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Abstract

Over the last decade maritime transport in the Gulf of Finland area has changed significantly. The disintegration of the Soviet Union forced Russia to start developing its own Baltic ports and terminals and to find new routes to export its oil. The Baltic States have enjoyed a remarkable economic boom, especially regarding new port and terminal development and oil transportation.

Due to the fact the Gulf of Finland is a sensitive brackish water area with a unique nature and environment, there has been a growing concern with accidental oil spills and various negative impacts caused by the maritime transport. Previous large-scale accidents elsewhere may have been the driving forces behind both the publicity and the calls from experts for new requirements to improve maritime safety and develop preventive measures against future accidents.

This report, commissioned by the Finnish Ministry of the Environment is an updated report of the earlier study on the Gulf of Finland's oil transport, published in 1999. The rapid changes in the oil business, new terminals and enlarging transport figures were the driving forces for updating this work. The report contains statistics on oil transport, terminal development, and it presents future development scenarios up to 2010. Much emphasis has been placed on safety-related activities and recommendation; therefore current activities to improve the safety and/or develop better oil spillage-combating measures have also been analysed and discussed.

Preface

Dear reader,

The Ministry of the Environment of Finland commissioned this publication to get updated information on oil transport plans on the Gulf of Finland: ports, traffic volumes and scenarios. This information is necessary for arriving at decisions on preventive measures and for oil-combating contingency planning. The authors also give an overview of the decisions made so far and the recommendations for further actions to prevent accidents and to protect the sensitive environment of the Gulf of Finland from the harmful impacts of the increasing maritime traffic.

Russia is now the largest oil producer in the world. During the last years there have been significant changes in the Russian oil export routes and networks. Two new oil ports have been opened and there are plans for more new oil ports on the Russian coasts of the Baltic Sea. This has totally changed the outlook for maritime transport, especially on the Gulf of Finland.

As traffic volumes on the Gulf of Finland continue to rise rapidly and substantially, the risk of accidents is also increasing accordingly. This year the total amount of oil transported on the Gulf may reach 100 million tonnes. For comparison, in 2000 the volume was 40 million tonnes and, based on estimates in development plans, the volume will rise up to 190 million tonnes by the year 2010.

The three countries of the Gulf of Finland – Finland, Estonia and Russia – have enhanced their co-operation to take preventive measures against accidents and they have increased their preparedness for oil-combating. The Gulf of Finland mandatory Ship Reporting System (GOFREP) came into operation on 1 July 2004.

This system has been established to improve maritime safety, to protect the marine environment, and to monitor compliance with the International Regulations for Preventing Collisions at Sea. It has been estimated that the GOFREP will reduce the risk of collision between two vessels by 80 per cent. Russia has decided to allow only double bottom tankers and, in wintertime, only ice-reinforced double hull tankers to arrive at the new oil ports in the Gulf of Finland.

Nevertheless, no system, no regulation, no double-hull tanker can totally eliminate the risk of accidents. Finland has already taken a decision to increase its oil spill response capability. Three vessels will be converted to oil spill response vessels and a new multipurpose icebreaker with oil recovery capability will be purchased next year.

Maritime safety has been a new focus in the work of HELCOM (the Baltic Marine Environment Protection Commission) since 2000. HELCOM's involvement was triggered by the accident of the oil tanker Baltic Carrier in Danish waters. Maritime safety issues were taken up at the 2001 and 2003 ministerial meetings, where changes were made to the Helsinki Convention and new regulations on maritime safety were adopted. This year, HELCOM launched new recommendations on the Safety of Winter Navigation in the Baltic Sea Area, including guidelines on ice classification.

In April 2004 the International Maritime Organization (IMO) nominated the Baltic Sea, except the Russian waters, as a Particularly Sensitive Sea Area (PSSA). This is a direct signal to seafarers to take into account the Baltic Sea's vulnerable environment. An especially sensitive part of the Baltic Sea is the Gulf of Finland, which is shallow and surrounded by a broken coastline of bays and islands, and which is partly covered by ice in wintertime.

One can compare the circumstances in the Gulf to the Arctic environment. If an oil accident occurred in any part of the Gulf of Finland, the oil would reach the coastline within two days, at the latest. The Gulf of Finland cannot endure a large-scale tanker accident, not environmentally nor economically.

In Europe, recently, there have been two major oil tanker accidents, namely Erika and Prestige, where the sea and coastal environment have been contaminated by oil for a long time. These accidents had a direct influence on the everyday life and livelihood of the local people, as well as broader consequences on the national economies of the countries concerned.

On the positive side, these events have led to prompt improvements in maritime safety on the regional and global level. We no longer see single-hull oil tankers in the European ports and, after 2015, these tankers will not be allowed to navigate in international waters.

This publication provides a comprehensive assessment of the present status of oil transport on the Gulf of Finland and the Baltic Sea. The state of the Baltic Sea will improve and the risk of oil damage will diminish only if all countries bordering the sea continue to work actively to protect it. This will require actions at the national, sub-regional and the whole regional Baltic Sea level. As the Baltic Sea is now surrounded by EU member states and Russia, this is very much a central question for the co-operation between the European Union and Russia.

Minister of the Environment of Finland

Jan-Erik Enestam

Acknowledgement

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The manuscript has been revised by several authorities and experts. Special thanks are directed to all of those experts who have provided valuable comments on the report. Here Mr. Olli Pahkala, Mr. Martti Poutanen and Ms. Henna Haapala of the Finnish Ministry of the Environment, and Mr. Kari Lampela and Mr. Kalervo Jolma of the Finnish Environment Institute should be mentioned, especially for their wise comments on the environmental and oil-spill related items. Mr. Ilmari Aro, Ms. Mirja Ikonen and Mr. Jorma Kämäräinen of the Finnish Maritime Administration have reviewed the winter navigation and IMO & EU related sections of the report. Valuable comments have also been received from Mr. Erkki Kotiranta of Fortum Shipping and Mr. Tadas Navickas of HELCOM. Special thanks go to Mr. Vladimir Vasilyev of CNIIMF, Russia and Mr. Rene Sirol of the Estonian Maritime Administration to evaluate the statistics related to Russian and Estonian transportations. We also wish to thank Mr. Alexandr F. Glukhov from the Port Authority of St. Petersburg and Mr. Artur Kivistik from the Port of Muuga.

Finally, special thanks are directed to Mr. Henrik Mantere, a student of the Helsinki University of Technology, who helped the authors by reorganising statistical information, making drawings and collecting a lot of source material for further research.

Contents

1. Introduction

The maritime traffic along the Gulf of Finland’s waters has increased significantly over the last decade. Perhaps the most significant change has been the end of the Soviet era and the following developments in the port and terminal field in the area: Russia lost the greater part of its Baltic Sea port & terminal capacity to the Baltic countries. In just a short time, this changed the maritime transport situation of the area: Finland lost a great part of the former Soviet transport as new capacity was created to the Baltic States. In Estonia Russian oil was transported to the port of Muuga, which rapidly grew into the largest oil terminal in the region. Other large oil terminals during the 1990's were Finland's Porvoo refinery in Sköldvik and the St. Petersburg Sea Port's Oil Terminal. Other large cargo flows went to St. Petersburg and to the Finnish ports of Hanko, Helsinki, Hamina and Kotka. Furthermore, a lot of timber was transported in the area, mainly to Finnish and Swedish pulp and paper mills.

In this new situation, Russia started to rapidly design new ports and terminals in the eastern part of the Gulf of Finland. Large-scale capacity figures were published that caused some concern among environmentalists and other experts. Much terminal capacity was designed for the transportation of oil and oil products, which may pose problems for this sensitive area. Now larger and larger tankers – in significant numbers – will sail along the sensitive gulf, raising questions about how this new situation may decrease the safety or endanger environmental protection.

The Baltic States (Estonia, Latvia and Lithuania) have strong, and growing structures for shipping and port activities. During Soviet rule, their ports handled significant amounts of Soviet exports. After gaining their independence, the Baltic Countries have retained, and even strengthened their role as transit points for Russia exports and imports. The development of the Port of Tallinn, and especially its Muuga oil terminal has been both rapid and intense. Dense traffic, plus new demands for frequent traffic arrangements and maritime safety all require reliable tools and actions to improve the safety issues.

After the first plans to construct new terminals were published in the beginning of the 1990's, the Finnish Ministry of the Environment started to actively follow this development, as well as the Environmental Impact Assessment (EIA) studies related to terminal constructions. At the same time, VTT Industrial Systems also started to collect data on the port development and to direct the strategic research resources towards improving maritime safety. The first overview of the situation was made in 1999 for the Finnish Ministry of the Environment; this concerned the existing and projected maritime transport situation for the Gulf of Finland (Rytkönen, 1999). Here the data concerned the period 1996–1998, and a prognosis of development up to 2010–2015. This commission also included a study of the legal aspects of the port construction works from an ecological perspective (VTT, 1999). Some analysis was made of the differences between the Western type of EIA process, and the same process as followed in Russia.

Rather soon other authors published further data on the transport development and on the projected growth rate of the area. An EU-Tacis funded research programme "Baltic Oil Pipeline Project" coordinated by the Danish COWI introduced several reports on the Baltic Sea oil transportation; especially on the risk of oil spills in the Gulf of Finland related to the new Primorsk oil terminal. The data here was mainly concerned with the period 1995–1997 and based on statistics collected by Lloyds and Eurostat. This project published more than 1,000 pages of technical data including EIA-related analyses, risk approaches, and numerical analyses on expected oil spill trajectories both in the terminal area and on the main shipping channel from Primorsk to the North Sea. The first phase of the Primorsk oil terminal was completed in 2001. The first oil tanker departed from Primorsk on December 28, 2001.

Another overview on the maritime transport development was given in the Baltic Maritime Outlook 2000, published by the Swedish Maritime Administration. This report (SMA, 2001) had data on 1997–1998 and was divided into two main sections: a general introduction to trade and seaborne cargo, ship movements and cost structures was given following a detailed section of country reports.

More topical data on the Baltic Maritime Traffic was provided by VTT's report on Statistical Analyses of the Baltic Maritime Traffic (VTT, 2002b). The goal of this study was to collect seaborne transportation data and to make prognoses up to the year 2010. The data was mainly on the year 2000, therefore a lot of findings and the data on traffic trends are still rather fresh and valid. This report especially analysed oil transportation and gave some statistics on the age and size distribution of the existing tanker fleet: it also discussed the need for risk-based approaches to define hot spot traffic areas in the Baltic Sea. The study was financed by the Finnish Ministry of Transport and Communications and the Finnish Environment Institute.

The statistical data of the previous VTT study was analysed more thoroughly in the case of the new ship reporting and routeing system (GOFREP) for the Gulf of Finland. Prior to introducing this trilateral system to the Gulf of Finland's international waters, a Formal Safety Assessment (FSA) study had to be performed and presented to the IMO (VTT, 2002a). This work discussed environmental and traffic conditions of the Gulf of Finland, analysed the accident statistical data and finally, using a dedicated risk methodology, presented the cost-benefit assessment of the risk control options used.

Both the above-mentioned VTT studies also used other published data by several other authors on the Baltic Sea area or published reports of various research consortia and programmes (e.g., Matros programme). Statistical data was also obtained from shipping registers, ports, shipping associations, HELCOM and Maritime Authorities.

This study, commissioned by the Finnish Ministry of the Environment, is an update of the earlier oil transport and terminal development study published in 1999 (Rytkönen, 1999). The previous report was written in Finnish, and therefore this new edition will have a significantly larger group of readers among the maritime community. The main reason for the new updated information has been the unexpected, rapid growth rate of oil transportation along the Gulf of Finland. Since of the previous report was published, a lot of new plans and rehabilitation projects for older terminals have been published. This year, the total amount of oil transported in the Gulf of Finland may reach 100 millions tons. At the same time all the other modes of maritime cargo are growing, new lines for both passenger and cargo are being opened, and the whole maritime situation of the area is becoming increasingly hectic. In this new situation, the Gulf of Finland now forms a borderline between the EU and Russia. It also has growing significance for the EU's energy supplies as a new source of Russian oil transportations.

The statistics in this report are based mainly on those from 2003. Some data is also included based on the first and second quarter of this year. Furthermore, prognoses on the oil traffic development up to the year 2010 have been updated. Statistical data has been collected from various sources, again from authorities, ports and oil terminals, plus other scientific or research organisations of the Baltic Sea area. Some key figures and tables have been included in the report. A lot of the data has been presented in graphic form, thus giving an easy introduction to the subject. A large set of numerical data has been left out of the report format, but will be used later if a large-scale FSA study is to be performed for the whole Baltic Sea area.

2. Gulf of Finland – a sensitive part of the Baltic Sea

2.1 Facts about the Gulf of Finland

The Baltic Sea (Figure 1) forms a shallow inland sea connected to the open ocean only by the narrow straits between Sweden and Denmark. The Baltic Sea marine ecosystem is very vulnerable to pollution due to the slow rate of natural cleansing and low salinity levels. Baltic Sea is strongly affected by excessive nutrient inputs, hazardous substances, increased maritime transport and fisheries.

Eutrophication caused by nutrient inputs exceeds the natural oxygen deficiency problem. It is still the most dramatic threat for the Baltic Sea and the Gulf of Finland. Every summer it becomes visible by intense algal blooms. Even if the input of nutrients would come to a stop in the future, eutrophication will remain an issue of major concern for a long time (Ehlers, 2004).

In the Gulf of Finland, the near-bottom oxygen conditions are affected by both inflows of saline water from the Baltic Proper and local conditions, especially in the heavily loaded eastern gulf. Extensive bottom areas in the Gulf of Finland have suffered from oxygen deficiency since the mid 1990s, exacerbating internal phosphorous loading and counteracting the decrease in external loading.

Pollution from ships is still a matter of concern. Illegal discharges of oil residues from ships statistically amount to 10% of all the oil in the Baltic Sea. Every year around 400 spillages are detected by airborne surveillance in the Baltic Sea. The total number of spillages is probably much higher. The amount of illegal releases in the Gulf of Finland area, however, has recently started to decline, perhaps due to better monitoring by Ship Reporting System (SRS) and Automatic Identification System (AIS).

Originating from accidental spillage or the illegal discharge of sludge, oil is the biggest cause of environmental damage from shipping in the Baltic Sea. 85 million people live in the Baltic drainage basin (Scandiaconsult, 2003).

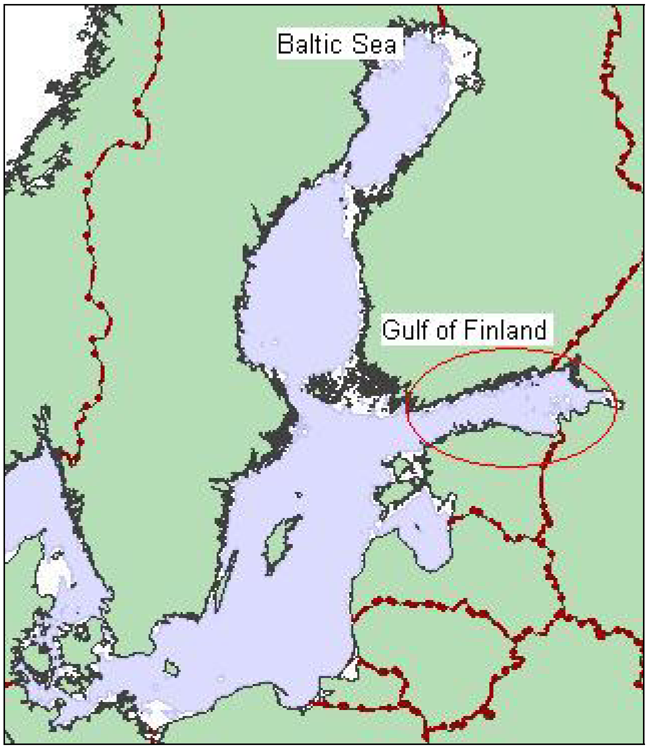

Figure 1. Baltic Sea and Gulf of Finland (MARIS, 2004).

The Gulf of Finland is approximately 400 km long and from 58 to 135 km wide. It is surrounded by three coastal states: Estonia, Finland and the Russian Federation. The average depth of the shallow gulf is 37 metres, and the total water volume is 1,103 km^3, which corresponds to about 5% of the total volume of the Baltic Sea. The gulf is an important corridor for shipping, St. Petersburg, Tallinn and Helsinki being the main ports. The largest oil harbours are Primorsk in Russia, Muuga in Estonia, and Sköldvik in Finland. From December to March the gulf is typically partly frozen.

The central part of the gulf is relatively deep, on average, 60 metres. The southeast part is quite shallow and the easternmost part – in front of St. Petersburg – is very shallow. The Neva Bay is limited from the east by the mouth of the river Neva, from the west by the protective dam of St. Petersburg, and has a small, average depth of only 3 m. The flat, horizontal bottom surface acts as a deposition area for solid particles arriving from the Neva river. The flow of the Neva makes up 83% of the average 114 km^3 of water flowing into Gulf of Finland each year.

The long-term average water flow of the Gulf of Finland rotates anti-clockwise in the gulf (Figure 2). Instability and changes in the direction of the flow caused by wind and density differences are characteristic of the gulf. The physical environment of the gulf also contains seiches, upwelling and horizontal turbulence of the water mass, which is composed of fresh water from rivers and rainfall, plus salty seawater flowing in from the Danish Straits (Rytkönen, 1999).

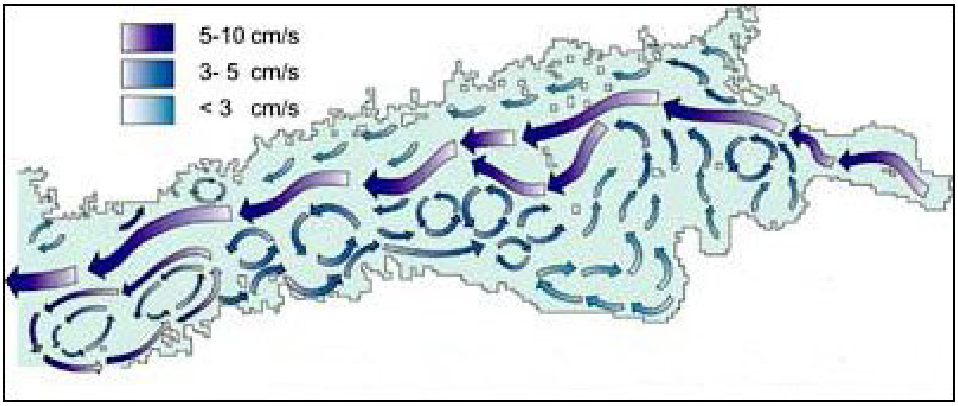

Figure 2. Simulation model of the average water flow in the Gulf of Finland (FIMR, 2004).

2.2 Environmentally sensitive areas

The increasing marine traffic and the possibility of a large oil spill present a threat to the fauna of the Gulf of Finland. Some of the Baltic herring spawning grounds are located on the Estonian and Finnish coasts, and a large-scale oil spill would also endanger local bird species around the gulf. Several migratory bird species use the Estonian islands Saaremaa and Hiiumaa as a resting area. The Baltic ringed seal and grey seal also have populations in the Gulf of Finland.

The nutrient load in relation to the area is two- or three-fold in the Gulf of Finland compared to the rest of the Baltic Sea. The situation is worst in the area close to St. Petersburg. Around 20 million people live in the Gulf of Finland drainage basin. Municipal sewage and industrial wastewater are the principal causes of water quality problems. Marine traffic causes around 10% of the oil pollution of the Baltic Sea. Large-scale oil spills have been rare, but due to the shallowness and sensitivity of the coastline, even smaller oil spills can have very serious consequences. Increasing maritime transport also means increasing NO_x emissions and increasing risk of introduction of non-native aquatic species (Chapter 2.3).

Activities of nature conservation in marine areas are of much more recent origin than in terrestrial and freshwater environments. Even though environmental problems have been observed and discussed, the scientific community and the general public have only become concerned about marine environmental problems over the last couple of decades.

Since the signing of the first Helsinki Convention in 1974, HELCOM has become the main forum for handling international environmental issues in the Baltic Sea Area. The governing body of the Convention is the Helsinki Commission – Baltic Marine Environment Protection Commission – known as HELCOM. The present contracting parties to HELCOM are Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia, Sweden, and the European Community. During the first 15 years, work was focused on environmental problems, but since the 1992 Convention, protection of biodiversity and ecologically important areas have been included on the agenda. After ratification, the new Convention entered into force on January 17, 2000. The Convention covers the whole Baltic Sea area, including inland waters as well as the water of the sea itself and the sea-bed.

Therefore not only is the Baltic Sea itself included within the frame of HELCOM, but so too are the terrestrial biotopes of the Baltic Sea coasts, as far as nature conservation is concerned. The protection of habitats, species and ecological processes, both in marine and coastal areas, are regarded as vital to the improvement of the environmental situation of the Baltic Sea Area.

The classification of certain sensitive areas would be a description of HELCOM's work, but it would not be a detailed enough representation of the wide spectrum of HELCOM's recommendations or actions. In the following, some sensitive areas are presented.

2.2.1 Baltic Sea Protected Areas (BSPA's)

An outcome of article 15 is the HELCOM Recommendation 15/5 (HELCOM, 1994) regarding establishment of a system to protect coastal and offshore marine areas. The idea is to include major biogeographic types and ecosystems, and that national systems of large marine protected areas – including complete eco-systems – should be established. The guidelines recommend a minimum size of 30 km^2 for marine and lagoon areas, and the criteria can be high biodiversity, habitats for endemic rare or threatened species or communities, habitats for migratory species, nursery and spawning grounds, and rare or unique geological or geomorphological structures or processes.

In 1994, the first 62 areas was adopted as Baltic Sea Protected Areas, Figure 3, and new recommendations have since been published such as Coastal and Marine Protected Areas in the Baltic Sea Region (HELCOM, 1996) and Red List of Marine and Coastal Biotopes and Biotope Complexes of the Baltic Sea, Belt Sea and Kattegat (HELCOM, 1998).

The establishment of marine and coastal Baltic Sea Protected Areas should be further promoted, especially in those areas where BSPAs have not yet been designated (Ehlers, 2004). Legal instruments must be introduced to control, reduce or ban adverse activities.

