CONTAINERIZATION OF THE BALTIC SEA - A COMPETITIVE PERSPECTIVE

inspired by challenges of rivalry and interchange between the gateways of Kattegat/The Sound and Gdansk Bay

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www.cra.handels.gu.se
Working Paper 2014:1

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Preface

The introduction of new big container ships sends waves on established transport systems and illustrates the need to satisfy the demand for ports enabling efficient loading and unloading. This study is an attempt to throw light on the impact of containerization on the accessibility of ports at the Baltic Sea with attention paid to the changing conditions after the fall of the Wall. Former locked in areas have become hinterlands of ports serving the international market. EU has strengthened this integration in efforts made in Interreg-programs exemplified by the Baltic Link stretching from Trondheim in the North via Gothenburg to Adriatic ports in the South.

These environmental changes influence the competitiveness of Gothenburg. The location, capacity and accessibility can be seen as competitive factors of the port of Gothenburg. Here, changes of competitive power of the ports are related to geographical level such as Northern Europe and the Baltic Sea Region (BSR) and analysed in relation to the development of the world trade. Furthermore, attention is paid to the competitiveness of the gateways of the Baltic Sea focusing Kattegatt/The Sound and Gdansk Bay.

The competitive ability of Gothenburg as a hub of the gateway Kattegatt/The Sound depends on the links to Norway as hinterland and the capacity of the port enabling traffic by big new container ships in international routes. These possibilities combined with routes between Gothenburg to ports at the Baltic Sea are favourable competitive factors. The accessibility to the Norwegian hinterland deviates from the picture of the Baltic gateways stressing the hinterlands of Russian territories. But, are there any signs that may challenge the competitiveness of the port of Gothenburg?

Studies of this issue have been performed at CRA (Centre for Regional Analysis) at School of Business, Economics and Law at University of Gothenburg. Åke Forsström, Urban Fransson and Jerry Olsson have generated valuable ideas and insights for the paper. Thank you!

Gothenburg in March 2014

Sten Lorentzon

Introduction

Development of the global trade pattern reflects growing flows of manufactured goods, which have taken a larger share of international trade. The introduction of containers has enabled efficient handling of goods, while globalization of production is increasing the trade. Observation of the geography of international trade reveals dominance of a small number of countries and changes characterized by a growing share of Asian countries. These changes depict the faster growth of the Pacific trade than trans-Atlantic trade (Rodrigue et al 2013).

Containerization has changed the conditions for the movement of goods as well as for the growth of trade. Political changes such as the fall of the Wall in 1989 also influence trade conditions. Earlier insulated Baltic areas became integrated to the economy of Western Europe and the conditions for Russian trade changed dramatically. The unification of Germany in 1990 was another transformation of the prerequisites for Baltic trade (Facts about Germany 2013-08-15). This integration was strengthened when Estonia, Latvia, Lithuania and Poland became members of EU in 2004 (European Commission 2013-08-15).

The Baltic Sea as a basin for ocean-going container ships is in some ports restricted by physical prerequisites. Small markets and limited hinterlands may also reduce competitiveness of ports. On the other hand, integration of Gdansk and Aarhus in the network of Maersk routes for new big container ships shows the ability of Baltic ports to participate and compete in global networking (Aarhus/Worlds largest ship 2013-10-11, EEE-jumbo 2013-10-11, Godset 2013). In Scandinavia the port of Gothenburg is located north of the sounds of Öresund and Stora Bält and south of Norway. Furthermore, Gothenburg is the largest port of Scandinavia and the only Swedish port with capacity to handle the new big ships[1]. An issue is if the economic development of the countries at the Baltic Sea, the growth of the Norwegian market and the launching of new big container ships will affect the competitive power of the port of Gothenburg.

[1] Maersk Mc-Kinney Möller arrived to Gothenburg 2013-08-27 (SvD 2013-08-29) and Majestic Maersk 2013-09-30 (GP 2013-09-30).

Approach

International trade is a condition to maintain the standard of living in most countries. This trade enables a rich variety of resources and facilitates distribution of goods that are produced in different parts of the world. Regional product specialisation becomes more important for the creation of wealth. The overall costs of production worldwide decrease by international trade. This means that competition in a global economy is dependent on the transport system (Rodrigue et al 2013). Furthermore, maritime networks are among the oldest forms of spatial interaction emphasizing the ability to understand the meta-geography of the world system from the maritime looking glass of basins, seas and oceans (Ducruet and Notteboom 2012).

Economic integration has grown parallel with the fragmentation of production systems and the expansion of international trade. This development is based on globalization. Trade promotes economic efficiency according to conventional economic theory. Today a large amount of space can be traded for a decreased amount of time at low costs. With trade competition increases and comparative advantages are exploited. Greater economies of scale based on specialization contributes to lower prices. A consequence is a situation of interdependency.

The linkages of commodity chains that integrate network of production, trade and service activities illustrate the production systems of the world. The chain consists of a series of nodes that are linked by various types of transactions. What is being produced and the markets where it is consumed will correspond to a unique geography of flows. The interdependencies have replaced relative autonomy and self- sufficiency as the foundation of the economic life of regions and firms.

The purpose of functional integration is to link the elements of the supply chain in a cohesive system of suppliers and customers. A set of supply/demand relationships implies flows of capital, information and freight. The need to overcome space is a driving force for the development of modern transport systems enabling more integration of geographically separated regions (Rodrigue et al 2013).

Port selection by the main players of the transport chain, such as shippers and ocean carriers, may reflect the overall network cost and performance. For example, some typical port choice criteria are:

* *Physical and technical infrastructure including the nautical accessibility;*
* *Terminal infrastructure and equipment, the hinterland accessibility and intermodal offer;*
* *Geographical location vis-à-vis the main shipping lanes and the hinterland* (Ducruet and Notteboom 2012, p 2).

Analysis of the relative position of ports in the global network reveals a certain level of robustness. Hub flows and gateway flows might slightly shift among nodes in the network. But the network properties remain rather stable. In addition, the analysis confirms the strong influence of geography and distance on the distribution of traffic and shows the dominance of intraregional links. Another issue concerns the benefit from inclusion of land-based networks, such as road and rail, at considering hinterland accessibility. In a world perspective the globalization is characterized by the shift of production from mature to emerging economies. The network is highly polarized by a few large entities illustrated by Singapore and Hong Kong in Asia and Hamburg and Rotterdam in Europe (Ducruet and Notteboom 2012). Rotterdam is the dominant player in the fast growing markets of intra-European and Far East markets. This position is related to its nautical access for the big vessels that are deployed on these routes (Notteboom 2009).

This paper considers the process of containerization with special attention paid to the container traffic of the Baltic Sea. An assumption is that the launching of big container ships means fewer ports enabling loading and unloading goods produced far away from the European market such as China. But this process influences the role and position of ports in different ways. For example, studies of the gateway of the Rhine – Scheldt Delta show that the large centres in the Delta - Rotterdam and Antwerp - are increasingly acting as substitutes, while smaller container ports more function as complements to one of the large load centres. Thus, the strong growth in maritime container flows challenge the gateway regions around the world. An observation is that multi-port gateway regions have a competitive edge over regions with only one load centre (Notteboom 2009).

Regionalization is a new phase in the development of port systems. Traditionally port systems regard the port itself. But by inland

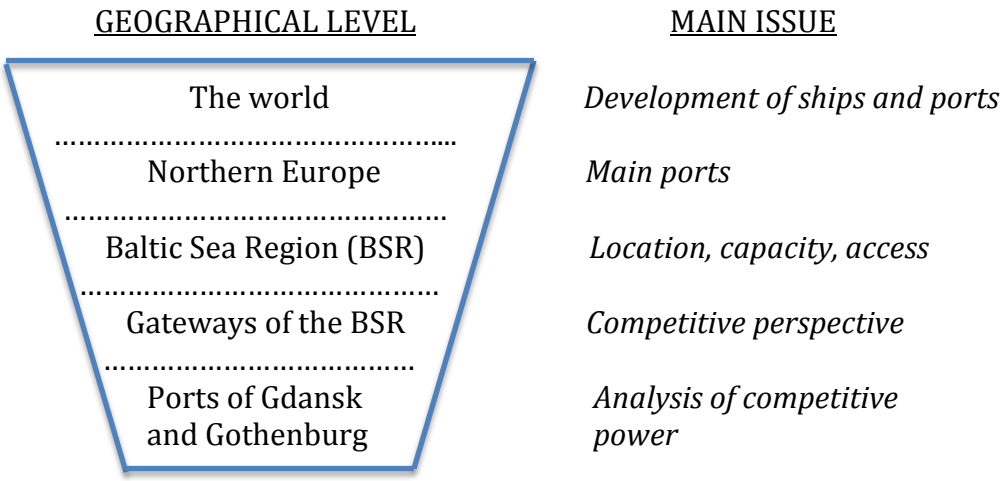
distribution port competition is based on decisions and subsequent actions of shippers and third party logistics providers. More efficient access to the hinterland increases port competitiveness. Different forms of networking with nodes and market players seem to be important for port authorities in the regionalization phase. To gain competitive advantage will more become a matter of including both physical investments and managerial capabilities beyond the port boundaries (Notteboom and Rodrigue 2005).

Widening of the approach to include regional competitiveness may also mean creation of power by networking and within clusters. National advantage is gained where national attributes are supportive of intracluster interchange. But competitive advantage is achieved by both rivalry and interchange in a mutual reinforcing system (Porter 1990). Besides, an evolutionary approach to networks can be applied to various types of spatial network such as networks of infrastructure and urban places (Boschma and Martin 2010). The location, the management of hinterlands and the function of ports are seen as strategic factors influencing the competitive power of regions.

Here, the location of Gothenburg in the heart of Scandinavia and the management of hinterlands are of special interest. The ability to use these factors is important at consolidating the port of Gothenburg as hub in relation to big ports such as Hamburg and Bremen/Bremerhaven as well as ports of similar size like Gdansk. Besides, this ability is emphasized by investments made in many Baltic ports to increase their traffic flows. These efforts also include networks connecting ports within and outside the Baltic Basin. Gothenburg is seen as one of the gateways to the Baltic Basin (Notteboom 2013).

