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FOREWORD

Maritime traffic in the Gulf of Finland has grown remarkably during the 2000's, which is mainly due to the strong economic growth and the increasing oil production and transportation activities of Russia. The Gulf of Finland is said to be one of the densest operated sea areas in the world. It is widely believed that the growth of maritime traffic will continue in the Gulf of Finland also in the future. Maritime safety risks in the Gulf of Finland are remarkable because the Gulf of Finland is a shallow and ecologically vulnerable sea area. The winter conditions bring about additional difficulties for shipping.

In this report, the current structure and future development of maritime transportation has been studied for the purposes of e.g. risk analysis. This has been done by analyzing the maritime traffic in the Gulf of Finland in 2007 and by formulating three alternative future scenarios for the maritime transportation in the Gulf of Finland in 2015. The scenarios have been based on the existing transportation scenarios and other forecasts on the development of maritime transportation. In addition, the economic development, key industries and maritime transportation infrastructure in the Gulf of Finland have been studied.

The maritime transportation in the Gulf of Finland is characterised by a majority of petroleum products in transportation. The key factors in the future development are how the global economy will develop considering the current instability and how Russia will develop.

This report has been written as a part of the research project "SAFGOF - Evaluation of the traffic increase in the Gulf of Finland during the years 2007-2015 and the effect of the increase on the environment and traffic chain activities" of Kotka Maritime Research Centre. In addition, this report is the result of Work Package 1 "Baltic Sea traffic flows". Research was accomplished by the Centre for Maritime Studies, the University of Turku (Kuronen, Helminen & Tapaninen), and the Department of Biological and Environmental Sciences, University of Helsinki (Lehikoinen). The research project is financed by the European Union – European Regional Development Fund - Regional Council of Kymenlaakso, City of Kotka, Kotka-Hamina regional development company Cursor Ltd., Kotka Maritime Research Association Merikotka and Kotka Maritime Research Center Corporate Group.

The Centre for Maritime Studies in the University of Turku expresses its gratitude to all the researchers and other parties who have contributed to the collection of data, their analysis and to the writing of the results.

Turku 3rd December, 2008

Juhani Vainio
Director
Centre for Maritime Studies

ABSTRACT

The Gulf of Finland is said to be one of the densest operated sea areas in the world. It is a shallow and economically vulnerable sea area with dense passenger and cargo traffic of which petroleum transports have a share of over 50 %. The winter conditions add to the risks of maritime traffic in the Gulf of Finland. It is widely believed that the growth of maritime transportation will continue also in the future.

The Gulf of Finland is surrounded by three very different national economies with different maritime transportation structures. Finland is a country of high GDP/per capita with a diversified economic structure. The number of ports is large and the maritime transportation consists of many types of cargoes: raw materials, industrial products, consumer goods, coal and petroleum products, and the Russian transit traffic of e.g. new cars and consumer goods. Russia is a large country with huge growth potential; in recent years, the expansion of petroleum exports has lead to a strong economic growth, which is also apparent in the growth of maritime transports. Russia has been expanding its port activities in the Gulf of Finland and it is officially aiming to transport its own imports and exports through the Russian ports in the future; now they are being transported to great extend through the Finnish, Estonian and other Baltic ports. Russia has five ports in the Gulf of Finland.

Estonia has also experienced fast economic growth, but the growth has been slowing down already during the past couples of years. The size of its economy is small compared to Russia, which means the transported tonnes cannot be very massive. However, relatively large amounts of the Russian petroleum exports have been transported through the Estonian ports. The future of the Russian transit traffic in Estonia looks nevertheless uncertain and it remains to be seen how it will develop and if Estonia is able to find replacing cargoes if the Russian transit traffic will come to an end in the Estonian ports. Estonia's own import and export consists of forestry products, metals or other raw materials and consumer goods. Estonia has many ports on the shores of the Gulf of Finland, but the port of Tallinn dominates the cargo volumes.

In 2007, 263 M tonnes of cargoes were transported in the maritime traffic in the Gulf of Finland, of which the share of petroleum products was 56 %. 23 % of the cargoes were loaded or unloaded in the Finnish ports, 60 % in the Russian ports and 17 % in the Estonian ports. The largest ports were Primorsk (74.2 M tonnes) St. Petersburg (59.5 M tonnes), Tallinn (35.9 M tonnes), Sköldvik (19.8 M tonnes), Vysotsk (16.5 M tonnes) and Helsinki (13.4 M) tonnes.

Approximately 53 600 ship calls were made in the ports of the Gulf of Finland. The densest traffic was found in the ports of St. Petersburg (14 651 ship calls), Helsinki (11 727 ship calls) and Tallinn (10 614 ship calls) in 2007.

The transportation scenarios are usually based on the assumption that the amount of transports follows the development of the economy, although also other factors influence the development of transportation, e.g. government policy, environmental

aspects, and social and behavioural trends. The relationship between the development of transportation and the economy is usually analyzed in terms of the development of GDP and trade. When the GDP grows to a certain level, especially the international transports increase because countries of high GDP produce, consume and thus transport more. An effective transportation system is also a precondition for the economic development. In this study, the following factors were taken into consideration when formulating the future scenarios: maritime transportation in the Gulf of Finland 2007, economic development, development of key industries, development of infrastructure and environmental aspects in relation to maritime transportation.

The basic starting points for the three alternative scenarios were:

- the slow growth scenario: economic recession
- the average growth scenario: economy will recover quickly from current instability
- the strong growth scenario: the most optimistic views on development will realize

According to the slow growth scenario, the total tonnes for the maritime transportation in the Gulf of Finland would be 322.4 M tonnes in 2015, which would mean a growth of 23 % compared to 2007. In the average growth scenario, the total tonnes were estimated to be 431.6 M tonnes – a growth of 64 %, and in the strong growth scenario 507.2 M tonnes – a growth of 93%. These tonnes were further divided into petroleum products and other cargoes by country, into export, import and domestic traffic by country, and between the ports. For petroleum products, the share of crude oil and oil products was estimated and the number of tanker calls in 2015 was calculated for each scenario.

However, the future development of maritime transportation in the GoF is dependent on so many societal and economic variables that it is not realistic to predict one exact point estimate value for the cargo tonnes for a certain scenario. Plenty of uncertainty is related both to the degree in which the scenario will come true as well as to the cause-effect relations between the different variables. For these reasons, probability distributions for each scenario were formulated by an expert group.

As a result, a range for the total tonnes of each scenario was formulated and they are as follows:

- the slow growth scenario: 280.8 – 363 M tonnes (expectation value 322.4 M tonnes)
- the average growth scenario: 404.1 – 465.1 M tonnes (expectation value 431.6 M tonnes)
- the strong growth scenario: 445.4 – 575.4 M tonnes (expectation value 507.2 M tonnes)

Three alternatives scenarios were evaluated to realize most likely with the following probability distribution:

- the slow growth scenario: 35 %
- the average growth scenario: 50 %
- the strong growth scenario: 15 %.

In other words, expert group evaluated the average growth scenario to be the most likely to realize, second likely was the slow growth scenario, and the strong growth scenario was evaluated to be the most unlikely to realize.

In sum, it can be stated that the development of maritime transportation in the Gulf of Finland is dominated by the development of Russia, because Russia dominates the cargo volumes. Maritime transportation in Finland is expected to be more stable and, in any case, such a growth potential cannot be seen in Finland. The development of maritime transportation in Estonia is rather challenging to forecast at the moment but, on the other hand, the transported tonnes in the Estonian ports are relatively small. The shares of export and import of the maritime transportation are not expected to change radically in the reference period.

Petroleum products will dominate the transports also in the future and the share of oil products will probably increase compared to the share of crude oil. In regard to the other cargoes, the transports of raw materials and bulk goods will probably be replaced to some extend by cargoes of high-value, which adds especially to the container transports. But in overall, substantial changes are not expected in the commodity groups transported by sea.

The growth potential of the ports concentrates on the Russian ports, especially Primorsk and Ust-Luga, if investments will come true as planned. It is likely that the larger ports do better in the competition than the small ones due to the economies of scale and to the concentration of cargo flows. The average ship sizes will probably grow, but the growth potential is rather limited because of geographical conditions and of the maritime transportation structure in the Gulf of Finland.

Climate change and other environmental aspects are becoming more central e.g. in transportation politics. These issues can affect the maritime transportation in the Gulf of Finland through, for instance, strict environmental requirements concerning the emissions from shipping, or the port investments. If environmental requirements raise costs, it can affect the demand of transportation.

In the near future, the development of the maritime transportation in the Gulf of Finland is mainly dependent on the current economic instability. If it will lead to a longer lasting recession, the growth of the transported tonnes will slow down. But if the instability does not last long, it can be expected that the economic growth will continue and along with it also the growth of transported tonnes.

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1 INTRODUCTION

1.1 General

Maritime traffic in the Gulf of Finland has grown remarkably during the 2000's, which is mainly due to the strong economical growth and the increasing oil production and transportation activities of Russia. It s widely expected that the growth of maritime traffic will continue in the Gulf of Finland also in the future. The growth of maritime traffic and especially of oil transportation has raised concerns about the safety of maritime traffic in the Gulf of Finland which is a shallow and ecologically vulnerable sea area. For instance, the dense passenger traffic between Helsinki and Tallinn and oil tankers in load heading to west are a combination which in the worst case could lead to a devastating accident in the Gulf of Finland.

The aim of this research report is to analyze the structure and future sights of maritime traffic in the Gulf of Finland in order to produce information e.g. for the purposes of risk analysis and for policymakers. The report includes statistical information on maritime cargo transportation and ship traffic in the Gulf of Finland in 2007, a presentation of the ports in the area and three alternative maritime transportation scenarios for the year 2015 (Safgof scenarios), which have been built on the basis of the existing maritime transportation scenarios and by analyzing the development of the economy, production and transportation infrastructure of the countries surrounding the Gulf of Finland: Finland, Russia and Estonia. The probability of the three scenarios has been studied in the context of probability distribution simulation.

The research report has been written as a part of the research project "SAFGOF - Evaluation of the traffic increase in the Gulf of Finland during the years 2007-2015 and the effect of the increase on the environment and traffic chain activities" of Kotka Maritime Research Centre (KMRC). The project has begun on 1 January 2008 and it ends on 31 December 2010. This report is the result of Work Package 1 "Baltic Sea traffic flows" and the study has been conducted by the Centre for Maritime Studies in the University of Turku. The project is financed by the European Union – European Regional Development Fund - Regional Council of Kymenlaakso, City of Kotka, Kotka-Hamina regional development company Cursor Ltd., Kotka Maritime Research Association Merikotka and Kotka Maritime Research Center Corporate Group.

The Centre for Maritime Studies is a special unit of the University of Turku and it is one of the leading providers of education, research and expert services in the maritime field in Finland. In addition to its national activities, the CMS has taken part in numerous international projects especially in the area of the Baltic Sea. The Kotka office of the Centre for Maritime Studies functions as a part of Kotka Maritime Research Centre. The KMRC has existed since 2005 and research units from four universities operate in its premises: the University of Helsinki, Helsinki University of Technology, the University of Turku and Kymenlaakso University of Applied Sciences.

A report has been formulated in co-operation with researchers Jenni Kuronen and Reima Helminen, and professor Ulla Tapaninen (University of Turku), and researcher

Annukka Lehikoinen (University of Helsinki), who has performed the probability distribution simulation of the Safgof scenarios.

1.2 Remarks on the contents of the report

The focus of this report lies in the cargo transport by sea in the area of the Gulf of Finland in 2007 and in 2015. Transportation of petroleum products is dealt separately in each part of the report. In 2007, the share of petroleum products in maritime transportation was over 50 % in the Gulf of Finland. The large share of petroleum products increases the risks of maritime safety in the area. In the report, passenger traffic is only included in the statistics on ship calls in 2007, and otherwise passenger traffic is not dealt with in this report.

The report is structured as follows. First, the overall picture of maritime traffic in 2007 is presented. After that, the ports and their future investment plans in the Gulf of Finland are presented individually. Then comes the scenario part, where the general remarks on transportation scenarios are presented first. The existing scenarios or other estimations on future transportation and prospects as well as the development of the economy and the key industries in the area of the Gulf of Finland are examined by country. After that, three alternative Safgof scenarios are presented. First, the scenarios have been formulated in tonnes by grouping the cargoes to petroleum products and other cargoes by country. These scenarios have been further divided into import, export and domestic traffic by country, and between the ports. The petroleum transports have been further divided into crude oil and oil products by country, and for the petroleum transports, also the development of tanker calls in the ports of the Gulf of Finland has been calculated. At the end, the probability distributions of the three scenarios are studied.

1.3 Definitions

Whenever possible and appropriate, the same definitions, as in the publication of the Centre for Maritime Studies “Baltic Port List 2006” (Saurama et al. 2008), have been used in this report.

Domestic traffic is the amount of traffic transported by sea directly between ports located within the same country. Domestic traffic is presented in tonnes, and it is only shown in total by each port.

International traffic is the amount of traffic that crosses country borders with either its origin or destination in another country. Transit traffic is included in the international traffic. Transit traffic comes from another country and goes through the port to be further transported to a third country.

Total traffic is the sum of domestic and international traffic. International traffic is divided between import and export, which describe the volume of cargo loaded and unloaded in the port. *Import* is the amount of cargo that arrives in the port from abroad by sea to be unloaded in the port. It consists of both international traffic that has its

destination inside the country, and of transit traffic. *Export* consists of cargo transported from the port to another country by sea. Export consists of cargo that originates inside the country as well as transit cargo.

Ship calls is the number of ships arriving at a port per year including both international and domestic traffic if not otherwise indicated.

Dry bulk includes the following NST/R[1] principal groups of dry cargo: agricultural products, foodstuffs and animal fodder, solid mineral fuels, ores and metal waste, crude and manufactured minerals, building materials, fertilizers and dry chemicals, dry bulk also includes round timber, wood pulp, peat, wood chips and pellets.

Liquid bulk consists of bulk that is in the NST/R classification typed as petroleum products (including both crude oil and oil products) and liquid chemicals. Also cargo that is reported as other liquid bulk is classified to this class.

Other dry cargo consists of parcelled goods and other goods that are not included in the previous classes. In the NST/R principal classification, metal products and machinery, transport equipment, manufactured articles and miscellaneous articles are classified to this class. Also, products reported as wood are classified to other dry cargo, unless they are reported as round timber or are clearly known to consist mostly of raw timber. Industrialized wood products, sawn timber, paper pulp and paper products are included in other dry cargo as well. Also, groups labelled as non-specified goods in containers, ferry goods, other goods in Ro-Ro units, other mixed cargo and general cargo are included in other dry cargo.

1.4 Statistical sources on maritime transportation

Finland

The statistics of maritime traffic in Finland are based on Finnish Maritime Administration's marine statistics, which are the official statistics of shipping in Finland (Merenkulkulaitos 2008a; Merenkulkulaitos 2008b; Merenkulkulaitos 2008c; Merenkulkulaitos 2008d; http://www.fma.fi/palvelut/tilastot/).

All the ports in the Gulf of Finland which had international traffic in 2007 are presented in the report, but the most detailed statistics include only the largest ports.

Russia

In Russia, no centralized authority or suchlike exists where detailed statistics on maritime traffic could be obtained. This means that the data on maritime traffic and on ports has been collected from various sources: from ports, from news services and from personal contacts. The same data as in the Baltic Port List 2007 (Centre for Maritime Studies 2008) has been used whenever possible. The level and scope of the data has

[1] Standard goods classification transport statistics (European Communities)

been very varying. To ensure the reliability of the data it will be double-checked and compared to the other sources whenever possible.

Estonia

Information on maritime transportation in Estonia has also been gathered and cross-checked from multiple sources: ports, Statistics Estonia, Maritime administration of Estonia, Eurostat. Whenever possible, the same data as in the publication "Baltic Port List 2007" (Centre for Maritime Studies 2008) has been used.

Reliable information has not always been found and some figures are own calculations and estimations. These figures are always pointed out. Otherwise, for the sake of clarity, the source of every figure is not separately presented in the statistical tables, but they are based on the sources mentioned above and in the running text.

2 MARITIME TRANSPORTATION IN THE GULF OF FINLAND

2.1 Maritime transportation in the Gulf of Finland in 2007

The Gulf of Finland is a part of the world's largest area of brackish water, the Baltic Sea. The Gulf of Finland is 400 km long and its width varies between 60 and 135 km. Three countries surround the Gulf of Finland: Finland, Russia and Estonia. The northern shores of the Gulf of Finland are rich in small islands. Estonia's shores do not have any archipelago. The Gulf of Finland is very shallow: the maximum depth is 60 metres and the average depth 37 metres. (For comparison: the average depth of the Mediterranean Sea is 1550 metres.) The Gulf of Finland is partly ice-covered, approximately from December to April. The ice-cover is the heaviest in the Russian side of the gulf. Because of its narrowness and shallowness, the Gulf of Finland can be considered a high-level risk zone. The traffic volumes are high and there is intersecting traffic especially between Helsinki and Tallinn. And the Gulf of Finland is not merely a traffic route but also an area of cultural heritage and of environmental value. (Nikula & Tynkkynen 2007)

In Finland, 17 ports had sea traffic in 2007 and, in addition, the traffic of Saimaa Canal goes along the Gulf of Finland. Many of the ports are quite small and the share of five biggest ports – Hanko, Helsinki, Sköldvik, Kotka and Hamina - was 86 % of the cargo tonnes in the Finnish ports in the Gulf of Finland. The total traffic in the ports of the Gulf of Finland in Finland was 61.2 million tonnes with about 22 000 ship calls in 2007. The share of domestic traffic was about 9 %.

Russia has five seaports on the shores of the Gulf of Finland: Vyborg, Vysotsk, Primorsk, St. Petersburg and Ust-Luga. These ports handled a total of 158.4 million tonnes of cargo in 2007 of which about 101 million tonnes consisted of petroleum products. The share of the Gulf of Finland totalled about 35 % of all the cargoes handled in the Russian ports in 2007.

The largest ports in Estonia are situated on the shores of the Gulf of Finland and the port of Tallinn (83 %) dominates the cargo volumes. The other ports in the Gulf of Finland include: Sillamäe, Kunda, Miiduranna, Vene Balti, Bekker and Paldiski Northern. The maritime traffic of Estonia is characterised by a large amount of Russian transit traffic: in 2007, 73 % of all goods transported through the Estonian ports were transit goods and of the transit goods 76 % were petroleum products. The share of the petroleum products of all cargoes in the Estonian ports in the Gulf of Finland was 58 % in 2007. In Estonia's own traffic the most important cargoes in export include raw wood and goods in trailers and, in import, crude and manufactured minerals and goods on trailers.

Figure 2.1 Major ports in the Gulf of Finland

In 2007, a total of 263 M tonnes of cargoes were transported in the Gulf of Finland. The share of the Finnish ports was 23.3 %, the Russian ports 60.2 % and the Estonian ports 16.5 %. The share of import was 22 %, of export 76 % and of domestic traffic of these three countries 2 %. The largest ports (in tonnes) were Primorsk with 74.2 M tonnes, St. Petersburg with 59.5 M tonnes, Tallinn with 35.9 M tonnes and Sköldvik with 19.8 M tonnes. (Appendix 1)

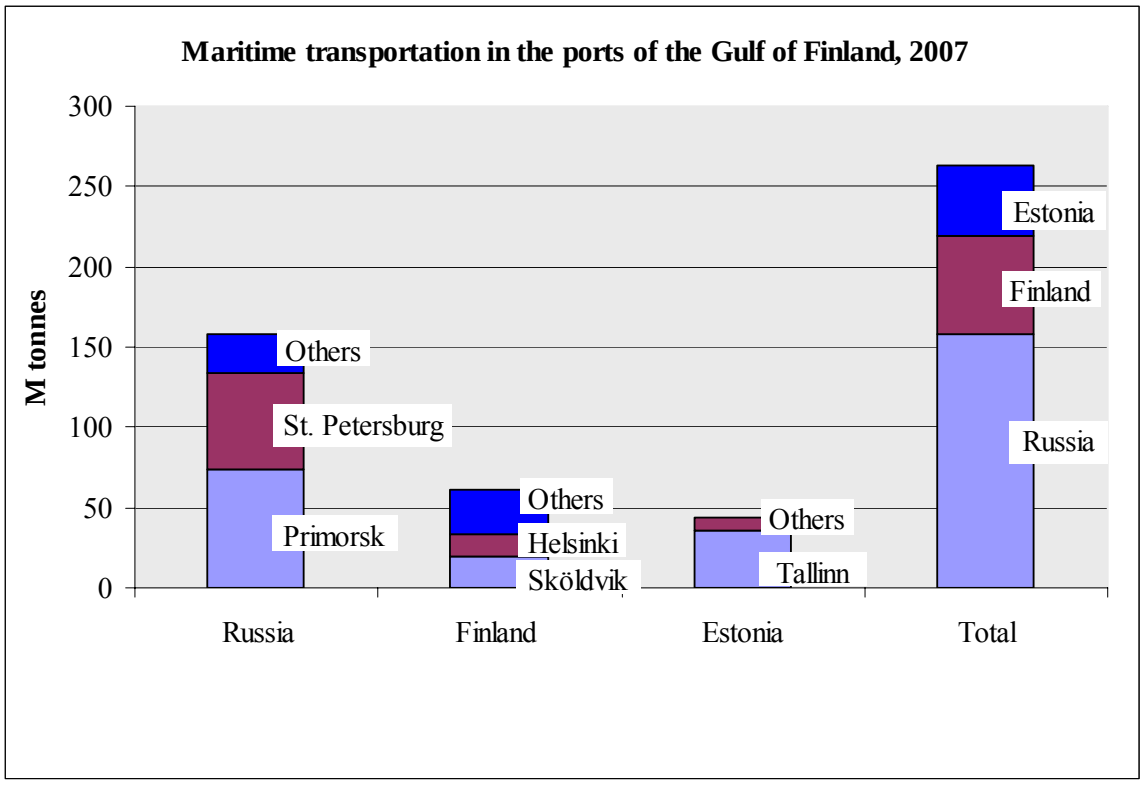

Figure 2.2 Maritime transportation in the ports of the Gulf of Finland, 2007

Approximately 53 600 ship calls were reported in the ports of the Gulf of Finland in 2007. Of these, 41 % visited the Finnish ports, 35 % the Russian ports and 24 % the Estonian ports. The most frequent ship traffic was found in the ports of St. Petersburg (14 651 ship calls), Helsinki (11 727) and Tallinn (10 614). 12 % of the ship calls were made by tankers. (Appendix 2)

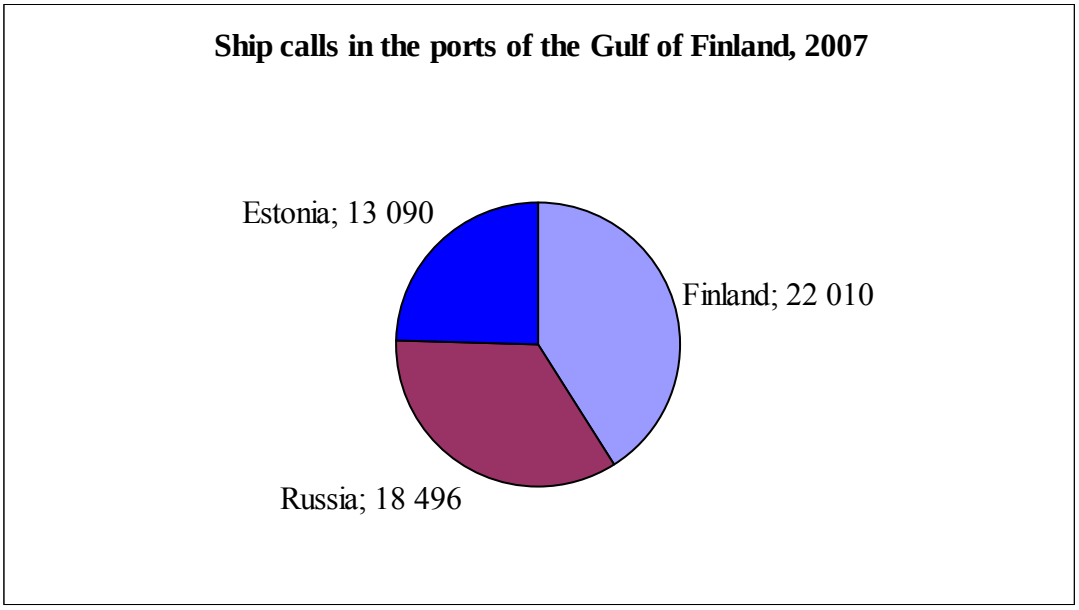

Figure 2.3 Ship calls in the ports of the Gulf of Finland, 2007

2.2 Transportation of petroleum products in the Gulf of Finland in 2007

Transportation of petroleum products formed 56 % of all cargo traffic in the Gulf of Finland in 2007. The share of the Finnish ports in the transports of petroleum products was 14.2 %, of the Russian ports 68.6 % and of the Estonian ports 17.2 %. Of the petroleum transports, 54.7 % were crude oil and the rest different kinds of oil products. The share of exported petroleum transports was 88 %, imported petroleum products 8.2 % and domestic traffic 3.7 %. Intrinsic traffic forms a part of the imported petroleum transports in the Gulf of Finland. (Appendix 3)

The petroleum transports consist of crude oil, which is exported from Russia mainly via Primorsk, and of oil products. In 2007, different kinds of oil products were transhipped via Vysotsk, St. Petersburg, Sköldvik, Kotka, Hamina, Sillamäe, Tallinn and Vene-Balti (export) and Helsinki, Sköldvik, Hamina, Tallinn and Vene-Balti (import). In Finland, crude oil is imported to the refineries in Sköldvik and Naantali, which produce oil products. Crude oil is mainly imported from Russia (Primorsk) to Finland, but also from the ports of e.g. Great Britain and Denmark. The Finnish oil refineries transport oil products by sea to Finland for domestic consumption and also abroad, mainly to Sweden, USA and the other western countries.