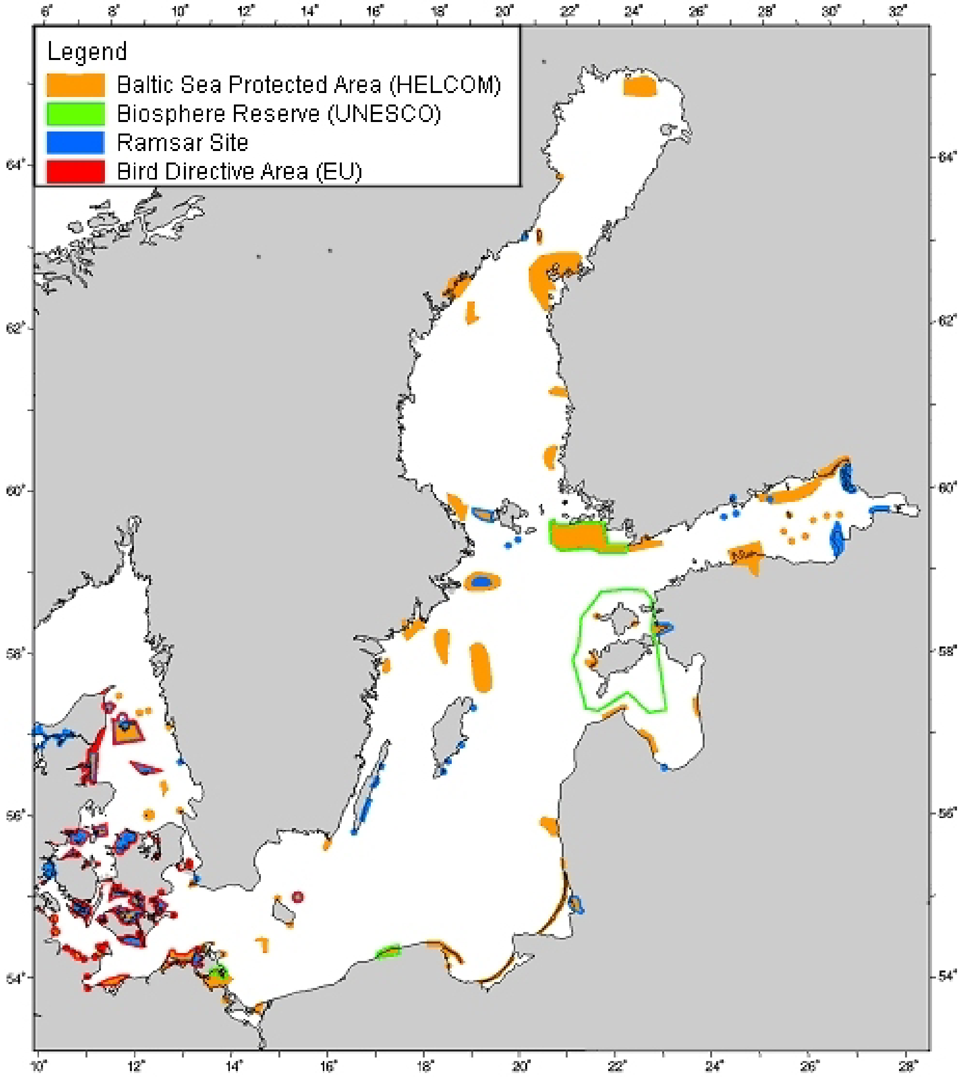

Figure 3. Protected areas of international categories with a marine or coastal content (COWI, 1998a).

2.2.2 Other protection measures under HELCOM

The increasing pressure on the coastal zone through anthropogenic activities is regarded as a permanent threat to biological, geological and geomorphological values. To be able to halt the further degradation of natural coasts, HELCOM

15/1 recommends that all contracting parties should take all appropriate measures to ensure future general protection of a coastal strip outside urban areas and existing settlements. The strip shall extend at least 100–300 m from the mean water line, both landwards and seawards. Within the protected strip, activities, which would permanently change nature and the landscape, should not be allowed, and intensive farming and forestry are to be restricted. A zone of at least 3 km landwards shall be established as a coastal planning zone, where major constructions must be preceded by a land-use plan, including an environmental impact assessment (COWI, 1998b).

2.2.3 Other international agreements on protected areas

The Convention on Wetlands of International Importance especially as Waterfowl Habitat is commonly referred to as the Convention on Wetlands, or the Ramsar Convention. More than 40 areas with a coastal or marine content in the Baltic Sea area are currently protected according to this treaty (COWI, 1998b).

Under UNESCO's Man and the Biosphere Programme, protection of natural diversity has a high priority and is to be undertaken by establishment of large biosphere reserves. These reserves are being established in each of the world's natural regions ("biogeographical provinces"), to serve as a measure of environmental quality, to help preserve gene pools, and to provide a basis for international research and scientific co-operation. The areas are usually larger complexes, with a core area, surrounded by buffer zones and transition areas. The biosphere reserves often encompass areas protected by other systems.

There are a lot of different coastal and marine biotope areas in the eastern part of the Gulf of Finland. The most sensitive endangered areas according to the HELCOM Red List are, for example, the sandy coastline near Zelenogorsk and east of Primorsk. The moraine settlements in Sista and Voronka rivers are also classified as endangered areas. Other special sensitive and endangered areas are the rocky coasts of the western part of Vyborg Bay, Gogland Island (and other large islands), the Neva estuary and the Vyborg Bay archipelago. Other offshore islands in the Eastern Gulf of Finland have a great environmental importance, too.

There are also a number of protected areas, which will need special care, especially from the point of view of oil-combating contingency planning. Oil spills can cause serious impacts on coastal areas. Marine organisms may be affected by oil in several ways:

- as a result of physical contamination
- by toxic effects of chemical components
- by accumalation of substances.

Physical contamination by hydrocarbon components is the main threat to marine organisms and habitats after an oil spill. The most endangered organisms are those living near shore-line or sea surface, such as seabirds, marine mammals and fish during their spawning season.

2.2.4 Particularly sensitive sea area, PSSA

The Marine Environment Protection Committee of the International Maritime Organization (IMO) decided on April 2, 2004 to designate the Baltic Sea a particularly sensitive sea area (PSSA). The Baltic was given special status protecting it from increased shipping and illegal oil dumping. Among other benefits, the status enables the bordering countries to set special standards for oil transportation, including the ships' quality or the crew's training. The eight countries bordering the Baltic who lobbied the IMO have two years in which to submit their proposals for the measures to be applied. However, Russia's territorial waters and Russian-registered ships are exempt from any special measures implemented in the Baltic, after Russia failed to agree to the deal over fears that the measures would be costly (IMO, 2004a).

2.3 The threat of aliens

There is a growing concern about the damage to the aquatic ecosystem caused by immigration of non-indigenous species. It is estimated that more than 3,000–4,000 million tonnes of untreated ballast water is released from ships annually, and ballast water has been recognised as a major vector for the transplant of aquatic species across bio-geographical boundaries. Up to 10,000 species are estimated to be in transit around the world at any given moment.

The European coastal ecosystems are under growing environmental pressures, one of them being alien species introduced by various vectors. Maritime traffic is one of the dominant vectors in the Baltic Sea, and more than 90 new species have already recorded from the Baltic Sea, of which 70 can now be regarded as established parts of the biotic community (Gollasch & Leppäkoski, 1999). The basic reasons for the rapid aquatic conquest of the new species within the growth of the maritime transport are the following:

- more berths are available in ports, providing more suitable targets for primary inoculations to become established, and enhancing opportunities for secondary spread
- better management of water quality in port regions, leading to the better conditions for imported organisms in ballast water to be established
- higher frequency of ship visits, rapid turn-around times in port and changes in trading patterns
- new trading links resulting in imports from new port regions.

Both the number and size of oil tankers are increasing in the Gulf of Finland. Tankers typically use massive amounts of ballast water. An Aframax class tanker may transport 50,000 m^3 of ballast water when entering a terminal to load oil. Thus growing oil transportation will also increase the risk of new aquatic species to be introduced to the gulf.

Currently the vector mechanism of the alien species is under research in the Gulf of Finland area. It is already acknowledged that Gulf of Finland area is one of the high-risk areas for the new species (Leppäkoski et al., 2002). St. Petersburg's fresh water "lagoon" forms a very potential substrate for aliens, not only due to the intensive foreign traffic but also because of the inland canal connection to the Black Sea and elsewhere. New terminals will also increase the risk of introduction due to the large amounts of ballast water to be pumped to the terminal area. For example; this year's expected oil transport volume for Primorsk, i.e., 40 million tons corresponds to around 2 million tons of ballast water that will be pumped into the port area. Among the proposed new terminals the new large port complexes will also increase the potential for the introduction of new species.

New ballast water management convention is recently accepted by IMO, which will introduce both the concepts of the ballast water exchange requirement and ballast water onboard treatment. New onboard treatment facilities have been studied and developed recently (MARTOB, 2004) but it will be a long time before the new technology is good enough to treat the massive amounts of ballast water from a single tanker or when the new IMO regulations will be ratified and come into the effect.

2.4 Winter navigation

2.4.1 Weather conditions in the Gulf of Finland

The ice conditions in the Gulf of Finland are mostly affected by two factors: the count of degree-days of frost and the prevailing westerly winds. The count of degree-days of frost (i.e., the cumulative average temperature of the winter) controls the ice growth and the amount of ice. The prevailing winds control the drifting and ridging of the ice field.

On an average winter the Gulf of Finland starts to freeze in the beginning of December. The average length of the ice season in the Gulf of Finland is 120 days outside St. Petersburg, and 30 days at the entrance of the gulf. The maximum level ice thickness is greatest at the eastern parts of the gulf and is about 50 cm in an average winter (Figure 4).

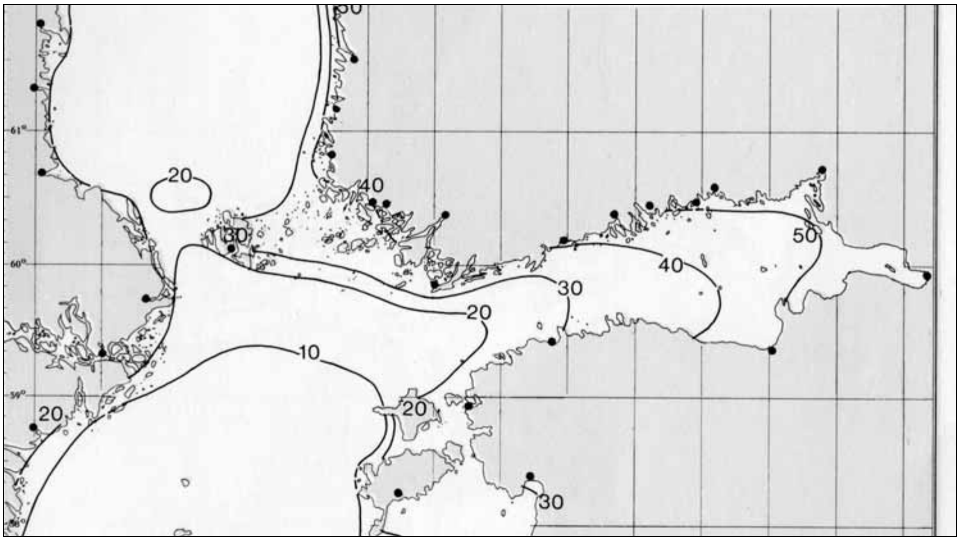

Figure 4. The largest average level ice thickness in the Gulf of Finland (Leppäranta et al., 1988).

Drifting and ridging of the ice is characteristic to the Gulf of Finland and it also affects winter navigation. The prevailing westerly winds push the ice eastward causing heavy ridging in the eastern parts of the gulf. The probability of encountering big ridges increases when moving east and the distance between ridges gets smaller. The ridges in the Gulf of Finland have normally sail heights of 0.3–1.0 m and keel heights of 5 to 7 times the sail height. The consolidated layer of the ridges is normally thicker than the level ice and thus the ridges are difficult to penetrate, forming the biggest obstacle to winter navigation.

In addition to ridging, the compression in an ice field due to wind drag causes direct problems to winter navigation. Vessels navigating in a compressive ice field might get stuck and get ice damage to the hull. Furthermore, following an icebreaker in a closing channel becomes difficult and high compressive loads may occur on the vessel midship.

Due to the characteristics of the Gulf of Finland there are no so-called easy winters, only hard and milder ones. In a hard winter the distances travelled in ice become long and the likelihood of encountering massive ridges become higher. During such a winter, all harbours in the Gulf of Finland are surrounded with ice. On milder winters not all harbours become icebound, and especially the southern shores tend to stay open. The Finnish harbours are all surrounded by ice, but the distances travelled in ice are fairly short as the ice edge is at the outer islands. The situation in the eastern parts of the gulf is somewhat different. On milder winters the total amount of ice at the gulf might be smaller but the winds push that ice towards the east where it packs and ridges against the far end of the gulf. The fairways to the eastern harbours are therefore covered with ice every winter, and the vessels have to sail through heavily ridged ice fields (VTT, 2002a).

2.4.2 Winter traffic

The winter traffic along the Gulf of Finland is carried out with the aid of national rules for winter navigation. Each country has its own special means and instructions to ensure fluent shipping in ice conditions. The essential part of these rules – and for the services provided for the merchant fleet – are the traffic restrictions, ice rules, and icebreaker assistance. Assistance during winter navigation in Finland is provided by the Finnish Maritime Administration in which the Winter Navigation Department monitors icebreaking services, imposes traffic restrictions, and grants exemptions to vessels, if need be. Similarly, in Russian and Estonian territorial waters ships are taken care in much the same ways.

As seen from the statistics of traffic volumes and number of ship calls, the influence of winter is not very remarkable in the central part of the Gulf of Finland. The total number of ships visiting one port naturally varies but the clear correlation between restrictions and traffic density cannot be seen. One reason for that may be that most of the ships visiting ports of the Finnish Gulf have ice classes IA and IA Super anyway and their dwt is big enough.

The most noticeable difference in traffic density between winter and summer is that in winter there are no fast ferries operating between Helsinki and Tallinn. Also foreign cruise ships do not visit ports in the Gulf of Finland in wintertime. In summer the number of cruise ship calls in Helsinki is about 200 and in St. Petersburg 220. Most of these ships visit Tallinn too. The Saimaa Canal is closed in mid-winter, so the vessels bounding to inland waterways are not operating in the Finnish Gulf. This phenomenon is also clearly visible in the vessel call statistic of the St. Petersburg Sea Port. Due to the frozen Neva River the amount of ships clearly diminish during the winter.

When the ice situation becomes difficult, traffic restrictions are imposed. The restrictions pertain to the availability of icebreaker assistance. Some of the restrictions are about safety independent of assistance standards, some are caused by the availability of icebreaker services. On the Finnish side of the Gulf of Finland the first restrictions are set on ice classes I and II and 1,300 dwt. The tightest restrictions are normally on ice class IA and IB combined with 2,000 dwt, and IC combined with 3,000 dwt. East of Porkkala, the tightest restriction in a normal winter is usually on ice class IA and 2,000 dwt. The granting of exemptions is tied to icebreaking resources, and in mild winters exemptions are granted more often.

Ice class has a fundamental basis on the safety of the ship hull and the essential propulsion machinery. The class defines sufficient installed power for safe operation in ice covered waters. The classification also defines certain hull structure against certain level ice, which in the Baltic Sea conditions is defined using the first-year ice definition. Classification also defines the requirements for propeller shaft as a minimum power for maintaining ship speed in re-frozen (brash ice) fairway navigation channel. More detailed definition is given in (Overgaard & Tustin, 2004).

In Finland the traffic restrictions are based on the Finnish–Swedish Ice Class Rules, 2002. There are also other rules available, based on other countries and classification systems. The correspondence between the Finnish–Swedish Rules and the Russian Maritime Register Shipping Rules has caused a lot of problems and confusion in the Gulf of Finland traffic. The equivalence of these rules has been discussed in chapter 6.7.2.

2.4.3 Icebreaker assistance

The winter 2002–2003 showed how the lack of icebreaker assistance influenced the merchant fleet: while the icebreakers were assisting the traffic of Primorsk oil terminal, the St. Petersburg Sea port in particular was suffering from a lack of assistance. There were moments when around 100 ships were waiting to enter or depart from the port. There were more than 3,000 railway wagons in the port terminal area waiting for unloading. At the same time, some consumer products were no longer found in the shops of the city, thus the Mayor insisted the marine authority should improve the ships' traffic. The Vysotsk coal harbour was also full of railway wagons; altogether there were more than 6,000 wagons in the ports and terminals of the eastern Gulf of Finland waiting for ships.

There was much public speculation on certain ships and their ability to sail along icy waters, mainly due to uncertainty on what was the correct ice class. This uncertainty has recently been solved by the HELCOM's ICE Expert Working Group. New HELCOM recommendation on winter traffic also defines other subjects related to safety, operational matters, and ice surveillance systems.

The safety of winter navigation and the adequate icebreaker assistance in the Gulf of Finland is rather difficult to evaluate, mainly for the following reasons:

Gulf of Finland waters are surrounded by three countries. Finland and Russia do not have any ratified bilateral agreement on the icebreaker assistance. Finland and Estonia ratified a bilateral icebreaking assistance co-operation agreement in 1995. The agreement, however, does not define all the necessary items properly, but is more or less functions with most rules of co-operation between the Helsinki and Tallinn traffic.

New GOFREP service has pointed out the need for better co-operation in winter. Data on the way-points has started to change between the in the Gulf of Finland as a part of HELCOM co-operation. This new service mode, however, is still in the development stage.

The icebreaking service requirements in Finland are based on the maximum four hours average waiting period for a ship to be assisted. An additional service requirement in Finland is the goal of guaranteeing that 90–95% of the ice-going ships can sail to the port without waiting. In Russia the current service is based on the system, in which the icebreaker tells a waiting position to the merchant ship. The usual way is to collect several ships and assist them as a convoy to/from the port. This system increases the waiting time, and thus delays the transportation.

In Finland no special fee is collected from the icebreaker service. All ships will pay special fairway fees based on the ship size and ice class. The costs of the icebreaker assistance will be covered by this fee. In Russia ships must pay for the assistance. The icebreaking fee in Russia is based on ship's volume, i.e. its length overall, beam and draught.

In Finland the State Shipping Enterprise (Finstaship) is the responsible for the management of the icebreaking services to all the 23 Finnish "winter ports" and to the ports determined by the Finnish Maritime Administration. This enterprise must guarantee adequate assistance for transportations to and from Finnish ports. However, the company can also sell its services to other clients. If a joint bi- or trilateral agreement is made for the Gulf of Finland area, this will require a totally new policy for the fairway costs and priorities. In Finland the shipping companies specialised in export will be prioritised to ensure the fluent frequency traffic with fixed timetables. In Russia the past winters have shown that priority is given to oil tankers, and rest of the ships must wait a longer time. See Figure 5 for a view of an icebreaker at work.

National icebreaker fleets use their own ice service, ice charts and communication systems. A joint system would require joint telematic systems linked to the GOFREP service. Here the monitoring, ice surveillance and the service must be harmonised together with the joint operational procedures.

Figure 5. Icebreaker assisting a chemical tanker in the Gulf of Finland (photo: Finnish Maritime Administration).

There have been a lot of mild winters in the Gulf of Finland over recent years. The winter of 2002–2003, in spite the normal width of the ice cover, was quite severe due to the larger thickness of the ice field. Only the Finnish ports were assisted properly, and both Estonia and Russia suffered from insufficient icebreaker capacity: there were thousands of railway wagons in Estonian and Russian ports waiting for ships. Certain consumer goods missing from the shops, and ships were left lying in the ice field waiting for the icebreakers. Estonia was forced to hire additional icebreaking assistance abroad, and in Russia icebreakers were also directed to Gulf of Finland to help the situation.

Large oil tankers, with the width of 50–55 m need two icebreakers to assist them: icebreaker width is usually in the order of 25–28 m, thus two ships are required to assist the tanker. Only Fortum's new Double Acting Tankers (DAT) classified as IA Super can survive without any assistance. In fact when these new ships started to visit the Primorsk oil terminal, they were often waited on by the Russian merchant fleet due to the wide channel they were opening (Figure 6).

Figure 6. Double acting tanker breaking ice stern first (photo: Fortum oyj).

3. Marine oil transportation

3.1 General development

The demand of shipping services is usually measured in tonne-miles, which is a product of cargo volume multiplied by the average distance in nautical miles transported over a time period. Another means is to use the volume of cargo being moved, but the former way gives perhaps better view of development. Figure 7 illustrates the development of the world's sea-borne trade of oil, 1992–2003.

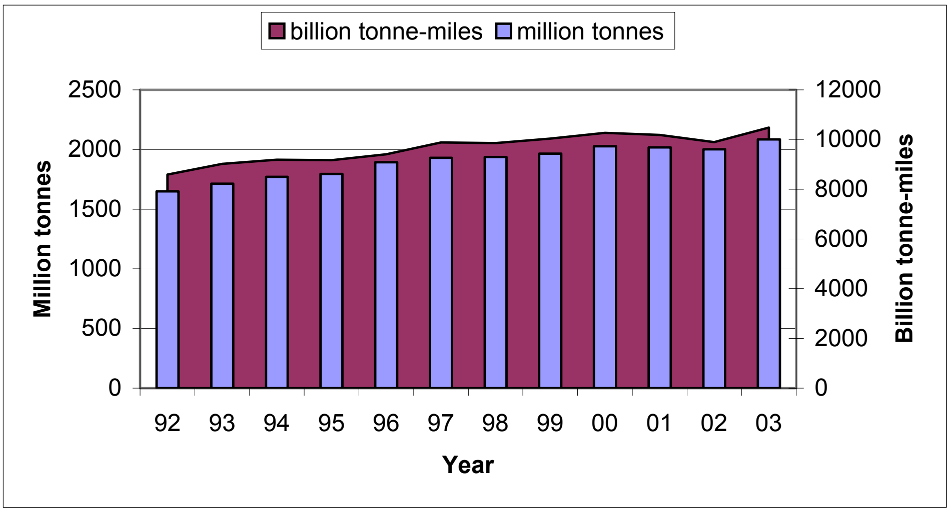

Figure 7. World sea-borne trade of oil in 1992–2003 (Intertanko, 2004).

As can be seen, international trade has increased from 1648 million tonnes in 1992 to 2085 million tonnes in 2003; which means an increase of 27%. Changes in oil trade patterns have a crucial impact on oil transport route structures. A shift to shorter hauls reduces tonne-mile demand even if the volume demand is unchanged and vice-versa (Koskinen & Ojala, 2003). In the 1990s the average haul length decreased because of increasing non-OPEC oil production, which was closer to main consumption areas.

World crude oil production in 2003 was 79.26 million barrels per day in total, which makes about 3963 million tons per year (Worldoil.com, 2004). The conversion table and abbreviations are presented in Appendix A. Oil price has changed substantially over the years as shown below in Figure 8. Some of the major reasons for the rise and fall of oil price are listed below.