The introduction of very big container ships underlines the importance of ports with big capacity. The location of Gothenburg at the corridor linking Trondheim in the North and Koper at the Adriatic Sea in the South raises questions if Gothenburg can strengthen its role as hub of this Baltic-Link corridor. The location, the infrastructure for transportation and hinterland accessibility are factors indicating competitive power of Gothenburg. But the aim to create alternative corridors of transportation to reduce congestion in some European flows of lorry traffic may also influence the competitiveness of different ports. These efforts need cooperation and point to the issue that the future of the ports will be based on the challenge to combine competition and cooperation.

The design of the paper pays attention to changing conditions of ports, such as introduction of new large container ships, to attract calls related to geographical level. Figure 1 shows the design of the paper.



Note: the approach mainly concerns container ships and container ports.
Figure 1 The design of the paper.

Background

Historically water has played a major role for the development of flows of transportation. Access enabled by water explains to large extent the creation of former and present settlement structures. Transportation by water has been much cheaper than by land. Thus, many cities have been established and grown at sea and river locations. Furthermore, the construction of canals stretched from the beginning of the 16th century the area reachable by water (Stutz and Warf 2012).

These efforts pushed the growth of foreign trade exemplified by the traffic of the Baltic Sea. In 1259 German Hanseatic League was founded. About 200 cities were brought together and dominated trade of fur, fish and wool in Northern Europe until the 15th century. But trade with the new world destabilised the trading centres of Europe in the 15th and 16th centuries and the league declined. Besides, during 16th and 17th centuries banking and trade power shifted from the south of Europe to the north (Europe 1992, Jönsson et al 2000).

Before the Industrial Revolution the technological development was concentrated on improving ships. But the invention of the steam engine

by James Watt in 1769 paved the way for technical advances. By its application to water and land transportation in the beginning of 19th century an era of cheap transports began. At the end of 20th century the introduction of commercial jet aircraft had two major effects; it enabled rapid individual travel over vast distances and it had effect of jet transport in the movement of certain kinds of freight. Another introduction is containerization that vastly has simplified transhipment of freight from one mode of transportation to another (Dicken 2011).

In European perspective some structural changes of port environment are observed since the mid 1990s. One is the increase of the number of Member States of EU from 15 to 28 members in 2013 (European Union 2013-10-27). Possibilities for new load centres and inland transport corridors were opened. Besides, the Europe-Far East trade implied a shift from the Atlantic Rim to the Suez route and the introduction of big container vessels have increased pressures on nautical access. The wave of consolidations leading to powerful global terminal networks and the influx of global terminal operators have also changed the port environment. These changes more or less influenced the competitive outlook for established container ports. But they have also enabled newcomers to enter the port scene (Notteboom 2012).

The size of the countries along the coast of the Baltic Sea indicates potential transport need for satisfaction of the demand of the Baltic market. The countries surrounding the Baltic Sea are shown in table 1.

Table 1 Population, surface area and population density in countries located at the Baltic Sea in 2010.

Country	Population (1000)	Surface area (km^2)	Inh./km^2
Finland	5 335	338 441	16
Russia	142 938	17 098 242	8
Estonia	1 340	45 227	30
Latvia	2 239	64 559	35
Lithuania	3 287	65 300	50
Poland	38 184	312 679	122
Germany	81 776	357 114	229
Denmark	5 545	43 094	129
Sweden	9 378	450 295	21

Source: Statistical Yearbook of Sweden 2013.

The number of inhabitants of the countries varies a lot as well as surface area and density. Russia deviates with its enormous area. But

Russian presence is mainly related to St Petersburg as the largest urban area and leading port of the Baltic Basin. The location of capitals is another factor that reflects the importance of the Baltic Sea as capitals may indicate strong economic activity. The capitals of Finland, Estonia, Latvia, Denmark and Sweden are located at the Baltic coast. These countries are also identified as unicentric with high concentration of governing and administrative activities to the capital (Ahnström 1973).

Even if the capitals of the most populated countries - Russia, Germany, and Poland - are located inland big urban areas are related to the Baltic Sea. St Petersburg is the second largest urban area of Russia, Gdansk/Gdynia constitutes the third position in Poland and Hamburg is the second largest urban area of Germany (Statesman´s Yearbook 2008, Portrait of the regions 2000, Statistisches Jahrbuch 2012). The areas include the largest container ports of these countries. Hamburg is integrated to the Baltic by the Kiel Canal. The cities of Gothenburg, Aarhus, Helsingborg and Malmö are also integrated in Baltic trade. Besides, Germany, Sweden and Denmark have direct connections to the Atlantic Ocean by the North Sea enabling hub-functions for Baltic traffic. See figure 1.

The Baltic Sea is above the Aland Islands referred to as the Gulf of Bothnia. In the east the Gulf of Finland connects the Baltic Sea to St Petersburg. Gulf of Gdansk and Gulf of Riga are included in the south and southeastern parts of the Baltic Sea, while the western end is difficult to determine. But the water flows on through Kattegat Bay into the Skagerrak Strait and to the North Sea. Another connection is the link between the Baltic Sea and the North Sea by the Kiel Canal; one of the world´s busiest artificial waterways (Worldatlas 2013-08-22).

In the perspective of Baltic Sea Region (BSR) studies indicate that most countries have more intensive relations with outside partners than with countries within the region. Sub-regional cooperation seems to go hand in hand with the development of external relations with other parts of Europe and with the overall global economic system (Cornett and Snickars 2002). But Sweden deviates. Nearly ¾ of Swedish export of goods is bound for Europe, while more than 80 per cent of the import to Sweden is from Europe. Norway is the most important country for Swedish export and Germany is the largest import country (Ekonomifakta 2013-08-21). Both countries are located near Sweden.

Note: The Baltic Sea is a shallow basin with a mean depth of 54 metres. The salinity decreases from oceanic levels at the North Sea boundary to freshwater in river mouths. Environmental activities are coordinated by the Baltic Sea Commission or Helsinki Commission (HELCOM) (Lappäranta, Myrberg 2009).

Figure 1 The Baltic Sea.
Source: Worldatlas (2013-08-22).

Some aspects justify observation of the traffic between Poland and Sweden even if the Polish share of Swedish trade is limited; 2.6 per cent of the export and 2.9 per cent of the import (Ekonomifakta 2013-08-21). One is the fact that Poland is the largest economy at the Baltic Sea dependent on transports via the Baltic to reach the oceans by the seaway. In addition, Poland invests in infrastructure enabling traffic between countries in the northern and southern parts of Europe. Swedish actors also push for these investments in infrastructure for the transport corridor Baltic-Link (see appendix A). This ambition is linked to the development of new big container ships for ocean traffic. Gothenburg is the only Swedish port with capacity to handle these new big container ships (Port of Gothenburg 2013-09-12).

Containerization; development of ships and ports

Containerization has vastly simplified transhipment of freight from one mode of transportation to another. This innovation was introduced in 1956 and by the first container ship goods were moved from Newark (New Jersey) to Houston (Texas) through the Gulf of Mexico. Container shipping has shrunk the planet and brought about a revolution as the cost of shipping is so cheap. Freight in containers corresponds nowadays to around 90 per cent of all non-bulk cargo (Dicken 2011). The size of the ships has increased and today ships can offer cargo of 18 000 containers (di.se 2013-09-09)[2].

These ocean-going ships demand investments in big port areas equipped with cranes of high capacity and sophisticated technology to satisfy demand for fast loading and unloading. Arguments for these investments are related to the turnover of the ports based on demand and supply of goods in surrounding areas. Thereby, the location of terminals for ocean-going big ships is restricted to regions functioning as hubs in flows of transportation.

In 1980 New York/New Jersey was still dominating as port for containers. But during the 1980´s the world trade changed by booming economy and changes of consumption behaviour. Growth, new trade agreements, free trade and increasing number of people were at focus. The period was also characterized by increasing containerization. In 1980 the ship Panamax was launched[3]. The 1980´s also meant huge growth of the Asiatic market. During the 21st century, the containerization is characterized by introduction of big ships (10 000 TEU and more)(Adolfsson 2013-09-10[4]. Recently Maersk has launched 2 ships enabling transport of 18 000 containers. The first of these ships will in the future operate the ports of Gdansk – Aarhus – Gothenburg - Bremerhaven – Rotterdam – Port Tangiers – Singapore – Yantian – Hongkong – Kwangyang – Ningbo – Shanghai – Tanjung Pelepas (Godset 2013).

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[2] One container - TEU - has a volume of 36,25 m^3 (8 feet x 8 feet x 20 feet)(NE 2013-09-30).

[3] The size of the ships that can pass the Panama-canal.

[4] AP Möller-Maersk has ordered 10 container ships with capacity of 18 000 TEU to be delivered 2013-2014. The ships are of the class Triple-E (Economy of scale, Energy efficiency, Environmentally improved); they are 400 metres long, 59 metres wide and 73 metres high (SvD 2013-09-12).

The development towards bigger ships is based on the growth of trade between Asia, Europe and USA. But the strong growth of loading and unloading at Asian ports is hard to follow by European and American counterparts. China has a leading role among container ports of the world. The port of Shanghai is nearly 3 times larger than the most important port of Europe, Rotterdam. In addition, the volume of Shanghai is 4 times more than the largest port of USA, Los Angeles. See table 2.

Table 2 Top 20 world container ports 2012.

Rank	Port, country	Volume (Mill. TEU)
1	Shanghai, China	32,58
2	Singapore, Singapore	31,65
3	Hong Kong, China	23,10
4	Shenzhen, China	22,94
5	Busan, South Korea	17,02
6	Ningbo-Zhoushan	16,83
7	Guangzhou Harbor, China	14,74
8	Qingdao, China	14,50
9	Jebel, Ali, Dubai, United Arab Emirates	13,28
10	Tianjin, China	12,29
11	Rotterdam, Netherlands	11,87
12	Port Kelang, Malaysia	10,01
13	Kaohsiung, Taiwan, China	9,78
14	Hamburg, Germany	8,90
15	Antwerp, Belgium	8,64
16	Los Angeles, USA	8,07
17	Dalian, China	8,00
18	Tanjung Pelepas, Malaysia	7,72
19	Xiamen, China	7,19
20	Bremen/Bremerhaven, Germany	6,28

Source: Top 50 World Container Ports (2013-09-10).