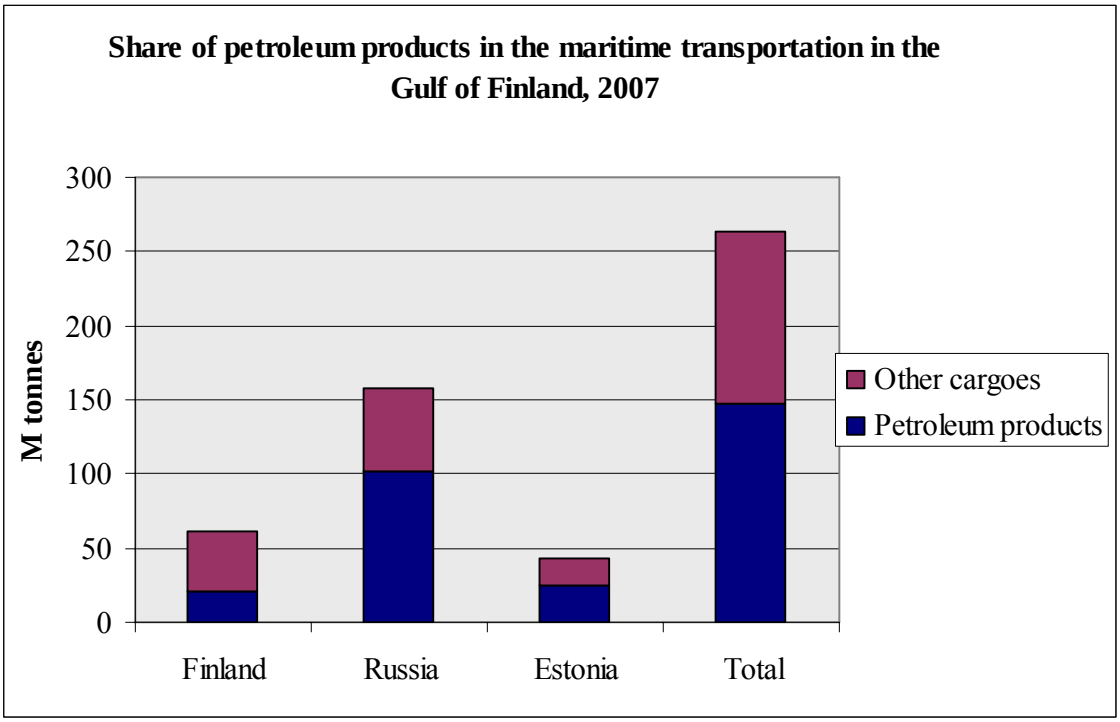

Figure 2.4 The share of petroleum products in the maritime transportation in the Gulf of Finland, 2007

50 % of the petroleum cargoes were loaded in the port of Primorsk in 2007. The other major ports in regard to the petroleum transports were Tallinn (Muuga harbour area), Sköldvik, Helsinki and Vysotsk.

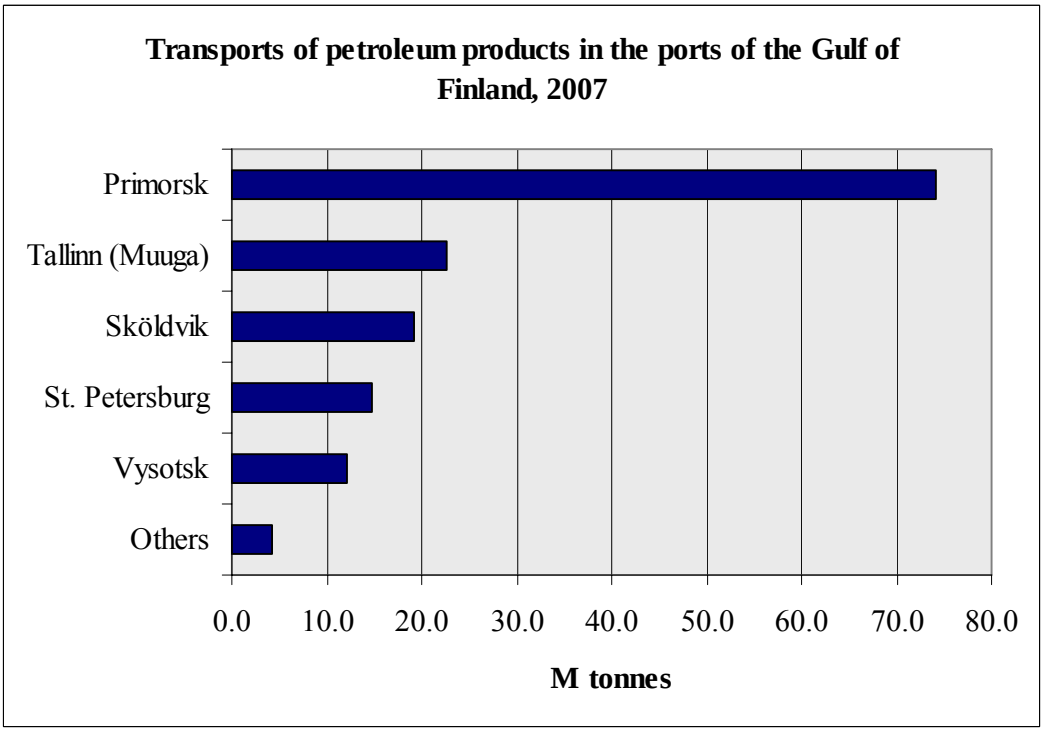

Figure 2.5 Transports of petroleum products in the ports of the Gulf of Finland, 2007

Approximately 6 300 tanker calls were reported in the ports of the Gulf of Finland in 2007, including all tankers in the ports that had petroleum transports. It should be noticed that some of these tankers transport e.g. chemicals. (Appendix 4)

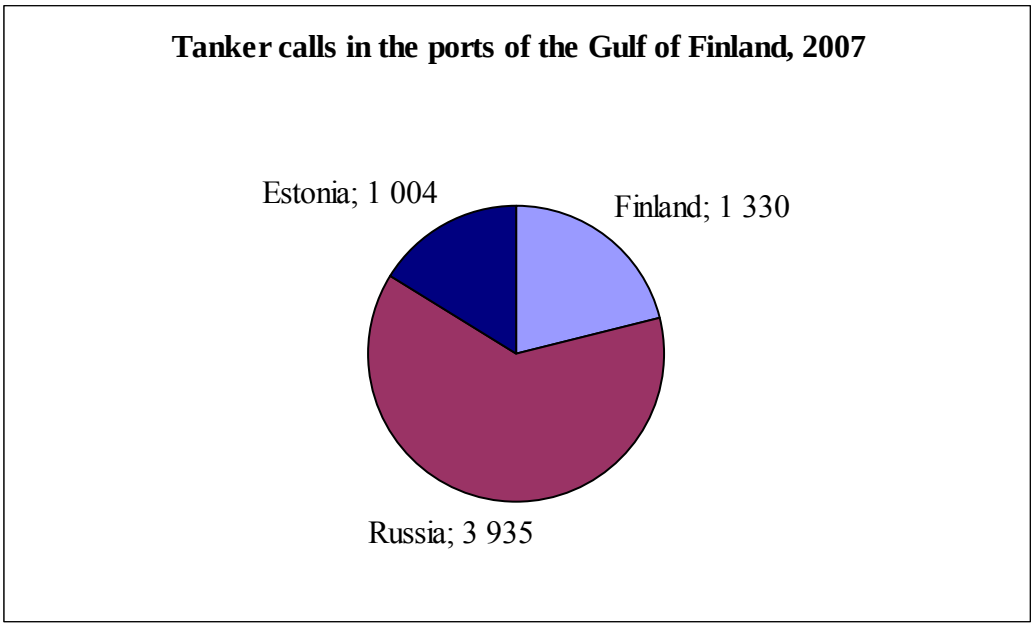

Figure 2.6 Tanker calls in the ports of the Gulf of Finland.

Most of the tankers shipping in the Gulf of Finland are relatively small. Crude oil is normally transported in larger tankers than oil products.

Table 2.8 Size distribution of tankers in the Gulf of Finland, 2007[2]

DWT (thousands)	**2007**
	%
<10	42
10-35	25
35-50	12
50-75	2
75-115	18
115-150	1

[2] Sources on tanker sizes: Portnet data system (Finland), Eurostat statistics (Estonia) (http://epp.eurostat.ec.europa.eu/portal/page?_pageid=0,1136228,0_45572945&_dad=portal&_schema=PORTAL), Port of St. Petersburg (www.pasp.ru). Ship sizes in Primorsk and Vysotsk have been estimated on the basis of maximum ship sizes and number of ship calls. The results of this analysis have been cross-checked with the ship size distribution in HELCOM AIS data from 17 days in the Gulf of Finland in 2007 (HELCOM 2008)

2.3 Depth of fairways and average ship sizes in the ports of the Gulf of Finland

The maximum ship size in the Gulf of Finland is limited by the depth of the fairway in the Danish strait, which is 15 metres. In the Gulf of Finland, only the ports of Sköldvik, Kotka, Primorsk, Ust-Luga, Sillamäe and Tallinn (Muuga harbour area) have a fairway of 15 metres. The average depths of the fairways in the ports of the Gulf of Finland are between 10-15 metres. Besides the depth of the fairway, the maximum ship size in the ports is limited by the handling capacity of the port, e.g. the size of berths. (Appendix 5)

The average ship size in the Gulf of Finland is relatively small due to the above mentioned reasons.

Table 2.9 The average size of the most common ship types in the Gulf of Finland, 2007 (HELCOM 2008)[3]

	GT	DWT	Length	Breadth	Draught
General cargo ship	3 588	4 684	97	14	5
Bulk ship	20 298	33 895	179	26	10
Container ship	14 165	16 128	158	23	9
Ro-Ro ship	13 247	8 587	148	21	7
Ro-Pax ship	12 447	2 896	108	18	4
Passenger ship	230	35	32	7	2
Cruiser	31 506	3 971	182	24	6
Tanker, crude oil	32 514	58 739	165	28	10
Tanker, product	12 467	20 605	119	19	7
Tanker, chemicals	12 224	19 190	140	22	9

[3] Based on HELCOM AIS data on ship traffic in the Gulf of Finland. Used data presents 17 days around the year 2007 (HELCOM 2008).

3 FINNISH PORTS[4]

3.1 Hanko

The Port of Hanko is the southernmost port in Finland. The port is specialized in importing cars (mainly transit to Russia) and exporting paper, but other cargoes are handled as well, including e.g. small amount of chemicals. The Port of Hanko is a communally-owned port.

In the future, the Port of Hanko expects an increase in the trailer and container traffic (Auto- ja kuljetusalalehti 2/2008). With the current infrastructure and operations models the port is near its maximum capacity. If there will not be any investments and the operations continue as they are now, the port's competitiveness will suffer in the long run and the cargo amounts are said to start to decrease by the year 2015. The sea areas around Hanko are protected due to environmental reasons and the port is situated in the vicinity of Hanko city, which can hinder the development of the port. One option would be to optimize the use of current capacity. (Kivari et al. 2007)

Table 3.1 Maritime traffic in the port of Hanko, 2007

Hanko	
Total traffic tonnes (t)	3 087 583
International traffic (t)	3 052 951
Import (t)	1 437 212
Export (t)	1 615 739
Domestic traffic (t)	34 632
Ship calls (total)	1 487
Cargo traffic by types of cargo in international traffic (t)	
Dry bulk	751
Liquid bulk	3 285
Other dry cargo	3 048 915
Containers (TEU)	60 618
Import (TEU)	30 467
Export (TEU)	30 151
Transit traffic (t)	802 891
Import (t)	693 943
Export (t)	108 948

[4] The summary of maritime traffic in the Finnish ports by commodity groups and of monthly ship traffic is presented in Appendices 6 and 7.

3.2 Koverhar

The Port of Koverhar is also situated in the municipality of Hanko and it is owned by the steel company OvakoWire Ltd. The port serves to small extend also other industrial companies in the area. Most of the traffic includes imports of raw materials.

Table 3.2 Maritime traffic in the port of Koverhar, 2007

Koverhar	
Total traffic tonnes (t)	1 400 686
International traffic (t)	1 344 466
Import (t)	1 157 162
Export (t)	187 304
Domestic traffic (t)	56 220
Ship calls (total)	192
Cargo traffic by types of cargo in international traffic (t)	
Dry bulk	1 149 898
Liquid bulk	-
Other dry cargo	194 568
Containers (TEU)	-
Import (TEU)	
Export (TEU)	
Transit traffic (t)	-
Import (t)	
Export (t)	

3.3 Inkoo

The Port of Inkoo is a privately-owned public port. The Port Company is called Inkoo Shipping Ltd and it is owned by industrial companies. The Port transhipps dry bulk, for instance coal, crushed stone and limestone. The traffic is import-oriented. Next to the Inkoo Port is also a berth of the Fortum power plant. In recent years, the port has expanded its storages and plans to build a new dock have been made. (http://www.inkooshipping.fi)

Table 3.3 Maritime traffic in the port of Inkoo, 2007

Inkoo	
Total traffic tonnes (t)	2 073 542
International traffic (t)	1 917 388
Import (t)	1 340 236
Export (t)	577 152
Domestic traffic (t)	156 154
Ship calls (total)	614
Cargo traffic by types of cargo in international traffic (t)	
Dry bulk	1 801 881
Liquid bulk	100 099
Other dry cargo	15 408
Containers (TEU)	-
Import (TEU)	
Export (TEU)	
Transit traffic (t)	-
Import (t)	
Export (t)	

3.4 Kantvik

The Port of Kantvik is situated in the municipality of Kirkkonummi and the port consists of two separate ports, which have common port regulations: Eteläsatama (Southern port), which is owned by the city of Helsinki, and Pohjoissatama (Northern port), which is owned by the sugar mill Danisco Sugar Ltd. The port areas are situated within a distance of 500 metres. Cargoes in Eteläsatama include coal, gypsum and cement, and in Pohjoissatama raw sugar. The port serves mainly local industrial companies.

Table 3.4 Maritime traffic in the port of Kantvik, 2007

Kantvik	
Total traffic tonnes (t)	846 200
International traffic (t)	796 417
Import (t)	653 566
Export (t)	142 851
Domestic traffic (t)	49 783
Ship calls (total)	224
Cargo traffic by types of cargo in international traffic (t)	
Dry bulk	587 410
Liquid bulk	-
Other dry cargo	209 007
Containers (TEU)	-
Import (TEU)	
Export (TEU)	
Transit traffic (t)	-
Import (t)	
Export (t)	

3.5 Helsinki

The Port of Helsinki is the largest general port for import and export in Finland. The Port of Helsinki is also the biggest passenger port in Finland.

The Port of Helsinki has major changes ahead at the end of 2008 when the Vuosaari port area is opened, which will redirect most of the cargo flows from the current three different port areas to the Vuosaari port area. The passenger terminals will stay in the port areas of Etelä- and Länsisatama as well as imports of coal at Sompasaari berth. Vuosaari is, above all, a port for unit loads: for containers and ro-ro units serving primarily consumer goods traffic. In addition, industrial products, raw materials and forestry products are transhipped in Vuosaari. (Fi.logistics 2008)

Table 3.5 Maritime traffic in the port of Helsinki, 2007

Helsinki	
Total traffic tonnes (t)	13 431 438
International traffic (t)	13 073 776
Import (t)	6 822 677
Export (t)	6 251 099
Domestic traffic (t)	357 662
Ship calls (total)	11 727
Cargo traffic by types of cargo in international traffic (t)	
Dry bulk	1 043 088
Liquid bulk	666 959
Other dry cargo	11 363 729
Containers (TEU)	431 404
Import (TEU)	224 326
Export (TEU)	207 078
Transit traffic (t)	244 564
Import (t)	208 663
Export (t)	35 901

3.6 Sköldvik

The Port of Sköldvik in Porvoo is the main port for petroleum product transhipments in Finland. It is also the biggest port in Finland when measured in tonnes. The Port of Sköldvik is part of the Neste Oil Ltd Porvoo refinery. In Porvoo, the refinery Neste oil produces about 150 different oil products and constituents, main products being fuels and raw material for lubricants. The capacity of the refinery is approximately 11 million tons of crude oil annually. The Porvoo refinery also produces bio diesel, which is made from vegetable oils and animal fats. The production capacity of bio diesel is 170 000 tons at the moment, but in 2009 a new bio diesel production plant of the same size will be opened. A part of the production goes to the domestic markets and a part is exported mainly to Europe and North America. Besides its own production, the port also serves other companies in the industrial area of Sköldvik: Borealis polymers Ltd and Styrochem Finland Ltd. Besides crude oil and oil products, also small amounts of other industrial feed materials, gases and chemicals are transported via Sköldvik.

By year 2010, the biggest investments in the port of Sköldvik are mainly fundamental improvements and renewals of pipelines. The port has five berths: five for oil, two for gas and chemicals and one for dry bulk.
(http://www.nesteoil.fi/default.asp?path=35,52,109,186,363)

Table 3.6 Maritime traffic in the port of Sköldvik, 2007

Sköldvik	
Total traffic tonnes (t)	19 760 163
International traffic (t)	16 308 692
Import (t)	10 337 769
Export (t)	5 970 923
Domestic traffic (t)	3 451 471
Ship calls (total)	1 251
Cargo traffic by types of cargo in international traffic (t)	
Dry bulk	-
Liquid bulk	16 276 331
Other dry cargo	32 361
Containers (TEU)	-
Import (TEU)	
Export (TEU)	
Transit traffic (t)	-
Import (t)	
Export (t)	

3.7 Loviisa

The Port of Loviisa is a communally-owned port and its main cargoes in import include coal and crude minerals and in export, sawn wood and cereals. The amounts of handled cargo have been relatively small and the port cannot grow much with the current infrastructure. There are plans to build a new berth to the port in the near future. (http://lotta.yle.fi/rswebpvo.nsf/sivut/uutisetlangaton?opendocument&pageid=Content36B19) In the future, it could be possible that the Port of Loviisa could take its share of e.g. Russian transit traffic. In principle, the location of the port is good, and there are road and railway connections to the port, although the railway is in the need of improvement.

Table 3.7 Maritime traffic in the port of Loviisa, 2007

Loviisa	
Total traffic tonnes (t)	1 273 368
International traffic (t)	1 269 705
Import (t)	515 771
Export (t)	753 934
Domestic traffic (t)	3 663
Ship calls (total)	357
Cargo traffic by types of cargo in international traffic (t)	
Dry bulk	645 664
Liquid bulk	5
Other dry cargo	624 036
Containers (TEU)	-
Import (TEU)	
Export (TEU)	
Transit traffic (t)	-
Import (t)	
Export (t)	

3.8 Kotka

The Port of Kotka is the biggest container port in Finland, and the main cargoes in import are timber, metals and minerals, and in export forestry products and chemicals. Russian transit cargoes play an important role: 26 % of all the cargoes were transit cargoes in year 2007. The Port of Kotka is a municipally-owned limited company. The port consists of three port areas: Mussalo, Hietanen and Kantasatama. To the port leads two fairways: Mussalo fairway of 15.3 metres and Orrengrund-Kotka fairway of 10 metres.

The main development projects include the container terminal in Mussalo and the car terminal areas in Hietanen, which are extended. General development plans for Mussalo and Hietanen by 2020 were made in 2007. The car terminal capacity of Hietanen can be doubled and the container areas in Mussalo can be extended remarkably. The goal is that construction work can be done if and when demand requires (http://www.portofkotka.fi/uusi/index.php). A railway connection to Mussalo is also under construction. There will be 10 new rails, and the work is supposed to be accomplished in 2010 (Kymen sanomat 12.3.2008). The so-called B-berth of Mussalo will be lengthened by over 300 metres and the basin will be deepened to 13 metres. (Kymen sanomat 22.2.2008)

Table 3.8 Maritime traffic in the port of Kotka, 2007

Kotka	
Total traffic tonnes (t)	10 589 881
International traffic (t)	10 231 928
Import (t)	4 870 142
Export (t)	5 361 786
Domestic traffic (t)	357 953
Ship calls (total)	2 870
Cargo traffic by types of cargo in international traffic (t)	
Dry bulk	2 790 194
Liquid bulk	706 383
Other dry cargo	6 735 351
Containers (TEU)	563 042
Import (TEU)	295 637
Export (TEU)	267 405
Transit traffic (t)	2 633 887
Import (t)	1 983 244
Export (t)	650 643

3.9 Hamina

The Port of Hamina is situated only 35 kilometres from the Russian border, and transit transports to/from Russia form a central part of the traffic. In year 2007, the share of transit traffic was 29 % in international traffic. Main cargoes in import include timber, liquid bulk (chemicals and oil products), general cargo in containers, and in export forestry products and chemicals. The port is a municipally-owned private company and it is situated in the vicinity of the town of Hamina.

The main investment projects in the near future include the deepening of waterway and an expansion of the container terminal by 2012, which enables the handling of 1 million TEU annually. The depth of the fairway is 10 metres at the moment and it will be deepened to 12-12.5 metres in 2008-2010 (Merenkulkulaitos 2008e). At the same time the fairway leading to the port is also righted. After the deepening of the fairway, the port capacity can increase with even 50 %.
(http://www.portofhamina.fi/index.php?language=2)

Table 3.9 Maritime traffic in the port of Hamina, 2007

Hamina	
Total traffic tonnes (t)	5 875 629
International traffic (t)	5 142 822
Import (t)	2 086 832
Export (t)	3 055 990
Domestic traffic (t)	732 807
Ship calls (total)	1 580
Cargo traffic by types of cargo in international traffic (t)	
Dry bulk	428 617
Liquid bulk	1 541 617
Other dry cargo	3 172 588
Containers (TEU)	199 002
Import (TEU)	102 699
Export (TEU)	96 303
Transit traffic (t)	1 499 969
Import (t)	551 606
Export (t)	948 363

3.10 Saimaa Canal

Finland also has sea traffic to inland waters through Saimaa Canal. The Saimaa Canal starts from Vysotsk and goes to the lake Saimaa. From there ships can continue to several inland ports. Along the canal, there are eight locks on the way. Due to the winter conditions the canal is closed for 2-4 months a year. Finland has rented a canal area from Russia and the current rental agreement will end in 2013. Negotiations to continue the agreement are underway.

Through the Saimaa canal mainly forestry products are exported and timber and minerals imported.