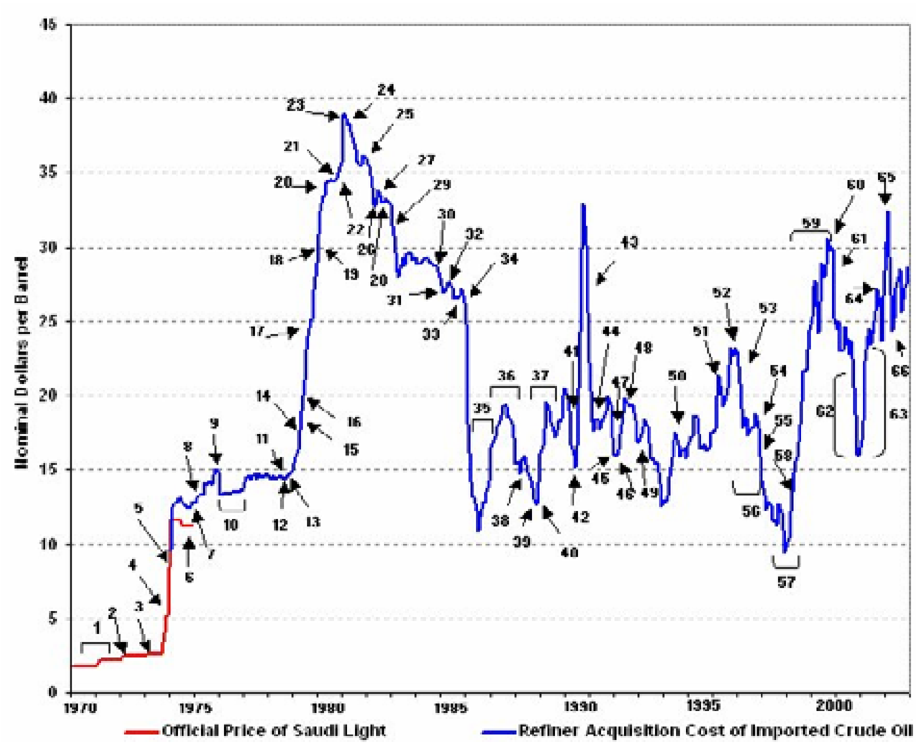

Figure 8. Oil price 1970–2003 (Energy Information Administration, 2004).

4. Oil embargo begins (October 19–20, 1973).
23. First major fighting in Iran–Iraq War.
42. Iraq invades Kuwait.
43. Operation Desert Storm begins.
52. U.S. launches cruise missile attacks into southern Iraq.
59. OPEC oil production cutbacks, weather and low oil stock levels.
62. September 11, 2001 terrorist attacks on the United States.
63. OPEC oil production cuts, unrest in Venezuela, and rising tension in the Middle East.
65. Unrest in Venezuela and oil traders' anticipation of imminent military action in Iraq.

Explanations for the rest of the marked numbers in the picture can be found on the Internet at http://www.eia.doe.gov/emeu/cabs/chron.html.

In August 2004, the crude oil price hit the new records as shown in

Figure 9. The recent surge in oil prices has been driven by ongoing security concerns in the Middle East and by a supply shortage. Global demand for oil has never been higher, increased by heavy consumption in the US and fast-growing China. A decision by several consumer countries to stockpile oil in the light of the ongoing uncertainty in Iraq has also stretched supplies. World crude prices have now increased by more than 25% in the last 12 months.

Figure 9. West Texas Intermediate Crude Oil Price (USD), June 2004 – August 2004 (BBC News, 2004).

3.2 More traffic – less oil spills?

In the Baltic Sea area, large oil spills with the magnitude of thousands of tons have been very rare. If large oil spills are examined on a world-wide scale, it will be seen that there has been a sharply decreasing tendency in recent decades, see Figure 10.

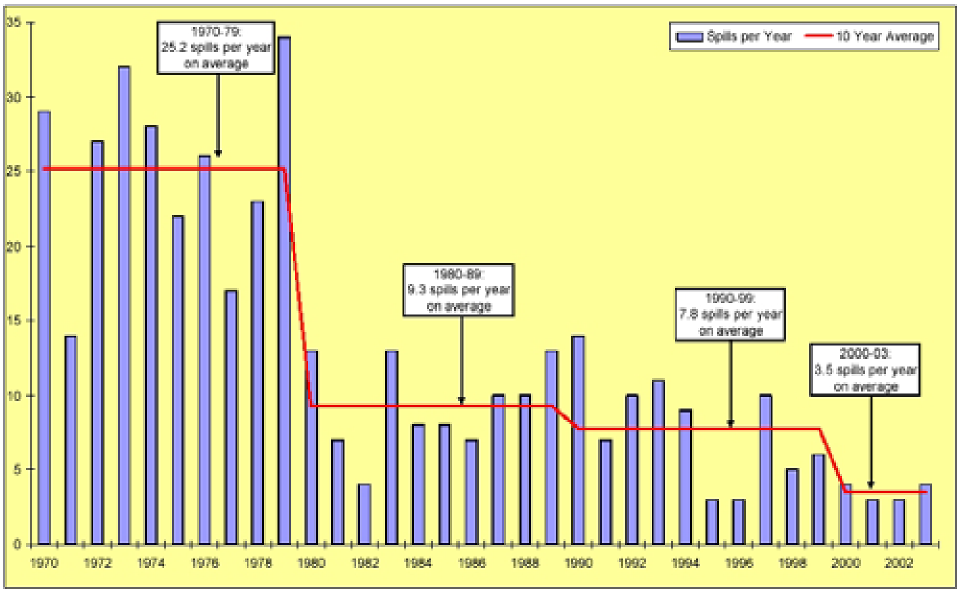

Figure 10. Numbers of oil spills over 700 tonnes (ITOPF, 2004).

Based on the statistics behind the figure, it can be observed that the average number of large spills per year during the 1990s was less than a third of that witnessed during the 1970s. It should be noted that at the same time the transport rates and port calls have been increased significantly, thus the decrease of oil spills reflects certain improvements in maritime safety during that period. Indeed, the past accidents have definitely led to efforts to develop safer ships with better navigation equipment. Attention has been paid also to training, IMO rules and new conventions, and this has led to positive developments, too.

The vast majority of spills, however, are small spills (i.e., less than 7 tonnes as defined in International Tanker Owners Pollution Federation, ITOPF). In most years it is probable that the share of small spills in the total amount of oil spills has been small, when the source has been accidental oil spills. A list of major oil spills since 1967 has been attached as an Appendix E. It can be noted from the Appendix that one of the most known oil spills (that of *Exxon Valdez*) ranks in only 35th position in terms of spill volume. However, some of the huge spills mentioned in the Appendix did not cause such severe damage, or did not had any impacts on the coastlines, and so are not well known to the general public. Statistics for oil spills in the Baltic Sea area can be found from the home pages of the Finnish Environment Institute (http://www.ymparisto.fi) and HELCOM (http://www.helcom.fi).

In the Baltic Sea area illegal oil and bilge water releases have been very common. During the past ten years, more than 400–700 illegal spills have been observed based on the aerial surveillance. The average spill has been around one cubic metre, the largest spills being some ten cubic metres of oil. However, the amount of illegal oil spills has started to decrease, perhaps due to the better surveillance and the sanctions imposed on the polluters. In 2003 there were 278 illegal oil spills in the Baltic Sea area, which was around 20% less than the previous year. Not all oil spills can be detected, thus it has been estimated that the total amount of illegal oil spills in the Baltic Sea is around 10,000 corresponding to 10,000 tons of oil annually. This amount is a lot larger than the total amount of accidental spills annually.

3.3 Russian oil

Russia holds the world's eighth largest oil reserves (proven reserves of 60 billion barrels) and has been world's second largest oil producer, behind only Saudi Arabia (Energy Information Administration, 2004). Russia depends upon energy exports for a critical share of its total export earnings (around 50% in 2003) and government revenues. The sharp rebound in oil prices over the past few years has been good news for Russia, especially its oil sector. The Russian government decided to raise the export fee on crude oil from USD 33.9/metric ton to 35.2, effective April 1, 2004 (Svensk Sjöfarts Tidning, 2004).

In addition to oil prices, Russian oil production has rebounded over the past few years. In 2004, Russia is expected to produce around 9 Mbbl/d (450 Mtons/y) of oil, up 48% from 6.1 Mbbl/d in 1998. In 2003, Russian oil production averaged about 8.4 Mbbl/d (420 Mtons/y), with consumption of 2.7 Mbbl/d and net exports of 5.8 Mbbl/d. In metric tons this means about 290 Mtons of oil exported in 2003 – of which about one third was shipped from the maritime ports (Energy Information Administration, 2004). However, these export figures differ, depending on the source. According to (Svensk Sjöfarts Tidning, 2004) 207 Mtons of oil was exported in 2003 and 242 Mtons is predicted for the year 2004. The major oil export outlets used by Russia are presented in Appendix C.

Production and export figures of the largest oil companies are presented in Figure 11. Exports here only include shipments to countries outside the former Soviet Union and CIS.

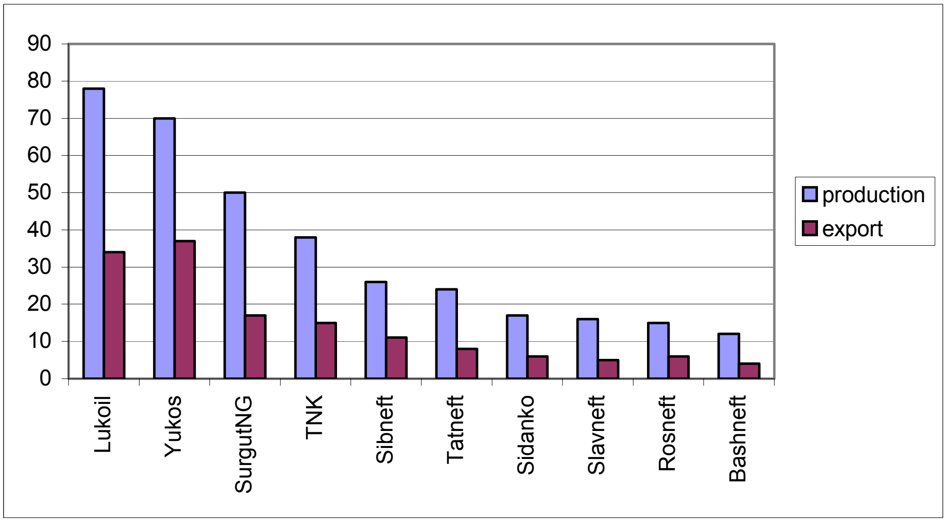

Figure 11. Production and export of the oil companies in Russia (Mtons). Year 2002 (Borodin et al., 2003).

Last year, Russia overrode Saudi Arabia and moved up to number one oil producer in the world with a production of 420 million tons. Production and transportation costs for Siberian crude are only $12/bbl. Russia is now producing 9.2 million bbl/d and according to Semyon Vainshtok, general director of Transneft, this means that there is already a 800,000 barrels shortage in the export capacity (Pesonen, 2004). While the oil export rate has been increased extremely quickly over the past five years, the oil production infrastructure has not developed at a similar pace. The capacity problems of the pipeline network may endanger the expected higher production rates. It is therefore uncertain whether the growth rate can be sustained in the long term. The Saudi Arabian and Middle East's influence on the development can not be dismissed as more than 2/3 of the world's known oil reserves are in that area. Saudi Arabia also has spare capacity which can be called upon when the oil market is shaken by external events (Overgaard & Tustin, 2004).

Russia's oil production increased last year by 10.7%, as compared to the year 2002. In January–June 2004 Russian oil companies brought 10.4% more oil to the market than over the same time the year before (223.6 Mtons). Oil export from Russia by the Transneft pipeline system in January–June increased by 22% to 86.7 Mtons (SeaNews, 2004).

The increase in the market price of the oil also put more pressure on the Russian plans to get more oil onto the world markets. Russian oil companies have used the opportunity to make good profits, because new tax increases are expected for the oil industry in Russia. Another factor has been the unclear energy politics of the large oil companies and the Russian federation. A good example is Yukos and the problems related to the privatisation acts (Koksharov, 2004). With increased foreign investments and joint ventures in Russia, oil output is expected to grow substantially over short to medium term period.

There has been speculation on how this oil production increase can be transported to the market given that the transport capacity is currently 100% fully booked. There are technical, economical and political limitations (such as those that support the Murmansk oil pipeline and terminal constructions): using large tankers will be economically feasible, the discount per one ton of oil is significant compared to the transportation costs with smaller ships. Technical limitations include the size limitations via Danish Straits or Bosporous Straits into the Black Sea. The largest tanker size that can be used in the Baltic has a displacement around 110,000 dwt and on the Black Sea 145,000 tons. The US shipments will require tanker sizes of more than 300,000 dwt's. Murmansk is the only Russian port that can handle such a large tankers. Currently the US and Russian authorities on the trade have continued their dialogue trying to encourage the Russian government to support certain projects, such as the proposed pipeline from Western Siberia to Murmansk, which would facilitate the export of oil to the east coast of the US.

Political limitations are especially visible in the Bosporous Straits: this year Turkey introduced limitation on freight ships moving through the Straits, and for security reasons tankers can only pass through at night. Since 1999, the traffic through the Bosporous Straits has increased by one and a half times, and the current limits have induced huge traffic jams, which can mean weeks of delay for oil transportations (Koksharov, 2004).

3.4 World tanker fleet

The output of the seaborne trade grew by 1.9% in 2002, and was even higher last year. The volume of the world merchandise exports also grew in 2003, contingent on developments following the implementation of US security measures and health controls to counter the recent SARS outbreak. Export expanded most in Asia, with countries in the Far East taking the lead.

The world tanker fleet of oil tankers and dry bulk carriers together made up 71.6% of the total world fleet tonnage in 2002. The fleet of oil tankers increased by 6.6% in 2002, while the increase of dry bulk carriers was smaller, 1.9% higher compared to 2001. Figure 12 illustrates the change in the world fleet size by principal types of vessels in 2001–2003 (UN, 2003).

The phase-out decisions made by IMO and EU for the single hull tankers, however, will be reflected in the market situation as a higher number of tankers in the order book of the shipyards. Although a lot of new product and chemical tanker capacity will be constructed, an analysis of tanker supply shows that there are only a handful of large ice-strengthened crude oil tankers available on the market and with increasing transport demand, more of these vessels are needed to guarantee the efficient, reliable, and safe transport of oil through the Gulf of Finland (Koskinen & Ojala, 2003). This results from a shortage of ice-strengthened tonnage capable of the winter conditions of the Baltic.

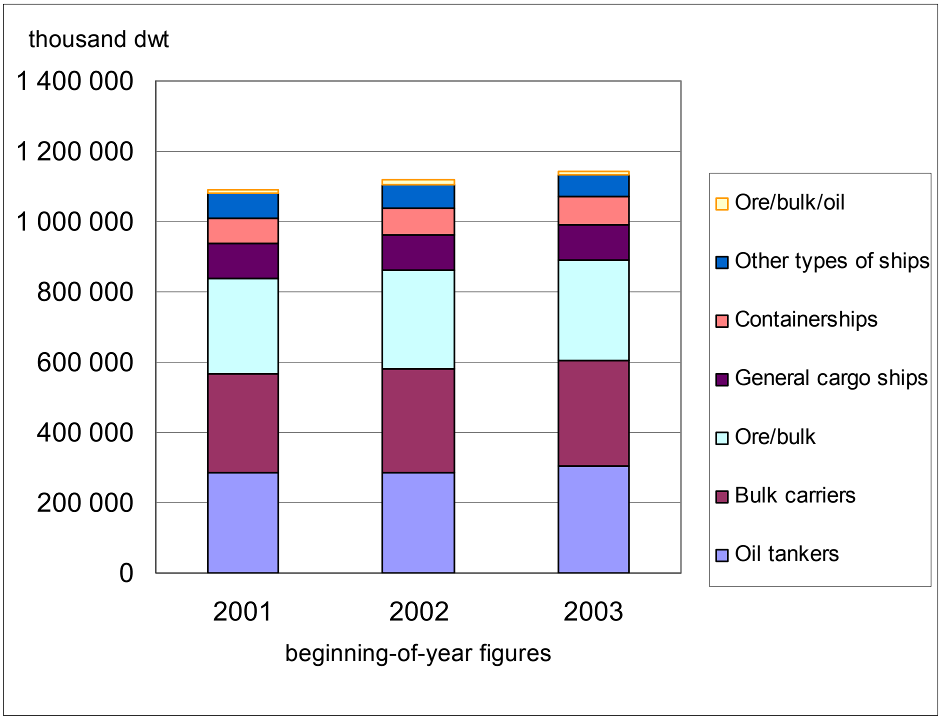

Figure 12. World fleet size by principal types of vessels in 2001–2003 (UN, 2003).

The average age of the world fleet decreased by almost a year to 12.6 years during 2003, with 28.1% of the fleet being 20 years and older. Figure 13 gives an indication of the tanker tonnage of open registry fleets as of January 1, 2003. It will be noted that the six largest open registries have the major part of the tankers, i.e., 94% of the total open registry fleet. The increase by a number of tankers owned by six major registries increased by 300 ships between in 2002–2003. The true nationality of major open registry fleets is given in the Appendix D, based on the data supplied by Lloyd's Register-Fairplay (UN, 2003).

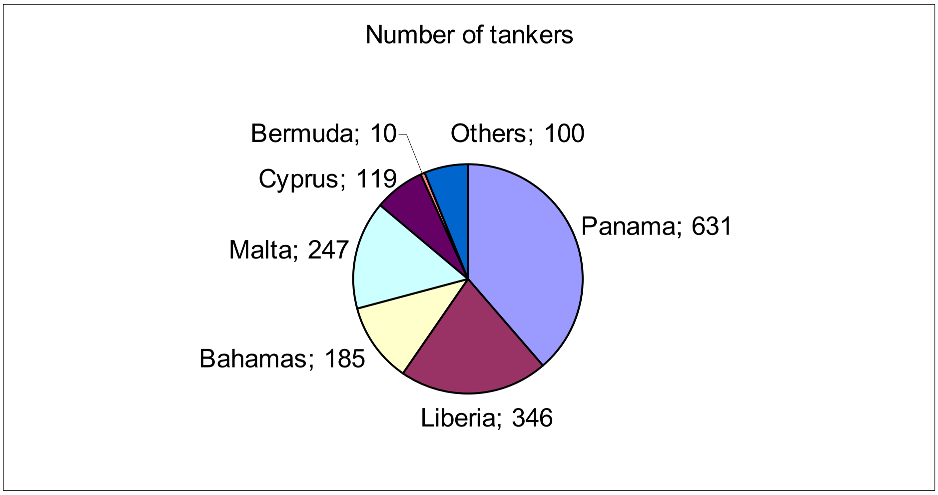

Figure 13. World tanker tonnage of open registry fleets as January 1, 2003.

In the Baltic Sea traffic and especially in the Gulf of Finland area, the general development trend observed in (VTT, 2002b) was the growth of tanker size. The average size of tankers visiting Muuga harbour doubled over the period of 1998–2001; up from 19,000 tons up to 41,000 dwt. In the Baltic Sea the maritime oil trade is limited to around 15 metres by the maximum draught of the vessels. Because of wide variation of the tankers draft/beam specification it is almost impossible to set an exact maximum vessel size capable of operating in the Baltic Sea. The most common tanker size in the Baltic, however, is an Aframax class ships of around 100,000 dwt. Larger Suezmax tankers up to 150,000 dwt can also be used in the Baltic, though not fully laden. Figure 14 gives the classification of the tankers.

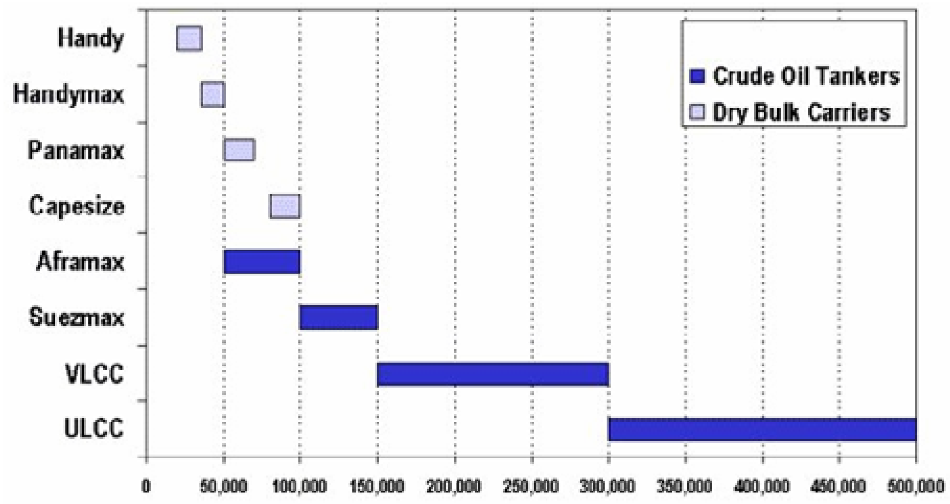

Figure 14. Tanker types and sizes (UN, 2000).

Major tanker size groups include:

- **Handy and Handymax**: Small-sized oil tankers with less than 50,000 dwt.
- **Panamax**: Represents the largest acceptable size to transit the Panama Canal; lengths are restricted to a maximum of 275 metres, and widths to 32.2 metres. The average size of such a ship is about 65,000 dwt.
- **Capesize**: Incapable of using the Panama or Suez canals, not necessarily because of their tonnage, but because of their size. As a result, "Capesize" vessels transit via Cape Horn (South America) or the Cape of Good Hope (South Africa). Their size ranges between 80,000 and 175,000 dwt.
- **Aframax**: A tanker of standard size between 75,000 and 115,000 dwt. The largest tanker size in the AFRA (Average Freight Rate Assessment) tanker rate system.
- **Suezmax**: This standard, which represents the limitations of the Suez Canal, has evolved. Before 1967, the Suez Canal could only accommodate tanker ships with a maximum of 80,000 dwt. The canal was closed between 1967 and 1975 because of the Israel–Arab conflict. Once it reopened in 1975, the Suezmax capacity went up to 150,000 dwt. An enlargement to enable the canal to accommodate 200,000 dwt tankers is being considered.

- **VLCC**: Very Large Crude Carriers, 150,000 to 320,000 dwt in size. They offer a good flexibility for using terminals since many can accommodate their draft. They are used in ports that have depth limitations, mainly around the Mediterranean, West Africa and the North Sea. They can be ballasted through the Suez Canal.

- **ULCC**: Ultra Large Crude Carriers, 300,000 to 550,000 dwt in size. Used for carrying crude oil on long haul routes from the Persian Gulf to Europe, America and East Asia, via the Cape of Good Hope or the Strait of Malacca. The enormous size of these vessels requires custom built terminals.

In the size groups of 80,000–100,000 dwt, the Aframaxes, roughly 46% of the tonnage is less than 11 years old, as can be seen from Figure 15. This is the type of the most important in North European trade (Koskinen & Ojala, 2003).