Main ports of northern Europe – an overview

After falling behind the Netherlands in 2010 United Kingdom in 2011 reclaimed its position as the largest maritime freight transport country of Europe. This position represents 14 per cent of the European maritime freight transport estimated to 3.7 billion tons. Figures of 2011 also show that Rotterdam, Antwerp and Hamburg remain

European top ports and that liquid bulk accounts for 39 percept of total tonnage. Göteborg is ranked nr 18 among ports in EU (Eurostat 2013-09-17). Figure 2 shows main European cargo ports in 2011.

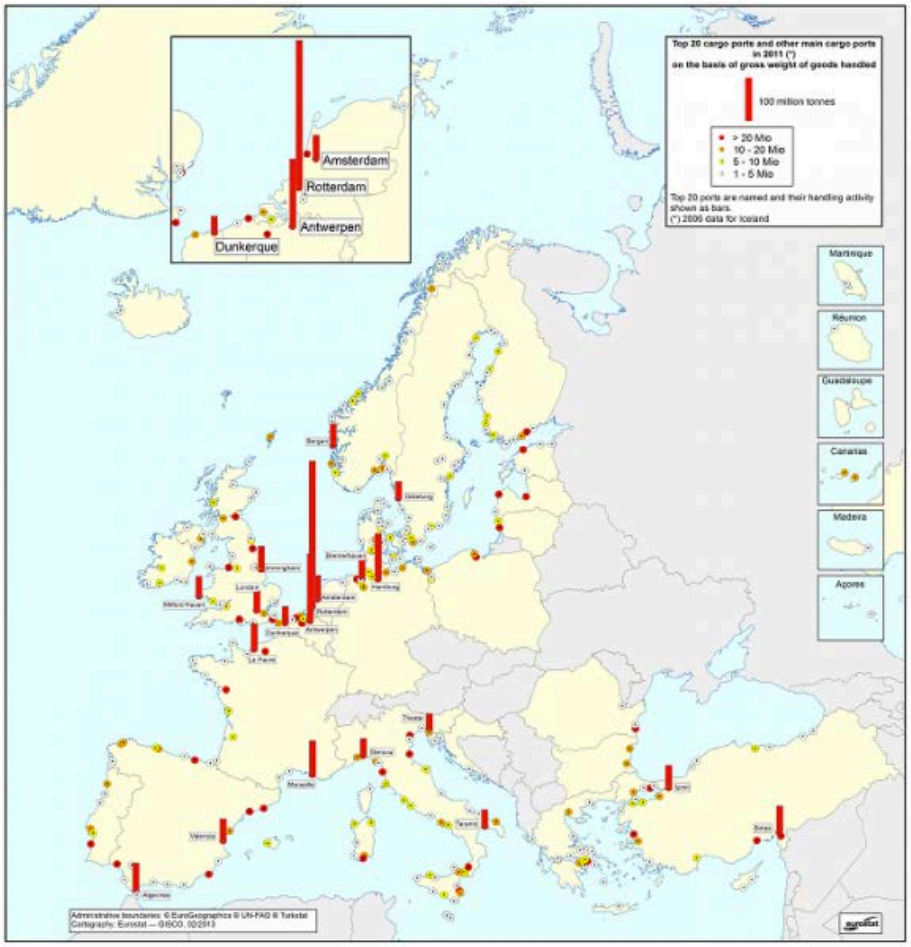

Figure 2 Main European cargo ports in 2011 by gross weight of goods handled.
Source: Eurostat (2013-09-17).

The largest European container ports are also located in Northern Europe; Netherlands (Rotterdam), Germany (Hamburg and Bremen/Bremerhaven) and Belgium (Antwerp). Furthermore, the 10 largest container ports of Northern Europe includes Felixstowe, Duisburg, St Petersburg, Zeebrugge, Le Havre and Southampton with capacity from 3,5 Mill. TEU (Felixstowe) to 1,6 Mill. TEU (Southampton) (Containerisation 2013-09-10). Göteborg has, according to the ranking of European ports by the volume of containers handled, rank 17 (about 900 000 TEU). The position of Gdansk is rank 20 (about 700 000 TEU)(Eurostat 2013-09-17).

The function of the European ports varies. Thus, the big ports of Hamburg, Rotterdam, Le Havre and Antwerp operate by combining as a dominant gateway function with sea-to-sea transhipment activities. Other container ports of Europe (ranked in size 1 – 15) such as Gioia Tauro, Marsaxlook and Algeciras act as almost pure transhipment hubs, while e.g. Genoa and Barcelona can be considered as nearly pure gateways. About 70 per cent of the total container throughput of the European port system is passing the top 15 ports (Notteboom 2013).

With regard to the latest wave of enlargement of EU northern ports have been favoured, especially Hamburg. But the rise of economic centres in the Baltic area and at the coastline of Mediterranean Sea has created opportunities for several multi-port gateway regions to develop transport networks. Furthermore, new opportunities might arise for port systems in the Baltic Sea as well as in the Adriatic Sea. An observation is that countries such as Czech Republic, Poland, Slovenia and Hungary have strong railway networks enabling extension of the hinterlands (Notteboom 2012).

Main ports of the Baltic Sea – an overview

The fall of the Wall in 1989 influenced the conditions of trade at the Baltic Sea in many ways. Since second World War the eastern parts of the Baltic was controlled by Soviet Union. But the changes during the 1990s meant that former Russian territories became independent states remembering of the situation during the period between the first and second World Wars. Estonia, Latvia, Lithuania and Poland became free countries. The conditions for trade and transportation of these countries as well as for Russia changed dramatically. Russian difficulties to adjust to this new situation, underlined by political unrest, delayed investments in infrastructure for transportation. This meant that great plans of expansion of ports were postponed; a fact to consider at looking upon Russian later investments in ports enabling international trade (Brodin 2003).

The feeder traffic of the Baltic Sea was in 2006 handled by 124 ships with a total nominal capacity of 83 500 TEU that five years later had increased to 160 feeders and 157 000 TEU. The growth of containers was more than the increase of the number of ships. The average capacity had grown from 675 to 981 TEU. It looks like a ”baltimax feeder” in the near future will not exceed 2 000 TEU. The turnover of

containers in Baltic ports grew from 6,4 to 7,4 million TEU during the period 2006 – 2010. Figures of 2010 identify 7,2 million TEU travelled to and from the Baltic in container ships. Of this feeders carried about 6,8 million TEU. Furthermore, estimations indicate that about 5,2 million TEU was transhipped to and from ocean vessels and about 1,6 million travelled as short sea cargo (Baltic Transport Journal 2011). Destinations for cargo ships are shown in appendix B.

Even if feedering container ships are seen as the real workhorses of the Baltic Sea ports enabling traffic by big ships may indicate potential competitiveness. For example, ships with length of more than 200 metres can reach ports at the Gulf of Finland and ports at the Gulf of Bothnia. At observation of the most frequent destinations of these big ships during random times Russia is identified as a leading actor of the Baltic. This is especially pronounced concerning tankers destination Ust- Luga. But Russia is also a main actor of traffic of big cargo ships of the Baltic Sea. See appendix C.

Handled throughput of the ports in the Baltic Sea is another indicator of the importance and competitiveness of the ports. Table 3 shows the ranking of the ports with regard to number of containers handled during 2011.

Table 3 Top 10 Baltic container ports 2011 ranked by volume (TEU).

Rank	Port	Volume (TEU)
1	St Petersburg	2 365 174
2	Gdansk	685 643
3	Gdynia	616 441
4	HaminaKotka	612 598
5	Helsinki	392 342
6	Klaipeda	382 185
7	Riga	302 973
9	Rauma	223 005
8	Tallinn	197 717
10	Lübeck	195 578

Note: Statement of Lübeck is from 2010. Aarhus, Helsingborg and Copenhagen/Malmö are located at the mouth of the Baltic Sea and not included here. Of these ports only Aarhus handle more than 200 000 containers.
Source: ESPO (2011 – 2012).

The big throughput of containers in St Petersburg reflects the importance of this gateway for transportation of goods to and from the Russian market. More demand for container transports of adjacent Russia also influences the high rank of HaminaKotka, while the volumes of Gdansk and Gdynia should be seen in relation to the dynamic Polish economy. The ports include the capitals of Finland (Helsinki), Latvia (Riga) and Estonia (Tallinn). Klaipeda is the container hub of Lithuania[5].

Here, attention is paid to the capacity of these ports and to the importance of Ust-Luga and Szczecin. Ust-Luga Container Terminal started in 2011 and illustrates the Russian efforts to strengthen their position in handling the container traffic. In 2012 a new container terminal was officially open in the Szczecin Seaport. The project was co-funded by EU; an example of the integration of Poland into the Western economies.

Denmark, Germany and Sweden offer easy access to the North Sea. Thus, the largest ports of Germany (Hamburg) and of Sweden (Gothenburg) are reachable by the North Sea. The largest container port of Denmark - Aarhus - is located at the mouth of the Baltic Sea (Nordregio 2013-10-21).

The Baltic Basin dominates the Russian container traffic and handles nearly 70 per cent of the container throughput of Russia including transit volumes via Finland and Baltic countries. The share of the Far Eastern Basin is about 20 per cent and the share of the Black Sea Basin is about 10 per cent of the Russian container throughput. Besides containerization has been introduced in North Russian Ports (Key Russian gateways 2013-10-14).

The *container port of St Petersburg* is the largest in the Baltic Basin and includes the two largest container terminals of the Basin. The capacity of the First Container terminal (FCT) is 1 350 thousand TEU (in 2011) and the capacity of Petrolesport (PLP) is 1 000 thousand TEU (in 2011) (Key Russian gateways 2013-10-14). An extensive feeder network links FCT to the big European ports of Rotterdam, Hamburg,

[5] As can be seen in appendix B and C destinations of cargo ships in the Baltic Sea underlines the role of St Petersburg, Riga, Klaipeda and Gdansk/Gdynia as ports. The establishment of the port of Ust-Luga strengthens the Russian presence of the Baltic Sea.

Bremerhaven and Antwerp. The depth of the port alongside berth is 11 metres (First Container Terminal 2013-10-15).