Table 3.10 Maritime traffic in the Saimaa Canal, 2007

Saimaa Canal	
Total traffic tonnes (t)	2 054 057
International traffic (t)	1 973 957
Import (t)	1 174 771
Export (t)	799 186
Domestic traffic (t)	80 100
Ship calls (total)	1 890
Containers (TEU)	-
Import (TEU)	
Export (TEU)	
Transit traffic (t)	2 703
Import (t)	2 703
Export (t)	-

3.11 Other ports

Lappohja
The Port of Lappohja is situated in the municipality of Hanko and it is a port of the steel company Rautaruukki Ltd., which has a production plant in Lappohja. In 2007, 186 022 tonnes of metals were exported from Lappohja.

Skogby
Skogby is a loading place for a small amount of exported minerals. In 2007, 27 031 tonnes of minerals were exported from Skogby.

Tammisaari
Tammisaari is a loading place for a small amount of imported minerals: in 2007, 6 065 tonnes.

Pohjankuru
Pohjankuru is a loading place for a small amount of imported metals – in 2007, 171 156 tonnes.

Sipoo/Kalkkiranta
In Sipoo Kalkkiranta, the lime production and refinement company Nordkalk Ltd has a mine and a factory. Small amounts of raw materials are imported through Sipoo/Kalkkiranta - in 2007, 44 102 tonnes.

Vessö
Vessö is a small loading place for gravel and sand – in 2007, 68 500 tonnes.

Tolkkinen
In Tolkkinen, Stora Enso Timber Ltd sawmill imports small amounts of timber and exports sawn products. In 2007, 106 068 tonnes of cargo was transported through Tolkkinen.

Isnäs
Isnäs is a small loading place mainly for crushed stone, gravel and sand – in 2007, 61 865 tonnes of cargo was imported and exported through Isnäs.

4 RUSSIAN PORTS

4.1 Vyborg

The Port of Vyborg transhipps mainly Russian exports, excluding petroleum cargoes. The port handles many types of cargoes, e.g. sawn wood, coal, fertilizers, chemicals and other liquid cargo. The port is located within the city of Vyborg.

There are plans to make Vyborg a modern container port in the future. Behind these investment plans is Oslo Marine Group, which plans to double the traffic until year 2010. In the future, more forestry products are also expected to be transhipped through the Port of Vyborg. (Tekniikka&Talous 15.8.2008)

Table 4.1 Maritime traffic in the port of Vyborg, 2007[5]

Vyborg	
Total traffic tonnes (M t)	1.1
International traffic (M t)	1.1
Import (M t)	0.2
Export (M t)	0.9
Domestic traffic (M t)	-
Ship calls (total)	250
Cargo traffic by types of cargo in international traffic (M t)	
Dry bulk	0.7
Liquid bulk	0.1
Other dry cargo	0.3
Containers (TEU)	-

4.2 Vysotsk

The port of Vysotsk is situated on the Vysotsk island, 160 kilometres north-west from St. Petersburg. The port was earlier used as a loading place for coal and gravel, but in year 2004 a new petroleum terminal was opened. It is operated by Lukoil. Exported oil products include heavy fuel oil, gas oil and diesel oil.

The future plans of the Port of Vysotsk concentrate on petroleum product transhipments. A railway connection to the terminal has been built and there are also plans to build a 40-kilometres-long branch pipe from the Kstovo-Primorsk (Baltic Pipeline System) oil pipe to Vysotsk. (Turun sanomat 27.3.2007) The representatives of Lukoil and Russian Railroads have signed an agreement to increase the capacity of the rail lines which connect Lukoil-owned refineries with Vysotsk. Lukoil is also adding two berths for oil tankers to the Vysotsk oil terminal. (Socor 2007)

[5] Sources: http://www.seanews.ru/news/news.asp?newsID=56105; Pimonenko (2008); Morcentr-TEK (2008).

In 2007, 12.2 million tons of petroleum products and 4.3 million tons of coal were exported via the Port of Vysotsk (www.loglink.ru/news/27863).

Table 4.2 Maritime traffic in the port of Vysotsk, 2007[6]

Vysotsk	
Total traffic tonnes (M t)	16.5
International traffic (M t)	16.0
Import (M t)	0.0
Export (M t)	16.0
Domestic traffic (M t)	0.5
Ship calls (total)	2300*
Cargo traffic by types of cargo in international traffic (M t)	
Dry bulk	4.3
Liquid bulk	11.7
Other dry cargo	0.0
Containers (TEU)	-

* Figure is an estimation, which is based on the relationship between tonnes and ship calls in Vysotsk in 2006.

4.3 Primorsk

The Port of Primorsk is situated behind the island of Primorsk (Koivisto) about 60 kilometres south from the city of Vyborg. The port began its operations in 2001 and it is lead by Spetsmornefteport Primorsk, a company which is a part of Transneft (oil pipe monopoly). At the moment, one oil pipe is leading to the port, and the building of another one is being planned. (Rybin 2007; http://www.offshoretc.fi/uutisia_toukokuu08.htm). In spring of 2008, Transneft put into operation the first launch of the complex of the oil products pipeline Kstovo-Yaroslavl-Kirishi-Primorsk and a terminal for transhipment of light oil products, which makes it possible to redirect transhipments from the Baltic ports to Primorsk. The complex is capable of handling 8.4 million tonnes of oil products annually. By 2009, it is planned to raise the capacity to 17 million tonnes, and later on even to 24 million tonnes if the refineries are upgraded accordingly.
(http://en.portnews.ru/comments/136/?print=1)

There are also plans to build a terminal for loading of oils, which are transported to the port by railway, and a terminal for liquefied natural gas (Hietala 2006). The capacity of the liquefied natural gas terminal would be 7,2 million tonnes a year (Karvonen et al. 2007). With these investments the capacity of Primorsk would be 120 tonnes by 2015 (http://www.offshoretc.fi/uutisia_toukokuu08.htm). It has also been suggested that Primorsk could handle containers and chemicals, which would happen in 2012 at the earliest (http://portnews.ru/digest/4024/?print=1).

[6] Sources: www.loglink.ru/news/27863; Morcentr-TEK (2008)

There has been plans to deepen the fairway so that tankers could take even 200 000 tonnes of oil cargo (Eurasia Daily Monitor 31.1.2007). Now the largest vessels in Primorsk have been 150 000 dwt (Suomen ympäristökeskus 2007). The port is capable of loading four tankers at the same time. The average time for loading of one tanker is 14 hours (Baltic Ports Organization 2008).

Table 4.3 Maritime traffic in the port of Primorsk, 2007[7]

Primorsk	
Total traffic tonnes (M t)	74.2
International traffic (M t)	74.2
Import (M t)	
Export (M t)	74.2
Domestic traffic (M t)	-
Ship calls (total)	740
Cargo traffic by types of cargo in international traffic (M t)	
Dry bulk	-
Liquid bulk	7.4
Other dry cargo	-
Containers (TEU)	-

4.4 St. Petersburg

The Port of St. Petersburg is the main logistic gateway from west to Russia. It is a port complex, which consists of several ports in the Neva river mouth. The port areas are: St. Petersburg cargo port (five basins: Eastern, Barochny, Passenger, Lesnoy Mol Roadstead and Coal Harbour) Kronstadt and Lomonosov (www.pasp.ru). The port of St. Petersburg handles many types of cargoes: coal, oil (mainly mazut and diesel oil) (Rybin 2007), metals, forestry products, groceries etc. It has the biggest container terminal in the Baltic Sea and so far it has been the only Russian container port in the Gulf of Finland. It is also the primary port for other dangerous cargoes, except petroleum products.

Although St. Petersburg is one of the largest ports in the Baltic Sea, it has some major disadvantages: its central location in the city causes problems for the hinterland connections and hinders the development of storages, parking areas and other necessary port infrastructure. The port is known for difficult ice conditions in the winter and the fairway leading to the port allows only one-way traffic at the time. In addition, the fairway needs constant dredging. (Karvonen et al. 2007)

A belt highway is being built to St. Petersburg, which will probably help traffic problems in the future, but it also requires building of terminals, storages and railway connections to the vicinity of the belt highway. Numerous projects are already under way. (Ruutikainen & Tapaninen 2007) Container handling capacity is going to increase due to numerous container terminal building projects. Also Ro-Ro terminals are to be

[7] Source: Morcentr-TEK (2008)

build to many port areas. In a few years, the container traffic is estimated to grow to 2-2.5 million TEU. (http://www.loglink.ru/news/31344) Russia is also aiming at removing the transports of new cars from the Finnish ports straight to the Russian ones. Many companies are enlarging their car handling capacity in St. Petersburg.

Although numerous investment projects are in progress in St. Petersburg, it has been said that in the future the maximum capacity of the Port of St. Petersburg could be max. 75 million tonnes per year due to the disadvantages of the port location. (Karvonen et al. 2007)

Table 4.4 Maritime traffic in the port of St. Petersburg, 2007[8]

St. Petersburg	
Total traffic tonnes (M t)	59.5
International traffic (M t)	58.6
Import (M t)	18.2
Export (M t)	40.2
Transit (M t)	0.2
Domestic traffic (M t)	0.9
Ship calls (total)	14 651
Cargo traffic by types of cargo in international traffic (M t)	
Dry bulk	10.4
Liquid bulk	14.4
Other dry cargo	33.8
Containers (TEU)	1 697 720

4.5 Ust-Luga

Ust-Luga is a relatively new port project in Russia: construction work began at the end of the 1990's. When the Soviet Union collapsed, Russia lost many of its former seaports when the Baltic States gained their independence. The Ust-Luga project was initiated to add the capacity of the Russian ports in the Gulf of Finland.

The port is situated 110 km south from St. Petersburg. The entire infrastructure of the port and of the hinterlands of the port have to be built from a green field including a railway and road connections and a town for 35 000 inhabitants. Ust-Luga is supposed to handle many types of cargoes (Ro-Ro, new cars, containers, dry bulk, and liquid bulk) in the future, but in 2007 only coal and cargo in train ferries were handled. There are also plans to start the industrial production of e.g. consumer goods or electronics in Ust-Luga (Ust-Luga company 2007).

In 2015, the total volume of Ust-Luga is planned to be 130 million tonnes. It has been recently decided that the final location of the BPS-2 (Baltic Pipeline System) will be in Ust-Luga instead of Primorsk as had been planned earlier. (http://www.offshoretc.fi/uutisia_toukokuu08.htm) Besides the crude oil pipeline there

[8] Sources: Morcentr-TEK (2008); www.pasp.ru

are plans to build also an oil product pipeline from Kirishi refinery to Ust-Luga (Socor 2007). In addition, Gazprom is planning to build a liquefied-natural-gas terminal to Ust-Luga. The second ship channel providing roundabout ship traffic will be built by 2010 (http://www.ust-luga.ru/activity/?s=port&lang=en).

The port of Ust-Luga is a co-project of the Federation of Russia and private companies, which have a tendency to progress slowly. The problem in Ust-Luga is also that everything has to be build from the beginning. Some experts also say that the maximum capacity of Ust-Luga is 35-40 million tonnes because of conditions of the sea bottom and fairway, which need constant and expensive dredging. (Karvonen et al. 2007)

Table 4.5 Maritime traffic in the port of Ust-Luga, 2007[9]

Ust-Luga	
Total traffic tonnes (M t)	7.1
International traffic (M t)	7.1
Import (M t)	0.0
Export (M t)	7.1
Domestic traffic (M t)	0.0
Ship calls (total)	555
Cargo traffic by types of cargo in international traffic (M t)	
Dry bulk	6.4
Liquid bulk	
Other dry cargo	0.7
Containers (TEU)	-

[9] Sources: Morcentr-TEK (2008); Muhina (2008).

5 ESTONIAN PORTS

5.1 Sillamäe

The port of Sillamäe is the closest port to Russia in the EU - only 25 km from the Russian-Estonian border. Sillamäe operates as a landlord type of port. (Oksanen 2007) The main cargo of the port is liquid bulk (oil products and chemicals) and it is dominantly an export port.

In 2008, the construction work of four quays will be completed. At present, the total length of the quays is 1.8 km, but it will expand to 2.7 km by the end of 2008. In the port space is reserved for future terminal expansions according to the master plan of the port. (http://www.silport.ee)

Table 5.1 Maritime traffic in the port of Sillamäe, 2007[10]

Sillamäe	
Total traffic tonnes (t)	1 777 659
International traffic (t)	1 777 659
Import (t)	548 176
Export (t)	1 229 483
Domestic traffic (t)	-
Ship calls (total)	565
Cargo traffic by types of cargo (t)	
Dry bulk	168 710
Liquid bulk	1 323 758
Other dry cargo	285 191
Containers (TEU)	-
Import (TEU)	
Export (TEU)	

[10] Source: Port of Sillamäe 2008.

5.2 Kunda

The Port of Kunda, which is situated in the town of Kunda, is privately owned by AS Kunda Nordic Tsement. The main cargo is round timber. The port serves the local industries. (http://www.heidelbergcement.com/ee/en/kunda/kunda_sadam/index.htm)

Table 5.2 Maritime traffic in the port of Kunda, 2007[11]

Kunda	
Total traffic tonnes (t)	1 742 142
International traffic (t)	1 742 142
Import (t)	632 155
Export (t)	1 109 987
Domestic traffic (t)	-
Ship calls (total)	603
Cargo traffic by types of cargo (t)	
Dry bulk	810 723
Liquid bulk	68 817
Other dry cargo	862 602
Containers (TEU)	-
Import (TEU)	
Export (TEU)	

[11] Source: Port of Kunda 2008.

5.3 Miiduranna

The Port of Miiduranna, situated near Tallinn, is a public limited company and, at the moment, it mainly exports liquid bulk (petroleum products and chemicals). The plan is to rebuild the territory of the AS Milstrands terminal in Miiduranna in order to replace the current transit business. In the future, only ferries and yachts will call at the port. These plans are expected to be carried out by the year 2011.
(http://seanews.info/news/news.asp?newsID=51773)

Table 5.3 Maritime traffic in the port of Miiduranna, 2007[12]

Miiduranna	
Total traffic tonnes (t)	690 110
International traffic (t)	690 110
Import (t)	103 687
Export (t)	586 423
Domestic traffic (t)	-
Ship calls (total)	135
Cargo traffic by types of cargo (t)	
Dry bulk	197 625
Liquid bulk	492 485
Other dry cargo	-
Containers (TEU)	-
Import (TEU)	
Export (TEU)	

[12] Source: Port of Miiduranna 2008.

5.4 Tallinn

The Port of Tallinn is the biggest port authority in Estonia. The port is a state-owned company operating as a landlord type of port with no cargo handling operations of its own. The port of Tallinn consists of five harbours: Muuga, Old City, Paljassaare, Paldinski south and Saaremaa. Of these, Saaremaa is not situated in the Gulf of Finland[13]. Paljassaare handles timber, oil products, coal, groceries and general cargo. Old City Harbour is the passenger harbour, which also handles Ro-Ro and general cargo. Muuga handles mainly petroleum products, dry bulk and containers. (Lloyd's Register Fairplay 2007) Muuga handles 99 % of all the containers going through the Estonian ports. (Hilmola et al. 2007)

Transit cargo constitutes more than 75 % of the total cargo volume handled in the port and approximately 90 % of the total transit cargo volume passing trough Estonia. (http://www.portoftallinn.com)

Development of a new container terminal with a capacity of 1,3 million TEUs (rising the capacity from the present 300 000) with two quays with the length respectively 378 and 420 m and depth 14.5 and 16 m has begun in Muuga. The plans also entail the reconstruction of three berths mainly serving dry bulk vessels and the lengthening of the container berth in Muuga. The future developments of the car terminal in Paldinski south harbour are supposed to enable the transhipping of 300 000 passenger cars annually from 2010 onwards. (http://www.portoftallinn.com)

Table 5.4 Maritime traffic in the port of Tallinn, 2007[14]

Tallinn	
Total traffic tonnes (t)	35 874 000
International traffic (t)	35 873 000
Import (t)	5 657 000
Export (t)	30 216 000
Domestic traffic (t)	1 000
Oil products/Liquid bulk (total, t)	
Ship calls (total)	10 614
Cargo traffic by types of cargo (t)	
Dry bulk	7 827 000
Liquid bulk	22 369 000
Other dry cargo	5 678 000
Containers (TEU)	180 911
Import (TEU)	N/A
Export (TEU)	N/A

[13] Saaremaa is included in the statistics on the Port of Tallinn.
[14] Source: Port of Tallinn 2008.

5.5 Bekker

The Bekker Port, situated in Tallinn, is a privately-owned port operated by RasmusSon Ltd. Its main cargo types are crushed rock and round logs.

Table 5.5. Maritime traffic in the port of Bekker, 2007[15]

Bekker	
Total traffic tonnes (t)	743 000
International traffic (t)	743 000
Import (t)	542 898
Export (t)	200 102
Domestic traffic (t)	-
Ship calls (total)	448
Cargo traffic by types of cargo (t)	
Dry bulk	589 367
Liquid bulk	-
Other dry cargo	153 633
Containers (TEU)	-
Import (TEU)	
Export (TEU)	

[15] Source: Port of Bekker 2008.

5.6 Vene Balti

The Port of Vene Balti, situated near Tallinn, is privately owned by BLRT Grupp AS. The main cargo of the port is liquid bulk (oil products and chemicals) and it is dominantly an export port.

Table 5.6. Maritime traffic in the port of Vene Balti, 2007[16]

Vene Balti	
Total traffic tonnes (t)	1 729 800
International traffic (t)	1 729 800
Import (t)	120 300
Export (t)	1 609 500
Domestic traffic (t)	-
Ship calls (total)	275
Cargo traffic by types of cargo (t)	
Dry bulk	-
Liquid bulk	1 509 200
Other dry cargo	220 600
Containers (TEU)	286
Import (TEU)	N/A
Export (TEU)	N/A

5.7 Paldiski Northern

The Paldiski Northern Port is located 50 kilometres west from Tallinn. It is a privately-owned port specializing in the handling of new cars, containers, general cargo and oversized project cargo. By 2010, the conditions for passenger transport will be created (http://www.portofpaldiski.ee/index.php?lang=eng&pid=2).

Statistical information on the Paldiski Northern port has not been available.

[16] Source: Port of Vene Balti 2008.

6 TRANSPORTATION SCENARIOS

Scenarios are made in order to trace how certain things might develop in the future. In the scenarios, drivers, trends and events are studied in order to combine them for a plausible description of possible, although not always probable, outcomes. Because the world is a complex place and the future is always uncertain, a scenario should always been regarded as one possibility, not as an accurate prophecy. A scenario approach often involves two or more alternative scenarios, which can be used to compare and examine alternative futures (e.g. Stead & Banister, 2003).

But why are scenarios made if they are not trustworthy descriptions of the future? Although the future cannot be precisely predicted, the scenarios can still give valuable insights: they can act as planning tools and early warning systems for current realities or work as catalysts for strategic discussion in the society. (Sørensen et al. 2008) A good scenario offers alternative views on the future in order to bring out how different factors might develop and what kind of effect they might have. (Mannermaa 1999)

The future can be traced in numerous ways. In some methods, the past development, e.g. on the basis of time series statistics, is used in order to formulate the future development, or scenarios can be done by outlining alternative futures by different methods such as using expert views or quantitative modelling.

In the construction of a scenario, conceptual framework is needed to capture changes in the external environment of a subject. They can be divided e.g. into the following types of drivers and trends:

- Socio-cultural
- Technical
- Economic
- Ecological
- Political or regulatory (Sørensen et al. 2008)

In connection with the scenario, building a goal is essential to find factors which affect the subject the most during the study. Also so-called weak signals can be useful in the scenario research. Weak signals are phenomena that are not so obvious today but they can develop into significant trends or drivers in the future. (Kuusi & Kamppinen 2002)

It is widely assumed that the amount of transports follows the economic development although also other factors influence the development of transportation, such as government policy, environmental aspects, technology, land use planning and social and behavioural trends (Shiftan et al. 2003). The relationship between the development of transportation and economy is usually analyzed in terms of the development of GDP and trade. In the long run, the development of transportation has been perceived to follow the development of GDP (Ubbels et al. 2003; Stead and Banister 2003). When the GDP grows to a certain level, especially international transports increase, because countries of high GDP produce, consume and thus transport more. An effective transportation system is also a precondition for the economic development.

Globalization is also one of the keywords in the development of transportation because it affects the volume of consumption and production as well as the place of production (Ubbels et al. 2003).

But the transportation scenario could also be based on other kinds of starting points, such as a structural change, a change of values, a crisis situation or the development of technology. In the structural change scenario the future would be analyzed from the point of view that there is a need for a controlled change in the society compared to the present day, e.g. the current way of life is ecologically unsustainable. The change of values scenario has a similar starting point, but it would be mainly private citizens who would generate the change instead of the society. In the crisis scenario it would be assumed that some sudden crisis or war would occur which would have deep impact on the functioning of the economy and the society. In the technology scenario it would be assumed that there would be remarkable technological innovations which would e.g. change the ways of transportation. (Lehto & Pastinen 2005) However, the transportation scenarios, which are used in this report, are based on the relationship between the development of economy and transportation.

6.1 Current international trends and transportation

Trends, which affect the future of transportation globally, can be grouped into megatrends, trade trends and logistic trends. The megatrends have an effect on almost all human activities. Because transportation is closely connected with trade, the trade trends are essential from the point of view of transportation. The logistics trends, on the other hand, are directly connected to the transportation.

According to Venäläinen and Löfgren (2008), utilization of ICT and the importance of safety, security and environmental aspects are worldwide megatrends, which affect also transportation. The most important world trade trends are globalization, networking and the growth of the role of Asia in global economy (e.g. Venäläinen & Löfgren 2008; Lautso et al. 2008). According to IMF, China contributed to the global growth with34 % and India with 11 % in 2007 while the USA and the euro area contributed only with 7 % each (Platou 2008). Global economic growth has been catalysed by the increasing globalization and deepening economic integration (UNCTAD 2007). In logistics, the main trends are e.g. containerisation or unitization of cargo, concentration of cargo flows, enhancement of speed and service level in logistics and transparency of supply chain (Venäläinen & Löfgren 2008).

The Ministry of Transport and Communications of Finland has recently published a report on future operational environment in the transport sector (Sala et al. 2008). Things which concern most maritime transportation in the long run are seen to be climate change and other environmental risks, the availability and price of energy, the development of transport-related technology, structural changes of trade and industry, and globalization.