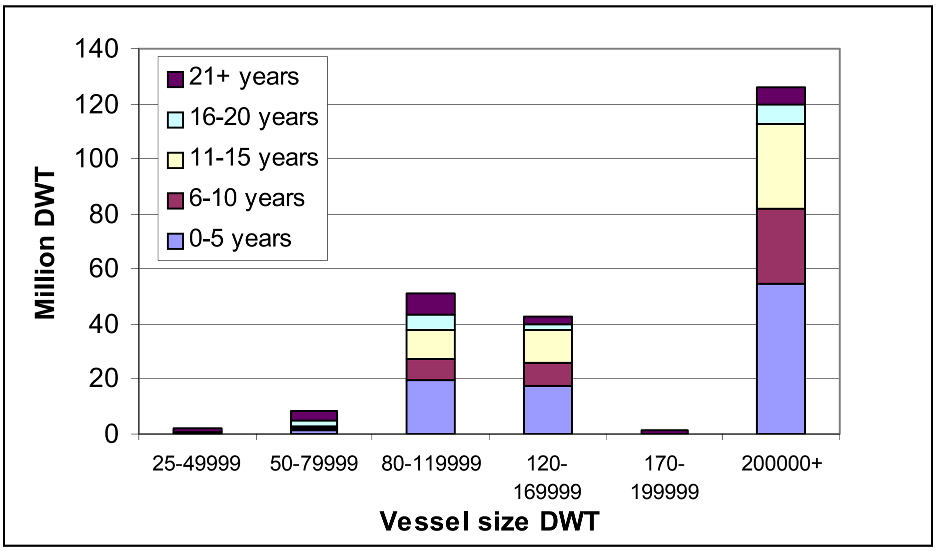

Figure 15. Crude oil tanker fleet age profile, April 2004 (Gibson, 2004).

In addition to size and age segmentation, oil tankers and crude oil carriers are at present segmented by hull structure. In early 1990's most crude carriers were single hulled. The current situation between single and double hull tankers in the world is shown in Table 1.

Table 1. Current single or double hull tanker situation (Gibson, 2004).

Type	Total	Single hull	Double hull	% Double hull
ULCC	13	9	4	31%
VLCC	412	180	232	56%
Suezmax	290	98	192	66%
Aframax	598	250	348	58%
Panamax	220	119	101	46%
20–60 000 dwt	981	563	418	43%
TOTAL	**2 514**	**1 219**	**1 295**	**52%**

The Baltic Sea situation was briefly analysed in 2002 (VTT, 2002b) where tanker hull types were analysed in selected Baltic ports. Comparison between the situation in 2001 and 2004 in the Gulf of Finland is presented below.

3.5 Tankers in the Gulf of Finland

The tanker data was analysed using the data received from the ports of Sköldvik, Primorsk, St. Petersburg, and Muuga. The harbour masters were asked for a list of vessels called the port in a one-month period, May 2004. The following parametres were asked:

- name of the ship
- IMO number for further analysis
- structure (single or double hull or double bottom)
- building year.

Similar data was gathered in summer 2001 and published in VTT, 2002b. In 2001 it was noticed that in regard to tanker age no essential development had been taken place since 1997. Structure data was not available from 1997. In the following, the situation in 2001 is compared to the topical data from 2004, comprising the age (Table 2) and structure (Table 3) of the vessels. It is worth noticing that the comparison is made by using the number of different vessels calling the port, not the total number of ship calls during this period.

There were 117 vessel calls made by 53 different tankers in Sköldvik harbour in May 2004. The average age of the tankers was 10 years (13 years in 2001) and percentage of double hull structure was 94% (not fully comparable to 42% in 2001 since 31% were unclear then). The double bottom share, on the other hand, has clearly gone down from the known figure of 27% in 2001 to 6% in 2004 (Raitamo, 2004).

In Primorsk, there were 38 vessel calls in May 2004. The port was visited by 25 tankers with average age of only 4 years. Two tankers (8%) had double bottom with segregated ballast tanks, the remaining 23 (92%) had double hulls (Port of Primorsk, 2004).

There were 59 vessel calls made by 45 different tankers in St. Petersburg oil harbour in May 2004. The average age of the tankers was 11 years (11 years also in 2001) and percentage of double hull structure was 76% (not fully comparable to 48% in 2001 since 38% were unclear then). The double bottom share, on the other hand, has gone down from known 14% in 2001 to 9% in 2004. Seven vessels (16%) had no information about the structure (Glukhov, 2004).

In Muuga harbour, there were 48 tanker calls in total in May 2004. The number of different tankers visiting the port in May 2004 was 39. The average age of all the tankers was 10 years. This is considerably less than three years ago when 30% of the tankers in Muuga were over 19 years old and the average age was over 15 years. Percentage of double hull tankers was 77% (48% in 2001) and double bottom 23% (17% in 2001). In 2001, 35% of tankers had single hull structure. According to these numbers, development has been very good (Kivistik, 2004).

Table 2. Average age of the tankers (years).

Terminal (number of vessels 2001 / 2004)	**2001**	**2004**
Sköldvik (26 / 53)	13	10
Primorsk (0 / 25)	-	4
St. Petersburg (29 / 45)	11	11
Muuga (23 / 39)	15+	10

Table 3. Tanker structure distribution (%).

Terminal (number of vessels 2001 / 2004)	**2001**			**2004**		
	DH	DB	SH	DH	DB	SH
Sköldvik (26 / 53)	42%	27%	N/A[1]	94%	6%	0%
Primorsk (0 / 25)[2]	-	-	-	92%	8%	0%
St. Petersburg (29 / 45)	48%	14%	N/A[1]	76%	9%	N/A[3]
Muuga (23 / 39)	48%	17%	35%	77%	23%	0%

DH = double hull DB = double bottom SH = single hull

[1] Structure not mentioned in St. Petersburg: 38% and in Sköldvik 31%.

[2] Traffic in Primorsk started in December 2001.

[3] Structure not mentioned in 15% of vessels in St. Petersburg.

Over three years, some positive development can be noticed in the tanker vessels that visit the main oil harbours in the Gulf of Finland. New vessels have been taken in use, as the average age of the tankers has not increased anywhere; indeed in Muuga it has actually gone down recognisably. Primorsk harbour is mainly visited by new 100,000 dwt tankers. Age development has had a positive effect on vessels' structures as well. There is no knowledge of single hull vessels visiting these harbours in May 2004 (though the structure of seven vessels in St. Petersburg is not known) and the share of double hulled tankers has grown distinctively. These are all good signs of growing safety consciousness in oil transportation.

4. Key factors affecting oil transportation in the Gulf of Finland

4.1 General

In 2003 Russia became the world's leader in daily oil and gas extraction. Increasing the energy resources export volumes is the most important line of international trade of Russia. Transit routes in the north west go via Baltic States and Belarus. The factors hindering energy resource export are political, economical, and environmental among others. The current port capacities are insufficient to meet the country's export needs, especially in the winter. All the major oil companies in Russia are realising or planning their own terminal projects in the Baltic. The problems in Primorsk are due to the limited number of tankers of high ice class that can visit the port during winter. This winter (2003–2004) the port was served by 34 vessels altogether.

Russia's largest oil ports are Novorossiysk and Primorsk. In 2003, 69 million tons of oil was handled in Novorossiysk in the Black Sea. The Primorsk port keeps expanding its capacities: in 2003 the handled volume was 17.7 Mtons. In November 2003, the Baltic Pipeline System throughput supplying the port was increased to 30 Mtons, in February 2004 to 42 Mtons, and by 2005 it should be 50 Mtons. The projected export volume in Primorsk this year is about 40 Mtons (SeaNews Weekly, 29/2004).

Whilst the Primorsk oil terminal has increased its capacity, the Latvian oil terminal Ventspils has suffered from the closing of the Transneft pipeline. Until the end of 2003, the Ventspils terminal was exporting between 15–20 million tons of oil every year. The pipeline leading to Ventspils terminal has been closed although some of the Russian oil companies have supported the quick opening of the Ventspils pipeline. Ventspils pipeline may be reopened if the Transneft's capacity at Primorsk is full, and not enough to handle the demand from the Russian oil companies. It is likely that the closing of the Ventspils pipeline is related to the shareholding play of the terminal operators, i.e., Transneft is trying to force the Latvian government to sell its shares, thus gaining the possibility of becoming a major shareholding company in Ventspils.

Although located in southern Baltic Sea rather than the Gulf of Finland, the Port of Kaliningrad plays an important role in the Russian oil handling business. The expansion of EU to the countries surrounding Kaliningrad makes any transport projects in the region political issues. In 2001–2003 new oil handling capacities were created at the Lukoil-Kaliningradmorneft terminal. By 2005 the terminal capacity is expected to be 6 million tons per year. The Kaliningrad Port Oil Base was expanded to handle 2 million tons per year (SeaNews Weekly, 29/2004).

The port's largest oil operators are the Kaliningrad Port Oil Base, Baltic Oil Handling Company, Lukoil-Kaliningradmorneft and BaltTerminalService. These four operators cover 95% of export liquid bulk volumes in the port (SeaNews Weekly, 41/2004).

Since May 1, 2004 the border between Russian Federation and European Union expanded from 1,300 km to 2,200 km, and the share of Russian export to the EU countries from 35% to 50% (SeaNews Weekly, 35/2004). The north western region demonstrates the most positive trend in respect to port infrastructure development. The most significant port projects are planned in the Russian northwest: oil handling facilities in Primorsk and Murmansk, and a container terminal in Ust-Luga (SeaNews Weekly, 28/2004).

As a curiosity, it should be mentioned that ports in Russia are practically the only branch that have no solid legal base. The notion of a sea port as defined in terms of law is neither a legal object nor a subject, and has no legal status. The law on ports was to be introduced to the Duma in the first quarter of 2004, but the draft was still with the Government when writing this report. (SeaNews Weekly, 34/2004)

4.2 Oil reserves and pipelines

Russia has proven oil reserves of 60 billion barrels, most of which are located in Western Siberia, between the Ural Mountains and the Central Siberian Plateau. In 2002, roughly two thirds of Russia's crude oil exports were sent to Belarus, Ukraine, Germany, Poland, and other destinations in Central and Eastern Europe. These destinations are all points along Russia's major export pipeline, Druzhba, and its multiple branches. The north western part of the Transneft pipeline network is shown in Figure 16. The remaining one third of crude oil exports were sent to maritime ports and in turn sold on world markets.

Figure 16. Selected Russian Crude Oil Export Pipelines (Energy Information Administration, 2004).

Crude oil exports via pipeline are controlled by Russia's state-owned pipeline monopoly, Transneft. Bottlenecks in the Transneft system make the company's export capacity incapable of meeting the oil producer's export ambitions. Recently, Russian oil producers have taken advantage of higher world oil prices and re-directed their surplus oil via railroad and river barge to external markets. However, the capacity problem has been acknowledged and new export infrastructure, including the Baltic Pipeline System (BPS), is under development.

The BPS carries crude oil from Russia's West Siberian and Timan–Pechora oil provinces westward to the port of Primorsk. The BPS allows Russia to reduce its dependence on transit routes through Estonia, Latvia, and Lithuania.

Kirishinefteorgsintez, a subsidiary of Surgutneftegas, is increasing the refinement rate of the Kirishi oil refinery located 175 km east of St. Petersburg.

The construction work at the refinery should be ready by 2006. The company has also plans to build a pipeline for the transportation of clear fuels from Kirishi to Primorsk (Häkkinen, 2003).

There are other projects to pump oil to western Europe: Transneft has initiated a new transporting system Druzhba and Adria for Russian crude oil through to the Croatian port Omisalj, which would allow it to bypass the Black Sea straits. This alternative would be start at nearly 5 million tons in the first stage, followed by an increase to 10–15 Mtons annually (Wingrove, 2004). There has also been discussion with Polish authorities on allowing the expansion of Transneft's lines, thus linking oil to Polish ports. Poland and Ukraine have already made an agreement to extend the Odessa–Brody pipeline to the Polish city of Plock to transport Kazakhstan crude oil to the refineries of the area.

Perhaps the most interesting development scenarios are related to oil transport to Asia–Pacific countries. There have already been several proposals to conduct a new pipeline to China, as well as studies on using rails to transport crude oil to the border.

Energy demand in Europe alone is not a sufficient driving force for the Russian oil production development. EU's energy support is not offering enough capacity for the Russian oil export. EU legislation does not support too close commitment to one large producer. Using only one large supplier would not be politically wise nor in accordance with competition legislation.

Therefore Russia is tempted to find new customers from US and Asian markets. The following chapter describes more closely the development of the proposed Murmansk pipeline and terminal. Realisation of this huge complex may influence the oil transport volumes along the Baltic Sea.

4.3 Murmansk pipeline project

In November 2002, four largest Russian oil companies signed “Memorandum of Mutual Understanding” on the development of an oil pipeline system via the sea bulk-oil terminal in the area of Murmansk (Lukoil, 2002). The construction is planned to commence in 2004 and be complete in 2007, when it will be put into operation. The yearly oil flow volume of the Western Siberia–Murmansk oil pipeline is expected to be 80 million tons. Lukoil could load half of the Murmansk pipeline system capacities with oil that the company plans to produce in the Timano–Pechora oil- and gas-bearing province (0.6–1.0 Mbbl/day). Other Russian majors (Yukos, TNK, Sibneft and Surgutneftegas) would provide the rest of the throughput. The past problems of Yukos' directors and the Russian Federation have probably influenced the final schedule, as well as the problems connected with the unification of Sibneft and Yukos.

In January 2003 it became known that Lukoil, Yukos, TNK, Sibneft and Surgutneftegas commissioned the Starstroi company to design a pipeline and a bulk-oil terminal in one of the harbours of the Kola Peninsula. According to the specifications, the total transhipping volume of the oil complex should gradually reach 120 million tons per year. The destination of the very large crude carriers (VLCC) will be the Rotterdam oil terminal or North America. One of Lukoil's arguments for the new terminal has been the expected export growth, especially in the USA.

There have been two pipeline routes under consideration: Western Siberia–Ukhta–Murmansk (length 3,600 km) or Western Siberia–Usa–Murmansk via the White Sea (length 2,500 km), see Figure 17.

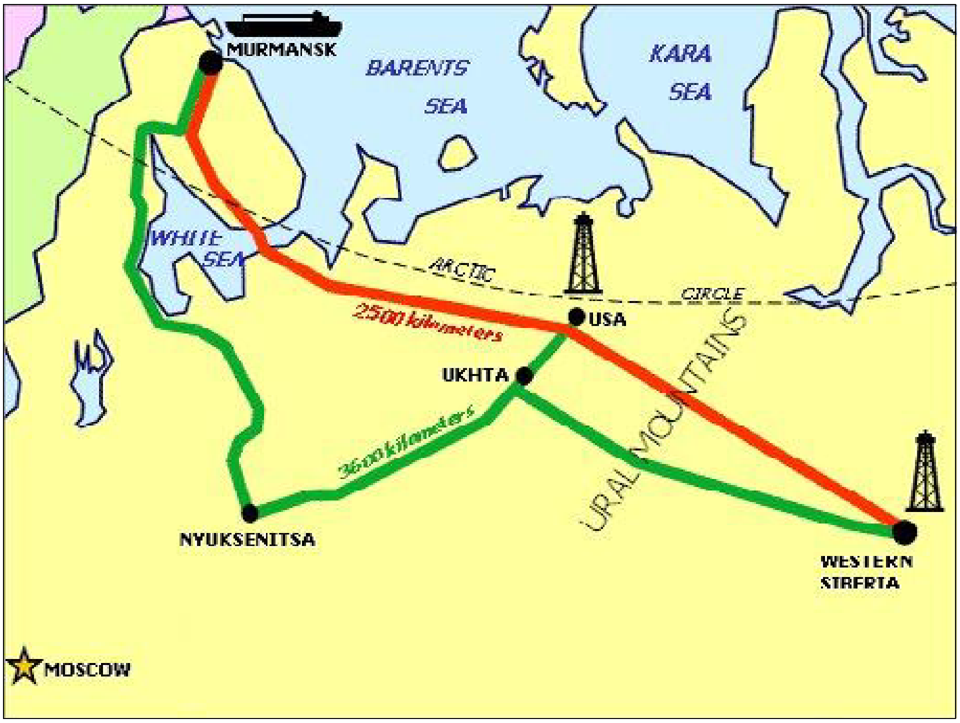

Figure 17. Two alternative routeings for Murmansk pipeline (Yukos, 2004).

The preliminary cost estimate for the realisation of the pipeline project has been 3.5–4.5 billion USD, depending on the route. The tariff on oil transportation in the eight-year payback period will be $19.70 to $24.10 per ton.

The Murmansk project would allow for between 1.6 and 2.4 million bbl/d of Russian oil exports to reach the United States via tankers with only nine days travel time, that is, much faster than shipping from the Middle East or Africa, see Figure 18. It is still unclear though whether the Russian government will allow private Russian oil companies to proceed with their plans to construct the port and its associated facilities, or if the project will be handed, either partially or entirely, to Transneft. Some Transneft officials have stated that expanding BPS system – as well as a few other key export projects – will be sufficient to keep pace with growing production. However, other sources support the Murmansk route based on numerous economical and environmental facts. Transneft's opinion is understandable because the company hopes to gain more transit fees from BPS (Energy Information Administration, 2004).

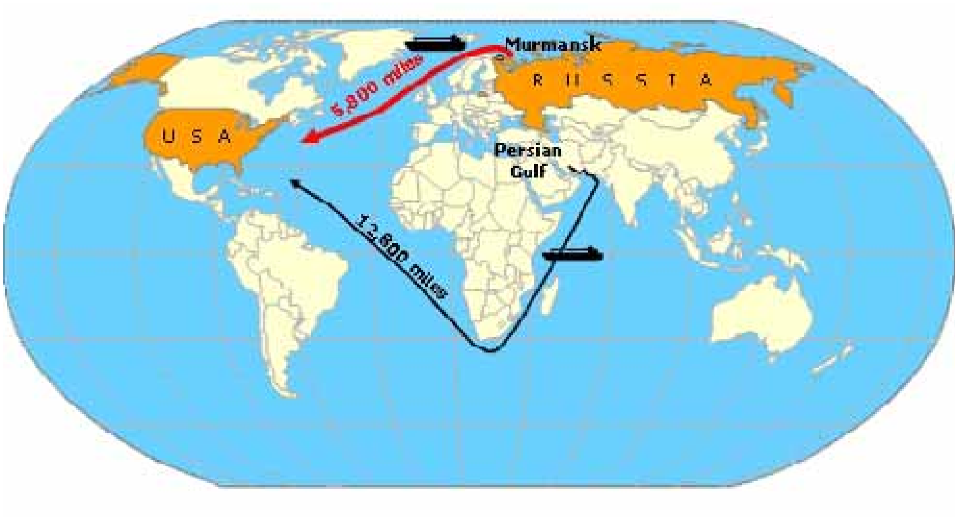

Figure 18. Distance from Middle East to North America in comparison with Murmansk (Yukos, 2004).

At present, crude oil and oil products are delivered by railway to the White Sea ports to be loaded there onto tankers, either for direct export or export via the Murmansk oil-loading terminal. In the summer of 2003, a new oil transportation route originating from central Russia was also started using river tankers via inland waterways for further transshipping in the White Sea. The offshore oil transshipping terminal is located in the Kola Bay in close proximity to Murmansk. The annual throughput capacity of the terminal is 5.4 million tons of oil. The sea port of Murmansk is ice-free and the Kola Bay is rarely covered with ice. That said, ice may drift from the rivers opening into the bay.

A new transport scheme for oil shipment was launched in March 2004, the key elements of which are the ports of Murmansk and Arkhangelsk. A reservoir tanker "Belokamenka" of 360,000 dwt has been placed on the Belokamensk raid outside Murmansk Sea Commercial port (SeaNews Weekly, 37/2004). The storage tanker was built in 1980 (ex Berge Pioneer) and is used to store crude oil arriving in small tankers from White Sea and from offshore facilities in the Barents Sea (SSG Newsletter 2/2004). The floating facility is provided by Rosneft and the Far East Shipping Company (FESCO). Rosneft will increase the oil shipments from Archangel to 2.5 million tons per year. The capacity of Archangel is also expected to increase to 4 million tons annually.

The significance of the northern oil export channel becomes greater with the growing complexity of restrictions imposed on supertanker passing the Black Sea and the Baltic Sea straits, and in view of the overloaded existing pipeline systems and railway network. Shipping oil via the Black and the Baltic Seas requires passing through narrow straits (in addition to the Gulf of Finland being covered by ice for about 4 months a year), which results in problems for most tanker types at loading and seafaring. From the Kola Bay, heavy tankers may easily reach international waters without facing such obstacles as ice, shallow waters and narrow straits. The Russian Government has made a priority list for oil export development. The project of Western Siberia–Murmansk pipeline is given the fourth priority in the list after the Baltic pipeline system development, management improvements and reconstruction of pumping systems and the Angarsk pipeline construction (Frantzen & Bambulyak, 2003).

4.4 Export alternatives

While the Russian government (Transneft) has been reluctant to build new export routes for oil transportation by pipeline, Russian oil companies have embarked on a vigorous search for a variety of ways to boost exports of both crude oil and petroleum products. As a result there have been numerous activities related to new proposals to build private oil and product-loading terminals, and to develop the existing railroad capacities. The delay in the Russian government's decision-making in building two new export oil pipelines – from Western Siberia to the deepwater port of Murmansk and from Angarsk to Nakhodka with a lateral to Daqing (China) – has pushed Russian oil majors to embark on an independent search for alternative routes to scale up oil and products exports (Baidashin, 2003).

Lukoil, for example, has launched the first stage of an export oil terminal on the Caspian Sea and is looking to raise the capacity of a northern oil terminal in Varandei on the Barents Sea to export oil from the Arctic shelf. Lukoil has recently completed the first phase of the Vysotsk terminal (see section 5.3.2). Rosneft is expanding an oil terminal in Arkhangelsk on the White Sea and investing in efforts to develop the infrastructure of the North Sea route. Yukos has arranged oil export via Vitino and onward to Europe via Murmansk. The terminal development seems to be especially intensive in the Baltic Sea area.

The driving force for the development is the international oil market price. OPEC (The Organization of Petroleum Exporting Countries) is keeping the price at the high level, which has forced Russian oil companies to find alternative transport routes for the oil export. Railroad and water transport, which previously were regarded as unprofitable means of oil transportation, now feature prominently in the export structure alongside the dominant pipeline delivery. According to data released by Russia's State Customs Committee, from January to July 2003, the export workload of the so-called alternative transport rose 130% to 37.2 million tons of oil compared with the same period of 2002. Among the companies that put this scheme to use, the most frequent over seven months were Yukos (some 12 million tons), Tyumen Oil Co. (TNK, 5.4 million tons), and Lukoil (4 million tons). Notably, according to Russian customs' statistics, Yukos's exports via alternative routes account for 30–40% of the overall volume of shipments abroad (Baidashin, 2003).