At the Gulf of Gdansk *the ports of Gdansk and Gdynia* compete to attract container shipping. On June 2007 the *Deepwater Container Terminal Gdansk* became operational with the arrival of the first commercial container ship. The port offers regular services to many ports exemplified by Maersk line on the route Gdansk – Aarhus – Gothenburg – Bremerhaven – Rotterdam – Algeciras – Suez Canal – Singapore – Yantian – Hong Kong – Kwangyang – Ningbo – Shanghai – Hong Kong – Yantian – Tanjung Pelepas – Suez Canal – Rotterdam – Bremerhaven – Gdansk calling once a week (AE10 service). Draft of the terminal is 15,5 metres (Port Gdansk 2013-10-16).

The Port of *Gdynia´s Baltic Container Terminal* (BCT) neighbours Gdansk. The capacity of the terminal is some 750 000 TEU (Baltic Container Terminal 2013-10-16). The port is preparing a series of projects to become a key part of the container supply chains serving central and eastern Europe. Thereby, it will attack the established hubs of Hamburg and Rotterdam. The deep-water facility in Gdansk should also be seen in this perspective of luring deep-sea container ships to make direct calls in the Baltic and skip traditional hubs. This strategy has to some extent been successful. In 2010 Maersk began handling the line´s 14 500 TEU Emma class in Gdansk. They found transhipment volumes to Russia (Loadstar Gdynia 2013-10-16).

In 2011 Port of Hamina and Port of Kotka were mergered to *Port of HaminaKotka.* A new company (Port of HaminaKotka Ltd) was established to manage the port activities. The port is the most eastern of the Finnish ports; 35 km from the Russian border, 245 km from St Petersburg and 970 km from Moscow. Furthermore, the port is the largest import/export node between Finland, Russia and the rest of Europe. By the merger the handling capacity of the port increased to more than 1,5 million TEU. This reflects by far HaminaKotka as the largest Finnish container port with Mussalo and Hietanen as main harbours (Shipping and Marine 2013-10-23).

Port of Helsinki is the main Finnish harbour concerning foreign trade and passenger traffic and the second largest container port. Most important destinations for container traffic of the Port of Helsinki are Hamburg, Bremerhaven, Rotterdam and Antwerp. About 50 per cent of the traffic refers to feeder and 50 per cent to intra-European traffic.

The port of Helsinki handles 28 per cent of the container traffic handled in Finnish harbours (Port of Helsinki 2012).

Containers shipped through the *Port of Klaipeda* is mainly (67 %) handled by Klaipeda Container Terminal (KCT). The capacity of the terminal is 450 000 TEU per year and the terminal serves 40 – 50 container vessels per month. Shipping lines links KCT to main Western European ports such as Hamburg, Bremerhaven and Rotterdam. Furthermore, KCT offers hinterland connections to destinations in Belarus, Russia, Kazakhstan, Ukraine and China. The draft of the terminal is 10 metres and the max. ship length is 230 metres (Klaipeda Container Terminal 2013-10-16).

The only *container port in Latvia* - *Riga* - has a favourable location on the transit route to and from Russia and the neighbouring Belarus. There is a well-developed network of hinterland connections such as a link with the Trans-Siberian Railway and scheduled container/block trains. The location means that Riga offers the shortest transit route to Moscow (Baltic Transport Maps 2013-10-15). The company Riga Container Terminal (Rigact) specializes in Sea-Rail transhipment operations. The drought of the container terminal is 9,5 metres (Riga Container Terminal 2013-10-15).

In 2012 the cargo tonnage shipped in containers at *the port of Rauma* surpassed the volume shipped in ro-ro and sto-ro traffic. The total capacity of Europort´s box terminal is 300 000 TEU. The port is the largest container port on the west coast of Finland and leading Finnish paper port. The port is reachable by the 10-metres deep Rihtniemi passage (Baltic Transport Maps 2013-11-07, Port of Rauma 2013-11-07).

The Muuga Harbour and the Paldiski South Harbour handle containers at the *port of Tallinn.* The capacity of the port is 450 000 TEU per year and allows for processing of container ships with 4 000 TEU. A new container terminal has been constructed with a depth of 14,5 metres. The port is well integrated by rail and road networks (Tallina Sadam 2013-10-21). Advantages of the port include convenient location, well-developed infrastructure and year-round navigation. The opportunities of the railway in Estonia is also seen as a competitive weapon (Port of Tallinn 2013-10-21). A tender to operate the container terminal at the port has been won by the Russian transport holding Rail Garant, that is one of Russias largest transport holdings. According to the plan the

potential of Tallinn port in the region will increase by efforts such as attracting more shipping lines and foreign investors (RIA Novosti 2013-10-21).

The *port of Lübeck* is the furthermost south-western transhipment hub of the Baltic Sea coast with a dense network of liner services to the region. The location facilitates hinterland connections enabled by excellent links such as the motorway to Hamburg, the rail network and the Elbe-Lübeck-Canal. But Lübeck is also the largest German container port located at the Baltic Sea even if its strength is related to its ro-ro traffic. The port specialises in paper and forest products and is the largest transhipment and distribution centre for Swedish and Finnish paper industry in Europe. Besides, The Terminal Scandinavienkai is the largest ferry terminal of Europe (Baltic Transport Maps 2013-11-08, Baltic Seaport of Lübeck 2013-11-08).

In 2011 operations at *UST-LUGA Container Terminal* (ULCT) started. The capacity is 440 000 thousand TEU. In comparison to St Petersburg ULCT has some advantages. For example, the location outside the urban area means that operation and development of the terminal are not restricted by the infrastructure and ecological factors. Regular calls at ULCT are performed by e.g. Maersk Line, CMA CGM and Unifeeder. The depth alongside berth is up to 13,5 metres (Ust-Luga Container terminal 2013-10-17). ULCT is located at the Gulf of Finland 36 km from the EU border and 147 km from St Petersburg (Baltic Ports Organization 2013-10-17).

Port of Szczecin is situated on the western bank at the mouth of the River Oder about 65 km inland from the Baltic Sea (WPS 2013-10-18).
In April 2012 a new container terminal co-funded by EU was officially open in the Finskie Quay in the Szczecin Seaport (Szczecin and Swinoujscie Seaports Authority 2013-10-18). The capacity of the terminal, which is the only container terminal within a radius of 300 km, will be 120 000 TEU per year. The port offers e.g. feeder lines to German ports, liner services to Great Britain, Finland, Estonia, Lithuania and West Africa and is the only port in Poland that has NATO Commercial and Government Entity Code enabling transhipment of military equipment (DB Port Szczecin 2013-10-18a). Besides, the port has direct sailings to Hamburg, Bremerhaven, Rotterdam, Gdansk, Gdynia, Klaipeda, Riga, St Petersburg, Copenhagen, Aarhus and Malmö. The length of the Finskie Quay is 240 metres and the depth 9,15 metres (DB Port Szczecin 2013-10-18b).

Gateways of the Baltic Sea – competitive perspective[6]

The ports above may be structured with regard to function such as combining a dominant gateway function with sea to sea transhipment activities, act as almost pure transhipment hub or be considered as nearly pure gateway. Another possibility is to look upon the position with regard to seaport group. Seaports within the same gateway region may form multi-port gateway regions. One criterion that can be used to cluster adjacent seaports is the relationship to nearby identical traffic hinterlands. In context of the European container port system and the Baltic Sea at focus 4 multi-port gateway regions can be identified; Kattegat/The Sound, Helgoland Bay, Gdansk Bay and South Finland (Notteboom 2013). Here, the integration of the ports of St Petersburg and Ust-Luga also is seen as a multi-port gateway.

Two of these five gateways are at the border of the Baltic Sea. The gateway Kattegat/The Sound consists of the ports of Gothenburg, Aarhus, Helsingborg, Malmö and Copenhagen, while the gateway Helgoland covers the ports of Lübeck, Hamburg and Bremerhaven/ Bremen. Hamburg is the largest port of Helgoland Bay and Gothenburg is the largest port of Kattegat/The Sound. Gdansk Bay, South Finland and the ports of St Petersburg and Ust-Luga are multi-port gateways with ports exclusively located to the Baltic Sea.

Gdansk Bay comprises the ports of Gdansk and Gdynia. These ports constitute an attractive region for loading and unloading of containers (handling 1 300 TEU per year), capacity to handle the largest container ships of the world and the ability to offer regular services to many ports including connections along the European-Asian transport route. Efforts are also made to lure deep-sea container ships to make direct calls in the Baltic and avoid traditional hubs. To find transhipment volumes to Russia is another operative challenge. Furthermore, investments are made in infrastructure for more intermodal links. Most of the hinterland is Polish territories. But extension of the hinterland is a goal at present exemplified by establishment of the corridor that links the Baltic and Adriatic seas by railway. At the same time customers are asking for both pricing and efficiency; key factors to reach successful return of the investments.

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[6] The approach of this section is based on the article by Notteboom, T (2013) ”Recent traffic dynamics in the European container port system” in *Port Technology International*, Issue 58, 2013.

The multi-port gateway of *South Finland* comprises the ports of HaminaKotka, Helsinki and Turku. HaminaKotka is the largest Finnish container port and handles, together with Helsinki and Turku, more than 70 per cent of all container transport in Finland. The volume handled by these ports was in 2011 more than 1 000 000 TEU (ESPO 2011-2012, Port of Helsinki 2012). HaminaKotka located close to the Russian border plays an important role as node between Finland, Russia and the rest of Europe. The location indicates accessibility to a comprehensive hinterland that may support an increase of the volume of containers in the future. Liner services to many European ports may also contribute to expansion of HaminaKotka. Furthermore, HaminaKotka is the centre for nearly all transit of containers in Finland. The depth of the fairway is 15,3 metres.

The ports of St Petersburg and Ust-Luga handle nearly 70 per cent of the container throughput of Russia including transit volumes via Finland and Baltic countries. The container port of St Petersburg is the largest in the Baltic Basin. Operations at Ust-Luga (ULCT) started in 2011. ULCT is one of Russia´s largest infrastructure projects. The investments will supplement St Petersburg and also be a gateway to Moscow. In addition, the location permits reduction of the voyage time between main ports of transhipment in Northern Europe and Russia. ULCT is located 36 km from the EU border and 147 km from St Petersburg. Besides, Russian cargo is handled through neighbouring countries. The depth alongside berth is up to 13,5 metres.