Sørensen Stig Yding et al. (2008) see the following drivers as the most important for the transportation sector in the future:

- Economic growth
- Priority of sustainability in public regulation
- Investments in infrastructure
- Liberalisation and harmonisation of the transport and logistics sector
- Technological development
- Energy prices

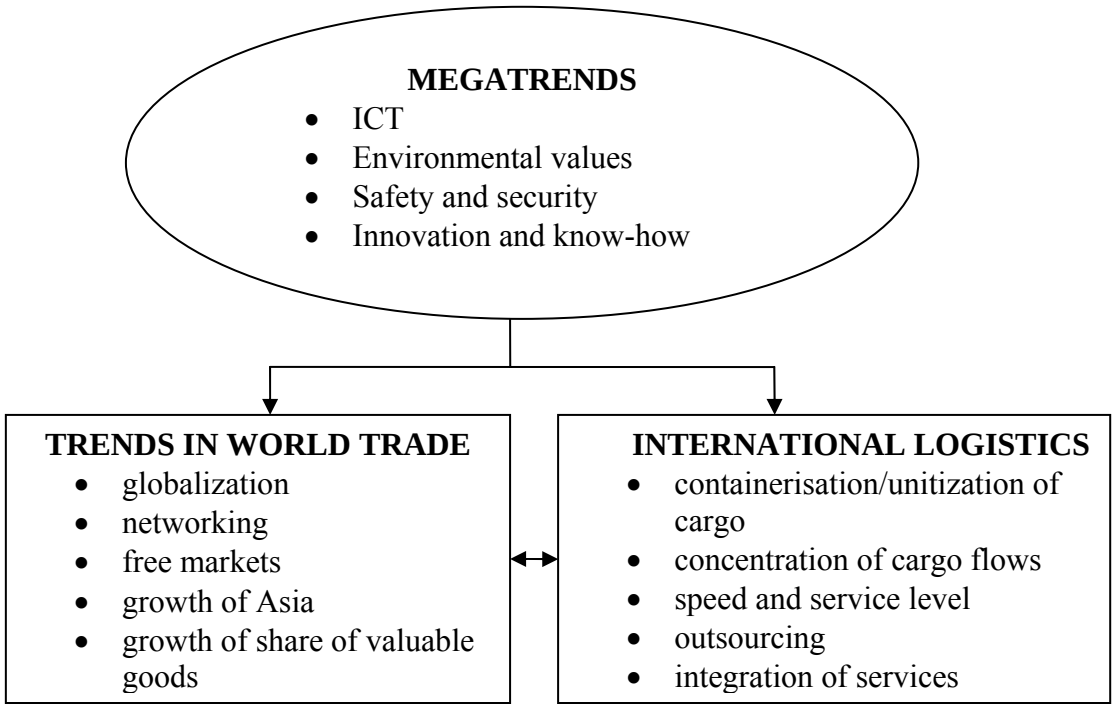

Figure 6.1 Trends in trade and logistics (Venäläinen & Löfgren. 2007, pp 5)

Climate change

Transportation is a producer of greenhouse gas emissions. International Maritime Organisation (IMO) is preparing a proposal to cut down greenhouse gas emissions of maritime traffic. There are e.g. plans which would allow the ship fuels in the Baltic Sea to contain 1% sulphur in 2010 and 0,1% in 2015 (Helsingin Sanomat 6.10.2008). This would be a remarkable change to the current situation where the ship fuels can contain 1.5 % sulphur in the Baltic Sea. So far, the problem is that fuel with a low sulphur content is not available and/or it is very expensive. Also, the EU is aiming to cut down on greenhouse gas emissions. But no matter what the exact requirements will be, it is probable that the climate politics will cause high pressures for change in the logistics sector and environmental requirements are likely to increase transportation costs in the future. (Sala et al. 2008)

Trade trends

In the last 4-5 years, the global economic growth has been faster than had been expected, but in 2008 the development of international economy seems to be slowing down. The main reasons for the international instability are insecurity in the financial markets, insecurity in the housing markets e.g. in the United States and rise in the prices of energy and groceries, which has increased inflation. It is difficult to estimate, how long and how much these factors will slow down the economic development, but it seems that the economic decline is hitting the developed countries the hardest while the developing economies still have strong economic growth. Recently, forecasters have, however, scaled back their estimates of economic growth for the forthcoming years. (Platou 2008)

Availability and price of energy

The consumption and demand of energy grows when the living standards improve globally. Fossil fuels are non-renewable natural resources and along with the growth of demand the prices will most likely rise in the future. The speed of the rise in prices is hard to estimate and currently even the price-reduction of oil has been apparent. It is not believed that higher oil prices would cut the demand for maritime transports in the near future but a shift from land to sea transport is expected because of the high oil prices (Centre for Maritime Studies & Baltic Ports Organization 2008). Ways to adapt to the situation include a reduction of transportation amounts or speed[17], improving the compatibility of energy-effective transportation modes (railway and water transportation) or improving the overall effectiveness of transportation. To achieve that, industries will optimize their logistics systems and the different industries and trade will add their co-operation and unify and centralize their transportations. (Sala et al. 2008) The development of alternative energy sources, such as sails in ships, might also be a way to adapt to the high energy prices.

The rise in the prices of energy can nevertheless have serious effects on the competitiveness of industries and logistics.

Operational environment of ports

A growth in ship sizes and a unitization of cargo cause investments pressures for ports, which reduces the competitiveness of small ports. The growth of container traffic also centralizes transports because profitable container traffic requires high frequencies. The EU is supporting the development of intermodal transport chains and short sea shipping. Co-operation between ports and logistic companies will intensify in order to be able to offer customers comprehensive services. (Venäläinen & Löfgren 2007; Centre for Maritime Studies & Baltic Ports Organization 2008)

[17] Consumption of fuel is dependent on the speed of the transportation means.

Shipping trends in the Baltic Sea region

In all transportation forecasts, it is believed that maritime transport volumes in the Baltic Sea region will continue to grow, especially the share of unitized cargo and petroleum transportations. The growth is mainly due to the economic development of Russia and other Eastern states, where growth of production and trade is concentrating on the Baltic Sea region. It is also probable that the share of sea transportation as a transportation mode is going to increase in the future. The growth of the sea transportation can be explained by economic growth, by considerable amount of bulk products in trade and by geographical factors. (The Institute of Shipping Analysis et al. 2006; Lehto et al. 2006; Centre for Maritime Studies & Baltic Ports Organization 2008)

Although the shipping volumes in the Baltic Sea region are increasing and a substantial growth is expected in the following years, there are many uncertain elements which may affect maritime transportation in the future even when assuming that strong economic growth would continue in the forthcoming years. Road connections are improving in the area and they can offer new transportation choices for maritime corridors. Also, the development of railway connections (e.g. Trans Siberian Railway) can bring changes in the future. Developing the capacity of the Russian ports might potentially change the present structure of transport flows in the area. An uncertain element is also to what extent the maritime operations will be further concentrated. (The Institute of Shipping Analysis et al. 2006)

6.2 Sources, basic factors and assumptions in Safgof scenarios

In this study totally new transportation scenarios are not created but, instead, the existing scenarios have been used as a starting point. By using the different scenarios, three alternative distributions for maritime traffic in the Gulf of Finland in year 2015 have been formulated. Alternative views on future development have been formulated by examining the current situation and by tracing factors which are the most essential to the future development of maritime traffic in the Gulf of Finland.

On the basis of the transportation scenarios and other related studies, the following factors are taken into consideration when building the Safgof scenarios: maritime transportation in the Gulf of Finland in 2007, economic development (general, and the development of GDP), development of key industries, development of infrastructure and environmental aspects in relation to maritime transportation. The political framework and governmental policies are mainly left outside the study or, in other words, they are assumed to stay as they are now. Also social and behavioural trends are left outside the study.

The sources of the Safgof transportation scenario are as follows:

1) The Gulf of Finland (Baltic Sea): “Baltic Maritime Outlook 2006” (The Institute of Shipping Analysis et al. 2006).
2) Finland: “Scenario on seaborne traffic between Finland and other countries up to 2030 “(Lehto et al. 2006)

3) Russia: Maritime transportation visions and forecasts, which have been found in news services or which are governmental goals, have been used. (e.g. Ministry of Transportation of Russian Federation 2008; http://www.offshoretc.fi/uutisia_toukokuu08.htm)
4) Estonia: "The Estonia freight Transport Report 2008" (Business Monitor International 2008).
5) Petroleum transportations: forecast of Finland's environmental administration and VTT Technical Research Centre of Finland (Hietala 2008)

By combining these scenarios/visions/forecasts with expert views, three alternative scenarios for the development of cargo tonnes in the Gulf of Finland were formed. They are called scenarios "slow growth", "average growth" and "strong growth". The total tonnes of these three scenarios are further divided into petroleum products and other cargoes, import, export and domestic traffic by country, and by ports. In the petroleum transports, tonnes were transformed to ship calls (tankers) by calculating the relationship between the development of transported petroleum tonnes and tanker sizes in the past.

First, the Baltic Maritime Outlook 2006 transportation scenario (which is later referred to as the BMO 2006 scenario) for the Baltic Sea region is presented and after that the other scenarios are introduced; also, the economic development and the key industries of each country (Finland, Russia, Estonia) are analyzed. In addition, the developments of petroleum and container transportation and of ship fleet in the Gulf of Finland are separately examined.

7 DEVELOPMENT OF MARITIME TRANSPORTATION AND RELATED ISSUES IN THE AREA OF THE GULF OF FINLAND

7.1 Baltic Maritime Outlook 2006 scenario

The Institute of Shipping Analysis (Gothenburg, Sweden), BMT Transport Solutions GmbH (Hamburg, Germany) and Centre for Maritime Studies (Turku, Finland) published a study on sea transportation scenarios in the area of the Baltic Sea, which was part of Master Plan Study for development of the Motorways of the Baltic Sea and it was financed by e.g. the European Community. The scenario extends to year 2020. The base year for statistical information is 2003 and the sea transportation is studied from two viewpoints: intra-BSR (Baltic Sea Region) and extra-BSR.

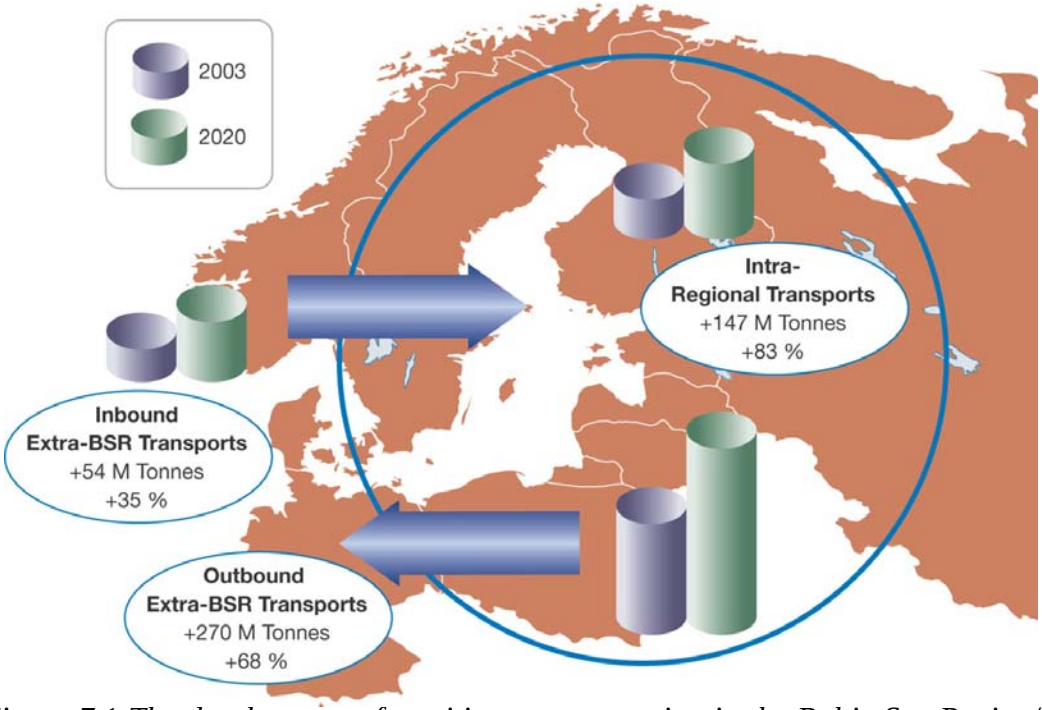

Figure 7.1 The development of maritime transportation in the Baltic Sea Region/Baltic Maritime Outlook 20062006 (The Institute of Shipping Analysis et al. 2006, pp. 5)

BMO 2006 forecasts a growth of 64 % in sea traffic by the year 2020 compared to the year 2003. In 2020 oil products, industrial products, building materials and chemicals will dominate the trade. A significant growth is expected in the transports of new automobiles, oil products and chemicals. Export transports are growing more than import transports. In the Baltic Sea Region, the share of sea transports is relatively larger compared to the rest of Europe. In BSR approximately 50 % of foreign trade is transported by sea. The ports in the Gulf of Finland, besides the ports in Germany and Poland, are expected grow the most in regard to the port calls in BSR. Intra-BSR trade is going to grow relatively more than the trade with extra-BSR, which means that the east-west transports are going to grow more than the transports in north-south direction.

The tendency in the transportation modes is more towards sea transports and the growth of trade is be largely realised as sea transports. (The Institute of Shipping Analysis et al. 2006)

7.1.1 Methodology in BMO 2006

The BMO scenarios were made by using EFM STAN modelling environment, which is developed by BMT Transport Solutions GmbH. The basic data for modelling included transport routes, nodes, transport modes and traffic flows of 2003. The used data for transport entailed e.g. port statistics, vehicle counting, traffic census and available statistics from national authorities. The basic elements of the trade scenarios consisted of GDP forecasts, European export and import forecasts, and calculations of import and export elasticity for the different commodity groups. The data on trade and transport were compiled from several sources: from national statistical bureaus, EUROSTAT, OECD, UN, ports, etc. The forecast growth figures were crosschecked with forecasts from other organisations and national authorities.

In the BMO 2006, three alternative scenarios were defined. In the basic scenario, the competitiveness of sea traffic compared to the other modes of transportation was assumed to stay the same, infrastructure improvements in the TEN-T programme (by the EU) were taken into account and fuel prices were expected to rise 3 % per year until 2020. Scenario B had the same basic assumptions but the competitiveness of sea transportation was assumed to improve from the initial situation. In scenario C the assumptions were otherwise the same as in the scenario B, but a 10 % growth was added to container traffic and the effects of European wide road fee were taken into account. In all the alternative scenarios, the traffic policy framework was expected to remain unchanging. One assumption in the models was also that there would be enough capacity for sea transportations regardless of the quantity of demand.

The result of the scenarios B and C was that the price-elasticity of sea transportation in the Baltic Sea seems to be low: a change in price does not greatly affect the demand or, in other words, move transportations from sea to the other transport modes, which is quite natural considering the geographical and political circumstances in the area. If the relative price of the sea transports goes down 3-5 %, it does not have a significant effect on the shares of the transportation modes according to the scenarios B and C. A growth in container traffic may add the share of road transportation. A drop in sea transportation prices could occur as a consequence of bigger and faster vessels and of more efficient use of the port capacity (development of handling operations and bigger port entities) in the future. (The Institute of Shipping Analysis et al. 2006)

7.1.2 The Gulf of Finland in year 2015 following the BMO 2006

A forecast of maritime transportation for the area of the Gulf of Finland based on the BMO 2006 has been calculated as follows:

1) The growth factor of trade (import and export) for years 2010 and 2020 per country is taken from the BMO 2006, p. 32 (The Institute of Shipping Analysis et al. 2006)
2) [(Growth factor 2020-growth factor 2010)/2]+growth factor 2010 = growth factor 2015.
3) Tonnes in the ports of the GoF in 2007* growth factor 2015 = import and export tonnes in 2015.

Basic assumptions are that the share of maritime transportation in total trade is staying the same (=maritime transportation follows the development of total trade) and the share of the ports in the Gulf of Finland of each country's total maritime traffic is staying the same in the reference period.

Table 7.2 Maritime transportation in the Gulf of Finland in 2015 following the BMO 2006 scenario

	Total	**Finland**			**Russia**			**Estonia**		
		Total	Import	Export	**Total**	Import	Export	**Total**	Import	Export
2007	**256.1**	55.8	30.7	25.1	157.0	18.6	138.4	43.3	7.9	35.4
2015	**386.0**	76.2	42.8	33.4	239.1	27.3	211.8	70.7	13.1	57.6
Growth factor	*1.51*	*1.37*	*1.39*	*1.33*	*1.52*	*1.47*	*1.53*	*1.63*	*1.66*	*1.63*

A forecast of international maritime traffic by commodity groups in 2015 based on the BMO 2006 scenario has been calculated as follows:

1) Development of trade volumes by commodity group from 2003 to 2020 in the BSR is taken from the BMO 2006, p. 33 (The Institute of Shipping Analysis et al. 2006)
2) Commodities are grouped into dry bulk, liquid bulk and other dry cargo[18]. For each group, the growth factor for years 2010 and 2030 has been calculated on the basis of the above mentioned table.
3) [(Growth factor 2020-growth factor 2010)/2]+growth factor 2010 = growth factor 2015
4) Realized tonnes in 2007*growth factor 2015= tonnes in 2015

Table 7.3 Maritime transportation by commodity groups in the Gulf of Finland in 2015 following the BMO 2006 scenario

	Total 2007	**Total 2015**	*Growth factor*
Dry bulk	41.4	53.9	*1.30*
Liquid bulk	145.5	199.9	*1.37*
Other dry cargo	69.2	89.9	*1.30*
Total	**256.1**	**343.8**	*1.34*

[18] Commodity groups are defined in chapter 1.3 Definitions

7.2 Future of maritime transportation in the Finnish ports

7.2.1 Growth outlook of seaborne transport between Finland and foreign countries up to 2030

The Finnish Maritime Administration has published a long-term sea transport scenarios since the 1990's, which are updated from time to time. The latest scenario "Growth outlook of seaborne transport between Finland and foreign countries up to 2030" (Lehto et al. 2006; referred later as the FMA scenario) is from year 2006 and it reaches up to year 2030. In the scenario, the long-term development of international sea transportation is modelled with econometric methods based on the time series statistics on sea transportation and economy from years 1980-2005.

In the scenario, sea transports are divided into three segments, which are seen to be dependent on different factors: transit transports, import and export of fuels and other sea transports. The other sea transports are divided further into commodity groups, and into bulk cargoes, unit cargoes and unit load cargoes. The result is also divided regionally into port groups with the assumption that the share of ports is going to stay the same as in year 2005.

When the long-term growth of GDP is assumed to be 2,5 %, demand for coal and oil products is assumed to stay at the same level as it is, the amount of sea transports between Finland and other countries is forecast to be 140 million tonnes in 2030 ~ a growth of 56 % between 2005 and 2030. The growth of imports is going to be larger than the growth of exports. Container traffic is forecasted to become threefold.

The main factor behind the growth of development is assumed to be the growth in services but also the electronic and metal industry is expected to grow in the period under review. In regard to the sea transports, the forest industry is going to stay in a central position. Also, the mining industry will increase its share when mining of new ore deposits becomes profitable due to the rise in raw material prices. Transported articles are going to be more valuable in the future and the growth of transportation need is smaller than one could expect on the basis of cargo values. At the end of the reference period, the prices are forecast to rise strongly due to the development of the current developing countries, and the rise in prices will slow down the growth of productivity and GDP. Also, the ageing of population and fall in the amount of able-bodied population can diminish the growth of GDP in the reference period.

7.2.2 Methodology in "Growth outlook of seaborne transport between Finland and foreign countries up to 2030"

The most essential factor in the long-term development of sea transports is assumed to be the relationship between the development of GDP and the development of trade between Finland and foreign countries. The growth of GDP has been discussed together with the growth of productivity, population development and amount of able-bodied population, structural change of production and share of foreign import/export in GDP.

The time series statistics are based on the statistics of Statistics Finland, Bank of Finland, OECD, and the Finnish Maritime Administration. Scenarios for economic development are compared with the economy scenarios of the Bank of Finland and The Research Institute of Finland (ETLA). In the energy scenarios, energy and climate strategy until 2025 by the Ministry of Trade and Industry has been used as source material. The development of energy-related transports is assumed to be more stable and to certain extend independent from the economic development. For transit traffic, five alternative scenarios are formulated. The development of transit traffic is mainly dependent on the development of the Russian economy and transport policy so it cannot be studied in the context of the development of the Finnish economy.

Table 7.4 Seaborne transports between Finland and other countries in 2030 according to FMA scenario

Finland	**Import**	**Export**	**Total traffic**
	2030		
	M tonnes		
Fuels	18.49	5.14	23.63
Raw wood	5.4	0	5.4
Other forestry products	1.6	26.94	28.54
Metals and metal products	4.63	5.94	10.57
Chemicals, fertilizers, cereals	4.96	8.38	13.34
Ores, minerals, concentrates	20.1	5.13	25.23
Other cargoes	21.66	15.52	37.18
Total traffic	76.84	67.05	143.89

Gulf of Finland*	**Import**	**Export**	**Total traffic**
	2030		
	M tonnes		
Fuels	11.45	4.87	16.32
Raw wood	2.8	0	2.8
Other forestry products	0.54	14.73	15.27
Metals and metal products	2.55	2.11	4.66
Chemicals, fertilizers, cereals	1.64	4.42	6.06
Ores, minerals, concentrates	4.9	1.82	6.72
Other cargoes	13.8	9.14	22.94
Total traffic	37.68	37.09	74.77

* includes Saimaa Canal

7.2.3 Finland in year 2015 following Finnish Maritime Administration scenario

In the FMA scenario, maritime transports for the year 2015 are presented without transit traffic. Here the transit tonnes are added to the total tonnes so that from the 5 alternative transit scenarios (Lehto et al. 2006, pp.36) a scenario called “View WSP” is chosen,

because it was the closest to the realized transit tonnes in 2007. The "View WSP" is based on a consultant view on the development of commodity groups in transit. In the "View WSP" commodity groups are given coefficients as follows: coefficient 1 stands indicates the situation in year 2005, coefficient 2 is chosen if a commodity group follows the average growth, coefficient 3 is chosen if a commodity group is expected to grow more than the average growth in the reference period (2005-2030).

Below, the first table shows the realized tonnes in the maritime traffic in 2007, and, for comparison, the tonnes for the year 2007, which are calculated on the basis of the FMA scenario 2005-2015. The tonnes in 2005 are taken away from the tonnes of 2015, and the sum is divided with 10 (years) = 0,925, which is the annual growth in tonnes when the growth is expected to be linear[19]. The tonnes for the Gulf of Finland in 2015 have been mechanically calculated with same distribution as between the ports in the Gulf of Finland and the other Finnish ports in 2007.

As it can be seen from table below, there were more maritime transports in 2007 as the FMA scenario had forecasted.

Table 7.5 Maritime transportation in Finland in 2015 following the FMA scenario

	Finland			
	Total	Import	Export	Transit
	M tonnes			
2007	102.6	54.4	41.2	7.0
2007 according to FMA scenario	*94.5*	*49.0*	*38.8*	*6.7*
2015	120.4	61.8	48.9	9.7

Table 7.6 Maritime transportation in Finnish ports of the Gulf of Finland in 2015 following the FMA scenario

	Finnish ports in the Gulf of Finland			
	Total	Import	Export	Transit
	M tonnes			
2007	55.8	27.2	23.4	5.2
2015	73.6	34.6	31.1	8.0
Growth factor	*1.32*	*1.27*	*1.33*	*1.54*

7.2.4 Future sights of the key commodity groups in maritime transportation in Finland

Maritime transportation in Finland consists mainly of transports of industries (e.g. forest industry, metal industry, chemical industry), energy-related transports (coal, petroleum products), transports of consumer goods and of Russian transit traffic. Transit traffic nevertheless differs from the other transportations in the Finnish ports, because transit traffic is dependent on the development of the Russian economy, transportation capacity

[19] In the original scenario the growth is not linear, but the figures for all the years in the reference period have not been available.

and politics. In the future, growth can be expected especially in the mining industry when the prices of raw material rise and the quarrying of ore deposits becomes affordable (Lehto et al. 2006).

Forest industry

The forest industry has traditionally been the core industry of the Finnish economy, but recently it has been under major challenges. In the most important export area of the Finnish forest industry in Europe, the growth in demand has been turning down, and at the moment, the markets for forest industry products are growing fastest in Asia and in Latin America. This means that the production is moved closer to the growing markets and also to countries with lower production costs. (Venäläinen & Löfgren 2007)

In Finland, the most urgent problem is, however, the purchase of timber. Nowadays timber is imported from other countries, mainly from Russia, because the domestic supply cannot satisfy the industrial demand. At the moment, the future of Russian import looks uncertain because Russia might be putting high customs duty on timber. Timber is also imported from other continents, e.g. eucalyptus tree from South-America, but it is uncertain if the other foreign imports can replace Russian timber in the Finnish forest industry. (Venäläinen & Löfgren 2007)

Despite of difficulties, it is believed that the forest industry will maintain its position as an important industrial sector in Finland, but there is certainly a structural change going on of which one sign is the recently heard news on the abolition of production units e.g. in Kemijärvi, Hamina and Imatra. There will be less production units and the ones that will be left are going to be larger. Probably in the future the Finnish forest industry is going to concentrate on the production of products of high degree of processing, which are more valuable. There is a need to develop totally new products as well. Also in bio energy sector there might be growing markets in the future. (Venäläinen & Löfgren 2007;http://www.metsateollisuus.fi/Infokortit/metsasektorin_muorros/Sivut/default.asp; Toivonen & Enroth 2007)

From the point of view of logistics, this means that the transports of forest industry are going to concentrate on certain routes and ports. The use of unit loads in transportation is going to increase. The most important forest industry ports are Hamina, Kotka and Rauma.

Metal industry

In metal industry, the future looks brighter than in the forest industry: demand of steel is growing in the whole world, especially in China, Far East and East-Europe, although it can be seen that also the demand of metal products is suffering from the current economic slowdown.

In Finland, the metal industry is concentrating on products of high degree of processing. The metal industry has invested a lot on production units in Finland and that makes good prospects for exports. A shortage of skilled labour in the metal sector is a problem

for the production and it can restrict the growth in the future. (Venäläinen & Löfgren 2007)

From the point of view of maritime transportation, however, the Finnish metal industry is more important to the ports in the Bay of Bothnia than to the ports in the Gulf of Finland.