In the Gulf of Finland area, all existing oil terminals and pipeline constructions have been built without foreign investors, except the new Vysotsk terminal, which has the strong support of US Overseas Private Investment Corp. (OPIC). Already there is a system for supporting privatisation activities: the Energy Treaty (ECT) was signed in Lisbon on December 17, 1994, and entered into force on April 16, 1998 (http://www.encharter.org). The Treaty promotes and protects the construction and operation of oil pipelines and oil terminals, especially in the Baltic Sea area. It also covers all aspects of the establishment, operation and use of oil pipelines and oil terminals simultaneously: the operation of oil pipelines and terminals is protected as an investment-related activity, and pipeline users may rely on the transit provisions of the ECT (Karl & Waern, 2003).

In the future there might be new proposals by the foreign companies, which may lead to the application of the ECT. The privatisation may support this development, although the crisis with the Yukos oil company may form an obstacle for foreign investors. Possible applications may include extending the Primorsk oil terminal and the Murmansk oil terminal complex in the future.

The importance of the Treaty is perhaps more profound for Latvia and Lithuania than for Estonia. Estonian oil transit is based on transport from Russia by rail. However, both Russian and Caspian Sea region crude oil reserves are significant contributions towards meeting the EU's security of energy supply in general, plus the objective of establishing and maintaining adequate sources of independent crude oil supplies.

Russia and Belarus have not yet ratified the Treaty. Transneft has also its own ongoing "power politics" with the Ventspils oil terminal. Wider construction works and new design will require foreign investors to co-operate, where the Treaty will give certain protection both for the investments and the protection of the freedom of transit. If this development is supported in the future, it may enhance the co-operation in the Baltic countries and to increase the transit through the oil pipeline network and oil terminals. This may then have an influence to the Gulf of Finland’s waters and dampen slightly the expected growth rate of the marine oil transportations for the area (Liuhto, 2003).

4.5 Port dues

Port competence is largely a matter of transit fees as well as port dues. The dues charged from a vessel for a port call depend on its size, type and ice class, as well as on the flag and the frequency of calls. The BPO (Baltic Ports Organization) Port Pricing workgroup carried research in which port dues charged in the Baltic Sea were compared (Baltic Ports Organization, 2002). The workgroup studied the state and port dues, and composed the following tables (Figure 19 and Figure 20) for comparison purposes.

The necessary or compulsory services a vessel needs when entering the port are fairway service (entrance channels and aids to navigation, towage, ice breaking and pilotage) and berthing facilities (quays, mooring and waste handling). Comparing the port pricing systems in different countries and different ports is not an easy task. In the BPO study, case studies were made to help comparison.

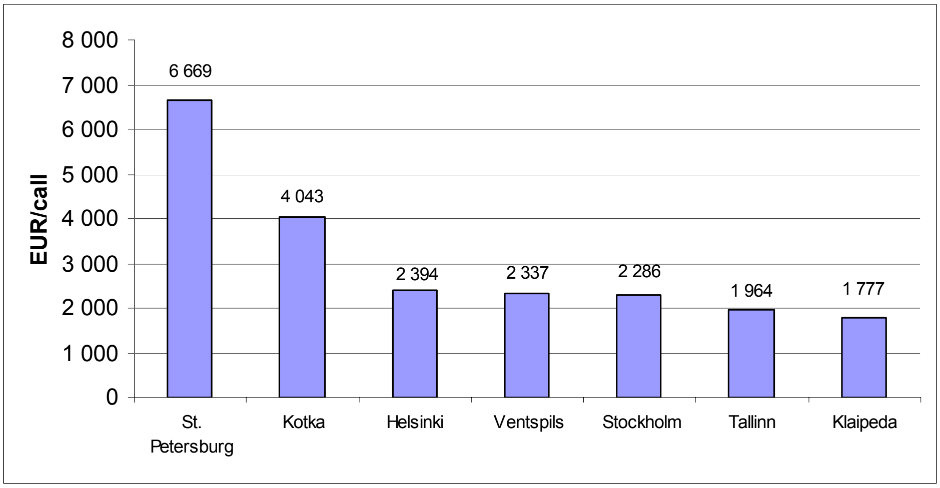

Figure 19. Port call costs for a non-EU-flag 2,658 GT container ship, ice class 1A, 52 calls/year (Baltic Ports Organization, 2002).

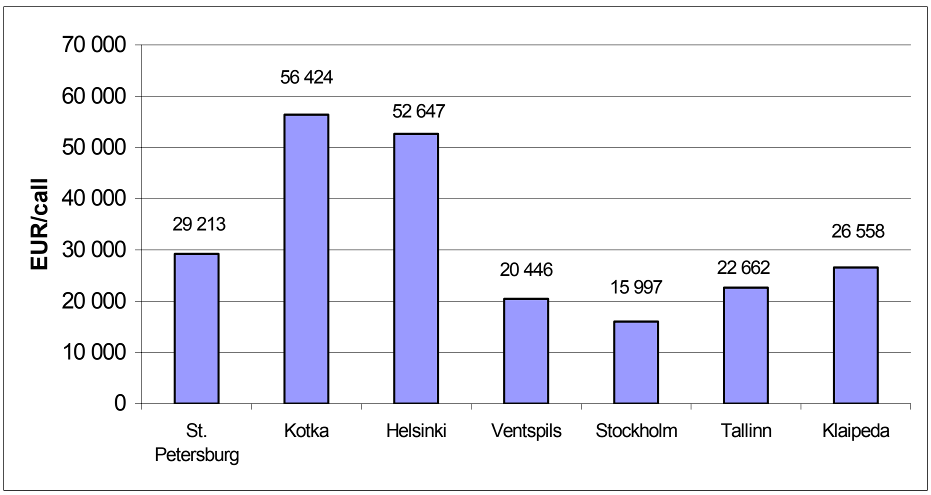

Figure 20. Port call costs for a non-EU-flag 17,521 GT tanker, ice class 1B, 5 calls/year, cargo 29,000 t (Baltic Ports Organization, 2002).

In the Gulf of Finland area, the dues of the Port of Tallinn for a 2,658 GT container ship seem to be 37% lower than in Helsinki. It might be surprising, that the due-level of St. Petersburg seems to be the highest one: St. Petersburg is twice as expensive as Helsinki, and 2.6 times more expensive than the Port of Muuga. It is the state dues that make the biggest part of the difference between Helsinki and Tallinn. In Finland around 80% of the dues are state dues, while in Estonia the proportion of the state dues is only around 30%, the rest of the dues being charged by the port.

Dues for a small tanker seem to be a lot more expensive in Finland than in the other Baltic ports. The reason for this is that in Finland cargo vessels have to pay the fairway fee for a maximum of the ten first entries per year, which makes the dues for the rare visitor expensive as compared to frequently visiting vessels.

Comparing the port dues is difficult because they are dependant on the vessel type and size. Harbours may also use their income differently – some enter them to owners (municipalities) as income, others are able to use profits directly for investments. However, with pricing policy where certain cargo modes get advantages, the port transportations are secured. The above examples highlights well how different ports are able to admit their own discounts based on the frequency of port calls, size of the vessel, ice class etc.

The Port of Tallinn charges a quay and mooring fee, a tonnage fee, and fees for services provided at the port. Vessels pay the state of Estonia the lighthouse and icebreaker fees. Piloting is paid to the piloting enterprise. In Estonia port dues are expected to rise in order to cover the icebreaker assistance costs. In Finland the port dues are based on the law on municipal port orders and transport charges. The ports are municipality owned and administrated by Port Authority. Stevedoring and terminal operators are privately-owned joint stock companies. In Russia, the State Maritime Administration (recently established RosMorPort) collects all navigation and port dues for an entering vessel in the commercial sea ports of the Russian Federation. The port dues include: tonnage, light, canal, berth, anchorage, environment, pilotage and navigation dues.

5. Port and terminal development

Port and terminal development in the Gulf of Finland area was intense through the 1990's and the pace is even faster in the beginning of the new millennia. Some essential figures are shown here in order to describe the traffic density on the main shipping channels. Oil harbours and their locations in Finland, Russia and Estonia are introduced via the figures from 2002 and 2003. In addition to the last years' results, estimations for up until 2010 are presented according to the development plans of existing and new terminals.

5.1 Oil transportation

The oil transportation in the Gulf of Finland amounted to 40 million tonnes in 2000, and estimations were carried out for the year 2005 yielding an expected transport rate of 85 million tonnes (VTT, 2002a). The prognosis was also made until the years 2010–2015. The long-term prognoses, however, seemed to give too low estimates compared to the port and terminal developments of the Eastern part of the Gulf of Finland area, mainly due to Russian and Estonian terminal development. Another factor, which was not clear at the beginning of 2000, was the influence of the new Russian terminal and transport capacity on the oil transit of the Baltic countries. Both the rapid development in Primorsk and the problems in Ventspils have reflected the changes in the past scenarios: the overall figure of the Baltic oil transportation development is not changed much, but rapid local changes have been taken place. The transportation figures were already close to 80 Mtons in 2003 and according to recent knowledge of development plans, will rise to 190 million tonnes by the year 2010 (Table 4). The oil transportation data is presented graphically in the Appendix B. The location of the oil terminals is presented in Figure 21. Gorki terminal will be built right next to Vistino. Muuga and Paldiski fall both into Port of Tallinn as well as Paljassaare, which is located in Tallinn. Miiduranna and Vene-Balti are also located in the Tallinn area so they are not shown separately on the map.

Table 4. Oil transportation in the Gulf of Finland (million tons). Realised in 2002 & 2003 and estimate for 2004 & 2010.

Port	2002	2003	2004	2010
Inkoo	0.3	0.2	0.2	0.3
Helsinki	0.8	0.6	0.4	0
Sköldvik	16.9	17	18	20
Kotka	0.2	0.3	0.3	0.5
Hamina	0.9	1.3	1.5	1.5
Vysotsk			4	12
Primorsk	12	17.7	40	60
St. Petersburg	10.6	11	12	15
Lomonosov				4
Batareinaya				15
Vistino				4
Gorki				12
Ust-Luga				5
Sillamäe				7
Aseri				2
Kunda				0.5
Vene-Balti		2.5	2.5	2.5
Miiduranna	1.3	2	2	2
Tallinn	24.3	23.8	25	28
Total	**67**	**76**	**106**	**190**

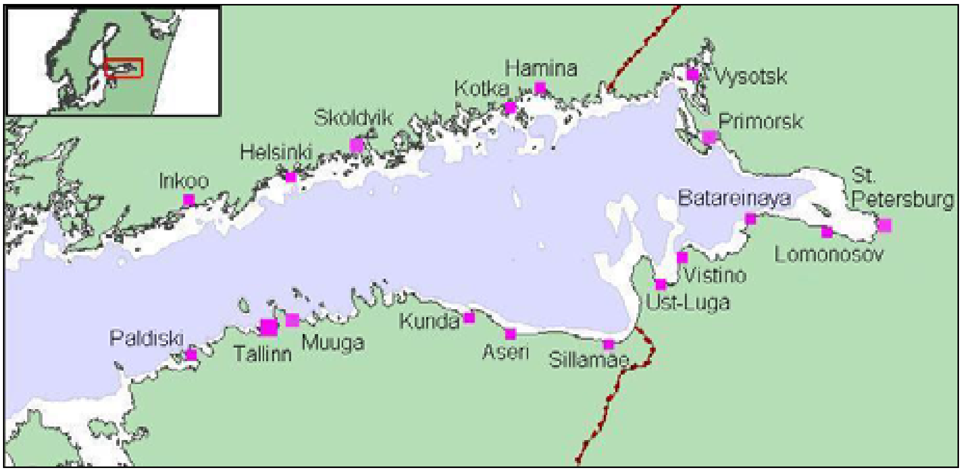

Figure 21. Oil harbours in the Gulf of Finland (MARIS, 2004).

5.2 Finnish oil harbours

The cumulative ports' handling (of foreign trade) in Finland in 2003 was 92.5 million tons of cargo. Export was 41.6 million tons (45%) and import exceeded 51.8 million tons. In addition to foreign trade, domestic trade handling made up 6.0 million tons and transit 5.5 million tons. Hence the total handling by Finnish ports was 104 Mtons. Ports in the Gulf of Finland handled more than a half of the total cargo tonnage in Finland: 58 Mtons altogether (56%). Finnish data used here is from (FMA, 2003 and FMA, 2004).

Sköldvik and Naantali are the largest entry points for crude oil. Sköldvik's share in the liquid bulk import is 61% and Naantali takes 17%. Cumulative share of Kotka, Hamina and Helsinki is 9% while the remaining 13% goes through other Finnish ports (Figure 22). Exported oil products are mostly routed via Sköldvik and Naantali. Transit products are handled in Hamina and Kotka. Other ports' shares remain small (Figure 23).

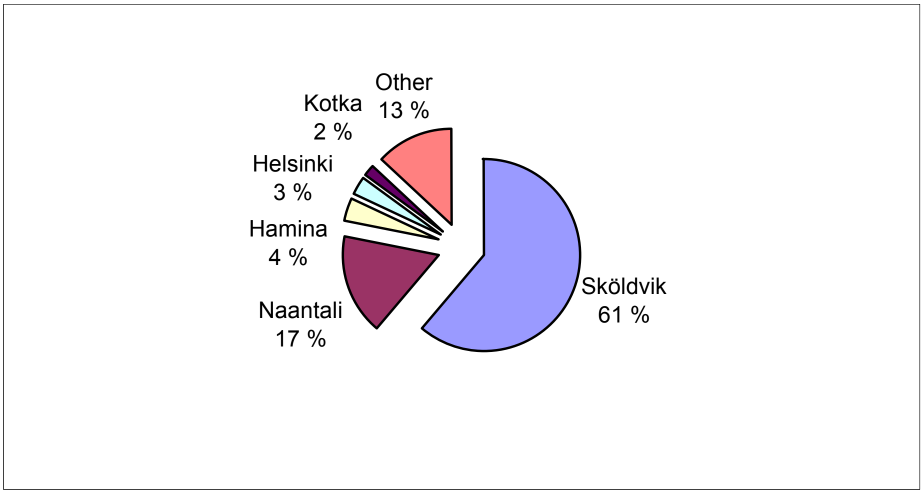

Figure 22. Liquid bulk import structure in Finland in 2003.

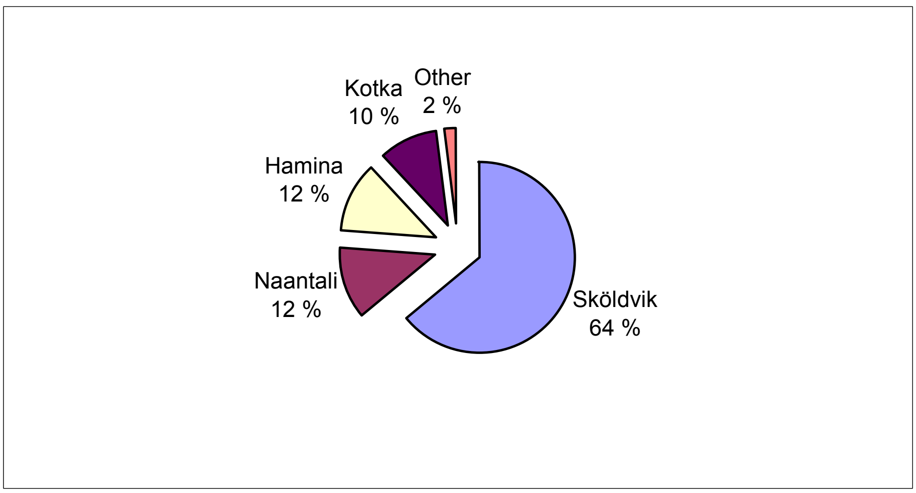

Figure 23. Liquid bulk export structure in Finland in 2003.

5.2.1 Hamina

The Port of Hamina is highly specialised in forest products, containers and liquid bulk. The traffic consists of forest industry exports (43% of cargo tonnes in 2003). Out of all cargo tonnes, 17% are unitised cargo. Liquid bulk export is the main cargo group for transit traffic (transit 24% of total cargo tonnes) from Russia, while the typical imported transit is usually containerised general cargo. Liquid bulk accounted for 39% of total cargo tonnes handled in the port in 2003 (Port of Hamina, 2004).

In 2003, 7.3 million tons of cargo was handled in Hamina (+19.6% compared to 2002). 1.3 million tons were oil products and 2.0 million tons were chemicals. Compared to 2002, the changes in handling were: oil products +29% and chemicals +26%. Crude oil was not shipped through the Port of Hamina.

The port has some 3 kilometres of quay line, of which 610 metres serve the 400,000 TEU Container terminal. There are seven ro-ro ramps, three berths for tankers and a pier for liquid petroleum gas (LPG), where the draught is from 7 to 10 metres. There are 3 units of SSG cranes, 8 mobile cranes and some 170 units of modern cargo handling devices. The port has more than 470,000 square metres of outdoor, indoor and heated storage capacity and 830,000 cubic metres of cisterns for dry and liquid bulk storage.

The fairway from Orrengrund to Hamina is 10 m deep. However, the new container basin foundation was laid with a 14 metre draught, enabling vessels to make use of the new fairway that is currently under development (Port of Hamina, 2004).

5.2.2 Kotka

The Port of Kotka consists of several harbours: City Terminal, Hietanen, Mussalo and smaller Poland and Sunila Quays. City Terminal is a multipurpose harbour used for lo-lo, sto-ro and project cargo vessels. Sawn timber, paper and pulp are shipped out, mainly in ro-ro vessels from Hietanen harbour. The Kotka Container Terminal in Mussalo has been designed to handle 500,000 TEUs per year. Each year millions of tonnes of bulk products are handled at Mussalo Deep

Water Terminal. The liquid bulk terminal is a specialised transhipment facility where expert handling is available for various high-value products. The terminal is also equipped to discharge liquids that require heating in cold weather (Port of Kotka, 2004).

In 2003, 10.5 million tons of cargo was handled in Kotka (-3.7% compared to 2002). 323 thousand tons was oil products and 1.8 million tons were chemicals. Compared to 2002, changes in handling were: oil products +28% and chemicals +2%. Crude oil was not shipped at all.

5.2.3 Sköldvik

The largest port by cargo handling in Finland, Sköldvik, is located near Porvoo, about 50 kilometres from Helsinki (Figure 24). Sköldvik, owned by oil company Fortum, is also the nation's largest oil harbour. Nowadays, a lot of crude oil is exported from Primorsk to Sköldvik refinery. If Primorsk got its own refinery in the future, this would have an effect on traffic in Sköldvik harbour as well.

In 2003, 17.5 million tons of cargo was handled in Sköldvik (-0.7% compared to 2002). Total amount consisted of 6.0 million tons of crude oil, 11 million tons of oil products and 0.5 million tons of chemicals. Compared to 2002, changes in handling were: crude oil -10%, oil products +6% and chemicals -39%.

Figure 24. Sköldvik harbour in Porvoo (Copyright Fortum oyj).

5.2.4 Helsinki

At present, the Port of Helsinki consists of four harbours: Laajasalo oil harbour, the South, West and North harbour. Most of the traffic uses the South, West and North (Sörnäinen) Harbour. Laajasalo Oil Harbour is about to be closed down and Vuosaari Harbour is under construction.

In 2003, 13.2 million tons of cargo was handled in Helsinki (+2% compared to 2002). 569 thousand tons were oil products and 228 thousand tons were chemicals. Compared to 2002, changes in handling were: oil products -33% and chemicals +3%. Crude oil was not shipped.

In the near future, large-scale changes will influence the Port of Helsinki. Laajasalo Oil Harbour will be closed down by the year 2010 and oil products will no longer be shipped to/from Helsinki. The general cargo harbour planned for Vuosaari, will replace the North and West Harbours, which would not have enough capacity to handle increasing volumes of cargo in the future. The new harbour comes into operation in 2008 and its calculated capacity will be 12 million tonnes of unitised general cargo per year. The Vuosaari Harbour will serve both ro-ro and lo-lo vessels. Passenger ship traffic through the South and West Harbours will continue as before.

5.2.5 Inkoo

Port of Inkoo is a private harbour. The port specialises in handling bulk cargo, and is Finland's biggest port for handling of different types of raw minerals. Maximum draft in the common channel is 13 m and 7.8 m in the dock area (Port of Inkoo, 2004).

In 2003, 3.1 million tons of cargo was handled in Inkoo (+37% compared to 2002). 183 thousand tons were oil products and 15 thousand tons were chemicals. Compared to 2002, changes in handling were: oil products -71% and chemicals +37%. Crude oil was not shipped.

5.2.6 Other ports

Naantali is not located in the Gulf of Finland but in the Archipelago Sea. Nonetheless, it is the second largest oil harbour in Finland and thus has an influence on the oil harbour development in Finland as a whole. In Naantali, there is a refinery, so a great deal of the cargo transported to Naantali is crude oil.

In 2003, 7.2 million tons of cargo was handled in Naantali (-1% compared to 2002). 2.2 million tons was crude oil, 1.3 million tons were oil products and 44 thousand tons were chemicals. Compared to 2002, changes in handling were: crude oil -4%, oil products -19% and chemicals -7%.

5.2.7 Prospects for 2004

All the above-mentioned statistics are from 2002 and 2003. As the foreign trade statistics from the 1st quarter of 2004 are already available (Table 5), some estimations about this year's figures may be made. Estimations are presented in Table 4. The mildness of winter 2003–2004 compared to the previous one is clearly reflected in the 1st quarter's results. The harbours in the east of the Gulf of Finland have been able to handle a lot more goods in 2004 than the year before. This effect is not reflected in Helsinki and Inkoo, which are located more to the west, and where the ice cover remains thinner.

Table 5. Finnish oil harbours' handling in January–March, 2004 compared to January–March, 2003.

Port	Change in total handling	Change in oil handling
Hamina	+18.2%	+57%
Kotka	+12.7%	+13%
Sköldvik	+20.8%	+10% crude oil +31% oil products
Helsinki	+7.5%	-30%
Inkoo	-40%	-28%

5.3 Russian oil harbours

According to the Russian Federation Ministry of Transport's estimates, the handling volume of Russian ports' made up 285,669 million tons in 2003. This exceeds the result of previous year by 9%. The north western ports' share of this was 99.8 million tons (+14%). Half of the volume trans-shipped by Russian ports was liquid bulk, in the northwest precisely 47%.