Gdansk Bay, South Finland and St Petersburg - Ust-Luga are identified as main multi-port gateway regions of the Baltic Basin. St Petersburg and Ust-Luga constitute the largest gateway followed by Gdansk Bay and South Finland. A common feature of these gateways is the Russian dependence. The Russian market appears to become more important as a factor that may stimulate the demand for transportation of goods. Another feature is related to the links by service lines connecting the gateways to established big ports such as Rotterdam, Hamburg and Antwerp. Thereby, the traffic by the gateways of Helgoland Bay and Kattegat/The Sound become of special interest.

The ports of Hamburg, Bremerhaven/Bremen and Lübeck constitute the multi-port gateway of *Helgoland Bay.* This gateway is also observed at studies of cargo ships in movement to destinations outside the Baltic Sea like other ports at the North Sea such as Antwerp, Rotterdam and

Hull[7]. A common route to reach destinations along the coastline of the North Sea from the Baltic Sea is via NOK (Kiel-kanal)[8]. This traffic is underlined by the fact that the largest German container ports - Hamburg and Bremerhaven - are located close to the canal (Statistisches Jahrbuch 2012). The canal is a busy commercial route with 35 000 ships passing through the canal last year. This is more than the combined number of ships through the Panama and Suez (Spiegel Online International 2013-06-06).

But disturbances of the traffic through the Kiel-canal have raised issues of its reliability. If ship-owners don´t see the canal as reliable they may switch to larger ships and shift to longer routes around Denmark. This would mean bypassing of Hamburg. This risk is stressed by the fact that the ports of Amsterdam and Rotterdam are more suitable as hubs for the Danish route. Another risk that may weaken the competitiveness of Hamburg is related to the ”feeder” ships. These vessels (200 metres and can hold close to 2 000 containers) primarily serve the Baltic region and are especially adapted to the locational prerequisites of Hamburg. The traffic of these ships is in many cases based on daily connections by ships that sail from Hamburg to some countries. This kind of sea freight can only work if the Kiel-canal is in service. Nearly a fourth of the freight transhipped in Hamburg leaves or reaches the port via NOK (Spiegel Online International 2013-06-06).

The gateway *Kattegat/The Sound* consists of the ports of Gothenburg, Aarhus, Helsingborg, Malmö and Copenhagen. These ports are small in comparison to the ports comprising the gateway of Helgoland Bay (Baltic Transport Maps 2013-10-25a,b). Gothenburg - located outside the Sounds of Öresund and Stora Bält - is more accessible for ocean-going ships than other ports of the gateway Kattegat/The Sound. Table 4 summarizes the throughput of containers of the ports.

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[7] Observation during the time 09.15 – 11.15 in 2013-10-09 shows 70 cargo ships in movement from the northern to the southern parts of the Baltic of which 45 had destinations to ports outside the Baltic Sea. Ports located to northern Germany, along the coasts of Belgium, Netherlands and France and ports of Eastern England had 18 percent each of these 45 destinations (AIS 2013-10-09).

[8] The Nord-Ostsee-Kanal (former Kaiser-Wilhelm-kanal and nowdays often called the Kiel-kanal) - 98,7 km - links Brunsbüttel – Kiel – Holtenau. The trip all the way takes 6,5 – 8,5 hours depending on type of the ship. The length of the ships are restricted to 235 metres, the breadth to 32,5 metres and the depth to 9 metres (Statistisches Jahrbuch 2012, Kiel-kanalen 2013-10-10).

Table 4 Throughput of containers (TEU) in 2011 of the multi-port gateways (ranked after volume) of Helgoland Bay, St Petersburg and Ust-Luga, Kattegat/The Sound, Gdansk Bay and South Finland.

Gateway/Port	Throughput(TEU)
Helgoland Bay	
Hamburg	9 014 165
Bremerhaven/Bremen	5 915 487
Lübeck	195 578 (in 2010)
St Petersburg – Ust-Luga	
St Petersburg	2 365 174
Ust-Luga (operations started in Dec. 2011)	-
Kattegat/The Sound	
Gothenburg	913 886
Aarhus	447 000 (in 2010)
Helsingborg	174 525
Copenhagen/Malmö	132 672
Gdansk Bay	
Gdansk	685 643
Gdynia	616 441
South Finland	
HaminaKotka	612 598
Helsinki	392 342
Turku	12 030

Note Not available ESPO-statistics of 2011 is substituted by figures from 2010. Statements of Ust-Luga and Turku are based on other sources.

Source: Processing of ESPO (2011 – 2012), Notteboom (2013), ULCT (2013-10-28), Port of Turku (2013-10-28).

The handled volume varies a lot, that is related to geographical features such as location, function, capacity, hinterlands and accessibility. Helgoland Bay is outstanding by its strategic location at the North Sea and the Kiel-canal enabling feeder traffic of the hinterland such as the Baltic Sea and services linked to many ports of the world. The large number of containers handled at the port reflects the important role of Hamburg as node in international transport systems.

Operations of Ust-Luga (started in December 2011) emphasize Russian efforts to expand trade and control the handling of containers. Increasing Russian influence of loading and unloading of goods in the Baltic Sea illustrate these efforts.

The gateway Kattegatt/The Sound covers the entrance to the Baltic Sea from the north. This location may facilitate growth of the hub-function by attracting big ships to the ports of Gothenburg and Aarhus. Handling of goods at these ports also enables distribution to countries inside the Baltic Sea. This extension should include Norwegian, Swedish and Danish markets.

In the region of Gdansk Bay investments in infrastructure for transportation are made to upgrade the ability to compete with large North Sea ports such as Hamburg and Bremerhaven. Big container ships should more frequently choose Gdansk/Gdynia as destination for distribution to the hinterland of the region; a strategy that up to now looks successful. The gateway tends to become more important as hub for distribution of goods to areas in East and Central Europe. These efforts also regard extension of service links along the Baltic-Adriatic corridor.

HaminaKotka is the dominating port of the gateway of South Finland. The location of the port close to the Russian border means that the port plays an important role as node between Finland, Russia and the rest of Europe. This closeness to Russian territories indicates accessibility to big markets in need of goods. Ability to contribute to satisfaction of this demand is a challenge for the port.

Other ports mentioned above – Tallinn, Riga, Klaipeda and Szczecin – are defined as gateways not integrated in any multi-port gateway. The volume of handled containers in these ports is less than the traffic of the gateways. In 2011 the number of containers handled in Klaipeda was 382 000 TEU (the largest port) followed by Riga's throughput of 303 000 TEU.

Access to deep-water ports has become a hot issue to attract new big container ships. The depth of the water at the ports presented here varies from 9.15 metres to 16,7 metres (Hamburg)(Port of Hamburg 2013-10-31). The deep at the multi-port gateways - Helgoland Bay, St Petersburg - Ust-Luga, Kattegat/The Sound, Gdansk Bay and South Finland – is in the interval 13,5 – 16,7 metres. But observations of cargo ships with destinations to ports at the Baltic Sea usually (more than 90%) need less than 9 metres depth[9].

[9] Observation performed at five periods stretching from 2 hours and 15 minutes to 3 hours and 45 minutes and was carried out 2013-09-05, 2013-

Characteristic for many of the ports is the Russian influence underlined by the position of the port of St Petersburg, which is and has been the largest container port in Russia. The throughput of the port verifies this strong position. The volume increased from 290 000 TEU in year 2 000 to nearly 2 400 000 TEU in 2011 (Geography of operations 2013-10-25).

The traffic reflects the activities of the ports. But the changes were modest during the period 2006 – 2011. The passages of cargo ships peaked in 2007 and were, in spite of increasing traffic, at most passages less 2011 than 2007. For all passages of different types of ships, mainly cargo (56%), tanker (17%) and passenger (7%), with transponder system (AIS) the peak of traffic in 2007 was recovered in 2011 (Trafikflödesinformation 2014-01-31)[10]. The flows of traffic is illustrated in figure D.

Ports of Gothenburg and Gdansk/Gdynia – competition and cooperation

This section argues that the position of the ports of Gothenburg and Gdansk/Gdynia in different transport systems depends on their ability to meet both competitive and cooperative challenges. But first attention is paid to present functions of the ports as container hubs enabled by access to hinterlands.

Functions of the ports

The functions of the *ports of Gdansk/Gdynia* are based on Gdansk as an old important harbour at the Baltic and the establishment of Gdynia after World War 1. Gdynia enabled access for Poland to the Baltic supported by construction of the railway from Upper Silesia to Gdynia. Both the port and the railway were constructed as Poland failed to get full control over Danzig (Gdansk), that after World War 1 was made a free city under administration of the League of Nations. But the shift

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09-18, 2013-09-26 and 2013-10-30. Altogether 383 ships were identified based on AIS-information.

[10] "AIS (Automatic Identification System) is a system that makes it possible for a vessel to identify and track the movements of other vessels. The system was developed and implemented to provide access to more information about vessels in the area than can be obtained via radar" (AIS Transponder System 2014-01-31, p. 1).

westwards of Polish territory in 1945 meant a new economic geography of Poland characterized by exchange of large eastern territories, mostly poor farming country, for a broad western strip of well-developed German territory. The ports of Danzig and Stettin became Polish (Mellor 1975, 1978).

At the port DCT of Gdansk (Gdansk Deepwater Container Terminal) the volume in 2012 was 897 TTEU, while the port of BCT (Baltic Container Terminal) in Gdynia handles 360 TTEU per year (Port Gdansk 2013-10-16, Baltic Container Terminal 2013-10-16)[11]. The largest ship of the world (Maersk Mc-Kinney Möller) has been docked at the DCT port of Gdansk (W–wa Jeziorki 2013-09-12). This ship has also been docked at the port of Gothenburg. Thus, the capacity of the ports of Gothenburg and Gdansk are big enough enabling traffic by the largest container ships of the world.

The number of containers at the *port of Gothenburg* has since the start at the end of 1960´s, with some exceptions, increased. This development follows the increase of the world trade and the general trend of containerization. In 2011 the volume reached nearly 900 000 containers (Göteborgs hamn 2013-09-12). But the perspective focusing regional development changes the competitiveness of Gothenburg to its position in the context of the Baltic Sea and Russia. By the growth of Russia and surrounding countries BSR (Baltic Sea Region) has become stronger. More than 60 percent of Sweden´s container traffic passes through Gothenburg (Göteborgs hamn 2013-11-29, Port of Gothenburg 2013-11-29, Trafikverket 2013-12-02).

