• Ship-owners</li> <li>• Science and research institutions</li> </ul>
<b>Region</b>	<ul style="list-style-type: none"> <li>• BSR</li> <li>• EU</li> </ul>
<b>Recommendations</b>	<ul style="list-style-type: none"> <li>• Ports should consider the need of available shore-side electricity on the quays in order to help the ship-owners to adapt the CO<sub>2</sub> emissions standards and maintain the competitiveness at the same time.</li> <li>• The legislators should give out guidelines to help the ship-owners and other related parties to adapt the requirements.</li> <li>• The legislators should determine the certain standards to the shore-side electricity systems in order to avoid confusion among related parties.</li> <li>• Ship-owners should carefully choose the new technologies in vessels to meet the new standards.</li> <li>• Science and research institutions should invent new solutions in order to help maritime community to adapt to the new regulations.</li> </ul>

## 8. Maritime surveillance systems- AIS

<b>Background</b>	<ul style="list-style-type: none"> <li>• Complex administrative procedures are one of the major barriers to the ports.</li> <li>• As ports' communities consist of several different institutions, the ship-owners are often required to go through complicated procedures when entering and leaving the port.</li> <li>• IMO adopted regulation 19 of SOLAS Chapter V- Carriage requirements for ship borne navigational systems and equipment.</li> <li>• In 2000, IMO adopted a requirement for all ships to carry automatic identification systems (AISs) capable of providing information about the ship to other ships and to coastal authorities automatically.</li> <li>• EMSA had launched a "Blue Belt" project in May 2011.</li> </ul>
<b>Impact</b>	<ul style="list-style-type: none"> <li>• All ship-owners are required to use automatic identification systems (AISs) on ships.</li> <li>• The Blue Belt project provides ship notification reports to customs authorities, with the aim of supporting customs by providing information about the voyages of vessels engaged in intra-EU trade.</li> <li>• The notification reports are generated automatically by SafeSeaNet and delivered to the relevant customs authority before a ships estimated arrival.</li> </ul>

	<ul style="list-style-type: none"> <li>• AIS and Blue Belt concept should made the information exchange between relevant parties easier and faster.</li> </ul>
<b>To whom it may concern (TWIMC)</b>	<ul style="list-style-type: none"> <li>• EU institutions</li> <li>• Public administration (national/regional/local)</li> <li>• Port community</li> <li>• Ship-owners</li> </ul>
<b>Region</b>	<ul style="list-style-type: none"> <li>• BSR</li> <li>• EU</li> </ul>
<b>Recommendations</b>	<ul style="list-style-type: none"> <li>• The ship notification reports should include cargo information.</li> <li>• The service should include all vessels trading in the EU.</li> <li>• Ship-owners should choose relevant AIS transmitters on time.</li> <li>• Ports and other related parties should work more together to achieve the objective of the concept and increase the competitiveness of the ports.</li> <li>• The customs should use SafeSeaNet in order to speed up processes at port level.</li> </ul>

## 9. Sanitary and veterinary regulations

<b>Background</b>	<ul style="list-style-type: none"> <li>• A number of different acts are regulating the sanitary and veterinary cargo trade between the EU countries and the third countries and inside the EU.</li> <li>• The ports have many trading routs between the third countries and the trade with the third countries have been causing a number of barriers to the ports.</li> <li>• The non-EU goods have more complicated procedures, for example, the third countries regulations for food.</li> </ul>
<b>Impact</b>	<ul style="list-style-type: none"> <li>• The multiplicities of required documents are requiring lot of work in the ports.</li> <li>• Constantly changing regulations in the third countries have been causing a lot of barriers and delays in the ports.</li> <li>• Misunderstandings with the laboratory test result have been causing unnecessary delays inside the EU ports.</li> </ul>
<b>To whom it may concern (TWIMC)</b>	<ul style="list-style-type: none"> <li>• EU institutions</li> <li>• Public administration (national/regional/local)</li> <li>• Port community</li> <li>• Representatives of third countries</li> </ul>
<b>Region</b>	<ul style="list-style-type: none"> <li>• BSR</li> <li>• EU</li> <li>• Relevant Third Countries</li> </ul>

**Recommendations**

- The EU should harmonize sanitary and veterinary regulations in maritime cargo trade inside EU and between the EU countries and third countries.
- The EU should standardize all laboratory food tests and made them recognisable between countries.
- The EU and third countries should work together for fluent flow of goods.