In general, the increase in handling was lower than in 2002 and behind the country's economical development. Reasons for that can be found in politics (any lawmaking activity was paralysed by the Duma elections) as well as in transport facilities (ports' capacities extension was insufficient, and the transport system proved inadequate as the load on it kept growing), (SeaNews Weekly, 28/2004).

Russian oil harbours are controlled by oil companies. Table 6 describes the main Russian port projects and their ownerships.

Table 6. Major stakeholders of the Russian oil terminal projects (Efimova et al., 2003).

Company	**Port project**
Lukoil	Vysotsk
Surgutneftegas	Batareinaya Bay, refinery plan to Primorsk
Rosneft	Ust-Luga, refinery plan to Primorsk
Nortwest alliance	Vistino
TNK-BP	Gorki
JSC Sea Port of St. Petersburg	Big port of St. Petersburg
Stevedoring company St. Petersburg Oil Terminal	Big port of St. Petersburg
Transneft	Primorsk

5.3.1 Primorsk

The Primorsk oil terminal is located 120 km northwest of St. Petersburg, and has been in operation since December 2001. The port is managed by the state-owned Transneft Company, which invested 279 million USD in developing the facilities. The Primorsk terminal is supplied by and was built for the Baltic Pipeline System (BPS), which originates in the Komi Republic. The BPS gives Russia a direct outlet to northern European markets, allowing the country to reduce its dependence on transit routes through Estonia, Latvia, and Lithuania.

In 2003 the port shipped 17.7 million tons of oil, which was 42 percent more than in 2002. The port put into operation two of the three stages of the Baltic Pipeline System. The first stage was put into operation in June 2003 increasing the pipeline carriage volume by 6 million tons. In July, the existing facility rose by another 500 thousand tons. During the autumn 2003, the system capacity was increased to 18 million tons. The second stage of the Baltic Pipeline System was finished in November 2003, and the 30 million tons facility was put into operation. By spring 2004 the pipeline system was to carry 42 million tons per annum. The diagram in Figure 25 shows the handling dependence from the stages put into operation (SeaNews Weekly, 25/2004).

There has been much speculation about the final expected capacity of the Primorsk oil terminal. One of the prognoses is shown in Figure 26 based on the CNIIMF's data (Vasilyev, 2004). The final capacity in Primorsk will probably be somewhere between 80–100 million tons annually. To reach the upper limit or even higher rates will require both new capacities for oil refining and transit capacity. Indeed, the Russian Petrotrans–Primorsk JSC (Joint Stock Company) has already pledged to widen the transit capacity by 12 million tons annually; including two million tons light oils and 8 million tons mazut. The realisation of this project will require around € 94 million and would take four years. Furthermore, both Rosneft and Surgutneftegas have reserved space for a new oil refinery near the Primorsk terminal with an annual capacity of 6–10 million tons. This plan has already accepted by the Leningrad Region and will be in operation in 2007 (Pravda, 2003). Tatneft has also approached the Leningrad Region's Government with an official request for a land allocation in the port area of Primorsk for the purpose of building a new refinery.

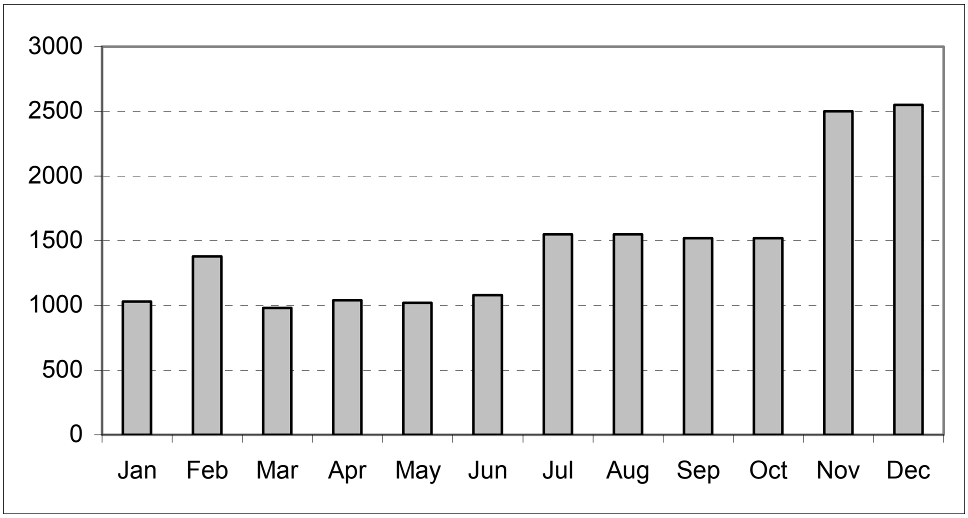

Figure 25. Dynamics of crude oil handling (in thousand tons) in Primorsk in 2003.

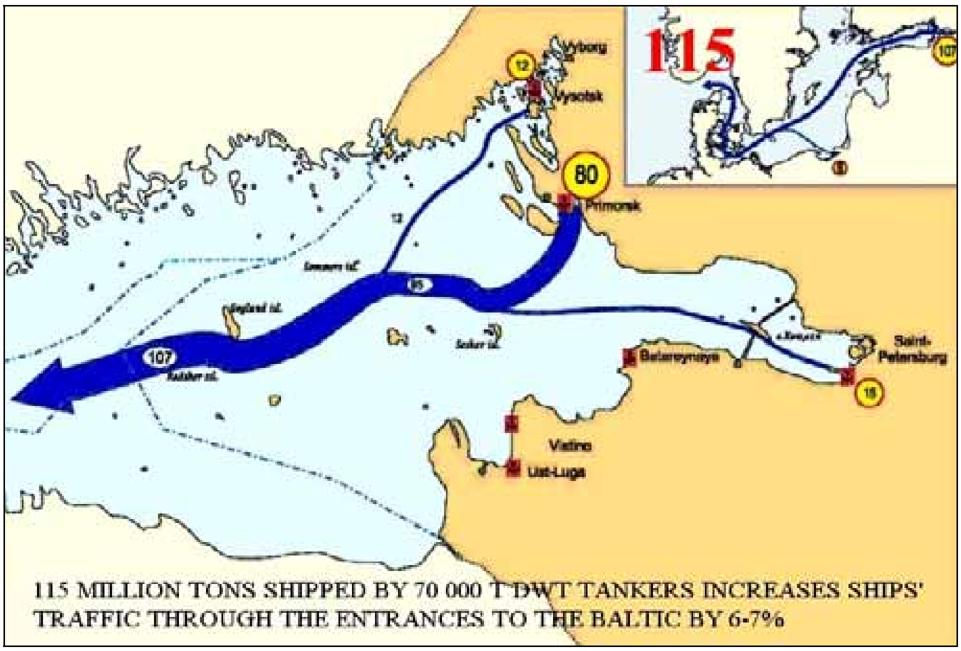

Figure 26. The expected oil flows from Vysotsk, Primorsk and St. Petersburg oil terminals in 2010–2012 (Vasilyev, 2004).

The maximum ship size for the Primorsk oil terminal is 307 m long with a maximum draught up to 15 metres and the deadweight of 150,000 dwt. It should be noted here that the water depth of the Danish Straits limits the maximum size of the ships, thus the practical limit of a fully laden tanker is the Aframax-class, i.e., near 100,000 dwt (Figure 27). Larger ships can only enter (or leave) the Baltic partially laden. Therefore large tankers cannot go through the Strait, but leave the cargo at Baltic ports, for example, at Gothenburg in Sweden or Sköldvik in Finland. The approach channel has been surveyed in order to allow even larger ships to enter the terminal inside the Baltic Sea traffic. The task of the new surveying has been to get 0.5 m more depth for the ships to leave the port. In addition to the main approach channel, the new alternative approach channels have been identified as a means to help the winter traffic.

Figure 27. MT Tempera manoeuvring in Primorsk, January 2004.

There are two 268 m long jetties in the port, with five standers each with the loading capacity of between 8,000–12,000 tons of crude per hour. The terminal has four tug boats to provide safe mooring for tankers. The terminal is also equipped with modern oil-combating facilities, many of them manufactured by the Finnish company Lamor Inc. (Zaitsev, 2002). When an oil tanker enters the Primorsk oil terminal, a specialist will investigate the ballast water. If the oil content is higher than 0.025 the ballast water will not be pumped to the sea. In the two years of operation only a few ships have been forced to go back or forced to take only a half load of oil due to the oil contamination in their ballast water tanks. The terminal also has bilge water reception facilities. Each ship pays a special "ecology fee" for the treatment of the bilge water. The fee for a 150,000 dwt tanker was 3,500 USD in 2003. If the ship has a certain certificate, the terminal inspectors may give a 50% discount from the ecology fee. The terminal treatment facility is based on both biological (50 m^3/day) and electrochemical (720 m^3/day) treatment.

5.3.2 Vysotsk

In 2003 the Vysotsk Port cargo turnover was reduced by nearly 23% and constituted 2,410 thousand tons. The port is specialised in coal, whose share of turnover is 85%, the remaining 15% share being pellets. In 2003 most of the volume went for export, while the share of local cargo transportation was 5,000 tons (SeaNews Weekly, 25/2004).

Lukoil launched the Vysotsk project on June 28, 2002, and on June 16, 2004 the new oil terminal was officially put into operation (Figure 28). It is located 160 km west of St. Petersburg, on Vysotsky Island. The new terminal is close to the old coal terminal, and the maritime traffic to Vyborg goes close, via the new terminal. The port is linked to the mainland by trail. The Russian Government introduced favourable railroad export tariffs, together with the domestic tariffs on transport oil products to the sea ports. Lukoil estimates it will save 5–7 USD on each ton of shipped products.

The terminal's first year’s capacity will probably not rise over 4 million tons in 2004. During the first phase, the tanker size would be 40,000 dwt but later, after deepening some fairway spots, 80,000 dwt tankers can be used. When the second phase is completed during the spring of 2005, capacity will increase to 11 million tons per year. There are even speculations the terminal will some day handle 15–17 million tons annually. The oil will be transported to Sköldvik (Finland), Gdansk (Poland) and Rotterdam (Holland).

Figure 28. Construction of Vysotsk oil terminal, September 2003.

The Vysotsk Oil terminal is built by the consortium consisting of Fluor Daniel Eurasia from US and Lukoil–Neftegazstroi. The total costs of the project are 235 million USD. The Vysotsk oil terminal has been supported by US investors. The US Overseas Private Investment Corp. (OPIC) has signed an agreement with the Russian company to finance the construction of the Vysotsk terminal. US interest has been focused on new transport routes for profitable oil shipments to the United States. The US administration has already issued $130-million guarantees for long-term credit so that the project can build an oil products terminal for Lukoil in Vysotsk.

Lukoil had problems opening the terminal for traffic due to problems related to the oil transportation by rail plus insufficient electrical power. Transneft has also been eager to influence the Vysotsk management, and has even suggested that the government to take over the terminal (Helmer, 2004).

5.3.3 Big Port of St. Petersburg

The Big Port of St. Petersburg is a notion uniting all operators of the St. Petersburg port. This is not a legal entity, but a virtual sum of terminals that handle cargo in the St. Petersburg port basin. Among the port operators at St. Petersburg are First Container Terminal, First Stevedoring Co, Second Stevedoring Co, Fourth Stevedoring Co, Timber Stevedoring Co, Baltic Bulker Terminal, Neva-Metall, Intechport, Petersburg Oil Terminal, Petrolesport, Rusmarine-Forwarding, Terminal-Service, In-Transit, Baltcore, Mobi Dick, etc. (Bulavina, 2004).

St. Petersburg Inland Port JSC is not part of the Big port and does not handle oil products. In 2003 St. Petersburg Inland Port JSC, formerly owned by North-West Shipping Company JSC, was sold to LSR group, one of the largest construction companies in the northwest region of Russia (SeaNews Weekly, 25/2004). The Big Port of St. Petersburg handled 42 million tons of cargo in 2003. The handling of oil products was increased by 4.1% and chemicals by 28%. The share of these two were 27% and 13% respectively. The handling structure is shown in the Figure 29 (SeaNews Weekly, 25/2004).

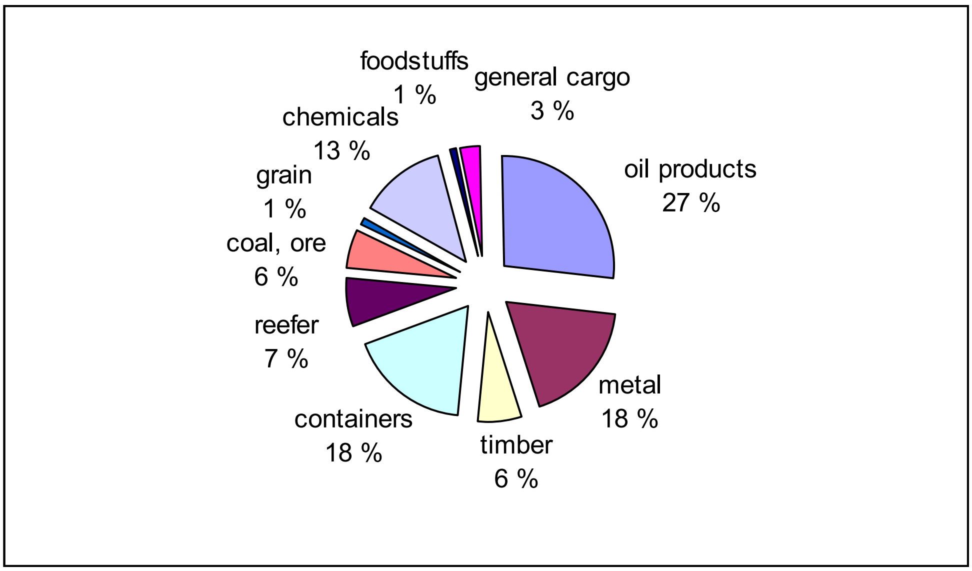

Figure 29. Big Port of St. Petersburg handling structure in 2003.

The Big Port trans-shipped 11 million tons of oil in 2003. Traditionally, most of the products are handled during the summer months since roadstead handling is closed during winter. The oil handling dynamics are shown in Figure 30. The oil products main operators are the Petersburg Oil Terminal (PNT), Baltic BASU and Eco Phoenix Holding. PNT's share of the Big Port handling was 96% in the first four months of the present year (SeaNews Weekly, 41/2004).

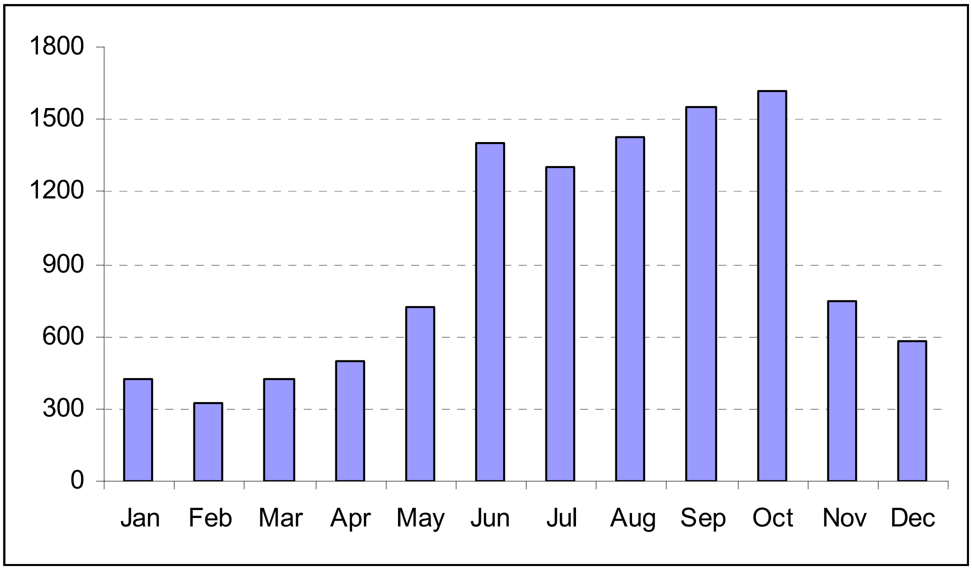

Figure 30. Monthly oil handling in St. Petersburg, year 2003. The impact of the severe winter is clearly visible.

The administration of St. Petersburg made a development plan in the beginning of 2002 to increase port handling capacity to 60 million tons annually. The costs of the development plan are near 1.5 billion USD (Häkkinen, 2003). The largest operator in oil handling is Petersburg Oil Terminal (PNT), which shipped 7.3 million tons of oil in 2003 (+7.5% compared to 2002). The terminal plans to expand its capacity to 12 million tons annually in 2005. There are official statements to the effect that this would be the limit of the oil export from St. Petersburg. The port wishes to concentrate more on the container traffic and improve its passenger terminals. Some investments, however, will be made by the Petersburg Oil Terminal to increase the crude oil export capacity by 2 million tons annually.

The real oil handling figures in the Big Port of St. Petersburg may be larger due to the oil transit. Oil has been transported via river Neva by small tankers, and reloaded to larger tankers to be further shipped away. The amount of ships on the Neva in 2002 was more than 7,000, and the oil transport rate along Neva is usually several million tons per year.

Since 1996, the Petersburg oil terminal has been implementing a development program spanning a period until 2005 and costing a total of $160 million. The company's management has renamed the Petersburg Oil Terminal as Petersburg Oil Port (Figure 31). Major partners of PNT include Surgutneftegaz, Lukoil, Sibneft, Tatneft, and TNK. The main maritime canal of the port of St Petersburg will be deepened to 13 metres and widened to 130–140 metres in order to allow vessels with a capacity of 80,000 tons to call at the port. Currently, the port can receive vessels with capacity no more than 40,000 tons. The project will be implemented in 2004–2005 (Rosbalt, 2004).

Figure 31. St. Petersburg oil terminal in June 2004.

5.3.4 Batareinaya

Batareinaya Bay on the Gulf of Finland is situated some 80 km west of St. Petersburg. Thus far only timber and coal have been exported from Batareinaya. The port's infrastructure is still in the early construction phase.

The Russian oil company Surgutneftegas announced in December 2002 that it would construct the Batareinaya terminal for light oil at a cost of 300 million USD. The planned capacity is 15 million tons annually and the terminal should be opened at the earliest in 2007 (Häkkinen, 2003).

The construction works of the Batareinaya oil terminal have been announced to start several times in the past years. According to the first plans made in 1993 (Lenmorniprojekt), the expected opening of the new terminal was scheduled for the year 2001. However, the past bank crisis in 1998 in Russia and the lack of investors have been postponing the project.

The proposed terminal plan contains a 540 m long quay wall for the tankers and other quay walls for other cargoes. The capacity of the cistern field will be 400,000m^3. The depth of the fairway channel is 15.0 m which enables Aframax class tankers to enter the port. The original lay-out of the Batareinaya terminal was made by the Russian Lenmorniprojekt design company, and has been published in (Rytkönen, 1999).

5.3.5 Lomonosov

Not far from Batareinaya is the Lomonosov port, which has a potential annual throughput of 2–4 million tons of oil. After the new circle road in St. Petersburg is completed, the Kotlin Island area, i.e., Kronstatd and Lomonosov, will offer a logistically better environment for the port development. It is likely that the expected 60 million tons capacity (total handling) of St. Petersburg would be the limit, and new capacity will be built in Kronstadt, Bronka and the Lomonosov area. There is already an oil terminal in Bronka, but thus far no offshore connection.

The Lomonosov port has not been developed at the expected schedule. The bottleneck for the proposed terminal is an unsufficient capacity of the railway connection. The lack of investments has also postponed the development. If another pair of rail was constructed the capacity would easily be more than 4,5 million tons annually. Cargo would be mainly metals for export and imported goods to Russia. The design depth of the fairway is 13.0 m. The lay-out of the port area is shown in (Rytkönen, 1999).

5.3.6 Vistino

In December 2003 two companies (Northwest alliance Ltd and Northwest reserve Ltd) submitted two alternative project plans of the new fuel/oil terminal in the Luga Bay near settlement Vistino. In Vistino companies intend to construct a 15 km railway and other infrastructure on the coast. Both these projects were accepted for consideration in the Committee for Economy of the Government of Leningrad Region. Northwest alliance Ltd won, as was officially declared by the Government of Leningrad Region in January 2004. The construction works are planned to begin at the end of 2004 and the new oil terminal of Vistino is planned for construction by 2008. At a cost of 115 million USD, the project is intended to handle 4 million tons of oil and oil products (Davydova, A. 2004).

5.3.7 Gorki

The Russian–British oil company TNK-BP (Tumen Oil Company – British Petroleum) plans to build an oil terminal with a tank capacity of 250,000 m^3 on the south coast of the Gulf of Finland, at Gorki close to the border with Estonia (SSG Newsletter, 6/2004). The Leningrad County Council has already approved the plans for the port. The planned terminal is located at the north-east coast of Luga Bay near the villages Logi and Gorki, only a few kilometres north of Vistino. According to TNK-BP, this project is not connected with Vistino project.

According to TNK-BP the investment in the terminal would cost €140 million, capacity for oil products would be 12 million tons (7.5 Mtons oil, 4 Mtons mazut and 0.5 Mtons diesel fuel) per annum. The design cargo turnover will be 5–7.5 million tons annually in the first stage. The company has still to give the final go-ahead to the plan. Investors intend to start the construction at the beginning of 2005 and to complete it by the end of 2006 (Nordic Council, 2004; Pesonen, 2004).

5.3.8 Ust-Luga

In addition to Vistino and Gorki, a third project in the area, an oil terminal with a capacity of five million tons per annum, is also planned for Ust-Luga (Nordic Council, 2004). Ust-Luga is a large port in the Leningrad Region, 200 kilometres west of St. Petersburg. So far the Ust-Luga port has handled coal, mineral fertilisers, timber and cargo containers. The water depth of the container terminal's basin will be 9.5 m while as the main approach channel of the Ust Luga port will be 13.6 m and 130 m wide. Figure 32 shows the location of the planned expansion of the port complex.