Historically BSR has been furnished by ports at the European continent such as Hamburg, Antwerp and Rotterdam. But by congestion at these ports and the market of the Baltic region ship operators tend to look for hub locations in BSR. Gothenburg can offer space for expansion. The port also operates transports by train to terminals in Sweden and Norway along with efficient handling of goods. This system – railport Scandinavia – carries half of the volumes handled in the container terminals of the port. This collection of goods in Sweden and Norway by commuting trains and by conquering the position as hub for volumes of the Baltic Sea will increase the attraction of the port enabling more calls. Reliable infrastructure for railway transport is seen as a decisive factor for continuous growth (Göteborgs hamn 2013-

[11] The capacity of DCT is 1 MTEU and the capacity of BCT is 700 TTEU (Polsk-Svenska Handelskammaren 2013-09-12).

11-29, Hugo 2013). Besides, rail shuttles are a key to reduce emissions and decrease the number of heavy vehicles (Port of Gothenburg 2013-11-29)[12].

Competitive challenges

Competitive challenges are related to changing conditions for transportation. The introduction of new big container ships illustrates how the ability to satisfy demand for equipment enabling efficient loading and unloading has become a strategic factor to attract ships at their routes. Capacity to satisfy this demand is restricted to ports that handle a large number of containers. The volume of containers at the ports of Gdansk/Gdynia is more and of Gothenburg is some less than a million a year. This seems to be a competitive size if the ports can offer relevant service equipment, even if the number of handled containers is small in comparison to the main competitive port of Hamburg.

Competition is also related to the demand of goods of the hinterlands of the ports and the standard of infrastructure for transportation enabling distribution of goods. Linkages between handling of big and small volumes are critical functions. Transportation at the Baltic Sea is mainly accomplished by "feeders" enabling transportation up to and even more than 2 000 containers. But the regular size is less than 1 000 containers. Hamburg plays a key role in this kind of loading, unloading and transportation to environmental ports including the Baltic Sea. Hamburg has also a competitive location with regard to transhipment of goods to and from ocean-going ships. An issue is if there is any weakness in the position of Hamburg as hub for container traffic to and from the Baltic Sea.

The studies indicate some factors that may influence Hamburg´s competitiveness. One is connected to the big volumes handled at the port that tend to mean relatively high costs for ship operators at using Hamburg as port. Difficulties to avoid congestion costs may decrease the competitive power of the port. This ability to offer low handling costs is especially pronounced in relation to the ports of Gdansk/Gdynia. The construction of new ports at Gdansk/Gdynia to attract big container ships is another effort to reduce costs for distribution of goods to Baltic areas. Gdansk/Gdynia tend to expand as gateway for distribution of goods to East- and Central Europe.

[12] The rail shuttles (some 25 daily) - called Railport Scandinavia - operate to and from the Port of Gothenburg.

The function of the Kiel Canal is also an important issue concerning the competitive power of the port of Hamburg. Problems to keep the canal in good shape have raised questions of reliability of the canal for regular traffic. The canal must function without interruption. Otherwise, the ship operators may choose routes such as Route T[13]. Thereby, the port of Gothenburg may strengthen its position as hub for Baltic trade as it is more reachable for ocean-going ships than other ports of Kattegat/The Sound. The location of Gothenburg at the entrance to the Baltic from the North may facilitate distribution of goods to countries at the Baltic Sea as well as to Norwegian, Swedish and Danish markets.

The competitiveness of Gothenburg is as well related to Norway as hinterland. This deviates from the regular picture of the Baltic gateways emphasizing the hinterlands of Russian territories. Growth of the Norwegian economy means more trade and demand for transports e.g. reflected in increasing truck-traffic at road E6 along the Swedish west coast (Forsström 2013). In addition, Gothenburg is located at the intersection of strong flows of goods. In this perspective Gothenburg may play a more important role as the largest port of Scandinavia and capacity to handle services to new big container ships of the world. Furthermore, the Port of Gothenburg has very extensive liner services throughout the world. Along with traffic directly to the final destination the port has feeder traffic to all major ports of continental Europe. Every day 70 trains arrive or leave the port (Port of Gothenburg 2013-12-02).

Another factor influencing the competitive power is related to the position of the ports in Europe. Actors on this scene are EU and EBRD (European Bank for Reconstruction and Development). Thus, EU within the Interreg ll C programme started the process to establish the Baltic Link. By opening up the national markets and introducing Trans-European Networks EU has moved towards transport integration (Hitiris 2003). One problem of the ports in the Baltic region is the dominance of feeder lines, which means increased transport costs. For example, EBRD supports investments in infrastructure to increase container handling capacity of Klaipeda Port (European Bank 2013-12-

[13] Route T is a transit route between Skagen (the Skaw) and the area NE of Gedser with minimum depth of 17 metres established by the Danish Government to ensure navigational safety of large ships passing through Danish waters (BalticMaster 2013-11-20).

02). But EBRD identifies many reasons to provide physical networks and services to the transport sector such as its ability to increase the access of businesses and consumers to markets and promote regional integration (Transport Sector Strategy 2013).

Cooperative challenges

Here, attention is paid to investments in infrastructure for transportation that links Oslo via Karlskrona – Gdynia to ports of the Adriatic Sea. This Corridor includes Road 27, the railway ”coast to coast” (Gothenburg – Karlskrona/Kalmar) and the ferry Karlskrona – Gdynia. There are functioning logistics with terminals for trucks and trains. But the capacity is too small with regard to increasing transport volumes. Existing logistics is an advantage as it enables construction of infrastructure for transportation at low costs (Baltic Link Association 2013-08-26). Figure 3 shows the corridor of Baltic Link. [14].

Polish investments are focused on increasing accessibility of the port of Gdynia (Baltic Link 2005). But the states surrounding the Baltic Sea are – except Russia – members of EU. Thus, efforts to develop the Baltic Link are related to the regional policy of EU. One example is the cross-border programmes between EU Member States around the Baltic Sea such as Öresund – Kattegat – Skagerrak, Central Baltic and South Baltic (Nordregio 2013-08-22). Another example is the EU Strategy for the Baltic Sea Region; the first comprehensive EU strategy to target a “macro-region”. EU-countries of the Baltic Sea Region face several common challenges, which are reflected in the jointly agreed Action Plan for the Strategy (EU Regional Policy 2013-08-22).

The efforts of Gdynia are directed to find new seams of gateway cargo to central and eastern Europe to become more attractive as destination for container ships compared to big ports like Hamburg, Bremerhaven and Rotterdam. These efforts include investments in infrastructure for transportation enabling handling of larger vessels. Another issue concerns expansion of intermodal links even if BCT has a high proportion (42 % in 2012) of containers moving out of the port on block trains. Most of the hinterland is at present Poland. But extension of the territory can include countries like Slovakia and Hungary (Loadstar Gdynia 2013-10-16).

[14] The Corridor may also include the distance Oslo – Trondheim (Baltic Link Association 2013-11-19).

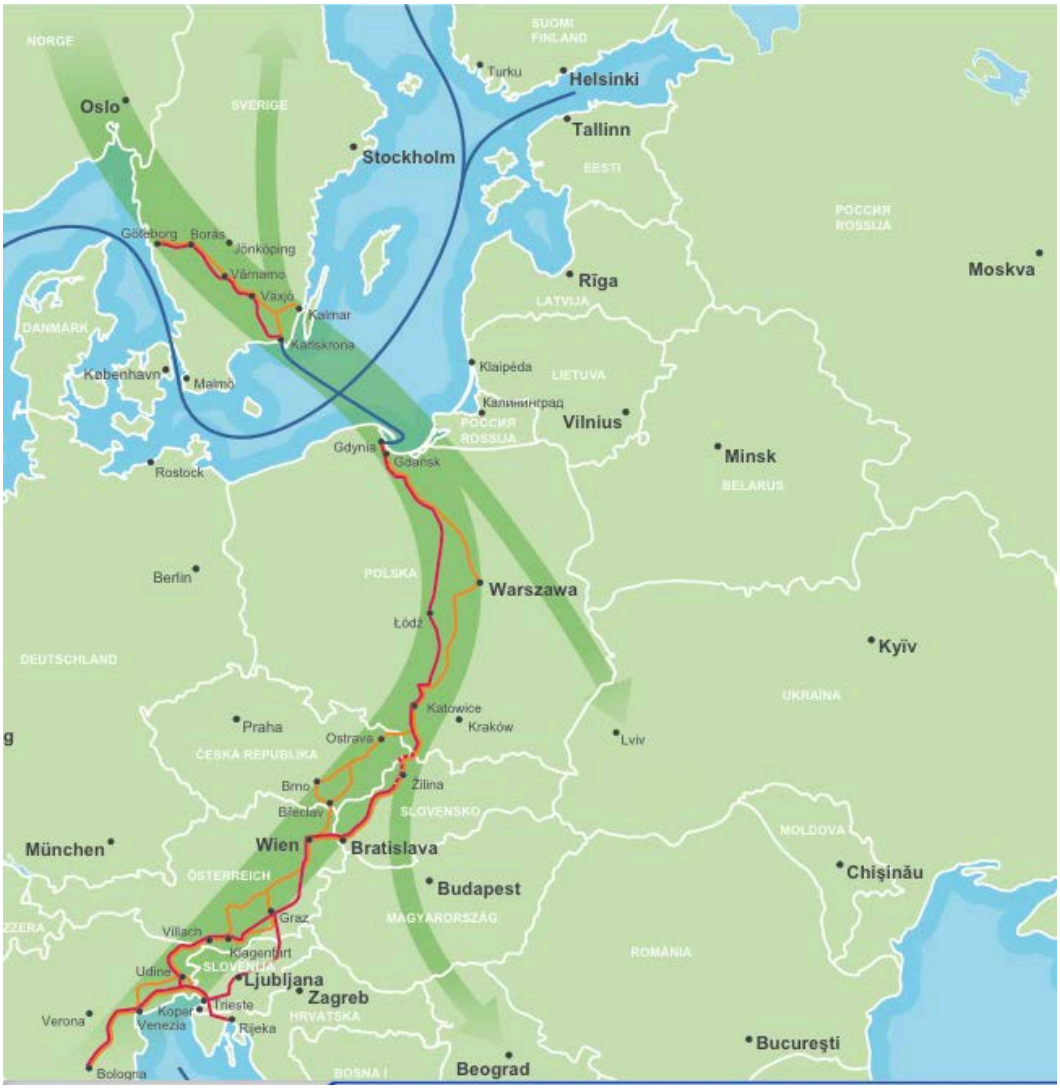

Figure 3 The transport corridor of Baltic Link.
Source: Baltic-Link (2013-11-18).