Chemical industry

Some of the main products in the Finnish chemical industry are forest industry-related chemicals, plastic products and agriculture-related chemicals. The development of the chemical industry is closely connected to the development of these industries. Thus, the growth of demand for chemicals has also been turning down recently. Still a growth of 2,5 % is forecasted to the year 2009. (Kemianteollisuus ry 2008) Transports of chemicals are important especially to the ports of Hamina, Kotka and Sköldvik.

Energy sector

In Finland, the share of oil in energy consumption is about 25 %. (http://www.stat.fi/til/ehkh/tau.html) Most of the oil is used in transportation, but oil is also used in heating and as an energy source in industry and agriculture. In regard to the oil products, demands for heavy fuel and light fuel oil have been decreasing as well as the demand for petrol. Instead, the demand for diesel oil has been growing. Diesel oil and also bio diesel oils are produced in Finland in the Neste Oil refineries. In bio diesel e.g. palm oil is used as raw material, which needs large transportation capacity in ships. Also, oil products are imported (e.g. from Russia) and exported (e.g. to the Baltic Sea area and North-America) by sea. The most important export products are petrol, diesel oil and light fuel oil. (Venäläinen & Löfgren 2007; http://www.oil-gas.fi/index.php?m=4&id=203) Coal had a share of 13 % of the energy consumption in 2007 (http://www.stat.fi/til/ehkh/tau.html).

The goals of the Finnish energy politics are to secure the reliability of energy deliveries and the availability of reasonable price energy but, at the same time, greenhouse gas emissions should be cut down. At the moment, Finland is to great extend dependent on fossil fuels which are imported from Russia.

The demand for energy/electricity is expected to grow. Finnish Energy Industries and Confederation of Finnish Industries EK have estimated that the demand for electricity would grow from 90 TWh in 2006 to 107 TWh in 2020 and to 115 TWh in 2030 if the economic growth will be stable, the operational environment of the industry remains favourable and the effectiveness of energy use will improve (Energiateollisuus & EK 2007).

At the European Council in 2007, the European Union countries committed themselves to remarkably cut down greenhouse gas emissions and to promote the use of renewable energy sources. On the basis of these EU goals, the Finnish government is preparing for a long-term climate and energy strategy. By 2020, the share of bio fuels is supposed to

be 10 % in the EU area and greenhouse gas emissions should be cut by 20 % from the 1990 level. By year 2020, the EU is aiming to cut down greenhouse gas emissions by 60-80 %. Because preparations for the energy strategy are under way, it is hard to evaluate how these goals are to be achieved in practise. The strategy should be in the reading of Parliament in the autumn of 2008. (http://www.tem.fi/index.phtml?s=2542)

Transit traffic

The transit traffic has a central role in the ports of Hanko, Kotka and Hamina. The main cargoes include transports of new vehicles and containers to Russia and chemicals from Russia.

The transit traffic is believed to grow also in the future due to the growth of the Russian economy. Although Russia is developing its own port capacity, it is estimated that there will be cargoes to the other routes as well because the growth of cargo flows is going to be larger than the planned capacity of the Russian ports. And it is not just the capacity which affects the choice of the transportation routes, but also the price and service level, the level of infrastructure, the speed of transportation, the frequency of transportation connection, safety and the functioning of border crossings or other authorities. So far, the transit cargoes, especially high value cargoes, are going via the Finnish ports because, compared to Russia, the safety level is good and the logistic sector is well developed. Although the relative share of the transit traffic via Finland in regard to the import and export of Russia may decrease, in tonnes it is expected to grow. Also, the value of the transit traffic to Finland may increase because of transports of high value goods and value-added services in logistics. (Kuronen & Tapaninen 2007) However, competition between different transportation routes in the Baltic Sea area is going to tighten when Russia is developing its own port capacity and the Baltic countries can offer affordable transportation routes as well (Venäläinen & Löfgren 2007). Also, the development of road and railway transportation connections to Russia might affect the sea transports in the future.

7.2.5 Economic development of Finland

In recent years, an economic boom has been in progress but it is now passing by and economic growth is slowing down in the coming years due to the slowing down of international economy. A deep depression in the Finnish economy is nonetheless expected because employment is expected to remain good and the foundation of economy is thought to be healthy. In 2009, the growth of GDP is forecast to be 1.8 % when it has been over 2 % in recent years. (Valtiovarainministeriö 2008) After 2011, the growth of GDP would be approximately 1.5 % per year due to the decreasing able-bodied population and the slowdown of the growth of productivity. (Kiander 2007)

Difficulties in international economy are slowing down the growth of exports. In metal industry, machine industry, electronic industry and equipment engineering the volume of orders is still good but also in these sectors the growth of production is slowing down. The demand for forestry products has already turned down. (Valtiovarainministeriö 2008) It has been calculated that if the import of timber from

Russia will stop and half of the amount of Russian timber could be replaced by timber from other sources, it would cut down the GDP by -0.5 %.(Suomen pankki 2007)

The instability of the economy can affect domestic consumption when consumers become more sceptical about the future. It turns down the growth of imports of consumer goods. If unemployment rates start to increase, it will also have devastating effect on domestic consumption. The growth of imports of raw materials can also turn down if the growth of industrial production is turning down. In 2009, the growth of import is expected to be 2 %. (Valtiovarainministeriö 2008)

In the long run, major challenges for economic development include e.g. the ageing of population and a high cost level which affects the competitiveness of industry and trade. The economic growth is forecasted to slow down permanently; approximately by 1.8 % per year until 2018. (http://www.jyu.fi/ajankohtaista/arkisto/2008/06/tiedote-2008-06-11-09-50-30-392875/)

7.3 Future of maritime transportation in the Russian ports

Russia has, compared to the European countries, a very different starting point for the development of transportation and transportation infrastructure, and it seems to have a strong interest to protect the transportation markets against foreign competition (Lautso et al. 2005). Russia is developing heavily its ports in the Gulf of Finland. Numerous projects are underway in different ports in order to add capacity, to build new terminals and warehouses, to build new motorways and other infrastructure. The investments in the port concentrate especially on the petroleum product transhipment capacity (export) and on the container transhipment capacity (import). The sea route via the Gulf of Finland has vital importance to Russia because the ports in the Gulf of Finland offer the shortest way to St. Petersburg and Moscow, which are the main economic centres of Russia. Europe is also one direction where the most of the petroleum exports are going at the moment.

The maritime transportation of Russia is characterised by the dominance of petroleum products. Russia also exports other raw materials (e.g. coal, metals, timber) and imports consumer goods. Also in the future the largest share of tonnes is going to consist of exports of petroleum products, which is dealt with in detail in Chapter 7.6. Also, a substantial increase is expected in goods transported in containers, in transports of new vehicles and also in exports of timber and forest products.

The interest of Russia is to redirect the cargo flows which are now going to Russia, from the Baltic or Finnish ports straight to the Russian ports. The Ministry of Transport of the Russian Federation has set a goal that by 2015 all Russian oil and coal transhipments through the Baltic ports should be redirected to the Russian ports, primarily to Ust-Luga and Murmansk. (http://portnews.ru/digest/3772/?print=1)

The biggest expectations and investments are dealing with the ports of Ust-Luga and Primorsk, but the other ports are expanding their activities as well. There are also plans to construct one totally new port to the bay of Vistino in the St. Petersburg region by

2013. The port is meant for transhipments of cars and it would have a capacity of 300 000 cars: 250 000 cars by the year 2011, and 50 000 cars by the year 2013. (Vedomosti Sankt-Peterburg 31.7.2008)

In container traffic has substantial growth potential: the worldwide container market is growing 7-8 % per year and the containerization in Russia is still at a relatively low level ~ 5-7 %. About 50 % of all the containers to Russia are transported through the port of St. Petersburg. (Hilmola et al. 2007) The container markets in Russia are forecasted to grow by 25 % per year, with volumes being 7-8 million TEU in 2010-2012 of which about 4 million TEU would go through St. Petersburg. (www.transportrussia.ru/2007-09-20/econom/bum.html) According to the "Transportation strategy of Russian Federation until 2030" (The Ministry of Transport of the Russian Federation 2008) 4.1 M tons of cargo would be transhipped in containers to the Russian ports located in the Baltic Sea in 2015.

The car markets in Russia have grown remarkably during the last few years. There is still plenty of growth potential because the level of motorization in 2006 was only 188 per 1000 person. In year 2007, 1.1 million new cars and 400 000 second-hand cars were transported to Russia. Of these, 719 000 cars (65 %) were transported to Russia through the Finnish ports. The other main transportation routes for cars are the Russian ports, the Baltic countries and the Black Sea. New capacity to handle new car transports is acquired to the ports of Ust-Luga and St. Petersburg in Russia, in the Gulf of Finland. (http://www.transportrussia.ru/2008-02-14/auto/rynok.html) About 3-4 million cars are planned to be imported to Russia in the nearest three-four years. (Vedomosti Sankt-Peterburg 31.7.2008) In the future, it is possible that cars are exported from Russia because many foreign car producers are planning to build a production plant to Russia (Ruutikainen & Tapaninen 2007).

In the future, the cargo flows in the Gulf of Finland can change to some extend because of the development of the northern ports in Russia, especially the port of Murmansk, which can become a major energy export route. The distance to the European ports is only four days and to the U.S. ports nine days, and the ice conditions in the winter are manageable. (Kotiranta 2008) In 2007, Murmansk handled 24.6 M tonnes of cargo, of which about 14 M was dry bulk and rest was petroleum. (www.rzd-partner.ru/news/2008/01/24/318347) Nowadays, oil is transported to Murmansk by train. Building an oil pipe to Murmansk would substantially increase the oil transports in Murmansk. Lukoil would have built a pipeline but Transneft, which is the state monopoly company of pipelines, did not allow private Lukoil to build a one. However, it is stated in the Traffic Strategy of the Russian Federation by year 2020 that the oil export capacity via the ports in the Barents Sea (Murmansk, Indiga) will be developed (The Ministry of Transportation of the Russian Federation 2008).

To estimate the future development of the Russian maritime transportation tonnes, information found in news services and the Transportation Strategy of the Russian Federation has been primarily used. Forecasts for maritime transportation tonnes for the Russian ports in the Gulf of Finland vary from 250 - 360 M tonnes in 2015. In the Transportation strategy of the Russian Federation until 2030 (The Ministry of

Transportation of the Russian Federation 2008), the sea traffic in the ports of the Gulf of Finland is predicted to be 266 M tonnes in 2015, of which 137.1 M tonnes of liquid bulk and 128.9 M tonnes of dry cargoes. Of the 266 M tonnes, 40.1 M tonnes would be transported in containers. The most optimistic views are based on port visions of the port capacity in 2015. If the most optimistic visions were to come true, the cargo tonnes would reach 357.7 M tonnes in 2015.

Table 7.7 Forecasts for maritime transportation in Russian ports in the Gulf of Finland

	Year 2007	Year 2015	Source
	M tonnes		
Vyborg	1.1	2.2	Capacity with planned investments (Tekniikka&Talous 15.8.2008)
Vysotsk	16.5	20.5	Capacity with planned investments (http://www.offshoretc.fi/uutisia.htm)
Primorsk	74.2	120	Capacity with planned investments (http://www.offshoretc.fi/uutisia.htm)
St. Petersburg	59.5	75	Max. capacity considering the circumstances of port location (Karvonen et al. 2008)
St. Petersburg	59.5	85	Capacity with planned investments (http://www.offshoretc.fi/uutisia.htm)
Ust-Luga	7.1	40	Max. capacity considering the circumstances of port location (Karvonen et al. 2008)
Ust-Luga	7.1	130	Capacity with planned investments (http://www.offshoretc.fi/uutisia.htm)
Total (pessimistic)	158.4	**257.7**	
Total (optimistic)	158.4	**357.7**	
Total	158.4	**266**	Transportation Strategy of Russian Federation (Ministry of Transport of Russian Federation 2008)

7.3.1 Economic development in Russia

After the economic crisis in 1998, the economy of Russia has grown steadily – from 6 to 10 % per year. Reasons to the growth include high prices of energy products and an increase in domestic consumption, investment and services. Due to the economic growth and rising wages the purchase power and consumption has grown remarkably. (Ruutikainen & Tapaninen 2007; Spiridovitsh 2008)

The economic growth is forecasted to slow down in the forthcoming years, from 8 % to 6 %. The IMF forecasts an annual GDP growth of 5.5 % (http://www.imf.org/external/country/RUS/index.htm). The development of the economy is slowing down because the production is slowing down in the key sectors (particularly in the oil industry), the production capacity of the industry is expiring, there are bottlenecks in the transportation infrastructure, and institutional and structural reforms are slowly progressing. There is also a lack of skilled workers in Russia. In addition, the rise in prices of oil is expected to stabilise, due to reasons of international demand, and the strengthening of the dollar price of oils has recently even depreciated. (Valtiovarainministeriö 2008). In the long run, the biggest threat to the development of

the Russian economy is considered to be the dependence of the economy on export incomes of oil, gas and metals. The major decrease in oil prices would have major impact on the economic development. A stable growth of the economy would require versatility in the production structure. In recent years, there has been growth in the consumer-oriented production sectors, such as construction, manufacturing industry, retail trade and other services. (Spiridovitsh 2008) The fragility of the international financial market and the slowing growth of the world economy do not seem to have a great effect on the economy of Russia. (Suomen pankki 2008)

The foreign trade of Russia has grown substantially in the 2000's. In recent years, especially import has grown: by 27 % in 2007 compared to the year 2006. Besides, the growth of demand import has benefitted the strengthening of rouble in relation to dollar and euro. Export grew by 14 % in 2007. (Spiridovitsh 2008) Foreign trade is predicted to grown in 2008, but in 2009 and 2010 the growth is slowing down a little bit. The imports are growing more than the exports.

The export consists mainly of raw material. In 2007, the share of oil in export was 34 % and gas 13 %. The other important commodity groups in export were metals, chemicals and forest products. In import, the most important commodity groups are machines, chemicals, groceries, automobiles and metals. (Spiridovitsh 2008) 70 % of the export goes to Europe. Dry bulk is imported from the IVY-countries and Southeast Asia. The imports from Europe are mainly general cargoes. (Lautso et al. 2008)

Lautso et al. (2005) have presented three different scenarios for the economic development of Russia. In a "maximum scenario", the Russian markets are opening up for competition and Russia joins WTO, which will cause a peak in growth in the 2010's. The structure of production and export is going to diversify. Productivity will grow. In a "probable scenario", the development goes as in the "maximum scenario" but it will happen much slower. The peak in growth would happen in the 2020's. In the "minimum scenario" Russia remains the oil export country and the protectionist situation will continue. Economic development will be unstable.

7.4 Future of maritime transportation in the Estonian ports

Maritime transportation in the Estonian ports is characterised by a large amount of Russian transit traffic, especially of petroleum products, but also coal and fertilizers are transported in the transit traffic via Estonia. Estonia's own import and export is only 27 % percent of the total tonnes. However, the future of the Russian transit traffic in Estonia looks uncertain. Possible threats to petroleum products transit traffic in Estonia are that Russia is officially aiming at transporting all petroleum products through its own ports by 2015. There are economic and political reasons for this aim. The transit cargoes already declined in Estonia in 2007, mainly due to a dispute over the removal of a statue related to the Second World War in Tallinn. Estonia is also competing with Latvia and Lithuania for the petroleum transit cargoes. (Terk et al. 2007) However, it seems likely that transit oil cargoes are declining in Estonia in coming years. The worst case scenario would be that all Russian transit traffic would cease from the Estonian ports. Estonia's own petroleum transports were approximately 0.2 M tonnes in 2007. It

seems that a substantial growth in Estonia's own petroleum transports is not expected, but the Russian petroleum transit could be replaced to some extend by e.g. Kazakhstan oil transit (Terk et al. 2007). In a research report on Russian oil transit (Terk et al. 2007), two alternative forecasts for oil transit traffic in Estonia are given: the worst case scenario with 17 M tons per year or the optimistic scenario with 23 M tons per year.

Otherwise, no major changes in e.g. Estonia's own production structure are expected to happen which would radically change the maritime transportation patterns in the future. In Estonia's own import and export, the main commodity groups are minerals, raw wood and consumer goods. According to the "Estonia Freight Transport Report 2008" (Business Monitor Outlook 2008), the shipping cargo turnover will grow at an average by 0.9 % per year in the period 2007-2011. If the same growth continues in 2012-2015, the Estonian ports in the Gulf of Finland will handle 46.5 M tonnes of cargo in 2015.

7.4.1 Economic development in Estonia

In recent years, Estonia has been one of the fastest growing economies in Europe. Between the years 2000 and 2007, Estonian GDP grew by an average of 9 % per year, which was due to a continued growth of exports, integration with the Nordic countries and institutional and regulatory reforms (Estonian Ministry of Foreign Affairs 2008). However, a growth rate that high is not sustainable in the long run, and the country has now experienced a slowdown of economic growth. In 2007, the GDP still grew by 7.1 % compared to the previous year but, at present, the Estonian Ministry of Finance forecasts a negative growth for the Estonian economy with 1 % decrease in 2008 compared to the previous year.

The decrease of the Estonian economy is a result of both domestic and international factors. At a national level, the regression of economic growth has been a consequence of high inflation and rapidly decreased domestic demand, which is expected to diminish by 2.3 % in 2008. The lessened domestic demand will cause the diminishing of imports in 2008 due to a slowing of private consumption and investment activity. (Ministry of Economic Affairs and Communications; Ministry of Finance 2008) External factors affecting the Estonian economy are increased energy prices, the slowdown of global economy and a common uncertainty related to it. In 2009, the Estonian economy is nevertheless expected to grow by 2.6 %, and between the years 2010 and 2012 the GDP is expected to grow by over 5 % per year (Table 7.8). (Ministry of Finance of the Republic Estonia 2008a, 2008b) IMF forecasts GDP to grow only 0.5% in 2009 (http://www.imf.org/external/country/EST/index.htm).

Table 7.8 GDP real growth forecast 2007-2012 (%) (Ministry of Finance of Estonia 2008)

2007	2008	2009	2010	2011	2012
7.1	-1,0	2.6	5.7	5.2	5.2

The lessened domestic demand and the slowdown of export will have effect on manufacturing, which is expected to slow down in 2008. In the coming years, manufacturing is nevertheless expected to grow along with increased domestic and

international demand between 2009 and 2012. The rise in domestic demand will also lead to an increase in the import of goods. (Ministry of Finance of the Republic of Estonia 2008b)

Estonia has a rather high rate for foreign investments because many enterprises i.e. from Finland have started to operate in Estonia striving for lower production costs. However, high inflation and quickly rising production and labour costs diminish the competition advantage of Estonia as a favourable enterprise environment. In the years to come, it will become more and more essential to improve the efficiency of production plants by investing in production devices.

Foreign trade

The year 2007 was a turning point for several years of remarkable growth in the foreign trade between Estonia and other countries. Affected by global economic trends, the growth rate of imports and exports diminished remarkably at the end of the year 2007, from a 10 % growth per year between 2003 and 2005 to only 4 % in 2007. (Ministry of Economic Affairs and Communications & Ministry of Finance 2008) The forecasts concerning the development of the Estonian economy in the years to come depends on the trends; which way the depression of the global economy and the slowdown of economic growth in the EU region turns after the year 2009. The other EU countries are the most significant trading partners of Estonia, forming more than 75 % of Estonia's total trade in 2007 (Estonian Ministry of Foreign Affairs 2008). Finland, Russia and Sweden are the main trade partners of Estonia.

The most important export products of Estonia are machinery and equipment, and wood and mineral products, which have grown remarkable during the recent years, affecting also the growth of maritime transports. The rising raw material and production costs have, however, diminished for example the manufacturing of machinery and equipment, which formed almost a quarter of the exports of Estonia in the previous years. In 2007, they totalled one fifth of all the exports of Estonia. On the other hand, also a lower demand in the market region weakened the growth of exports. The growth in timber products export in 2007 was mainly due to the rise of wood prices, but the amount of wood products has been inhibited by the lack of raw material. (Ministry of Economic Affairs and Communications & Ministry of Finance 2008)

The most important import products in Estonia are machinery and appliances, mineral products and transport equipment. In 2007, the import of many commodity groups began to slow down. The biggest decrease in import concerned especially machinery and equipment and mineral fuels. (Estonian Ministry of Foreign Affairs 2008)

The Estonian wood industry is closely connected to the Scandinavian wood sector through ownership relations, and most of the Estonian wood products are sold in export markets. The most important forest products are sawn timber, log houses and construction details. A shortage of raw material in the forest industry restricts the growth of export of wood products, which is due to decisions made by forest owners more than the actual forest production capacity. During the previous couple of years, the

felling volume of Estonian privately-owned forests has diminished remarkably; especially the increment in broad-leaved trees is exceeding the annual felling volume. The increasing wood prices have nevertheless awakened the interests of forest owners to manage their forests more efficiently. Expectations concerning the near future of the forest industry in Estonia are optimistic, however, and the demand for export is expected to grow. (Ministry of Economic Affairs and Communications & Ministry of Finance 2008)

In addition, export-oriented and heavily concentrated production of pulp, paper and paper products grew by two times between the years 2001-2007, with the year 2007 being the most remarkable year of growth. The main products, aspen pulp and uncoated paper and paperboard, formed 90 per cent of the industry's exports in 2007. In the years to come, the paper industry will face difficulties because of a rise in raw material prices and because Russia plans to increase wood export duties. (Ministry of Economic Affairs and Communications & Ministry of Finance 2008)

The manufacture of machinery and equipment has grown remarkably in recent years together with increased production efficiency, production costs and product prices. As the previous fields of manufacture, also the manufacturing of machinery and equipment is directed mainly to foreign export markets. The future sights in the business are good and the value added is forecast to be about 1.5 times greater in 2014 than in 2006 (Ministry of Economic Affairs and Communications & Ministry of Finance 2008). The manufacture of machinery and equipment has not yet faced great difficulties in diminished demand, but finding qualified labour, and investments on fixed assets have played an important role during the last few years. However, weakened demand has started to set challenges also in this sector.

7.5 Transportation of petroleum in the Gulf of Finland

The current energy consumption worldwide is based on fossil fuels and especially on petroleum products. The global demand of petroleum is expected to increase mainly due to the growing energy needs of developing economies such as China.

Russia is the second largest oil producer and also the second largest exporter in the world (http://tonto.eia.doe.gov/country/index.cfm). The growth of the oil exports is mainly due to the rising prices of oil. The oil industry has a strong connection to the politics in Russia, which has its own effect on the matter. In 2007, Russia officially declared that the goal is to transport crude oil and oil products via the Russian ports and transportation routes, when nowadays a considerable amount is transported through the Baltic countries (over 20 %) and through countries in the Middle-East. (Hietala 2006) So, also in the future the Russian oil exports by sea are channelled most likely through the Russian ports in the Gulf of Finland, Kaliningrad and the new deep sea ports in the Barents Sea area. However, the production and export infrastructure of oil in Russia needs some improvements. Nowadays, only some oil can be transported by pipeline to the port and the rest has to be transported by rail or river routes, which are more costly transportation ways. Of all the oil cargoes, more than 60 % and of crude oil more than 90 % are transported by pipeline (Rybin 2007). But if the bottlenecks in the

infrastructure are solved, Russia has huge sources of oil and the oil industry is likely to increase substantially; thus, Russia is expected to increase oil production by 1,8 % annually (http://www.rzd-partner.com/news/2008/05/30/325094.html).

Oil is transmitted to the Russian ports in the Gulf of Finland through the Baltic Pipeline System or by rail. An expansion project of the BPS is currently underway. There have been several options where the pipeline could be directed, but at the moment it looks like it is going to Ust-Luga. Besides the oil pipeline, there will be also an oil product pipeline to transport oil products from the Kirishi refinery to Ust-Luga. (http://en.portnews.ru/comments/136/?print=1). Oil would be redirected to the Baltic Pipeline System from the Druzhba pipeline that runs via Belarus and Ukraine to the territory of the European Union. Russia wants to reduce its reliance on overland export routes through third countries and because of that oil is redirected to the Baltic pipeline. Russia is also probably planning to redirect some oil from Kazakhstan to Primorsk through the BPS because the Russian and Kazakh governments are discussing about a project to increase the annual oil capacity of the Kazakhstan – Russia pipeline from 15 to 25 million tons. (Socor 2007) Russia is also aiming at expanding the oil refineries of Kirish, Nizhni Volga and Tatarstan near St. Petersburg. (http://www.uusisuomi.fi/ulkomaat/23699-oljynkuljetukset-suomenlahdella-lisaantyvat) The major export market for the Russian oil is Europe, but the share of Asia will probably grow in the long run.