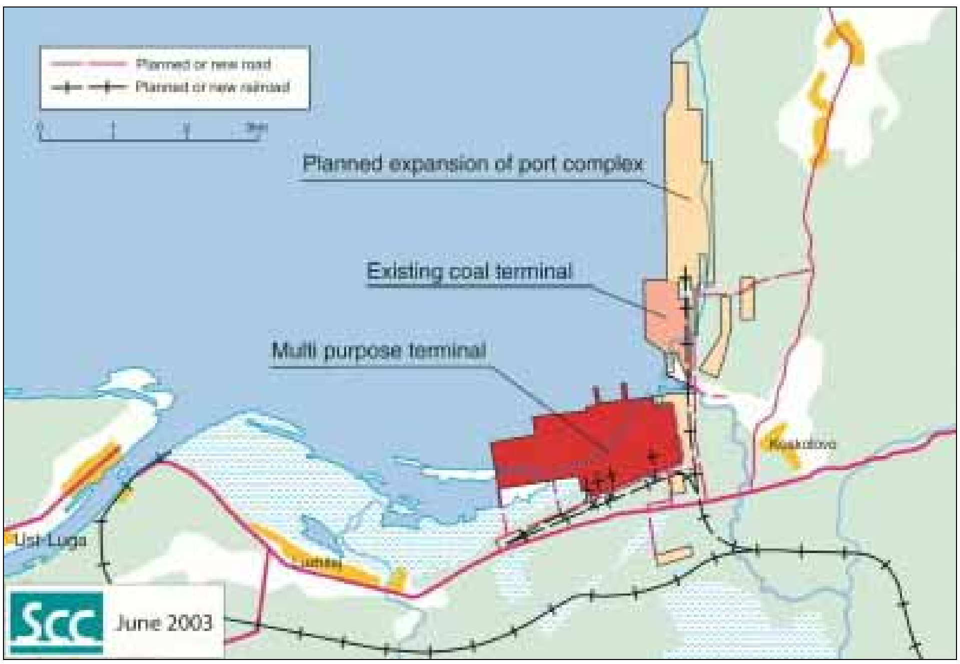

Figure 32. Location of Ust Luga port complex (Scandiaconsult, 2003).

In 2003 the Ust-Luga port transshipped 442,000 tons of cargo, which is more than twice the volume of 2002. 253,000 tons of export coal was transshipped by Rosterminalugol Company, which started operation in May 2003. The port also transshipped 185 thousand tons of timber for export from Factor river terminal (SeaNews Weekly, 25/2004). See Table 7 for a complete list of terminals in the port.

The Ust-Luga Company will begin construction of the new oil terminal in 2004. The first stage will cost around 30–35 million USD. The second stage will increase the annual capacity to the 10 million tons of petroleum products and chemicals, with the estimated budget of 110–120 million USD. The whole terminal is planned for completion in 2012, with the total capacity of 25 million tons annually (SSG Newsletter, 4/2004).

Table 7. Cargo capacity and terminals of Ust-Luga port.

No	Terminal	Capacity th ton / year	Vessels th dwt, / mooring
1	Liquid food product terminal	250	9/1
2	Perishable goods terminal	300	10/1
3	Row sugar terminal	500	40/1
4	Grain complex	3000	70/1
5	Container terminal and ro-ro cargo	4500	30–60/4
6	Rail- and motor ferry crossings	2700	Mukran type/2
7	Constructions of general port system		
8	Port vessels (base)		/4
9	Bin storage		/2
10	Coil terminal	8000	70/1
11	Ore terminal	2000	70/1
12	Ferrous metal and metal scrap reloading terminal	3200	16–50/4
13	Color metal terminal	1000	16/25/1
14	Fertilizer terminal	5700	16–70/3
15	Pipes concreting complex		20/1
16	Forest terminal	1000	10/3
17	Concrete and MCM reloading terminal	350	30/1
18	Sanitary protection terminal		/1
19	General cargo terminal	1500	10–20/3
20	Liquid chemicals terminal	1000	25/2
	Total	35 000	

Construction of a multipurpose terminal at Ust-Luga is part of the development of a port complex STP Ust-Luga, which was decided by presidential decree in 1993. The terminal consists of a ro-ro/ferry terminal and a container terminal. The capacity is planned for approximately 4 million tons per year, mainly trucks and trailers. A coal terminal has already been constructed (Scandiaconsult, 2003). Ust Luga's multipurpose port will have several construction phases. The fluid cargo terminal will have the capacity of 5 million tons per year (Häkkinen, 2003). Most part of the products will be petrochemicals, such as ethylbenzol, isopropen, styrol etc.

5.3.9 Prospects for 2004

All the above-mentioned statistics are from 2003. As the statistics from the 1st quarter of 2004 are already available (SeaNews Weekly, 37/2004), some estimates about this year's figures may be made. Estimates are presented in Table 4. Winter 2002–2003 was more severe than 2003–2004 and had a great effect on marine transportation in the eastern part of the Gulf of Finland. This is clearly shown in the 1st quarter results in 2004 (Table 8).

Table 8. Russian oil harbours' handling in January–March, 2004 compared to January–March, 2003.

Port	Oil handling 1–3/2004	Change
Primorsk	9.36 Mtons	+180%
St. Petersburg	1.79 Mtons	+ 50%

5.4 Estonian oil harbours

The total amount of all goods handled in Estonian ports in 2003 was 46.7 million tons (-0.8% compared to 2002). The port of Tallinn's share of this figure was 81%. In 2003 Estonian ports handled around 19.8 million tons oil products and nearly 8 million tons of crude, which totaled was almost 8% less than in 2002. The port of Tallinn handled alone 23.8 million tons of oil products and crude oil (Statistical Office of Estonia, 2004).

5.4.1 Tallinn

The Port of Tallinn consists of four harbours on the northern coast of Estonia. The Old City Harbour has been active for hundreds of years. Much more recent are Paljassaare Harbour, the Paldiski South Harbour, and the Muuga Harbour, established in 1986. Figure 33 shows the locations of Muuga, Paljassaare and Old City Harbour. Ports of Vene-Balti and Miiduranna are also shown. Paldiski South Harbour is not visible here as it locates 45 km west of Tallinn (Figure 21).

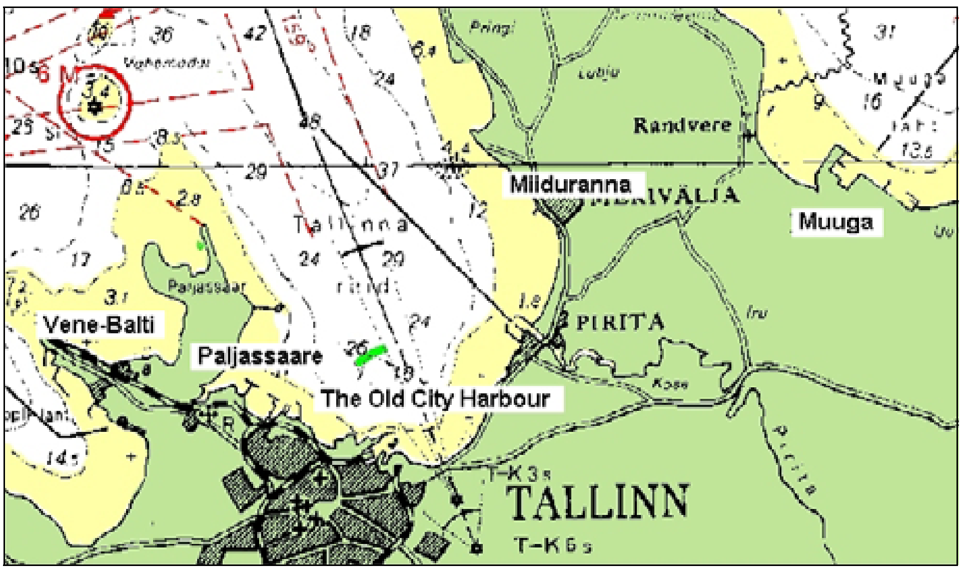

Figure 33. Ports and harbours in Tallinn city area (© Finnish Maritime Administration, 2004, permission to publish: 1837/721/2004).

Tallinn ranks first of all Baltic States' ports by handling over 37.6 million tons, of which liquid bulk constitutes 63%, i.e., 23.8 million tons (2003). Changes compared to 2002 were small. 36% of liquid bulk was oil products and 35% crude oil. Oil product handling was less than in the previous year but the crude oil handling volume exceeded that of 2002. The throughput increase of crude might have been caused by the passage limitation in the Bosporus and the Dardanelles, which resulted in cargo flow shift to the Baltic ports. In terms of cargo, transit constituted 76%, export 12.8%, and import 10.7%. Cargo traffic distribution by type is shown in Figure 34 (Port of Tallinn, 2004).

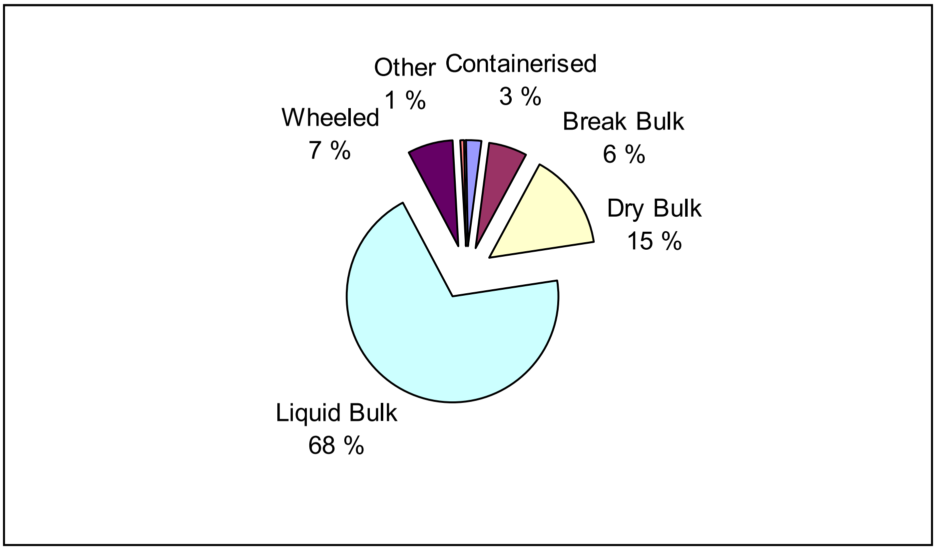

Figure 34. Cargo traffic share by cargo type in Tallinn, 2003.

5.4.2 The Old City Harbour

The Old City Harbour is one of the biggest and busiest passenger ports in the Baltic region. As for cargo handling, the Old City Harbour has focused on ro-ro and lo-lo services, but handles also mixed cargo and container shipments.

5.4.3 Muuga

Muuga Harbour is located 17 kilometres east of Tallinn and is the main cargo harbour for the Port of Tallinn. The cargo volume handled in Muuga accounts for some 80% of the Port of Tallinn's total cargo volume. Nearly ¾ of the cargo loaded in Muuga Harbour is crude oil and oil products. Oil tank capacity is 622,600 m³. See Figure 35 for a view of a Suezmax tanker in Muuga.

Figure 35. MT Alambra in Muuga harbour.

In order to facilitate growth for the future, construction of some remarkable new buildings is under way in Muuga. The oil handling capacity increased this year when a new 240-m long oil quay was opened to shipping activities. The water depth of the new quay is 18 m. It will allow the loading and discharging of tankers of up to 125,000 dwt. Tankers can be loaded from two sides. The cost of the new quay was 7.2 M€ (SSG Newsletter 19/2004). There has also been discussion about building another new quay in the part of the port where Pakterminal operates (SSG newsletter 25/2004).

The railway link with Russia is one of the most effective rail links in the Eastern Europe (Figure 36). However, the rail capacity will soon reach its maximum and will need upgrading. As the cargo traffic volumes are increasing, new railway tracks are needed for the realisation of expansion plans (Port of Tallinn, 2004).

Figure 36. Railway wagons in Muuga terminal.

Also Pakterminal, now operating in Muuga, is expanding: an agreement has been made with Estonian Transoil (a subsidiary of Neste Eesti) to purchase three cisterns and construction rights in Muuga. Capacity is needed especially for gasoline and the motor fuel imports of Neste. In 2003, Pakterminal handled 7.9 Mtons of petroleum products (SSG Newsletter 16/2004).

5.4.4 Paldiski

Paldiski South Harbour is located 45 km west of Tallinn. In Paldiski the emphasis is placed on ro-ro activity, plus the export of local goods and transit of liquid bulk and metals. Significant growth is expected in the coming years. Due to the harbour's development potential, a remarkable proportion of the Port of Tallinn's investments go to Paldiski. As the oil terminal will be enlarged, the planned timber and metal terminals require deep waters for vessels larger than the harbour can presently accommodate, the aquatory was dredged up to 12 metres in 2002, which enables the continuous growth of cargo volumes.

Development projects under way in Paldiski South Harbour include the construction of two berths able to accommodate oil tankers with a maximum size of 50,000 dwt, new terminals and enlargement of the possibilities to serve containerised goods. Currently the maximum throughput capacity is limited to 2.5–3 million tonnes per year by the railway. If the terminal operators continue to show similar growth rates, the realisation of the Kopli by-pass (in Tallinn) by Estonian Railways guarantees the continued increased freight volumes and throughput capacity. Additionally, the current 3 km of railways in Paldiski South Harbour will be prolonged as the new terminals develop (Port of Tallinn, 2004).

Oil is now being transported by rail through Tallinn to Paldiski Lounassadam. In 2003 the annual volume was in the order of 300,000 tons, but was expected to rise. Tallinn's city council has been against the transportation of dangerous goods through the city, thus an alternative route round the city has been planned.

5.4.5 Paljassaare

Paljassaare Harbour is situated on Paljassaare peninsula in Tallinn, approximately six kilometres from the centre of the city. Its handling capacity is some 3 million tonnes per year. Paljassaare Harbour specialises primarily in handling mixed cargo, coal and oil products, as well as timber and perishables. The harbour is also used for cooking oil shipments by the neighbouring refinery. Oil tank capacity is 42,000 m^3 in Paljassaare. 0.6 million tons of oil and 0.6 million tons of coal are handled in the harbour per year (SSG Newsletter 9/2003).

The rail and road connections to Paljassaare Harbour are satisfactory. Any upgrading of the railway capacity depends on the future cargo volumes passing through the city (Port of Tallinn, 2004).

5.4.6 Miiduranna

The Port of Miiduranna (Figure 37) is located on the coast of Tallinn Bay. The port area comprises two basins: the northern and southern. There are 10 quays and their total length is 878 m, depths vary from 2.5 to 13 m. Maximum dimensions for a tanker in the port are: length 195 m, breadth 32 m, and depth 12.3 m. Maximum dimensions for dry cargo vessels are: length 110 m, breadth 20 m, and depth 5.6 m. 2 million tons of oil were handled in Miiduranna in 2003 (Port of Miiduranna, 2004).

Figure 37. Miiduranna harbour area (Port of Miiduranna, 2004).

5.4.7 Vene-Balti

Vene-Balti is the westernmost port in Tallinn. The port is capable of receiving ships of up to 35,000 tons deadweight. The total length of the port's 21 quays is over 2 km. Depth at moorings for dry cargo carriers is 8 m and for tankers 11 m. 2.5 million tons of oil was handled in Vene-Balti in 2003 (BLRT Grupp, 2004).

5.4.8 Kunda

Kunda is located in the Bay of Kunda, halfway from Tallinn to the Russian border. There are no oil shipments from the Port of Kunda as yet, but there have been plans. At present, the estimate for oil transport in 2010 is some 0.5 Mtons. A new chemical terminal will be opened in Kunda port this year. Kunda Nordic Cement (the Port of Kunda) and Baltic Tank AS are building a terminal for liquid goods with a storage capacity of 50,000 m^3 (SSG Newsletter 5/2004).

5.4.9 Aseri

The planned Aseri harbour is located in eastern Estonia, some 130 km east of Tallinn. It will be designed for annual handling of 20 million tons of various products delivered by train, lorries and other vehicles. Projected commencing traffic will consists of about 7 million tons, i.e., from 8–11 trainloads a day.

The general market expectation is that Russia will need additional transit harbours in the Gulf of Finland for future export and import to/from EU and other countries. The distance from the border and major Russian oil refineries are the key factors for Aseri as compared to Tallinn. At present, the estimate for oil shipments from Aseri in 2010 is about 2 million tons per year. Competition between Aseri and Tallinn may affect on oil shipments by increasing the transit shipments from Aseri and decreasing them from Tallinn (Kalotex, 2004).

5.4.10 Sillamäe

The Sillamäe Port, located some 20 km from the Estonian–Russian border, is in the development stage. An oil terminal of up to seven million tons yearly capacity is planned. Next year, there are plans to launch the first phase of the terminal; this will be of three million tons capacity. Construction of the wharves is currently in progress and assessment of environmental effects has been made prior to the building of the oil terminal. In the first phase, five berths will be completed by the middle of next year, each with a water depth up to 16.5 metres. The development plan includes the handling of oil, petroleum products and chemicals, containers, dry-bulk and ro-ro cargo. The port is also in an ideal situation for a new passenger line terminal, which could be arranged between Kotka, St. Petersburg and Gogland island. Sillamäe port would also mean competition for the Russian multipurpose port development in Ust-Luga (Estonian Trade Council, 2004).

5.4.11 Prospects for 2004

All the above-mentioned statistics are from 2003. Statistics from the 1st quarter of 2004 are already available from the Port of Tallinn and some estimates about this year's figures may be made (Table 9). Other Estonian ports that are shipping oil this year are Vene-Balti and Miiduranna. Current information is not available so the estimate is based on last year's figures of 2.5 Mtons in Vene-Balti and 2 Mtons in Miiduranna for 2004 (Table 4). In the experts' estimation, the Baltic countries entering the EU will not affect the oil transit volume via their ports since the demand for oil in Europe is still growing and the majority of the volume will still be exported from Russia (SeaNews Weekly, 38/2004).

Table 9. Tallinn oil harbours' handling in January–March, 2004 compared to January–March, 2003.

Port	Change in total handling	Change in liquid bulk
Tallinn	+18.7%	+31%

6. Improving safety and security in the Gulf of Finland

6.1 Background

Oil tankers transport some 1,800 million tonnes of crude oil around the world by sea every year. Most of the time, oil is transported quietly and safely. The potential for oil to pollute the marine environment was first recognised by the International Convention for the Prevention of Pollution of the Sea by Oil, in 1954 (OILPOL 1954). It was still recognised, however, that although accidental pollution was spectacular, operational pollution was the bigger threat. Since then, oil spill accidents have tended to precede the improvement of regulations.

In 1967, the *Torrey Canyon* ran aground while entering the English Channel and spilled her entire cargo of 120,000 tons of crude oil into the sea. This resulted in the biggest oil pollution incident ever recorded up to that time. It was essentially this incident that eventually led to the adoption of MARPOL in 1973. The International Convention for the Prevention of Pollution from Ships (MARPOL) is the main international convention covering prevention of pollution of the marine environment by ships from both operational and accidental causes.

1978 Conference on Tanker Safety and Pollution Prevention adopted a protocol to the 1973 MARPOL Convention, expanding on the requirements for tankers to help make them less likely to pollute the marine environment. Just one month after the Conference, the *Amoco Cadiz* ran aground off Brittany, giving France its worst oil spill ever. The tanker lost 223,000 tons of crude oil, covering more than 130 beaches in oil.

In March 1989, the *Exxon Valdez*, loaded with 1,264,155 barrels (about 170,000 tons) of crude oil, ran aground in the north eastern portion of Prince William Sound in Alaska, spilling over 30,000 tons into the sea. After the disaster, the United States introduced its Oil Pollution Act of 1990 (OPA 90), making it mandatory for all tankers calling at U.S. ports to have double hulls.

In December 1999, the tanker *Erika* broke in two in heavy seas off Brittany, France, while carrying approximately 30,000 tonnes of heavy fuel oil. Some 14,000 tonnes of oil were spilled and more than 100 miles of Atlantic coastline were polluted. As a result of the *Erika* disaster, proposals were submitted to the IMO's MEPC (Marine Environment Protection Committee) to accelerate the phase-out of single-hull tankers. The *Erika* disaster also forced the European Union to take action against oil spill hazards and pollution.

In November 2002, the tanker *Prestige* broke apart and sank in rough weather carrying about 77,000 tons of oil. After one year, about 64,000 tons of the oil had leaked to the sea. The *Prestige* incident led to calls for further changes to MARPOL 73/78.

Prevention of pollution from maritime traffic has been a major item for the Baltic Sea States since the beginning of their environmental co-operation in the 1970s. The largest oil spills taken place in Baltic Sea include the *Antonio Gramsci* in May 1979 (spill 5,500 tons) off Ventspils, Latvia, and the *Baltic Carrier* in March 2001. The *Baltic Carrier*, with a cargo of 33,000 tons of heavy fuel oil, collided with a bulk carrier *Tern* off coast of Denmark. 2,700 tons of heavy fuel oil leaked from the cargo tanks into the open sea. The Helsinki Commission promptly reacted by holding an extraordinary meeting in September 2001 in Copenhagen. At the meeting, the Contracting Parties, represented through the ministers responsible for maritime transportation and the environment, and a representative from the European Community agreed on a package of measures, to ensure the safety of navigation and the adequacy of emergency capacity in the Baltic Sea area.

In the following, the methods in use to improve the maritime safety in oil transportation in the Baltic Sea and in the Gulf of Finland are presented. Some current research projects are also outlined.

6.2 ISPS code

In December 2002, the International Convention for Safety of Life at Sea (SOLAS), 1974, was amended. The existing Chapter XI of SOLAS was re-identified as Chapter XI-1 and a new Chapter XI-2 was adopted to enhance maritime security. Part ‘A’ of this code is mandatory from July 1, 2004. Part ‘B’ includes guidance for implementation and application. The IMO International Ship and Port Facility Security Code (ISPS Code) brings also the oil terminals world wide under the scope of SOLAS. The Objectives of the ISPS Code are to establish co-operation between Security Authorities, Shipping and Port Industries to assess and detect security threats and take preventative measures against security incidents affecting shipping or port facilities used in international trade. Responsibilities for ensuring maritime security are established and exchange of security related information is to be ensured. The Code also provides a methodology for security assessments. Oil tankers, shipping companies and terminals must have trained Security Officers and Security Plans. Examples of the practical effects of the new code are Ship Security Alert System capable to initiate and transmit a ship-to-shore security alert if security of the ship is under threat, and the measures designed to prevent unauthorized access to the port facility, to ships moored at the facility, and to restricted areas of the facility.

6.3 Single hull tanker phase-out

6.3.1 IMO actions

IMO's (International Maritime Organization) major function is to make shipping safer. The measures incorporated in safety conventions and recommendations apply to tankers as well as other ships. The regulations regarding the structure of tankers are included in MARPOL 73/78 (The International Convention for the Prevention of Pollution by Ships). It includes regulations regarding the subdivision and stability that are designed to ensure that, in any loading conditions, the ship can survive after being involved in a collision or stranding.

The 1978 MARPOL Protocol introduced the concept known as protective location of segregated ballast tanks, and the 1983 MARPOL amendments ban the carriage of oil in the forepeak tank – the ship's most vulnerable point in the event of a collision. In 1992 MARPOL was amended to make it mandatory for tankers of 5,000 dwt and more (if ordered after July 6, 1993) to be fitted with double hulls, or an alternative design approved by IMO (Regulation 13F in Annex I of MARPOL 73/78). The requirement for double hulls that applies to new tankers has also been applied to existing ships under a programme that began in 1995 (Regulation 13G in Annex I of MARPOL 73/78).