The railway that links the Baltic and Adriatic seas exemplifies this extension. Two trains a week to and from the Slovenian port of Koper at the northern tip of the Adriatic Sea are already handled by BCT. But key to the success of Gdynia´s investment depends on how the intermodal operators connected to European interior perform with regard to both pricing and efficiency (Loadstar Gdynia 2013-10-16).

In Swedish perspective some advantages are identified at implementing the Baltic Link. It will be easier for Swedish companies to establish activities on the market of East- and Central Europe. The Corridor offers alternative transport routes from North Africa and

Asian markets via Suez. The Link makes it possible to bring goods by railway through Europe after reloading at ports of Adriatic Sea. Thereby, Sweden is linked to the big ports of the Adriatic Sea. Besides, the Corridor stretches east of the Alps with less weather problems enabling faster and shorter transports that mean environmental and economic advantages (Baltic Link 2013-11-18).

Traffic between Gothenburg and Oslo is already established by truck- and train connections. Thus, Gothenburg is an important hub in the transport corridor of Baltic Link. This kind of action reflects challenges of cooperation in European context where Baltic Link is presented as a project connecting the Swedish west coast and Norway with the port of Gothenburg, that is further linked to the port of Karlskrona, the Baltic Sea, the ports of north-eastern Poland and the corridors towards Central Europe and the Mediterranean (Baltic Link 2005). But, the Port of Gothenburg also has as aim to use its strategic position as a link between Atlantic/North Sea and the Baltic Sea to develop the infrastructure within and outside the port to generate more capacity and improved access (Port of Gothenburg 2013-09-12).

Concluding remarks

Economic and political changes have created new conditions for development of trade and transport of the world. The containerization has enabled efficient handling of goods at low shipping costs reflecting the growth of trans-Pacific trade in relation to trans-Atlantic trade. Political changes, such as the fall of the Wall, have meant new trade and transport links. Introduction of new big container ships has changed competitive conditions exemplified by demand of large ports with high-tech equipment. Focus of this paper is the impact of these global changes on the container traffic at ports of the Baltic Sea Region including Gothenburg.

In world perspective the shift from trans-Atlantic to trans-Pacific trade is illustrated by the growth of the Chinese container traffic. The port of Shanghai has grown to the largest in the world and handles nearly 3 times more containers than the leading European port Rotterdam. Hamburg is the second largest container port of Europe and is like most important European ports located to northern Europe. These ports operate by combining the function as dominant gateway with sea-to-sea transhipment activities.

An observation is that the latest enlargements of EU have favoured the northern ports, especially Hamburg. Another political change regards the effect of the collapse of Soviet Union. Russia lost the majority of its port facilities. But by 2006 the remaining Russian ports had recaptured lost volumes. At the same time large amount of Russian cargo is handled through Finnish and Baltic ports even if ULCT (UST-LUGA Container Terminal) is seen as a key port gateway in the heart of Russia´s Baltic Western region. The port is one of Russia´s most extensive infrastructure projects and will supplement the largest container port at the Baltic Sea - St Petersburg - and also be a gateway to Moscow. These efforts mean increasing competition.

With European container port system and the Baltic Sea at focus 4 multi-port gateway regions can be separated. These are Kattegatt/The Sound, Helgoland Bay, Gdansk Bay and South Finland. In this context integration of St Petersburg and Ust-Luga is also seen as a multi-port gateway. Helgoland Bay (Hamburg, Bremerhaven/Bremen and Lübeck) is the dominating multi-port gateway. This position is underlined by the leading role of Hamburg as hub for traffic at the Kiel Canal and its function as hub for comprehensive hinterlands inside and outside of the Baltic Sea. The location of Hamburg enables loading and unloading of goods from global to local destinations. This includes reloading of goods by using the “feeder” - workhorse of the Baltic Sea - that also seems to be a competitive vessel in the near future.

With regard to competition between multi-port gateways of the Baltic Sea Gdansk/Gdynia is of special interest. One reason is its role as the largest Polish port area and its effect on the economic development of Poland. Another reason is the location of Gdansk/Gdynia at the cross road for trade and transport links east-west and north-south of Europe. The location is especially favourable to conquer the hinterlands of East- and Central Europe. This justifies investments in infrastructure for transportation that upgrades the role of Gdansk/Gdynia as hub in the transport corridor of the Baltic Link. These efforts are also made to lure deep-sea container ships to make direct calls in the Baltic. In this perspective attention should be paid to the competitiveness of the gateways of Helgoland Bay and Kattegat/The Sound.

Competition between ports located inside and outside of the Baltic Sea is evident regarding the gateways of Gdansk/Gdynia and Helgoland Bay. In Swedish perspective the competitive ability is also related to the development of the Baltic Sea Region by cooperation. Hereby, the

location of Gothenburg within the transport corridor of Baltic Link is strategic by enabling flows of goods from Trondheim in the North to Adriatic ports in the South. Along this route the ports of Gothenburg and Gdansk/Gdynia have capacity to handle large volumes of big container ships. This competition is oriented in two geographical directions. One direction concerns the potential markets of East- and Central Europe and Russia furnished mainly by the ports of Gdansk/Gdynia. The other direction links Gothenburg to the Norwegian hinterland and enables handling of goods destined for the Baltic Sea Region as well as for the Scandinavian market.

The calls of big new container ships confirm the ability of ports inside and outside of the Baltic Basin to compete as hubs in international transport networks illustrated by the ports of Gdansk/Gdynia and Gothenburg. These ports may also increase their competitive power as congestion costs of traditional ports such as Rotterdam and Hamburg may hinder further growth. Efforts to establish Baltic-Link should also be seen in the context of foreseen congestion problems in traffic corridors. Besides, the Kiel Canal has shown vulnerability that may lead to less reliability and more interst in passing Denmark to reach ports of the Baltic Sea. Thus, push-factors may affect selection of ports at shipping to and from the Baltic Sea and Scandinavia.

The hub-function of the port of Gothenburg is strongly dependent on Norwegian priorities of investments in infrastructure for transportation. The economic development of Norway combined with access to capital of the Norwegian Oil Fund are decisive factors for the ability of Gothenburg to become more integrated in international networks such as routes for ocean-going container ships. Therefore, investments in infrastructure for transportation in Sweden that satisfy Norwegian demand for efficient container traffic should be given high priority. These efforts include investments in different means of transport to increase the function of Gothenburg as hub for transport of goods to and from Norway, Sweden and the Baltic Sea Region.

The competition between ports of the Baltic Sea Region can be seen as a fight between different groups of ports. One group such as Hamburg and Rotterdam has capacity to handle big container ships and ability to distribute goods, in this case by feeders, to ports of large hinterlands including the Baltic Sea. Another group consists of ports, e.g. Gdansk/Gdynia, Aarhus and Gothenburg, which can handle big container ships and distribution of goods to environmental markets.

Besides, there is a group of ports unable to handle big container ships. A decisive factor for the ability to handle big volumes is infrastructure for transportation at reloading to ship, train or truck. This is illustrated by the prerequisites of the Baltic Link. Goods from Asia may be reloaded at ports of the Adriatic Sea and further distributed by train to places in East- and Central Europe. A result is shorter distance by sea-transport and saving of time.

Selection of port by operators, e.g. shippers and ocean carriers, may reflect the overall network cost. Port choice criteria concerns physical and technical infrastructure such as terminal equipment, hinterland accessibility, intermodal offer and location. Gothenburg is located north of the sounds of Öresund and Stora Bält but south of Norway. The port is the largest Scandinavian and only Swedish port with capacity to handle new big container ships. An observation is that network properties remain rather stable even if hub flows and gateway flows might slightly shift among nodes in the network. An issue is if the economic development of the countries at the Baltic Sea, changes of the Norwegian market and the launching of new big container ships will affect the competitive power of the port of Gothenburg.

This competitiveness also depends on international agreements of the reduction of emissions. At present introduction of rules for clean ship-fuel indicates higher costs at seaborne traffic that may lead to an advantage for transportation by train in relation to ship. In this perspective the location of Gothenburg at the west coast of Sweden with easy access for ocean going ships and linked to the Scandinavian hinterland by railway connections is of special interest. But more traffic by train also means risk for bottlenecks of the railways. Thus, the efforts of Gothenburg to strengthen its position as hub for traffic for both the Scandinavian countries and countries at the Baltic Sea emphasize the importance of investments in infrastructure for railway traffic[15]. With regard to on-going extension of the Gothenburg Port Line to double-track line the present situation indicates that further investments should apply to railway links of the hinterland[16].

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[15] This remark was stressed by the European coordinator Luis Valente de Oliveira in the report ”Priority Project 21. Motorways of the Sea” (2009) paying special attention to the need of investments in the bypass of the bottleneck on the railways interconnecting the railways with the Port of Gothenburg reducing impact on the urban area.

[16] The Gothenburg Port Line is presented in Trafikverket (2013-12-02).

Another aspect concerns the regionalization of port systems, which breaks the traditional approach to regard port systems as the port itself. This new approach includes different forms of networking with nodes and market players. Competitive advantage will more become a matter of including both physical investments and managerial capabilities. In this paper location, the management of hinterlands and the function of ports are seen as strategic factors influencing the competitive power of regions. Thereby, the efforts made to create the Baltic Link as a transport corridor between Trondheim in the North and Adriatic ports in the South should also be seen in the context of regional cooperation. Competition and cooperation, such as between the ports of Gothenburg and Gdansk/Gdynia, seem to lead to strong competitiveness of both ports.

Appendix A: Baltic Link[17]

In 1999 an EU financed project started within the Interreg ll C programme called SEBTrans with aim to map the situation regarding trade and person travels in the area of the Baltic Sea. The issue concerned questions like which countries trade with each other and what volumes of goods this trade generated. Forecasts of trade and transportation were also made. The result of the studies was problematic as it showed a rapid growth of trade and transportation at the same time as the transport system showed a number of bottlenecks.