In Finland and in Estonia, the demand for crude oil and oil products can be expected to remain unchanged in the near future.

Finland's environmental administration and VTT Technical Research Centre of Finland have estimated that oil transports in the Gulf of Finland would total 260 million tonnes by 2015 (figure 7.9) (Hietala 2008). Oil experts have doubted the growth rates because they do not necessarily correspond with the speed of the construction of the pipelines. It has been said that by 2020 the crude oil production may lack about 15 million tonnes behind the terminal capacity. (http://en.portnews.ru/comments/136/?print=1)

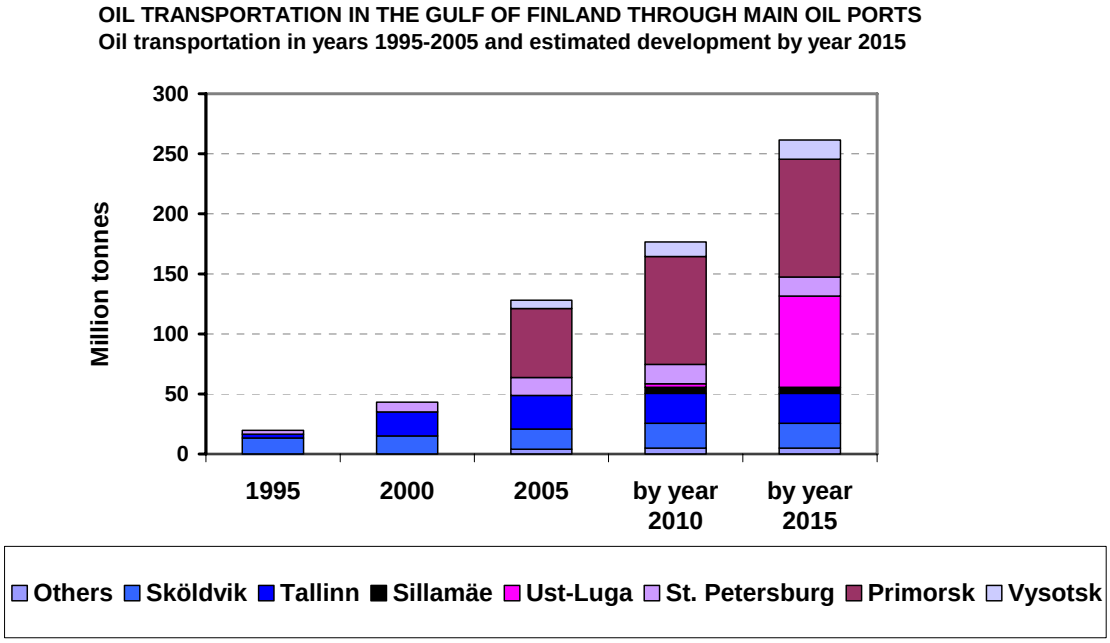

Figure 7.9 The development of petroleum transportations in the Gulf of Finland by year 2015 (Hietala 2008)

Environmental politics, both internationally and nationally, aim at affecting the consumption of energy in order to cut down CO^2 and other emissions from fossil fuels. In the long run, the growth of demand, limits of production capacity and taxation or other economic control can diminish the share of oil as an energy source and maybe add to the shares of natural gas, coal, renewable energy sources or nuclear power.

7.6 Container transports in the Gulf of Finland

Worldwide container transportation markets have been growing strongly and more and more goods are transported in containers. Because substantial growth is expected in the container transports also in the Baltic Sea area, the container traffic is viewed here separately.

In 2007, 3.1 M TEU was transported in the ports of the Gulf of Finland. The largest container ports were St. Petersburg (1.7 M TEU), Kotka (0.7 M TEU) and Helsinki (0.4 M TEU). In the future, the Port of Ust-Luga is planned to become a major container port in the area and a container terminal has already been built there. However, the container traffic has not started yet in Ust-Luga.

Table 7.10 Container transports in the ports of the Gulf of Finland, 2007

Port	**Containers** ***TEU***
Hanko	60 618
Helsinki	431 404
Kotka	563 042
Hamina	199 002
Finland	**1 254 066**
St. Petersburg	1 697 720
Russia	**1 697 720**
Tallinn	180 911
Vene-Balti	286
Estonia	**181 197**
Total	**3 132 983**

The main reason for the growth of container transports is that the world markets for trade have grown worldwide. But it is not just that – the container transports grow because they attract cargoes from goods which have not yet been containerised, especially in regard to the general cargo ship segment. The reason for the success of containers is that companies can send batches of goods to the other side of the world without having to charter an entire ship. Due to technical differences, container ships can carry more cargo per GT than general cargo ships, which also decreases the costs of the port, and berth dues. The growth in container traffic has added to the competition of container ship tonnage and there is a good supply of ship capacity in the container markets. In sum, a container is proved to be a flexible and competitive choice for transporting goods. (Lloyd's Register Fairplay 2007; Venäläinen 2008)

Following the BMO 2006 scenario, the current 6 million TEU in the North Sea Baltic Hub area will grow to 20 million by 2020 (Lloyd's Register Fairplay 2007). According to Venäläinen (2008), container transports are to quadruple in the Baltic Sea area. In any case, Russia dominates the growth: in 2000-2005 more than 40 % of the total growth was related to the container traffic to Russia, and during 2003-2020 it will be accountable for a growth of 31 % of the total volume, followed by Finland with 18 %. Container trade in Russia grows by an average of 25-30 % per year. The transit of Russian containers through Finland will continue to increase and is expected to exceed 1 M TEU by 2020. Especially Kotka and Hamina will benefit from the Russian transit traffic in containers. (Lloyd's Register Fairplay 2007)

It is questionable if there is going to be enough terminal capacity to handle the container volumes. Although private companies would be willing to invest in the new capacity it can be that the environmental requirements or other reasons (such as port legislation or other governmental actions) are blocking the investments. However, terminal capacity can also be increased by improving the efficiency of the existing terminals.

One central question in container traffic is also the balance between import and export transportations in containers. Often in some ports, cargo is transported only to one direction and empty containers have to be transhipped from one port to another. The Port of St. Petersburg is an example of such a port where there is merely incoming container traffic. The empty containers are often carried to the ports of Kotka and Hamina where the containers are loaded before a ship heads back to the hub port. Due to this, also the average ship size in St. Petersburg is the same as in Kotka and Hamina. It is also characteristics for the Baltic Sea Region that to certain extent the containers are transported in Ro-Ro-ships which are mainly shipping forest products and trailers. (Lloyd's Register Fairplay 2007)

7.7 Development of cargo ship fleet

In the Gulf of Finland, the most frequent cargo carrying ship types visiting the ports are dry bulk/cargo ships, Ro-Ro ships, container ships and tankers. The average ship size is rather small: most of the ships are under 20 000 GT and the ships which exceed that are mainly tankers or container ships. The ship size in the Gulf of Finland is limited by the depth of the fairway in the Strait of Denmark, which is 15 m, and there are only few ports in the Gulf of Finland (Sköldvik, Kotka, Primorsk, Ust-Luga and Muuga), which have a fairway of 15 metres to their ports. Cargo flows in the area are also relatively small (excl. petroleum transportation), which makes smaller ships more profitable because they can offer more frequent and flexible services than the larger ships. The nationality of the ships operating in the Gulf of Finland is rather varying. In Finland and in Estonia only about 30 % of import and export is transported by Finnish/Estonian ships and European-owned ships are dominant in Finland and Estonia (Merenkulkulaitos 2008b; Statistics Estonia). For Russia, the figure is greater, e.g. in St. Petersburg about 60 % of the arriving ships are Russian ships (http://www.pasp.ru).

Due to the variety of nationalities of ships it cannot be precisely known what kind of ships there will be in the Gulf of Finland in the future. However, there is a world-wide tendency that ships are becoming larger and the size of ships in order books is generally larger than the size of existing fleet. Another trend for the European-owned ships is that they are increasingly ice-strengthened, especially the tankers. (The Institute of Shipping Analysis et al. 2006)

Overall, the recent years have been booming years in the ship-building industry. World fleet is growing fast, which is largely due to the booming world economy. Ships that have been ordered in 2007 are scheduled for delivery approximately in 2010. 2006 was a good year especially for tanker orders, and in 2007 bulk carriers and container vessels had high ordering rates (Platou 2008; BRS 2008). It is typical for ship orders that they come in cycles. In 2007, not only the number of tanker orders decreased, but also the ordered ships were smaller tankers, almost -40 % in dwt compared to the previous year, which might be due to the fact that the most oldest tankers are small and there is a pressure to replace them with new ones. In container ships, the carrying capacity of almost 3.8 M TEU was added to the ordering books in 2007. In the container markets, large tonnage delivery is expected as well as a large order book at the moment (UNCTAD 2007). The high ordering activity of 2007 cannot continue at the same level

for long, and thus it can be expected that in the becoming years there will be a decrease in ship orders. (Platou 2008) In the Baltic Sea area, the share of container, tanker and reefer ships is expected to increase and the share of dry bulk and other dry cargo ships is expected to decrease. Also, the amount of fast Ro-Ro and Ro-Pax ships is expected to increase. (The Institute of Shipping Analysis et al. 2006) Because of the earlier mentioned limitations, the maximum ship size cannot grow much in the Gulf of Finland, but it can be expected that the average ship sizes will grow to some extend, especially in tankers operating in the Russian ports and in container ships in the Gulf of Finland.

In Appendices 8 and 9, the statistics on EU fleet at the end of 2007 and the ship order books for the EU flags are presented.

8 SAFGOF SCENARIOS FOR MARITIME TRANSPORTATION IN THE GULF OF FINLAND IN 2015

In chapters 2-7, the current situation and future sights of maritime transportation in the Gulf of Finland have been analyzed. On the basis of this information, economic, industrial and transportation trends for three Safgof scenarios were formulated.

In all the scenarios, the basic assumption is that Russia will be the strongest driver in the development due to the huge growth potential of the Russian economy. Finland already has a well developed economy and there is not such a growth potential than in Russia. Especially the structural changes in production and the ageing of population are slowing down the speed of economic growth. The future of Estonian maritime transportation has several options due to the e.g. current economic slow-down and instability of Russian transit traffic in Estonia. On the other hand, there is growth potential in the Estonian economy and possibilities to benefit from transit traffic.

8.1 Scenario "slow growth"

The scenario "slow growth" is based on the assumption that the current economic recession will be severe and relatively long-lasting in the area of the Gulf of Finland. Here, the basic assumptions behind the "slow growth scenario" are presented.

General development

- All three countries experience economic recession, which is due to the recession of the global economy.
- Europe, which is the main market area for transportations going via the Gulf of Finland, suffers from an even harder recession than developing countries, which results to low demand.
- In addition, the structural change in production slows down especially the economies of Finland and Estonia.
- Domestic demand is low due to the recession.
- Recession reduces investments.
- The depth and duration of the recession are hard to estimate, but recovery begins after 2010, which adds to the transports at the end of reference period.
- Environmental requirements are becoming so tight that they affect negatively to the economic growth.

Finland

- Forest industry is facing major problems in Finland due to a shortage of raw material, low demand and high production costs.
- Ageing of population decreases productivity.
- Demand for transit transports via Finland does not grow due to the recession of the Russian economy.

Russia

- Structure of the Russian economy stays heavily dependent on the prices of oil and other raw materials.
- Russia has a strong interest to redirect transports to its own ports.

Estonia

- Rising production costs decrease the competitiveness of the Estonian industries
- In the forest industry, a shortage of raw material occurs.

Oil industry

- Due to the recession and high prices of oil, the growth of demand for oil and oil products slows down.
- Russia invests less than planned on oil production and transportation capacity.
- Also environmental aspects slow down the growth of demand for oil.
- Oil transit in Estonia ceases completely.

Sea transportation

- Demand for transports decreases because of global recession.
- Port investments are reduced due to the instability of economy.
- Ports maintain their current share or manage to grow their share mainly because of the rationalisation of operations.
- Larger ports do better in the competition than the small ports.
- Container ports benefit from the growth in container traffic.
- Finland maintains current cargo flows.
- Ports in Russia do not develop as fast as expected.
- In the ports of Estonia, oil transit ceases and the ports have difficulties to find replacing cargoes.
- Rise in prices of energy adds to the transportation costs, but it probably adds to the share of sea transportation compared to other transportation modes.
- Rise in prices of energy and environmental requirements slow down the speed of sea transportation (slower speed – less fuel consumption).
- Shipowners become cautious with ship orders.
- Ship sizes do not grow remarkably – only to the extend which can be currently seen in the order books.

According to the scenario "slow growth", the total maritime transportation tonnes in the Gulf of Finland would be 322.4 M tonnes in 2015, which would mean a growth of 23 % compared to the situation in 2015. The sources for the figures in Table 8.1 are:

- *petroleum products* Finland: stays in the level of 2007, Russia: Transportation Strategy of the Russian Federation, Estonia: only Estonia's own petroleum transportations
- *total tonnes* Finland: stays in the level of 2007, Russia: the BMO 2006 forecast, Estonia: the amount of other cargoes grows by 2 % annually, which is based on the average growth of the past ten years in the Estonian ports.

The amount of other cargoes has been calculated on the basis of these figures.

Table 8.1 Maritime transportation in the Gulf of Finland in 2015, scenario slow growth

Scenario slow growth 2015				
	Finland	Russia	Estonia	Total
	M tonnes			
Petroleum products	21	137	0.2	158.2
Other cargoes	41.0	102.1	21.1	164.2
Total	62.0	239.1	21.3	**322.4**

8.2 Scenario "average growth"

The scenario "average growth" presents "business as usual" alternative. Economic recession will pass quickly and economic growth continues.

General development

- Current economic instability does not last long and the economic growth continues.
- Especially the Russian economy experiences strong growth.
- Demand for industrial products is good.
- Employment and domestic demand stays in a good level.

Finland

- Structural change in the forest industry happens without major problems. New products replace the old ones and raw material problems are solved.
- Transports consist more of high-value goods, which slows down the growth of cargo tonnes.
- Economic growth slows down due to the ageing of population, which in turn slows down the growth of productivity.
- The amount of transit transports grow but their relative share of the Russian foreign trade decreases when Russia develops its own ports.

Russia

- Economic growth is strong but Russia is not able to diversify its economic structure and it is still strongly dependent on raw material prices.
- Export of oil is growing but production and transportation capacity do not grow quite as much as planned.
- Domestic demand grows strongly, which adds especially to container traffic and the imports of new automobiles.
- Russia has a strong interest to redirect transports into its own ports.
- There is a lack of skilled labour.

Estonia

- Despite of the current slowdown the strong economic development of the past years continues in the reference period.

- Effectiveness of production increases and adds to the competitiveness of Estonia.
- High prices of timber secure the supply of raw material for forest industry in Estonia.

Oil industry

- Oil prices rise and global demand is high.
- Russia is expanding its production and transportation capacity.
- In Finland and in Estonia, the demand for oil grows but not to a high degree.
- New energy sources are examined in order to cut costs and to fulfil the environmental requirements.
- Oil transit decreases in Estonia, but Russian oil is still transported via the Estonian ports.

Maritime transportation

- Port investments are made but the most ambitious plans do not realize.
- Especially in Finland and in Estonia, the environmental requirements are slowing down the speed of port investments.
- Large ports win out in the competition.
- Container transports grow strongly, which benefits container ports.
- Hinterland connections and the development of infrastructure concentrate on the largest ports, which further add to their competitiveness.
- Ship sizes grow, which also benefits the larger ports.
- In ship types, tankers, container ships and Ro-Ro ships add to their share of traffic when traditional bulk and dry cargo ships lose their shares.
- The high price of energy adds to the transportation costs which benefits sea transportation as a transportation mode.
- Rise in the prices of energy and the environmental requirements slow down the speed of sea transportation (slower speed – less fuel consumption).

The scenario "average growth" would mean a growth of 64 % in maritime transportation tonnes compared to the year 2007. Such a strong growth could occur due to the strong development of Russia. The sources for figures are:

- *petroleum products* Finland: grows by 9,5 % from the level of 2007, Russia: the capacity of ports in 2015 which transport petroleum products, Estonia: Terk et al. 2007
- *other cargoes* Russia: Transportation Strategy of the Russian Federation
- *total tonnes* Finland: the BMO 2006 forecast, Estonia: Business Monitor International 2008.

Table 8.2 Maritime transportation in the Gulf of Finland in 2015, scenario average growth

Scenario average growth 2015				
	Finland	Russia	Estonia	Total
	M tonnes			
Petroleum products	23	180	17	220
Other cargoes	53.2	128.9	29.5	211.6
Total	76.2	308.9	46.5	**431.6**

8.3 Scenario "strong growth"

The scenario "strong growth" presents the most optimistic visions of economic development and transportation in the Gulf of Finland.

General development

- Economic growth is fast, especially in Estonia and Russia, in Finland the economic growth is slower.
- Global demand for industrial products is good.
- Employment and domestic demand is good.

Finland

- Structural change in the forest industry happens without major problems. New products replace the old ones and raw material problems are solved.
- Transports consist more of high-value goods, which slows down the growth of cargo tonnes.
- Employment and domestic demand stay good.
- Economic growth slows down due to the ageing of population, which in turn slows down the growth of productivity.
- The amount of transit transports grow but their relative share of the Russian foreign trade decreases when Russia develops its own ports.

Russia

- Russia is able to diversify its economic structure; and the economic growth of Russia is above the average level
- Oil still plays a central role in economy.
- Domestic demand grows strongly, which adds especially to container traffic and the imports of new automobiles.
- There is a lack of skilled labour.

Estonia

- Despite of the current slowdown, the strong economic development of the past years continues in the reference period.
- Effectiveness of production increases and adds to the competitiveness of Estonia.

- The high prices of timber secure the supply of raw material for the forest industry in Estonia when the Estonian forest owners are willing to sell.

Oil industry

- Global demand for oil grows regardless of price.
- Production and transportation capacity in Russia grows strongly.
- Russia develops its oil refining industry and the share of oil products in transports grows.
- Russian oil exports are also still transported via the Estonian ports.
- In Finland and in Estonia, the demand grows but not to a high degree.

Maritime transportation

- The growth in cargo traffic is so strong that all the available capacity is in use.
- Ports are making plenty of investments.
- In Finland and in Estonia, the environmental requirements can slow down the speed of port investments.
- Large ports grow even larger but also small ports are doing well in the competition.
- Ship sizes grow, which also benefits the larger ports.
- In ship types, tankers, container ships and Ro-Ro ships add to their share of traffic when traditional bulk and dry cargo ships lose their shares.
- The high prices of energy add to the transportation costs, which benefits sea transportation as a transportation mode.

In the "strong growth" scenario the growth in maritime transportation would be 93 % compared to the situation in 2007. Such a huge growth would be mainly stemming from a growth in petroleum transports in the Gulf of Finland, which in turn adds to the other transports when incomes from petroleum increase wealth in Russia. Sources for figures are as follows:

- *petroleum products* Forecast of Finland's Environmental Institute/VTT Technical Research Centre of Finland (Hietala 2008)
- *total tonnes* Finland: FMA forecast, Russia: the sum of the most optimistic visions of the port capacity, Estonia: the BMO 2006 forecast

Table 8.3 Maritime transportation in the Gulf of Finland in 2015, scenario strong growth

Scenario strong growth 2015				
	Finland	Russia	Estonia	Total
	M tonnes			
Petroleum products	25	206	31	262
Other cargoes	53.8	151.7	39.7	245.2
Total	78.8	357.7	70.7	**507.2**

8.4 Safgof maritime transportation scenarios: shares of import, export and domestic traffic

Shares of import, export and domestic traffic have been calculated following the shares of the realized tonnes in 2007 with the exception of Estonia's slow growth scenario where the share of imports grows because the exports of Russian petroleum transit cargoes are assumed to end in the Estonian ports.

The exact figures for each scenario are found in Appendices 10-12.

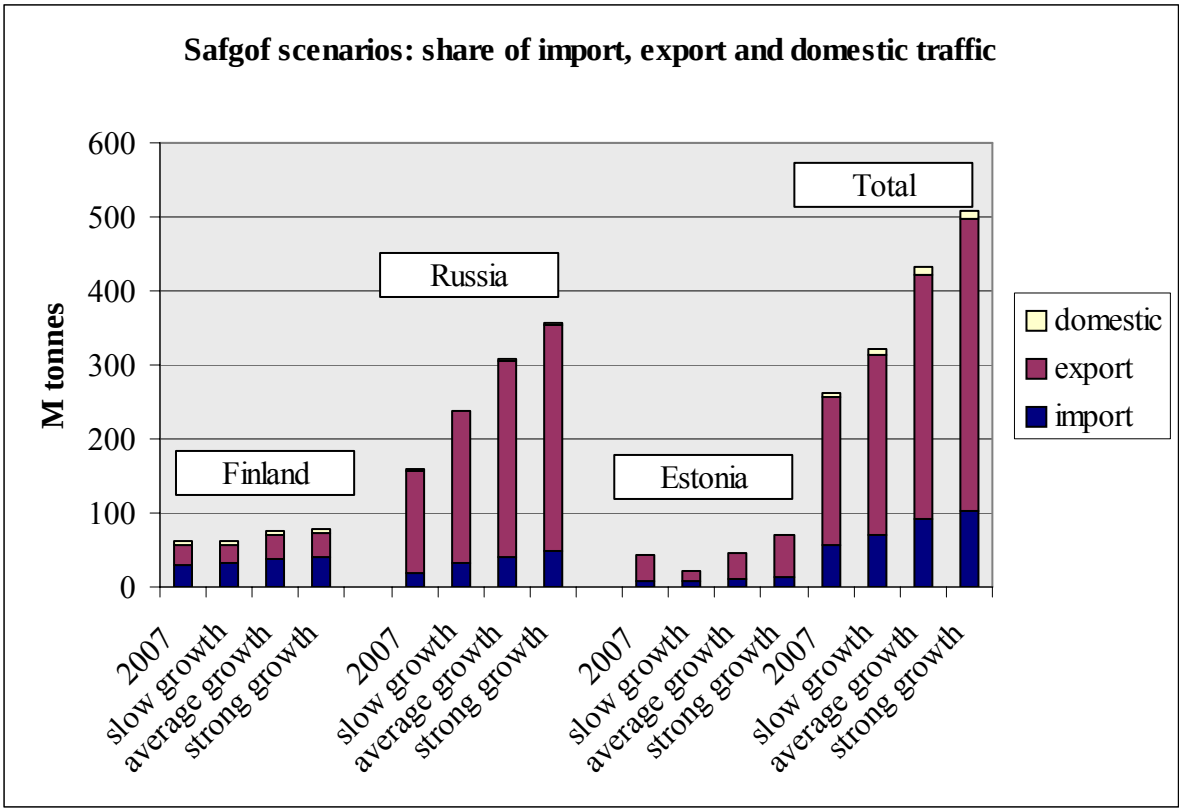

Figure 8.4 Safgof scenarios: share of import, export and domestic traffic

8.5 Safgof maritime transportation scenarios: ports

Finland

The shares of the ports are otherwise assumed to stay the same as in 2007; but in regard to the scenarios average and strong growth, petroleum transports grow less than other transports, which decreases the share of Sköldvik and increases the shares of Hanko, Helsinki, Kotka and Hamina compared to the year 2007.

Table 8.5 Safgof scenarios: Finnish ports

	Hanko	Helsinki	Sköldvik	Kotka	Hamina	Saimaa Canal	Other ports	Total
	M tonnes							
2007	3.0	13.4	19.8	10.7	5.9	2.1	6.4	**61.3**
Slow growth 2015	3.0	13.6	20.1	10.8	6.0	2.1	6.5	**62.0**
Average growth 2015	4.4	17.4	21.8	14.0	8.0	2.6	8.0	**76.2**
Strong growth 2015	4.6	18.0	22.4	14.5	8.3	2.7	8.2	**78.8**

Russia

The shares of the ports in the slow and average growth scenarios indicate own calculations which are based on the view that petroleum transportations and the share of Ust-Luga grow and the other ports have witnessed only modest growth in cargo tonnes. In the strong growth scenario, the figures are based on the most optimistic views on the development of port capacity.