## Conclusion

The current study was compiled to analyse the main coming requirements of security, safety and administrative procedures and their influences on the ports' activities and economy. The research main focus was on five ports in the Baltic Sea Region- Stockholm, Helsinki, Tallinn, Turku and Naantali- and the regulations that are coming force in the near future and may be affecting the activities and economies of the ports.

All results of the research have been obtained due to different research methods and techniques. Research methods included questionnaires, interviews, internet materials, previously complied studies, etc.

The results of the research showed that one of the main coming requirement what are concerning the ports and other related parties is the Sulphur Oxide emissions standards. The new SO<sub>x</sub> limits may lead to new situation in the maritime community, for example, operating ships in SECAs will become disproportionally more expensive, the possible rise to a shift of cargoes currently transported by ship onto land transport, etc. In addition, in order to minimize the possible risks, the current study brought out recommendations to the relevant parties to adapt the new situations.

Other regulations with impacts on the ports are the nitrogen oxide emissions standards, Schengen regulation, Ballast water directive and carbon dioxide emissions standards. All these requirements are coming force in the near future and these will have direct or indirect influence to the ports.

In addition, the current study analysed other topics that are brought out as a bottlenecks in the ports resulting from the national and international legislations. Such topics are co-operation in IT-field, competence management in port community, maritime surveillance systems- AIS and sanitary and veterinary regulations. These topics are causing different barriers in the ports' works and they directly or indirectly come from legislations.

The current study gave recommendations to all relevant parties concerning all above mentioned coming requirements based on the research findings. The recommendations should help the parties to adapt the new coming regulations and maintain the competitiveness of the ports and the entire area.

The research brought out the fact that in maritime industry, all parties are connected to each other. It was impossible to look only the ports without including ship-owners, terminal operators, customs and other parties to the research. All coming regulations and requirements, that are affecting the ship-owners, are also affecting the ports as well, and therefore the current study are covering all communities of the ports and in some cases more widely.

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## Questionnaire

The current questionnaire is compiled by the Estonian Maritime Academy in the framework of Interreg IVa program PENTA project. In the project there are five ports, Tallinn, Stockholm, Naantali, Turku and Helsinki involved. Project partners are Centre for Maritime Studies of University of Turku and TFK Transport Research Institute Stockholm.

The aim of this questionnaire is to find out are the ports ready for the new coming requirement of security, safety and administrative procedures in Pentathlon and how these requirements may influence the ports' activities and economy. Special attention is paid to the selected IMO's and EU's requirements and initiatives that are coming into force in the near future (until 2020). We are also thankful if You describe other related problems that these requirements may cause.

The questionnaire is divided into four sections; each section contains questions about a specific topic. The questionnaire will take approximately 30 minutes to complete.

### 1. Sulphur regulations (in SECA coming into force in 2015)

- 1.1** Could the implementation of the Sulphur directive lead to new investment in infrastructure and technical equipment at the port?

- 1.2** Will the port be ready to offer alternative fuels (e.g. LNG) to vessels?

- 1.3** Will the port be ready to receive scrubber residues?

**1.4** Has the port planned an additional obligation to monitor SO<sub>x</sub> levels on ships?

**1.5** Are there any additional requirements for the port concerning Sulphur directive?

**1.6** What would be the impact of Sulphur directive to the port economics?

**1.7** Do You have additional comments about this subject?

**2. Co-operation developments in IT field, databases, information sharing**

**2.1** List the IT systems that the port community is using for information transfer?

**2.2** What are the main problems with these IT systems?

**2.3** Do You foresee the interconnection of Your IT systems with the future EU Maritime Common Information Sharing Environment?

**2.4** Do You have additional comments about this subject?

**3. Schengen rules related to the third countries**

**3.1** Does the Schengen rules related to the third countries are causing delays in border control at the port?

**3.2** How this problem can be solved?

**3.3** Do You have additional comments about this subject?

**4. Port workers competence**

**4.1** Do the port workers' certified competencies correspond to the job/assignments?

**4.2** Should the port workers have common standard of competence levels within the EU (according to the EU Qualification Framework)?

**4.3** Do You have additional comments about this subject?

**Thank You!**

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