Next project was SEBTrans-Link of the EU programme Interreg lll B. This project (2002 – 2005) was directed to studies of technical solutions for the transport system in order to solve found problems. The outcome of this project was identification of studies of bottlenecks and hindering in the infrastructure of the Baltic-Link corridor from Gothenburg to Gdynia with further connection to the Adriatic Sea. The distance between Gdynia at the Baltic Sea and ports at the Adriatic Sea is about 1 700 km (Baltic Link-korridoren 2013-11-19).

After these studies followed Baltic-Link Motorway of the Sea Gdynia-Karlskrona project including investments such as a new combined terminal in Alvesta, upgrading of the railway Emmaboda-Karlskrona and infrastructure in the Port of Karlskrona together with investments in the Port of Gdynia. These efforts should be put into service during the project period 2010 – 2013 enabling handling of larger volumes of goods in the Corridor and facilitate the aim of modal shift. The project has been co-ordinated by the Regional Council of Southern Småland as representative and member of the Baltic-Link Association[18]. A Monitoring Committee representing the two involved member states of Poland and Sweden has followed the project. The final conference of the project took place 2013-10-25 (Regeringskansliet, slutkonferens Baltic Link 2013-11-20).

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[17] This section is mainly based on Baltic-Link Motorways (2013-11-19).

[18] Baltic-Link Association was created in 2005 as a result of the projects SEBTrans and SEBTrans-Link and is a network of more than 20 members representing Swedish municipalities, regional associations and ports along the Swedish part of the Baltic-Link corridor (Baltic Link Association 2013-11-19a). The objectives include to follow up how the work has been implemented within the SEBTrans-Link project and knowledge building about the corridor SEBTrans-Link (Baltic Link Association 2013-11-19b).

Appendix B: Cargo ships in movement to destinations in the Baltic Sea

Table B Cargo ships in movement to destinations in the Baltic Sea during the time 13.15 – 17.00 in 2013-09-05 and 13.00 – 15.45 in 2013-09-18.

Rank	Port	Number	%
1	St Petersburg	28	16,3
2	Riga	15	8,7
3	Klaipeda	9	5,2
4	Gdansk/Gdynia	8	4,7
4	Ust-Luga	8	4,7
5	Szczecin	7	4,1
6	Rauma	6	3,5
7	Luleå	5	2,9
8	Oulu	4	2,3
9	Ventspils	3	1,7
9	Tallinn	3	1,7
9	Hanko	3	1,7
9	Kotka	3	1,7
Sum:		102	59,2

Note: The number of identified cargo ships is 172; 96 during the first and 76 during the second period. The ports refer to the statements of destinations of 3 or more ships.
Source: AIS (2013-09-05, AIS 2013-09-18).

An observation is that the destinations to the Russian ports of St Petersburg and Ust-Luga correspond to slightly more than a fifth of the destination [19]. The shares of destinations of Riga, Klaipeda, Gdansk/Gdynia and Szczecin are in the interval 4 - 9 per cent.

These destinations also include the largest container ports of respective country; St Petersburg (Russia), Riga (Latvia), Klaipeda (Lithuania), Gdansk/Gdynia (Poland), Tallinn (Estonia) and Kotka (Finland). Denmark, Germany and Sweden have easy access to North Sea exemplified by Aarhus, Hamburg and Gothenburg (Nordregio 2013-10-21).

[19] Observations of the traffic in 2013-09-26 (09.30 – 12.45) verify the strong position of the ports of Ust-Luga and St Petersburg. These ports correspond to more than a fourth of the traffic of cargo ships during this period (AIS 2013-09-26).

Appendix C: Ships of more than 200 metres length in the Baltic Sea in movement northwards to Baltic destinations

Table C.1 Tankers and cargo ships of more than 200 metres length in the Baltic Sea in movement northwards to Baltic destinations at random times of observation during the period 2013-09-02 - 2013-09-04.

Type of ship	Destination	Length
Tanker	Odense	249
Cargo	Riga	227
Tanker	St Petersburg	215
Tanker	Klaipeda	248
Cargo	Riga	225
Tanker	Primorsk	250
Tanker	Ust- Luga	228
Tanker	Ust-Luga	229
Tanker	Riga	225
Cargo	Gdansk	367
Tanker	Ust-Luga	244
Tanker	Kokkola	223
Cargo	Oxelösund	225
Cargo	St Petersburg	210
Cargo	Rostock	225
?	Stigsnaes	292

Note: The figures are based on information of the ships passing the Great Belt and Öresund 13.15 – 14.15 and 15.30 – 16.30 2013-09-02; 09.15 – 11.15 and 15.00 – 16.30 2013-09-03 and 09.30 – 11.30, 2013 09-04. The ships are registered when moving through the gateways of Great Belt and Öresund and further in to the Baltic Sea.

Source: Processing of AIS (2013-09-02 – 2013-09-04).

Besides, Russia is a main user of big cargo ships for transportation of goods at the Baltic Sea[20]. See table C.2.

[20] Information of cargo ships of more than 200 metres length in movement to destinations in the Baltic Sea during the time 13.00 – 15.45 in 2013-09-18 underlines the importance of the traffic to Russia. Of 76 ships both ships longer than 200 metres had Russian destinations. Observations 2013-09-26 emphasize this traffic; of 73 ships (at 9.30 – 12.15) 6 had a length of more than 200 metres of which 3 had Russian destinations. At 19.30 – 22.00 3 ships were more than 200 metres length, one of these had Russian destination (AIS 2013-09-18, AIS 2013-09-26).

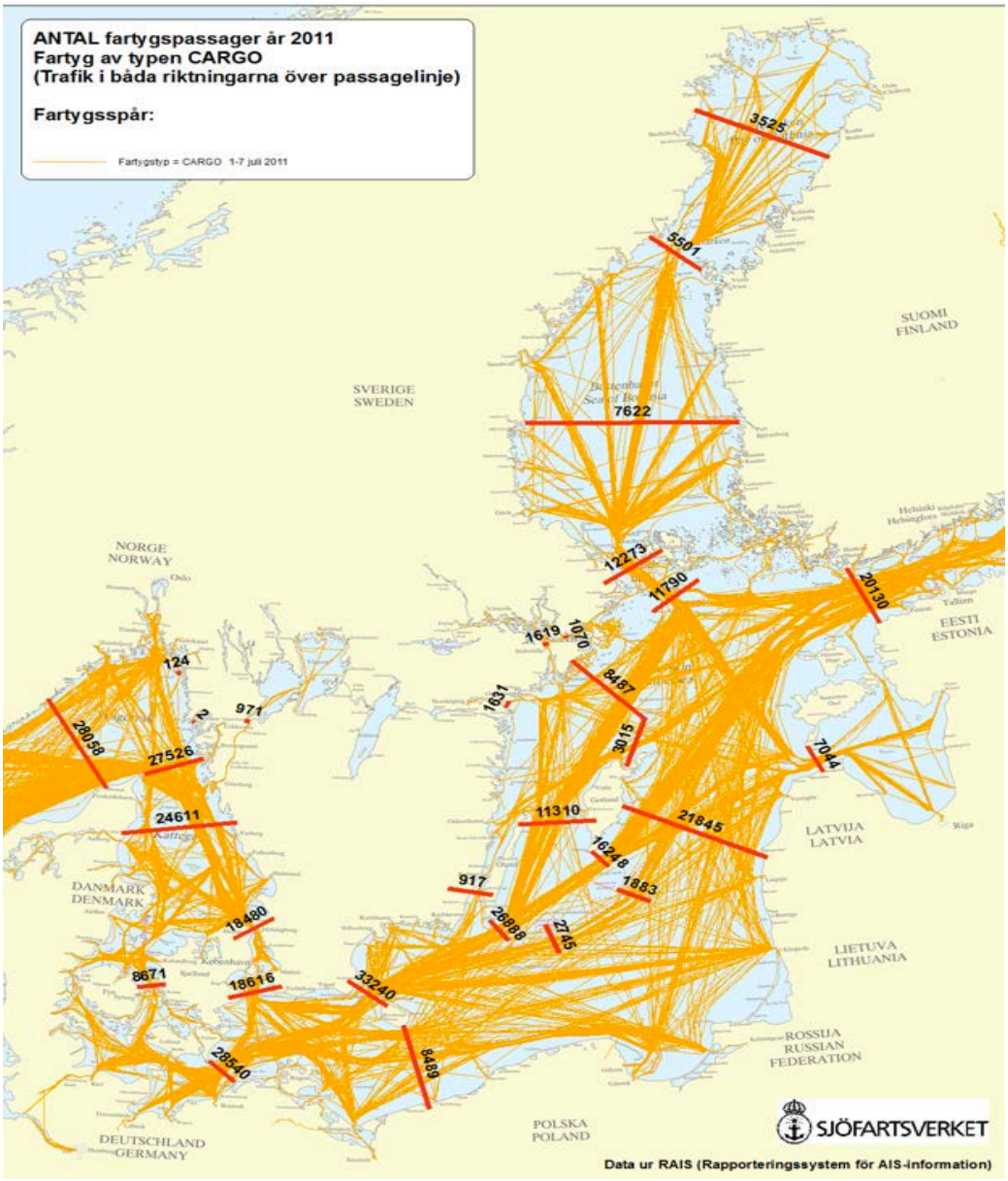
Table C.2 Cargo ships of more than 200 metres length in the Baltic Sea in movement northwards to Baltic destinations during the time 13.15 – 17.00 in 2013-09-05.

Destination	Length	Broad	Deep
Riga	229	38	7,2
Oxelösund	225	32	15,0
Ust-Luga	229	32	8,8
Luleå	230	32	7,2
Kokkola	223	32	7,1
St Petersburg	210	30	10,1
Ust-Luga	228	32	9

Note: These 7 ships of more than 200 metres length are identified in the list of 96 cargo ships entering the Baltic Sea during the time 13.15 – 17, 2013-09-05.
Source: Processing of AIS (2013-09-05).

Table C.2 also shows the traffic of big ships to the Swedish ports of Oxelösund and Luleå. But Swedish trade is mainly handled at ports of Kattegat Bay and Skagerrak Strait.

Appendix D: Flows of traffic of cargo ships with marking of number of passages in both directions in 2011.



Note: The figures show ships of the type cargo with transponder system (AIS).

Figure D Flows of traffic of cargo ships with marking of number of passages in both directions in 2011.

Source: Trafikflödesinformation (2014-01-31).

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