Table 8.6 Safgof scenarios: Russian ports

	Vyborg	Vysotsk	Primorsk	St. Petersburg	Ust-Luga	Total
	M tonnes					
2007	1.1	16.5	74.2	59.5	7.1	**158.4**
Slow growth 2015	1.7	17.5	100.0	65.0	54.9	**239.1**
Average growth 2015	2.0	18.5	120.0	81.6	86.8	**308.9**
Strong growth 2015	2.2	20.5	120.0	85.0	130.0	**357.7**

Estonia

The shares of the ports in maritime transportation are assumed to stay the same as in 2007.

Table 8.7 Safgof scenarios: Estonian ports

	Sillamäe	Kunda	Miiduranna	Tallinn	Bekker	Vene-Balti	Paldiski Northern	Total
	M tonnes							
2007	1.8	1.7	0.7	35.9	0.7	1.7	0.8	**43.3**
Slow growth 2015	0.9	0.8	0.3	17.7	0.3	0.8	0.4	**21.3**
Average growth 2015	1.9	1.8	0.8	38.6	0.8	1.8	0.9	**46.5**
Strong growth 2015	2.9	2.8	1.1	58.6	1.1	2.8	1.3	**70.7**

* The share of ports is assumed to stay the same as in 2007.

8.6 Safgof maritime transportation scenarios: petroleum transports

Petroleum transports are going to maintain their central role in the maritime traffic of the Gulf of Finland also in the future. The largest ports in regard to the petroleum transports are going to be Primorsk, Ust-Luga, Sköldvik, and Tallinn (the Muuga harbour area) if Estonia maintains its position as a transit country for Russian oil exports.

In regard to the petroleum transports, also the number of tanker calls in the ports of the Gulf of Finland has been calculated.

Slow growth

In the slow growth scenario the amount of the petroleum transports would grow only by 7.3 % due to the global recession. It would also mean only a slight growth in the number of tanker calls in the Gulf of Finland.

Here both the shares of crude oil and oil products and tanker size are assumed to stay the same as in 2007.

Table 8.8 Scenario slow growth: transports of petroleum products

Transportation of petroleum products, slow growth 2015				
	Finland	**Russia**	**Estonia**	**Total**
	M tonnes			
Crude oil	5.8	100.5	0.0	106.4
Oil products	15.2	36.5	0.2	51.8
Total	21.0	137.0	0.2	158.2
Tanker calls in the ports of the Gulf of Finland, slow growth 2015				
Number of ship calls	1 336	5 311	8	6 655

Average growth

In the average growth scenario, the amount of petroleum transports would grow with almost 50 %, which reflects the significance of the petroleum transports as the most central driver of the development in the area of the Gulf of Finland.

The shares of crude oil and oil products have been assumed to stay the same as in 2007. The average tanker size grows with 1.26 times compared to the year 2007. This factor has been calculated on the basis of the time series statistics on the development of the amount of the petroleum transports and on the ship calls (per transported tonnes). These statistics have shown that the tanker ship sizes and ship call frequencies do not grow with the same speed as the transported tonnes, which is probably due to the more efficient use of ship capacity and to the slight growth of ship sizes. Thus, in practise, the growth of 1.26 in ship sizes does not mean that the maximum ship size grows in the Gulf of Finland, but that the average ships size grows. In the average growth scenario, there would be approximately 1 400 more tanker calls in 2015 than in 2007 in the Gulf of Finland.

Table 8.9 Scenario average growth: transports of petroleum products

Transportation of petroleum products, average growth 2015				
	Finland	**Russia**	**Estonia**	**Total**
	M tonnes			
Crude oil	6.4	132.1	0.5	139.0
Oil products	16.6	47.9	16.5	81.0
Total	23.0	180.0	17.0	220.0
Tanker calls in the ports of the Gulf of Finland, average growth 2015				
Number of ship calls	1 464	5 538	675	7 677

Strong growth

In the strong growth scenario, the petroleum transports grow by 78 % compared to the year 2007. In regard to the tanker calls, it would mean approximately 1 500 more tanker calls than in 2007.

In the strong growth scenario, the share of oil products is estimated to grow by 10 % in Russia because in this scenario Russia would develop its own refinement capacity. In Estonia and in Finland, the shares of crude oil and oil products are assumed to stay the same as in 2007. The tanker sizes grow in the strong growth scenario 1.26 times, as in the average growth scenario.

Table 8.10 Scenario strong growth: transports of petroleum products

Transportation of petroleum products, strong growth 2015				
	Finland	**Russia**	**Estonia**	**Total**
	M tonnes			
Crude oil	6.9	142.7	0.9	150.5
Oil products	18.2	63.3	30.1	111.6
Total	25.0	206.0	31.0	262.0
Tanker calls in the ports of the Gulf of Finland, strong growth 2015				
Number of ship calls	1 591	4 958	1 230	7 779

8.7 Safgof scenarios: probability distributions[20]

As can be seen from the scenario descriptions, the future development of maritime transportation in the GoF is dependent on so many societal and economic variables that it is not realistic to predict one exact point estimate value for the cargo tonnes for a certain scenario. Plenty of uncertainty is related both to the degree in which a scenario will come true as well as to the cause-effect relations between the different variables. For these reasons, probability distributions for each scenario were formulated.

[20] The theory and practices concerning the elicitation and use of experts' probabilities are described in detail e.g. in O'Hagan et al. (2006).

Uncertainty related to the predicted amounts of cargo transported within the Gulf of Finland in year 2015 was assessed by a group of experts[21]. The point estimates (expectation values) for the three scenarios presented in the previous chapter as well as the assumptions behind them were used as a starting point. After this, the experts defined their subjective degrees of belief on these values by together evaluating realistic ranges for the values to illustrate the uncertainty they saw to be dealt with. These ranges for the tonne values are presented in Appendix 13.

After this, an elicitation of the experts' degrees of belief and scenario-specific probability distributions for the cargo tons were produced (see figures 8.2-8.4). This was done by using WinBUGS software (Bayesian Inference Using Gibbs Sampling, Spiegelhalter et al. 2005) that implements the Markov chain Monte Carlo simulations (MCMC, Gilks et al. 1995) – based on stochastic sampling with large numbers of iterations – for user-specified belief models. The amount of cargo tonnes was expected to be log-normally distributed, and the ranges given by the experts were regarded as the 95 % confidence intervals. The number of the iterations used in the simulations was 30000.

The spread and skewness of the distributions were largely conditional to the scenario and to the group of products. The more confident are the experts, the narrower and more peaked are the distributions. In the case that larger amount of uncertainty was seen to be located on either side of the expectation value, the distribution becomes skewed, having a longer tail on that side.

In overall, the expert group estimated the distributions to be wider in the case of Russia because the transported tonnes in Russia are to a large extent greater than in Finland and Estonia. With Russia, the range varies between 10 and 25 M tonnes while the range varies only between 0.1-9 M tonnes in Finland and in Estonia.

The amount of petroleum transports in Finland in all the scenarios was thought to have quite a narrow distribution because the demand for petroleum in Finland is expected to be relatively stable. Russia had wider distribution in all the scenarios, especially so in the strong growth scenario where the expectation value was thought to be the most uncertain. The petroleum transports in Estonia were seen to have more uncertainty above the expectation value because of the instability of the development of the Russian transit transports in Estonia. If Estonia maintains its position as a transit country for the Russian oil products exports, the amount of the transit petroleum transports will have more growth potential.

The other cargoes were seen to have a relatively even distribution in all three scenarios. In the slow growth scenario, Finland was thought to have more uncertainty below the expectation value, which means that the economic recession can hit harder to Finland than to Russia and Estonia which have had stronger economic growth in last ten years. On the other hand, in the strong growth scenario Finland was thought to have more

[21] The group of experts was organised on 5 Nov 2008 and the participants were researchers of the Safgof project group or of Kotka Maritime Research Centre and the professor of maritime logistics.

uncertainty above the expectation value which indicates that the economy can also grow more than expected.

The figure on the next page shows that the expert group estimated that the average growth scenario has the smallest range in terms of the distribution of transported tonnes, the strong growth scenario had the widest range and the slow growth scenario was in between these two.

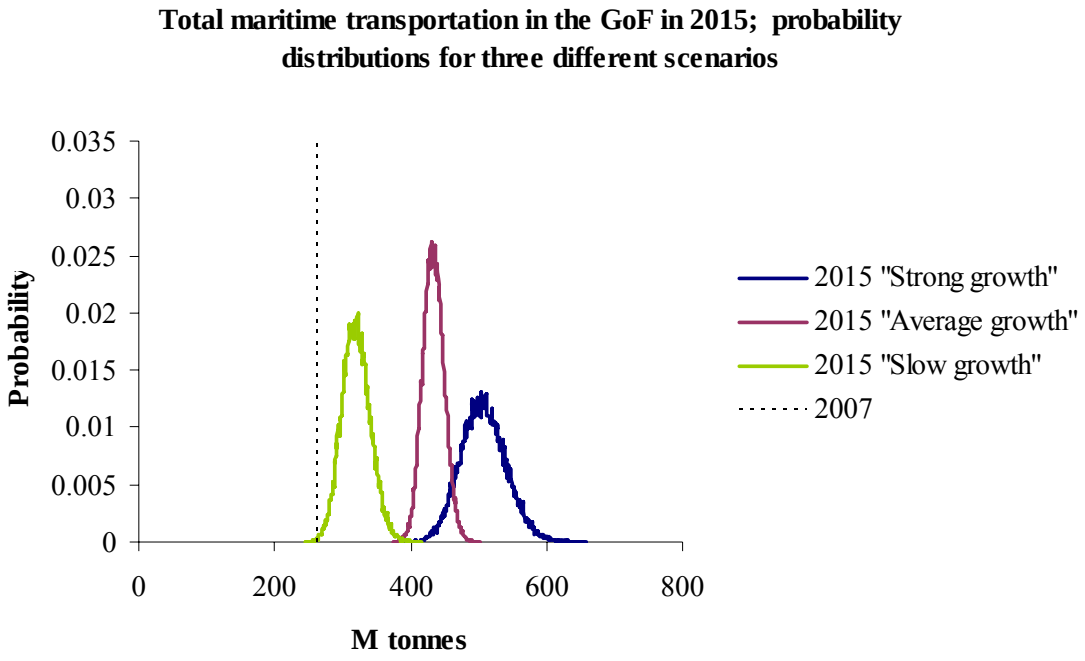

Figure 8.11 Total maritime transportation in the GoF in 2015; probability distributions for three different scenarios[22]

[22] Probability on the y axis is a relative number proportional to 1. Year 2007 (on the basis of the observed statistics) is known to have the value 1, but for the sake of visual clarity the scale of y axis has been cut down.

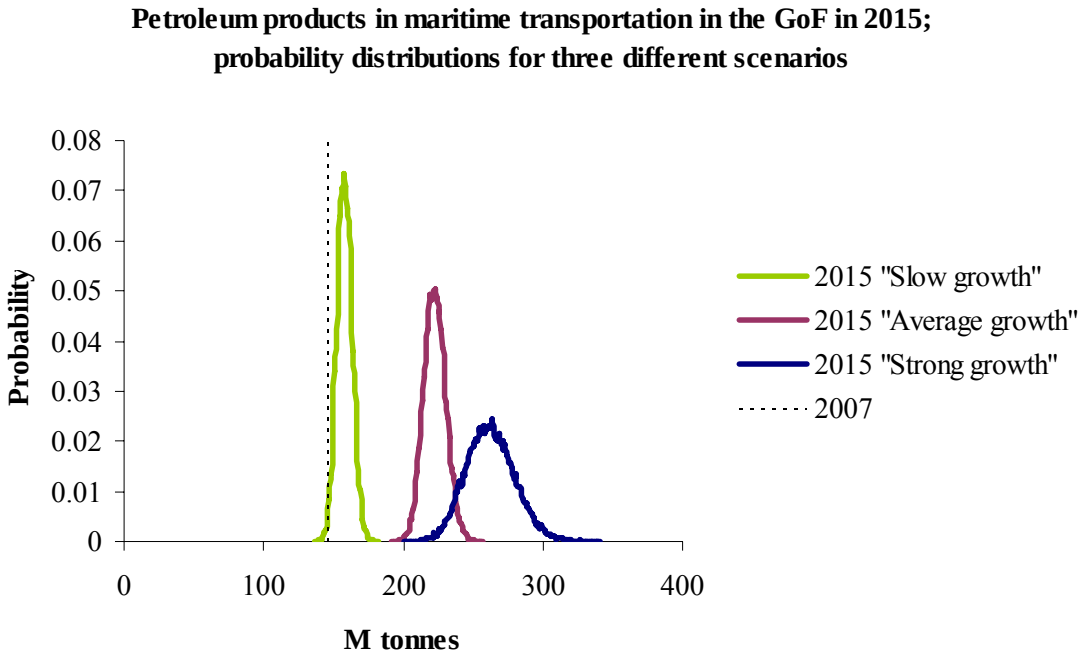

Figure 8.12 Petroleum products in maritime transportation in the GoF in 2015; probability distributions for three different scenarios

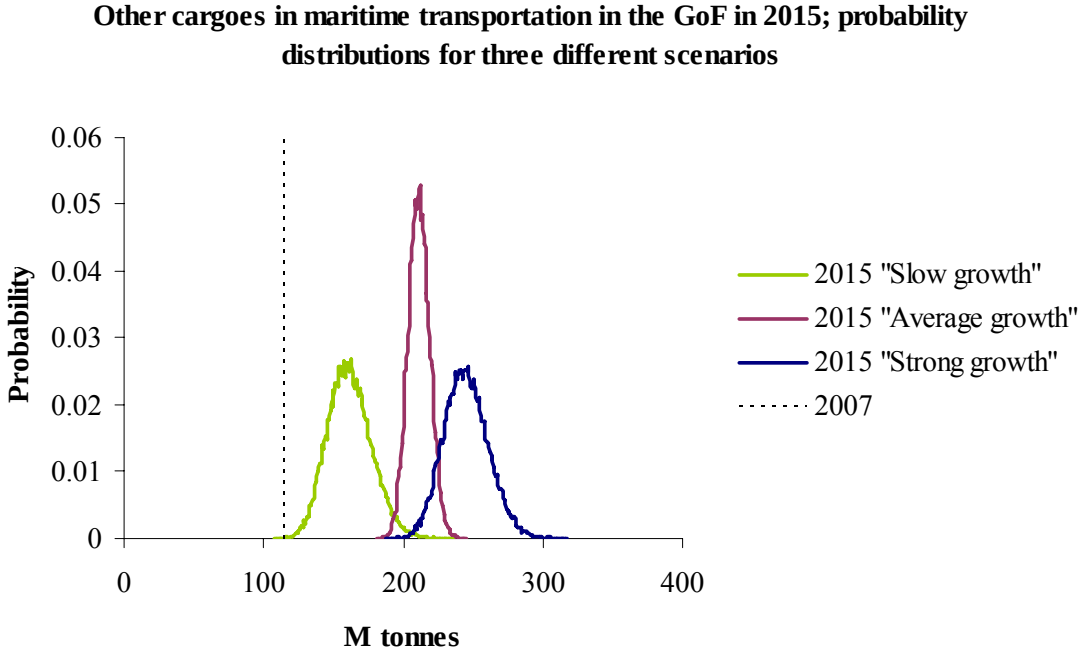

Figure 8.13 Other cargoes in maritime transportation in the GoF in 2015; probability distributions for three different scenarios

The overall uncertainty related to the cargo forecasts for 2015 was evaluated by constructing compiled probability distributions of the three scenarios. First of all, an

equally weighted distribution was produced in which case all the scenarios were assumed to be equally likely to come true (each having 33 % of weight). Secondly, the group of experts defined the weighting according to their degrees of belief. They considered the scenario "average growth" to be the most likely, having 50 % of their score, whereas the scenario "slow growth" got 35 % and the "strong growth" 15 %. Finally, the experts made an optimistic scenario weighting assuming fast recovery from the current slowdown of economy with the scenario "average growth" still having 50 %, but the "slow growth" 15 % and the "strong growth" 35 % of their belief score.

For the compiled distributions, the distributions of all three scenarios were combined by using an aggregation method called linear opinion pooling, described e.g. in O'Hagan et al. (2006, p. 181). This simply means taking a weighted average of the individual distributions while the weights sum up to 1. In this case, the expectation values and the end points of the 95 % confidence intervals from different scenarios where pooled with the weighting proportions described above and the new distributions simulated by using these. The following figure shows how different weight proportions affect the future predictions of the total cargo tonnes.

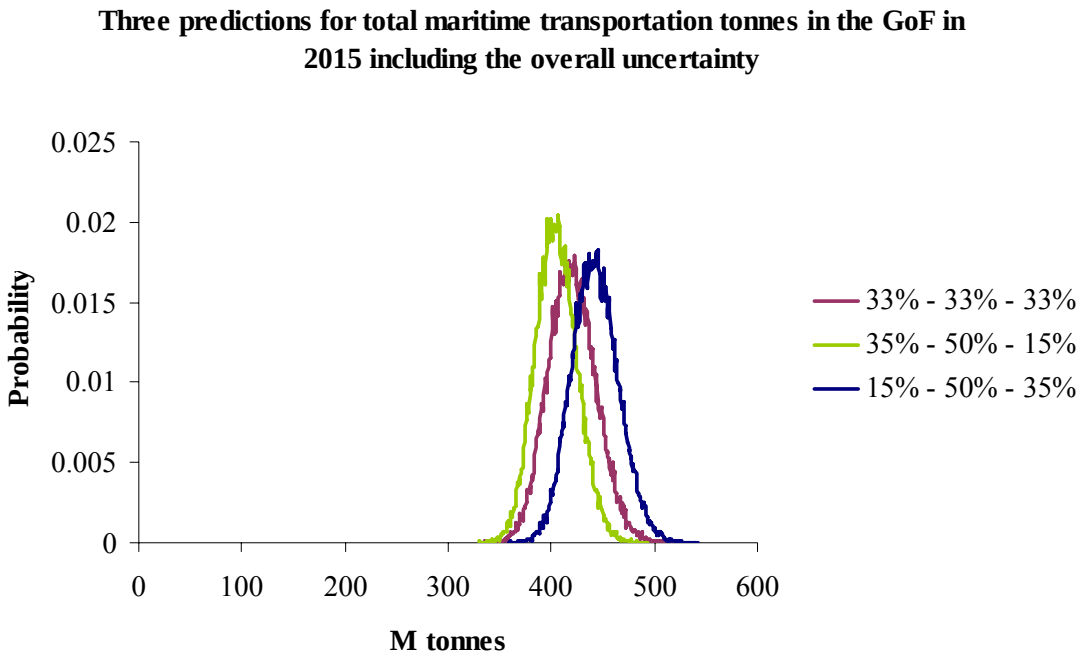

Figure 8.14 Three predictions for total maritime transportation tonnes in the GoF in 2015 including the overall uncertainty[23]

In sum, the average growth scenario was thought to be the most likely to realize according to the views of the experts group. In the average growth scenario, the expectation value was 431.6 M tonnes total and the range for it was seen to be between

[23] The overall uncertainty arises from different growth scenarios. Each probability distribution is based on different degrees of belief concerning the realization of growth scenarios.

404.1 and 465.1 M tonnes. If the current economic slowdown will lead to a deep recession, maritime transportation in 2015 can be closer to the slow growth scenario; but if economy will recover quickly, the development of maritime transportation will be closer to the strong growth scenario.

9 CONCLUSIONS

The Gulf of Finland is said to be one of the densest operated sea areas in the world. It is a shallow and economically vulnerable sea area with dense passenger and cargo traffic of which petroleum transports have a share of over 50 %. It is widely believed that the growth of maritime transportation will continue also in the future.

The Gulf of Finland is surrounded by three very different national economies with different maritime transportation structures. Finland is a country of high GDP/per capita with diversified economic structure. The number of ports is large and maritime transportation consists of many types of cargoes: raw materials, industrial products, consumer goods, coal and petroleum products, and the Russian transit traffic of e.g. new cars and consumer goods. Russia is a large country with huge growth potential; in recent years the expansion of petroleum export has lead to a strong economic growth, which is also apparent in the growth of maritime transports. Russia has been expanding its port activities in the Gulf of Finland and it is officially aiming to transport its own imports and exports through the Russian ports in the future. Now they are being transported to great extend through the Finnish, Estonian and other Baltic ports.

Estonia has also witnessed strong economic growth, but the growth has been slowing down already during the last couples of years. The size of the economy is small compared to Russia, which means the transported tonnes cannot be very massive. However, relatively large amounts of the Russian petroleum exports have been transported via the Estonian ports. The future of Russian transit traffic in Estonia looks nevertheless uncertain and it will remain to be seen how it will develop and if Estonia is able to find replacing cargoes if the Russian transit traffic will come to an end in the Estonian ports. Estonia's own import and export consists of forestry products, metals or other raw materials and consumer goods. Estonia has many ports on the shores of the Gulf of Finland but the port of Tallinn dominates the cargo volumes.

In 2007, 263 M tonnes of cargoes were transported in maritime traffic in the Gulf of Finland, of which the share of petroleum products was 56 %. 23.3 % of cargoes were loaded or unloaded in the Finnish ports, 60.2 % in the Russian ports and 16.5 % in the Estonian ports. The largest ports were Primorsk (74.2 M tonnes), St. Petersburg (59.5 M tonnes), Tallinn (35.9 M tonnes), Sköldvik (19.8 M tonnes), Vysotsk (16.5 M tonnes) and Helsinki (13.4 M) tonnes.

Approximately 53 600 ship calls were reported in the ports of the Gulf of Finland. The densest traffic was found in the ports of St. Petersburg (14 651 ship calls), Helsinki (11 727 ship calls) and Tallinn (10 614 ship calls) in 2007.

In this report, the future of maritime transportation in the Gulf of Finland has been forecast until year 2015. Three alternative scenarios (slow growth, average and strong growth scenarios) were built on the basis of the existing maritime transportation scenarios and by analyzing the economic development, production and transportation infrastructure in the countries surrounding the Gulf of Finland: Finland, Russia and Estonia. The probability of the three scenarios was studied in the context of probability distribution simulation.

The transportation scenarios are usually based on the assumption that the amount of transports follows the economic development although also other factors influence the development of transportation, e.g. government policy, environmental aspects, and social and behavioural trends. The relationship between the development of transportation and the economy is usually analyzed in terms of the development of GDP and trade. When the GDP grows to a certain level, especially the international transports increase because countries of high GDP produce, consume and thus transport more. An effective transportation system is also a precondition for the economic development. In this study, the following factors were taken into consideration when formulating the future scenarios: maritime transportation in the Gulf of Finland 2007, economic development, development of key industries, development of infrastructure and environmental aspects in relation to maritime transportation.

Basic starting points for the three alternative scenarios were:

- the slow growth scenario: economic recession
- the average growth scenario: economy will recover quickly from the current instability
- the strong growth scenario: the most optimistic views on economic development will realize

According to slow growth scenario total tonnes for the maritime transportation in the Gulf of Finland would be 322.4 M tonnes in 2015, which would mean the growth of 23% compared to 2007. In average growth scenario total tonnes were estimated to be 431.6 M tonnes – growth of 64%, and in strong growth scenario 507.2 M tonnes - growth of 93%. These tonnes were further divided to petroleum products and other cargoes by country, to export, import and domestic traffic by country, and to ports. For petroleum products the share of crude oil and oil products was estimated and the number of tanker calls in 2015 for each scenario was calculated.

However, the future development of maritime transportation in the GoF is dependent on so many societal and economic variables that it is not realistic to predict one exact point estimate value for cargo tonnes for a certain scenario. Plenty of uncertainty is related both to the degree in which a scenario will come true as well as to the cause-effect relations between the different variables. For these reasons probability distributions for each scenario were formulated by an expert group.

As a result, a range of total tonnes for each scenario was formulated and they are as follows:

- the slow growth scenario: 280.8 – 363 M tonnes (expectation value 322.4 M tonnes)
- the average growth scenario: 404.1 – 465.1 M tonnes (expectation value 431.6 M tonnes)
- the strong growth scenario: 445.4 – 575.4 M tonnes (expectation value 507.2 M tonnes)

The probability of the three alternative scenarios was evaluated in three alternative ways by the expert group: 1) all the scenarios were assumed to be equally likely to come true (each having 33 % of weight); 2) the scenario "average growth" was evaluated to be the most likely, having 50 % of the score, whereas the scenario "slow growth" got 35 % and "strong growth" 15 %, 3) an optimistic scenario weighting assuming fast recovery from the current slowdown of the economy with the scenario "average growth" still having 50 %, but the "slow growth" having 15 % and the "strong growth" 35 % of the score. As a result of the simulation, graphs indicating the probability distributions of the three scenarios were formulated.

In sum, it can be stated that the development of maritime transportation in the Gulf of Finland is dominated by the development of Russia. Maritime transportation in Finland is expected to be more stable and, in any case, such a growth potential cannot be seen in Finland. The development of maritime transportation in Estonia is rather challenging to forecast at the moment but, on the other hand, the transported tonnes in the Estonian ports are relatively small. The shares of export and import of the maritime transportation are not expected to change radically in the reference period.

Petroleum products will dominate the transports also in the future and the share of oil products will probably increase compared to the share of crude oil. In relation to the other cargoes, the transports of raw materials and bulk goods will probably be replaced to some extend by cargoes of high-value, which adds especially to the container transports. But in overall, substantial changes are not expected in the commodity groups transported by sea.

The growth potential of the ports concentrates on the Russian ports, especially Primorsk and Ust-Luga, if investments will come true as planned. It is likely that the larger ports do better in the competition than the small ones due to the economies of scale and to the concentration of cargo flows. The average ship sizes will probably grow, but the growth potential is rather limited because of geographical conditions and of the maritime transportation structure in the Gulf of Finland.

Climate change and other environmental aspects are becoming more central e.g. in transportation politics. These issues can affect the maritime transportation in the Gulf of Finland through, for instance, strict environmental requirements concerning the emissions from shipping, or through port investments. If the environmental requirements raise costs, it can affect the demand of transportation.

It can be concluded that the in the near future the development of maritime transportation in the Gulf of Finland is affected most by the current economic

instability. If it will lead to a longer lasting recession, the growth of transported tonnes will slow down remarkably. But if the instability does not last long, it can be expected that the economic growth will continue and along with it also the growth of transported tonnes.

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APPENDICES

Appendix 1. Maritime transportation in the Gulf of Finland, 2007

		International traffic			Domestic traffic
Port	**Total traffic**	**Total**	**Import**	**Export**	**Total**
	M tonnes				
Hanko	3.0	3.0	1.4	1.6	0.0
Koverhar	1.4	1.4	1.2	0.2	0.0
Inkoo	2.1	1.9	1.3	0.6	0.2
Helsinki	13.4	13.0	6.8	6.2	0.4
Sköldvik	19.8	16.3	10.3	6.0	3.5
Loviisa	1.4	1.4	0.6	0.8	0.0
Kotka	10.7	10.3	4.9	5.4	0.4
Hamina	5.9	5.2	2.1	3.1	0.7
Saimaa Canal	2.1	2.0	1.2	0.8	0.1
Others	1.4	1.3	0.9	0.4	0.1
Finland	**61.2**	**55.8**	**30.7**	**25.1**	**5.4**
Vyborg	1.1	1.1	0.2	0.9	-
Vysotsk	16.5	16.0	0.0	16.0	0.5
Primorsk	74.2	74.2	-	74.2	-
St. Petersburg	59.5	58.6	18.4	40.2	0.9
Ust-Luga	7.1	7.1	0.0	7.1	0.0
Russia	**158.4**	**157.0**	**18.6**	**138.4**	**1.4**
Sillamäe	1.8	1.8	0.6	1.2	-
Kunda	1.7	1.7	0.6	1.1	-
Miiduranna	0.7	0.7	0.1	0.6	-
Tallinn	35.9	35.9	5.7	30.2	0.0
Bekker	0.7	0.7	0.5	0.2	-
Vene Balti	1.7	1.7	0.1	1.6	-
Paldiski Northern port*	0.8	0.8	0.3	0.5	-
Estonia	**43.3**	**43.3**	**7.9**	**35.4**	**0.0**
Total	**263.0**	**256.1**	**57.2**	**198.9**	**6.8**

* Information on Paldiski Northern port was not available. Figure is estimation based on total tonnes of maritime transportation in Estonia, of which shares of other ports have been taken away. Share of import and export has been estimated on the basis of share of import and export in other Estonian ports.

Appendix 2. Ship calls in the ports of the Gulf of Finland, 2007

Port	**Ship calls**	**Ship calls by ship type in international traffic**			**Domestic traffic**
	Total	Dry cargo ships*	Tankers	Other ships**	
Hanko	1 487	1 390	3	64	30
Koverhar	192	180	-	2	10
Inkoo	614	410	1	133	70
Helsinki	11 727	2 679	49	8 707	292
Sköldvik	1 251	7	846	8	390
Loviisa	357	275	1	76	5
Kotka	2 870	2 336	180	281	73
Hamina	1 580	1 226	251	7	96
Saimaa Canal	1 224	1 106	-	118	N/A
Other ports	708	458	15	31	204
Finland	**22 010**	**10 067**	**1 346**	**9 427**	**1 170**
Vyborg	250	250	-	-	N/A
Vysotsk***	2 300	800	1 500	-	N/A
Primorsk	740	-	740	-	N/A
St. Petersburg****	14 651	11 513	1 777	1 361	N/A
Ust-Luga	555	555	-	-	N/A
Russia	**18 496**	**13 118**	**4 017**	**1 361**	**N/A**
Sillamäe	565	N/A	N/A	N/A	-
Kunda	603	N/A	N/A	N/A	-
Miiduranna	135	N/A	N/A	N/A	-
Tallinn	10 614	N/A	N/A	N/A	N/A
Bekker	448	431	2	15	-
Vene Balti	275	N/A	N/A	N/A	-
Paldiski Northern port*****	450	N/A	-	N/A	-
Estonia GoF	**13 090**	**N/A**	**1 004**	**N/A**	N/A******
Estonia Total	*14 008*	*3 617*	*1 004*	*9 387*	N/A******
Total	**53 596**	N/A	**6 367**	N/A	N/A

* Ro-Ro cargo ships, container ships, bulk carriers, other general cargo ships
** Passenger ships, Ro-Ro passenger ships, tugs, barges, other ships
*** Information on Vysotsk was not available. Figure is an estimation, which is based on the relationship between tonnes and ship calls in Vysotsk in 2006.
**** Statistics on ship types have been available only on Jan-Nov period (www.pasp.ru), for December ship type shares are calculated following the same share in ship types as in Jan-Nov period
***** Information on Paldiski Northern was not available. Figure is estimation, which is based on calculation of average ship size in Estonia, and that figure is corrected upwards, because Paldiski North is a dry cargo port and average size of dry cargo ships is smaller than tankers.
****** Amount of domestic ship traffic is insignificant, year 2006 0.03% of all traffic

Appendix 3. Transportation of petroleum products in the Gulf of Finland, 2007

		International traffic			International traffic			Domestic traffic
		Crude oil			Oil products			Oil products
Port	**Total traffic**	**Total**	**Import**	**Export**	**Total**	**Import**	**Export**	**Total**
	M tonnes							
Hanko	0.0	-	-	-	0.0	0.0	-	-
Inkoo	0.0	-	-	-	0.0	0.0	-	-
Helsinki	0.4	-	-	-	0.3	0.2	0.0	0.2
Sköldvik	19.1	5.8	5.8	-	9.9	4.3	5.6	3.5
Kotka	0.3	-	-	-	0.1	0.0	0.1	0.3
Hamina	1.0	-	-	-	0.4	0.3	0.1	0.7
Finland	**20.9**	**5.8**	5.8	-	**10.6**	4.8	5.8	**4.6**
Vysotsk	12.2	-	-	-	11.7	-	11.7	0.5
Primorsk	74.2	74.2		74.2	-	-	-	-
St. Petersburg	14.7	-	-	-	14.3	-	14.3	0.4
Russia	**101.1**	**74.2**	-	74.2	**26.0**	-	26.0	**0.9**
Sillamäe	0.9	-	-	-	0.9	-	0.9	N/A
Tallinn	22.7	0.7	-	0.7	22.1	1.5	20.6	N/A
Vene Balti	1.6	-	-	-	1.6	0.1	1.5	N/A
Estonia	**25.3**	**0.7**	-	0.7	**24.6**	1.6	23.0	N/A
Total	**147.4**	**80.7**	5.8	74.9	**61.2**	6.4	54.8	**5.5**

Appendix 4. Tanker calls in the ports of the Gulf of Finland, 2007

Port	**International traffic Tankers**
	number of calls
Hanko	3
Inkoo	1
Helsinki	49
Sköldvik	846
Kotka	180
Hamina	251
Finland	**1 330**
Vysotsk	1 500
Primorsk	740
St. Petersburg	1 695
Russia	**3 935**
Sillamäe	N/A
Tallinn	N/A
Vene Balti	N/A
Estonia	**1 004**
Total	**6 269**

The table contains both tankers carrying petroleum products and tankers carrying chemicals or other liquid cargo in international and domestic traffic in the ports that had oil transports in 2007.

Appendix 5. The depth of fairways and maximum ship sizes in the ports of the Gulf of Finland

Port	Depth of fairway	Max. length	Max. breadth	Max. draught
	metres			
Finland				
Hanko	13	N/A	N/A	N/A
Koverhar	9.1	N/A	N/A	N/A
Inkoo	13	N/A	N/A	N/A
Helsinki	10*	N/A	N/A	N/A
Sköldvik	15.3	N/A	N/A	N/A
Loviisa	9.5	N/A	N/A	N/A
Kotka	10, 15.3	N/A	N/A	N/A
Hamina	10**	N/A	N/A	N/A
Saimaa Canal	4.2	82.5	12.6	4.4
Russia				
Vyborg	8-9	135 (165)	N/A	6.5
Vysotsk	7.5	N/A	N/A	N/A
Primorsk	15	310	N/A	15.0
St. Petersburg	11.0	260	N/A	11.0
Ust-Luga	16	N/A	N/A	N/A
Estonia				
Sillamäe	16	300	56	11.9
Kunda	9.2	150	30	8.5
Miiduranna	13	195 (tankers), 110 (dry cargo)	32/20	12.3/5.6
Tallinn				
Muuga	18.0	300	48	17.1
Old city	10.7	320	40	N/A
Paldiski South	13.5	230	35	12.6
Saaremaa	10.0	200	30	9.5
Paljassaare	9.0	190	30	8.6
Bekker	N/A	140	22	6.5
Vene Balti	N/A	200 (tankers), 185 (dry cargo)	35/35	11/7,5
Paldiski Northern port	N/A	170	32	8.4

* Vuosaari port area

** year 2010: 12 m

Appendix 6. Cargo traffic in the ports of Finland by direction, 2007

Port	**Import International traffic**	of which from Baltic Sea direction	of which from Russian GOF ports	of which from Estonian GOF ports	**Import Domestic traffic**
	tonnes	%	%	%	tonnes
Hanko	1 437 212	*99.0*	-	*1.0*	34 145
Koverhar	1 157 162	*100.0*	-	-	8 503
Lappohja	-	-	-	-	-
Skogby	-	-	-	-	-
Tammisaari	6 065	*100.0*	-	-	-
Pohjankuru	171 156	*100.0*	-	-	-
Inkoo	1 340 236	*55.8*	*30.0*	*14.2*	723
Kantvik	653 566	*74.9*	*1.4*	*23.7*	-
Helsinki	6 822 677	*77.8*	*6.1*	*16.1*	229 671
Sipoo/Kalkkiranta	44 102	*80.9*	-	*19.1*	2 462
Sköldvik	10 337 769	*43.3*	*54.2*	*2.5*	996 147
Vessö	-	-	-	-	-
Tolkkinen	58 679	-	*94.5*	*5.5*	-
Isnäs	2 000	-	-	*100.0*	-
Loviisa	515 771	*40.3*	*33.9*	*25.9*	885
Kotka	4 870 142	*82.8*	*11.9*	*5.3*	303 102
Hamina	2 086 832	*88.4*	*2.8*	*8.8*	261 414
Saimaa Canal	1 174 771	*37.7*	*56.7*	*5.6*	29 008
Total	**30 678 140**	*66.3*	*26.0*	*7.7*	**1 866 060**

Port	**Export International traffic**	of which to Baltic Sea direction	of which to Russian GOF ports	of which to Estonian GOF ports	**Export Domestic traffic**	**Total**
	tonnes	%	%	%	tonnes	tonnes
Hanko	1 615 739	*92.0*	*0.3*	*7.7*	487	3 087 583
Koverhar	187 304	*100.0*	-	-	47 717	1 400 686
Lappohja	186 022	*100.0*	-	-	-	186 022
Skogby	27 031	-	-	*100.0*	-	27 031
Tammisaari	-	-	-	-	-	6 065
Pohjankuru	-	-	-	-	-	171 156
Inkoo	577 152	*3.8*	*13.4*	*82.9*	155 431	2 073 542
Kantvik	142 851	*49.0*	*1.9*	*49.0*	-	796 417
Helsinki	6 251 099	*77.0*	*0.9*	*22.1*	127 991	13 431 438
Sipoo/Kalkkiranta	-	-	-	-	-	46 564
Sköldvik	5 970 923	*99.4*	-	*0.6*	2 455 324	19 760 163
Vessö	68 500	-	-	*100.0*	-	68 500
Tolkkinen	47 389	*100.0*	-	-	-	106 068
Isnäs	59 865	-	-	*100.0*	-	61 865
Loviisa	753 934	*99.7*	-	*0.3*	2 778	1 273 368
Kotka	5 361 786	*98.2*	*0.2*	*1.6*	54 851	10 589 881
Hamina	3 055 990	*97.4*	*2.4*	*0.3*	471 393	5 875 629
Saimaa Canal	799 186	*98.8*	*0.4*	*0.8*	51 092	2 054 057
Total	**25 104 771**	*89.7*	*0.9*	*9.3*	**3 367 064**	**61 016 035**

Appendix 7. Ship calls in Finnish ports by month, 2007

Port	International traffic												Domestic traffic	Total Traffic
	Ship calls													
	January	February	March	April	May	June	July	August	September	October	November	December		
Hanko	123	101	126	127	134	114	126	129	116	130	120	111	30	1 487
Koverhar	12	15	19	18	15	15	16	16	15	13	15	13	10	192
Lappohja	7	5	7	5	7	6	2	5	4	5	6	6	-	65
Skogby	-	-	-	-	2	2	5	4	2	1	-	-	-	16
Tammisaari	-	-	1	-	-	1	-	1	-	-	-	-	-	3
Pohjankuru	3	5	5	6	7	6	4	4	4	5	4	5	-	58
Inkoo	29	21	36	49	56	60	54	53	49	52	45	40	70	614
Kantvik	18	14	10	19	21	17	18	19	13	18	24	18	15	224
Helsinki	631	559	649	955	1 142	1 183	1 273	1 279	1 106	1 021	876	761	292	11 727
Sipoo/Kalkkiranta	-	1	-	-	1	1	5	2	1	1	3	-	3	18
Sköldvik	58	58	72	84	88	64	75	90	73	68	67	64	390	1 251
Porvoo archipelago	-	-	-	-	-	-	-	-	-	-	-	-	186	186
Vessö	-	-	-	-	9	11	8	5	1	8	10	4	-	56
Tolkkinen	4	5	6	2	5	1	6	-	5	1	2	2	-	39
Isnäs	-	-	-	3	3	2	3	7	5	6	7	8	-	44
Loviisa	23	18	19	37	36	34	36	23	36	34	24	32	5	357
Kotka	196	198	230	218	244	245	243	259	245	267	227	225	73	2 870
Hamina	112	97	114	112	117	112	130	136	126	154	144	130	96	1 580
Saimaa Canal	43	-	-	45	143	178	179	147	141	151	127	67	N/A	1 221
Total	**1 259**	**1 097**	**1 294**	**1 680**	**2 030**	**2 052**	**2 183**	**2 179**	**1 942**	**1 935**	**1 701**	**1 486**	**1 170**	**22 008**

Appendix 8. EU fleet according to cargo ship types in 1.1.2008, ships of 1000 GT and over (ISL 2008)

Flag*	Tankers		Bulk carriers		Container ships		General cargo ships		Total	
	No	1000 dwt total	No	1000 dwt total	No	1000 dwt total	No	1000 dwt total	No	1000 dwt
Greece	346	38 515	253	19 007	45	2 735	82	393	726	60 650
Malta	295	14 550	450	23 140	68	1 704	491	4 046	1 304	43 440
Cyprus	124	7 039	299	16 020	180	4 506	219	2 097	822	29 662
UK	258	11 536	62	5 790	177	7 160	197	1 617	694	26 103
Germany	27	907	1	322	280	13 328	51	290	359	14 847
Italy	227	6 125	51	3 644	31	1 312	119	1 470	428	12 551
Denmark	85	3 151	8	705	86	6 296	91	375	270	10 527
France	70	5 277	2	345	25	1 776	15	59	112	7 457
Netherlands	77	861	6	375	78	1 748	523	3 782	684	6 766
Belgium	29	3 247	20	2 642	8	222	18	189	75	6 300
Sweden	68	1 001	7	45	-	-	83	1 262	158	2 308
Spain	41	1 672	9	43	26	345	40	193	116	2 253
Bulgaria	10	35	38	992	6	78	19	153	73	1 258
Finland	10	492	3	38	3	37	53	356	69	923
Portugal	29	534	10	170	5	33	55	251	99	988
Luxembourg	20	295	8	417	7	129	9	98	44	939
Lithuania	2	6	2	29	1	4	38	266	43	305
Slovakia	-	-	5	60	-	-	44	247	49	307
Latvia	7	153	-	-	-	-	13	59	20	212
Romania	2	42	-	-	-	-	13	95	15	137
Ireland	2	18	-	-	1	7	24	136	27	161
Estonia	3	9	-	-	-	-	8	29	11	38
Poland	3	9	-	-	-	-	8	22	11	31
Austria	-	-	-	-	2	6	2	12	4	18
Total	**1 735**	**95 474**	**1 234**	**73 784**	**1 029**	**41 426**	**2 215**	**17 497**	**6 213**	**228 181**

Appendix 9. Ships in the world order book for EU flags by cargo ship types 1.1.2008, ships of 300 GT and over (ISL 2008)

Flag*	Tankers		Bulk carriers		Container ships		General cargo ships		Total	
	No	1000 dwt total	No	1000 dwt total	No	1000 dwt total	No	1000 dwt total	No	1000 dwt
Greece	380	24 118	423	43 570	57	4 890	44	739	904	73 317
Germany	147	4 853	224	17 299	581	27 932	312	3 541	1 264	53 625
UK	97	5 892	35	4 081	31	1 928	58	553	221	12 454
Italy	96	5 296	92	5 404	5	157	23	489	216	11 346
Denmark	106	4 880	73	3 874	33	2 138	48	663	260	11 555
Cyprus	51	3 197	31	1 712	60	1 193	37	679	179	6 781
Netherlands	40	1 073	31	2 392	49	1 205	182	1 569	302	6 239
France	6	53	6	412	48	4 400	4	9	64	4 874
Belgium	20	876	27	1 911	15	549	6	60	68	3 396
Spain	9	734	3	787	1	17	8	41	21	1 579
Poland	-	-	23	967	-	-	3	22	26	989
Sweden	30	729	-	-	-	-	7	148	37	877
Portugal	1	150	7	521	-	-	4	27	12	698
Latvia	7	363	-	-	-	-	4	18	11	381
Finland	-	-	2	38	-	-	5	49	7	87
Malta	2	94	-	-	-	-	1	3	3	97
Bulgaria	-	-	2	64	-	-	2	31	4	95
Ireland	-	-	-	-	-	-	8	94	8	94
Slovenia	-	-	1	57	-	-	-	-	1	57
Estonia	2	16	-	-	-	-	1	5	3	21
Total	**994**	**52 324**	**980**	**83 089**	**880**	**44 409**	**757**	**8 740**	**3 611**	**188 562**

Appendix 10. Safgof scenarios: Finland

Finland	**Petroleum products**			**Other cargoes**			**Total**			**Total traffic**
	Import	Export	Domestic	Import	Export	Domestic	Import	Export	Domestic	
	M tonnes									
2007	10.6	5.8	4.6	20.1	19.3	0.8	30.7	25.1	5.4	**61.2**
Slow growth 2015*	10.7	5.8	4.6	20.4	19.6	0.8	31.1	25.5	5.4	**62.0**
Average growth 2015*	11.7	6.4	5.1	26.5	25.5	1.1	38.2	31.9	6.1	**76.2**
Strong growth 2015*	12.7	6.9	5.5	26.8	25.8	1.1	39.5	32.7	6.6	**78.8**

* The shares of import, export and domestic traffic are assumed to stay the same as in 2007.

Appendix 11. Safgof scenarios: Russia

Russia	**Petroleum products**			**Other cargoes**			**Total**			**Total traffic**
	Import	Export	Domestic	Import	Export	Domestic	Import	Export	Domestic	
	M tonnes									
2007	-	100.2	0.9	18.6	38.2	0.5	18.6	138.4	1.4	**158.4**
Slow growth 2015*	-	135.8	1.2	33.1	68.1	0.9	33.1	203.8	2.1	**239.1**
Average growth 2015*	-	178.4	1.6	41.8	85.9	1.1	41.8	264.3	2.7	**308.9**
Strong growth 2015*	-	204.2	1.8	49.2	101.1	1.3	49.2	305.3	3.2	**357.7**

* The shares of import, export and domestic traffic are assumed to stay the same as in 2007.

Appendix 12. Safgof scenarios: Estonia

Estonia	**Petroleum products**		**Other cargoes**		**Total**		**Total traffic**
	Import	Export	Import	Export	Import	Export	
	M tonnes						
2007	1.6	23.7	6.3	11.7	7.9	35.4	**43.3**
Slow growth 2015*	0.0	0.2	7.4	13.7	7.4	13.9	**21.3**
Average growth 2015*	1.1	15.9	10.3	19.2	11.4	35.1	**46.5**
Strong growth 2015*	2.0	29.0	13.8	25.9	15.8	54.9	**70.7**

* The shares of import, export and domestic traffic are assumed to stay the same as in 2007.

Appendix 13. Scenario-specific probability distributions for cargo tonnes

Year 2015, scenario "slow growth"												
	Finland			**Russia**			**Estonia**			**All**		
	Petroleum products	Other cargoes	Total	Petroleum products	Other cargoes	Total	Petroleum products	Other cargoes	Total	Petroleum products	Other cargoes	Total
	M tonnes											
lower limit	20.5	38	58.5	127	77.1	204.1	0.1	18.1	18.2	147.6	133.2	280.8
expectation value	21	41	62	137	102.1	239.1	0.2	21.1	21.3	158.2	164.2	322.4
upper limit	21.5	43	64.5	147	127.1	274.1	0.3	24.1	24.4	168.8	194.2	363

Year 2015, scenario "average growth"												
	Finland			**Russia**			**Estonia**			**All**		
	Petroleum products	Other cargoes	Total	Petroleum products	Other cargoes	Total	Petroleum products	Other cargoes	Total	Petroleum products	Other cargoes	Total
	M tonnes											
lower limit	22.5	51.2	73.7	170	118.9	288.9	15	26.5	41.5	207.5	196.6	404.1
expectation value	23	53.2	76.2	180	128.9	308.9	17	29.5	46.5	220	211.6	431.6
upper limit	23.5	55.2	78.7	190	138.9	328.9	25	32.5	57.5	238.5	226.6	465.1

Year 2015, scenario "strong growth"												
	Finland			**Russia**			**Estonia**			**All**		
	Petroleum products	Other cargoes	Total	Petroleum products	Other cargoes	Total	Petroleum products	Other cargoes	Total	Petroleum products	Other cargoes	Total
	M tonnes											
lower limit	24	52	76	181	126.7	307.7	25	36.7	61.7	230	215.4	445.4
expectation value	25	53.8	78.8	206	151.7	357.7	31	39.7	70.7	262	245.2	507.2
upper limit	27	60	87	231	176.7	407.7	40	40.7	80.7	298	277.4	575.4

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