In April 2001, following the *Erika* incident off the coast of France in December 1999, IMO adopted a revised phase-out schedule for single hull tankers, which entered into force on September 1, 2002 (the 2001 amendments to MARPOL 73/78). The new revised MARPOL regulation 13G sets out a stricter timetable for the phasing-out of single-hull tankers, giving the year 2015 as the principal cut-off date for all single-hull tankers. In December 2003, further revisions to 13G were made, accelerating the phase-out schedule even further. These amendments are set to enter into force on April 5, 2005. The effects of the phase-out can be seen in Figure 38 as increasing share of tankers are double hulled.

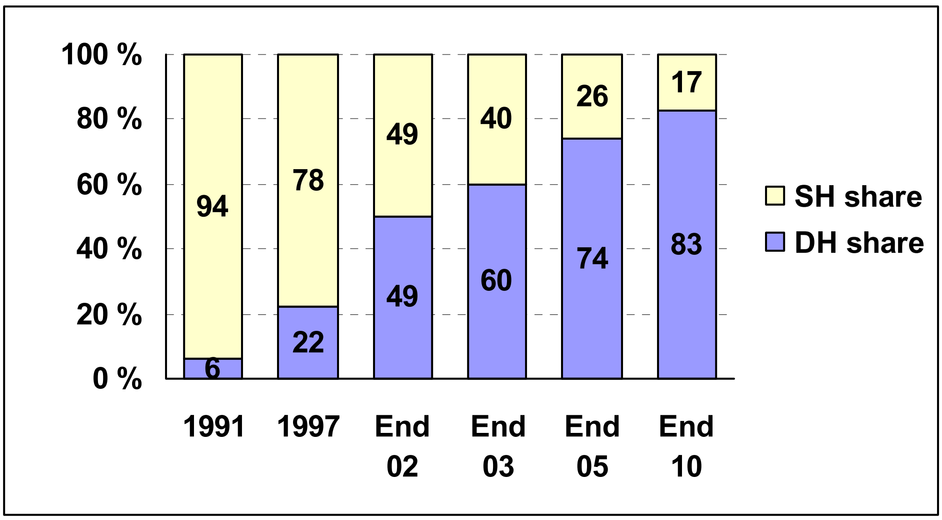

Figure 38. Tanker renewal – fleet by hull (Ranheim, 2004).

Under a revised regulation 13G of Annex I of MARPOL, the final phasing-out date for Category 1 tankers (pre-MARPOL tankers) is brought forward to 2005. The final phasing-out date for category 2 and 3 tankers (MARPOL tankers and smaller tankers) is brought forward to 2010. The full timetable for the phasing out of single-hull tankers is presented in Table 10 (IMO, 2004b).

Table 10. Phase-out schedule for single-hull tankers (IMO, 2004b).

Category of oil tanker	**Date or year (***
Category 1	5 April 2005 for ships delivered on 5 April 1982 or earlier 2005 for ships delivered after 5 April 1982
Category 2 and Category 3	5 April 2005 for ships delivered on 5 April 1977 or earlier 2005 for ships delivered after 5 April 1977 but before 1 January 1978 2006 for ships delivered in 1978 and 1979 2007 for ships delivered in 1980 and 1981 2008 for ships delivered in 1982 2009 for ships delivered in 1983 2010 for ships delivered in 1984 or later

(* A Conditions Assessment Scheme (CAS) will have to be applied to all Category 1 vessels continuing to trade after 2005 and all category 2 vessels after 2010. The requirements of the CAS include enhanced and transparent verification of the reported structural conditions and of the ship and verification that the documentary and survey procedures have been properly carried out and completed.

A new MARPOL regulation 13H on the pollution prevention from oil tankers bans the carriage of Heavy Grade Oil (HGO) in single-hull-tankers of 5,000 tons DWT and above after the date of entry into force of the regulation (16 months after the issued date of changes which is April 5, 2005), and in single-hull oil tankers of 600 tons DWT and above but less than 5,000 tons DWT, not later than anniversary of their delivery date in 2008.

The revised definition of HGO means any of the following:

- crude oils having a density at 15^{o}C higher than 900 kg/m^3
- fuel oils having either a density at 15^{o}C higher than 900 kg/m^3 or a kinematic viscocity at 50^{o}C higher than 180 mm^2/s (cST)
- bitumen, tar and their emulsions.

6.3.2 EU actions

New regulations of the European Union to speed the phase-out of single hull tankers and to allow the transportation of heavy fuel oil only with double hull tankers will improve the safety in a quite short period. In December 1999 the 36,694 dwt *Erika* (built in 1975) sank in EU waters off Brittany, France. In November 2002 the 81,259 dwt *Prestige* (built in 1976) sank off Galicia, Spain. Both were single hull tankers carrying fuel oil. Partly in reaction to these incidents, amended European Regulation on single hull tankers took effect October 21, 2003 in all Member States of the European Union. This regulation introduced three measures: the forbidding of carrying heavy grades of oil to or from ports of the Member States on single-hull tankers, the acceleration of the phase-out of all single-hull oil tankers (carrying any grade of oil), and stricter technical inspections of aging single hull-tankers that have not yet reached their age limit. The Regulation also took effect for the Accession Countries when they became full members of the European Union in May 2004, and brought the EU in line with the United States, which restricted single-hull tankers carrying heavy-grade fuel from its waters in 1992, three years after the 1989 *Exxon Valdez* disaster in Alaska (EU, 2004).

It should be noted here that all the EU actions do only regulate Finland and Estonia in the Gulf of Finland traffic. Russian Federation is a member of IMO and regulates shipping also on national level.

6.4 Oil spill response capacity

Oil spills caused by tanker incidents almost inevitably result in catastrophic environmental damage. As described earlier, the Baltic Sea marine ecosystem is very vulnerable to pollution. The Gulf of Finland would not bear a large-scale tanker accident, either environmentally or economically. Oil spill response capacity should be increased as the transportation volumes grow.

Of the Gulf of Finland coastal states only Finland has established an oil spill fund. Therefore Estonia and Russia should be encouraged to establish similar funds, from a tax/levy on tonnage of oil shipments, to be used to improve the safety of the oil transportation and to assist in the immediate response to a spill.

The fund could be based on the amount of oil transported through the waters, or have a certain cap that would ensure adequate countermeasures in the region if something would go wrong. Due to the limited area of the gulf it would only take one or two days for oil to reach the shore-line.

Due to the recently increased marine oil and chemical transportation the trilateral expert co-operative meeting stressed the importance of the preventive measures regarding accidents in the Gulf of Finland (Jalkanen, 2004). A lot of emphasis has been put on the adequate oil-combating capacity and co-operation, both nationally and internationally. One of the most vital future actions would be the signing of a marine oil and chemical pollution co-operation agreement between Estonia and Russia, an action that would strengthen the oil-combating co-operation of the area. The elaboration of a trilateral oil spill response action plan for the Gulf of Finland would here offer a sure path to better environmental protection, and the readiness of countermeasures. It should be noted here that strengthening the trilateral co-operation of the Gulf of Finland is in line with the HELCOM policy of putting more emphasis on the sub-aerial co-operation, in which local expertise on the most critical problems and the best available means to control unwanted actions can be maximised.

The privatisation and the foreign investors are also changing the oil prevention and response strategy in Russia: the participation of foreign investors usually leads to the harmonisation of western and Russian standards, EIA process and operative issues. In oil exploration business and construction of new terminals the bilateral agreements affect on the methodologies and EIA processes quickly. One example of this development is the bilateral agreement of US Department of Energy and the Russian Federation on oil spill prevention and response signed in March 12, 2003. The work program of this agreement contains re-commendations, workshops, prevention standard harmonisation, development of response techniques, management issues and sociopolitical and environmental impacts. Other examples of this development are recently published EIA reports on the new oil terminals of Vysotsk and the container terminal of Ust Luga, required by the international investment banks and investors.

6.4.1 Maritime Accident Response Information System (MARIS)

The three coastal states of the Gulf of Finland have seven oil response vessels and five aircraft for monitoring and surveillance. In total, there are 38 vessels capable for oil recovery and 18 aircraft in Baltic Sea region, according to Maritime Accident Response Information System (MARIS). These vessels are capable of combating oil spills in any part of the Baltic Sea. For example, the afore-mentioned OILI I and Russian Aglaya and Harding 1500 type vessels are not listed in MARIS. In addition, oil terminals and municipalities have their own oil-combating vessels and other equipment.

The Nordic Council of Ministers initialised a project to map out oil spill risks and the capacity to combat them in the Baltic Sea. The project was funded completely by the council and realised by the Finnish Environment Institute (SYKE). MARIS is the result of this work. It has been created by joining different existing datasets into a common format and under a single user interface. The purpose of MARIS is to help users visualise the risks of maritime transportation in the Baltic Sea but also the means to handle these risks, concentrating mainly on the risk of oil pollution and the use of oil spill response equipment. MARIS can be used to view different datasets on oil spill risk and response over a common background map and in different combinations. The data is stored in a WGS84 coordinate system and Mercator projection. The atlas consists mainly of a number of datasets describing:

- the areas most sensitive and vulnerable to oil spills
- the traffic and risk distribution
- the available resources for combating oil spills in the Baltic Sea area (MARIS, 2004).

MARIS is available online at http://www.helcom.fi/maris.html.

6.4.1 Response capacity in Finland

The Finnish Environment Institute (SYKE), operating under the Ministry of the Environment, is the competent government marine pollution-combating authority. SYKE is in charge of measures against pollution incidents in the open sea and whenever severity of an incident so necessitates. The core of the response capacity is formed by the Finnish Navy and by vessels from the Frontier Guard. The Finnish State Shipping Enterprise (Finstaship) also has nine fairway maintenance vessels equipped with build-in oil recovery systems. The Government of Finland has plans to purchase a new multi-purpose icebreaker that would be capable of oil and chemical spill response operations, and to help Russia and Estonia invest in oil spill response capacity. The rebuilding of two out guardian vessels of the Finnish Frontier Guard, M/S Tursas and M/S Uisko, to convert them into multipurpose vessels – for open water and ice conditions – will be completed in 2004–2005. The Finnish oil recovery vessels located in the Gulf of Finland are listed in Table 11. In addition to these, Finland has two Dornier 228 aircraft with remote sensing equipment capable of detecting oil, even in poor visibility conditions (HELCOM, 2003a).

Table 11. Finnish oil recovery vessels in the Gulf of Finland.

Vessel	**Site**	**Length**	**Tank capacity**	**Max lifting cap**
HYLJE	Kirkkonummi	54 m	800 m^3	96 m^3/hr
OILI I	Helsinki	24 m	80 m^3	60 m^3/hr
SEILI	Kotka	50.50 m	196 m^3	72 m^3/hr
MERIKARHU	Helsinki	58 m	40 m^3 +sacking equip.	91 m^3/hr

6.4.2 Response capacity in Russia

The State Marine Pollution Control, Salvage and Rescue Administration of the Russian Federation (SMPCSRA) is the Russian organisation responsible for combating oil and other harmful substance pollution in the sea area (at national level). It is part of the State Maritime Administration of the Ministry of Transport of the Russian Federation. In the Baltic Sea area SMPCSRA has delegated the contingency functions to Baltic BASU, which operates out of St. Petersburg. The Baltic BASU has 12 specialised vessels and floating units for oil spill-combating and 5 subsidiary vessels in Kaliningrad. Russian oil recovery vessels located in the Gulf of Finland are listed in Table 12, according to HELCOM Oil Combating Manual (HELCOM, 2003a). Russian RosMorPort has recently (July, 2004) ordered two new icebreakers for the Gulf of Finland area to be completed in 2006 and 2007. According to the tender documents both ships have options for the oil recovery equipments. There is, however, no supporting data to guarantee that these options will be realised.

Table 12. Russian oil recovery vessels in the Gulf of Finland.

Vessel	Site	Length	Tank capacity	Max lifting cap
YASNIY	St. Petersburg	82 m	400 m^3	4x70 m^3/hr
3 UNITS HARDING1500		17 m		
2 UNITS AGLAYA-TYPE		24 m	5 m^3	25 m^3/hr

6.4.3 Response capacity in Estonia

The Estonian Board of Border Guard (EBG) is responsible for the co-ordination of combating oil and other harmful substances at sea. Equipment, including booms, skimmers, hot water washers, absorbents, etc. is mainly located in Tallinn. A LET-410 aircraft is available for monitoring and for assisting in directing response operations. This aircraft is not yet equipped with SLAR sensors, however, it does have RDR-1400c onboard search and weather radar. The Estonian oil recovery vessels located in the Gulf of Finland are listed in Table 13 (HELCOM, 2003a).

Table 13. Estonian oil recovery vessels in the Gulf of Finland.

Vessel	Site	Length	Tank capacity	Max lifting cap
REET	Tallinn	30 m	50 m^3	80 m^3/hr
TRIIN	Tallinn	34 m	15 m^3	80 m^3/hr
KATI	Tallinn	40 m	113 m^3	120 m^3/hr

6.4.4 Response development required

There has been intensive co-operation among the Gulf of Finland countries to monitor the water quality, to find out ways to minimise the antropogenic impact and to develop oil spill countermeasures. This trilaterally based work has had meetings and workshops both in scientific and high political level. One of the last high-level meetings in Espoo, March 2004, listed certain recommendations for the future development (Jalkanen, 2004):

- the oil recovery fleet of the Gulf of Finland area should be increased by number of the vessels and by better capability
- mechanical oil recovery equipments for the ice conditions should be improved
- research and development is required for the development of the pumping capacity of the high-viscosity oils
- the oil types and qualities should be identified and defined in the Gulf of Finland area, thus after an accidental oil spill the countermeasures can be started in the best manner
- more knowledge is required to find out both the short-term and the long-term behaviour of oil in the Gulf of Finland environment
- aerial surveillance of the area should be increased.

The regionally feasible standard for oil response equipment / personnel should be agreed trilaterally. This would require a preparation of Memorandum of Understanding in a high political level. Here the response planning standard should be based on the previously mentioned full FSA study, for three levels:

1. open water recovery capacity in a predetermined period (48 or 72 hours period), including both the recovery and pre-storage capacity
2. open water booming capacity in predetermined period (protective measures) and
3. shore-line recovery and cleaning capacity, for a certain amount of oil to be recovered. Here the standard should be set at least at 20 000–30 000 tons of oil, corresponding one or two oil tanks of the Aframax class tanker.

6.5 GOFREP

The Gulf of Finland mandatory Ship Reporting System (Gulf Of Finland REPorting, GOFREP) is a mandatory Ship Reporting System, adopted by the IMO (MSC.139(76)), for the international waters of the Gulf of Finland. GOFREP was established to improve maritime safety, to protect the marine environment, and to monitor compliance with the International Regulations for Preventing Collisions at Sea. The system is in operation as of July 1, 2004. The sea areas in the Gulf of Finland are monitored jointly by Finland, Estonia and the Russian Federation.

See Figure 39 below. The Gulf of Finland has been divided by mutual agreement into two monitoring sectors. The Central Reporting Line dividing the GOFREP area between the monitoring areas of Finland and Estonia is drawn through the mid points of the separation zones of the traffic separation schemes (TSS) off Kõpu, the Hanko Peninsula, Porkkala and Kalbådagrund to 59°59’,15N 026°30’,0E. Estonia (Tallinn Traffic) monitors the southern sector and Helsinki Traffic in Finland monitors the northern sector. The eastern part of the Gulf of Finland, the Russian territorial waters, is monitored by Russia (St. Petersburg Traffic).

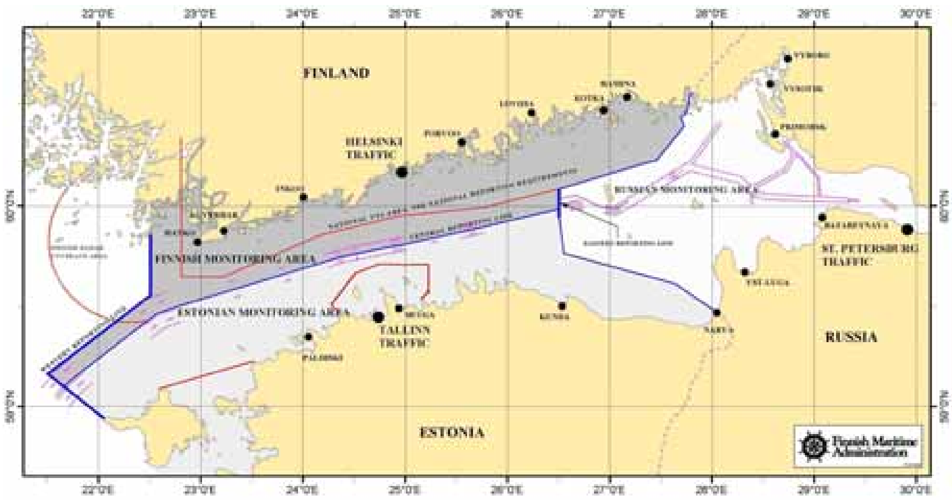

Figure 39. GOFREP area (Copyright: Finnish Maritime Administration).

As the volume of traffic grows, so does the risk of accidents. According to a risk analysis on shipping in the Gulf of Finland (VTT, 2002a), GOFREP will reduce the risk of two vessels colliding by 80%. The risk of oil spill will be proportionally reduced. Even if GOFREP reduces the accident probability, no preventive measure can eliminate all risks. Ship crews will still be responsible for the navigation of their ships after the system comes into operation.

GOFREP Traffic Centres collect and provide information on shipping related to the safety of navigation, for instance navigational warnings and information about traffic, weather or ice. All vessels of 300 GT or more are required to participate in GOFREP. Vessels of under 300 GT are required to participate in circumstances where they:

- are not under command or at anchor in the traffic separation scheme (TSS)
- are restricted in their ability to manoeuvre
- have defective navigational aids.

Vessels using GOFREP are monitored by radar and AIS as are those contravening the Regulations for Preventing Collision at Sea 1972 (as amended), and their course and speed are broadcast. If a vessel continues to contravene regulations after a reprimand, the offender will be reported to the maritime authorities for further action. The maritime authority may report the matter to the offending vessel's Flag State for action to be taken in accordance with IMO Resolution A.432(XI). More detailed information is given in the GOFREP Master's Guide, which was issued in May 2004 (GOFREP, 2004).

6.6 Exclusive Economic Zone (EEZ)

The Finnish Parliament is working on a governmental bill (HE 53/2004) concerning the Finnish economic zone. The economic zone is a jurisdiction area defined in the UN Convention on the Law of the Seas (UNCLOS) as a maritime area between territorial waters and open sea (SopS 49–50/1996, in Finnish). In the Gulf of Finland, the proposed economic zone would extend to the so-called middle line, i.e., the line agreed with the neighbouring states in question. That area consists almost totally of the present fishing zone of Finland.

Considering the vessel traffic data obtained in GOFREP activity, it is notable that in the economical zone Finland can apply the Finnish Vessel Waste Act. This means that foreign vessels can be also sanctioned for contravening the Finnish Vessel Waste Act if the offence happens in the Finnish economic zone. GOFREP data might be essential when detecting and proving which vessel is responsible for the spill.

6.7 Recent HELCOM activities to improve the maritime safety

6.7.1 General

Because oil transport volumes are increasing the risk of a larger scale accident involving an oil spill will also be higher in the future. Thus far only small oil spills have taken place in the Gulf of Finland. In terms of scale, hundreds of tons of oil have been involved. Major part of the oil spills have been illegal bilge water releases of few tons. Based on the accident statistics of the Vessel Traffic Service (VTS) stations in Finland, there have been around 80 shipping accidents in the Finnish territorial waters of the Gulf of Finland over the last decade. This amounts to roughly eight accidents per year. HELCOM's annual statistics for the whole Baltic Sea shows roughly 55–60 accidents per year, and there is only a limited number of accidents leading to the significant oil spills. Thus it is difficult to make any statistical analyses of the oil spill statistics, given the rather limited data and the lack of large-scale accidents. One can believe that an oil spill is a probability, but precise data related to any such estimation would be limited.

The Gulf of Finland’s traffic has already been analysed in connection with the GOFREP (see section 6.5) service, based on 2000 traffic volumes. When this service was introduced to IMO an FSA analysis was made to define both collision risks and the benefits of the system for the maritime community. In this study, the only risk handling option presented was the GOFREP service. Now for the whole Gulf of Finland a full FSA study should be performed, including analysis of shipping traffic along the coastal waters – and the potential risk of groundings – and the traffic along the international waters. The most difficult task would no doubt be the qualitative ranking of the risk-handling tools, which would be available to cope with the risks in advance. This would be the task where a lot of decision makers, experts, and stakeholders are needed for joint brainstorming sessions.

When considering the improvement of maritime safety or the protection of the marine environment, there are a lot of items for further research and development. The following presentation gives a list of items suitable for the improvement of safety and environmental protection. Some of the items listed below are based on the HELCOM work, some came from various occasions such as expert meetings and workshops.

6.7.2 Winter Navigation

Following the HELCOM extraordinary ministerial meeting in Copenhagen in September 2001, a special ICE working group was established. The working group completed its tasks at the end of 2003. As a result of the group's work, a new recommendation was launched by HELCOM entitled "Safety of Winter Navigation in the Baltic Sea Area" (HELCOM, 2004a). The new recommendation includes guidelines on the following subjects:

- Ice surveillance systems; a task on how information about ice conditions should be obtained and distributed.
- Equivalence of ice classification rules; a task to identify any approximate correspondence table between Ice Classes of the Finnish–Swedish Ice Class Rules (Baltic Ice Classes) and the Ice Classes of other Classification Societies, Table 14.
- Safety requirements such as traffic restrictions based on the safety aspects and their defined exceptions, plus the winterisation of ships.
- Operational matters related to winter navigation; this task introduces how the GOFREP traffic centres, icebreakers and the administration should distribute information about way-points and certain operational instructions to ships. These instructions contain information on sailing alone, or in ice, or under icebreaker supervision with the additional aspects with escorting, towing, or convoy-type assistance.

Table 14. Approximate correspondence between ice classes.

Classification Society	Ice Class				
Finnish–Swedish Ice Class Rules	IA Super	IA	IB	IC	II
Russian Maritime Register of Shipping (Rules 1995)	UL	L1	L2	L3	L4
Russian Maritime Register of Shipping (Rules 1999)	LU5	LU4	LU3	LU2	LU1
American Bureau of Shipping	IAA	IA	IB	IC	D0
Bureau Veritas	IA SUPER	IA	IB	IC	ID
CASPPR, 1972	A	B	C	D	E
China Classification Society	B1*	B1	B2	B3	B
Det Norske Veritas	ICE-1A*	ICE-1A	ICE-1B	ICE-1C	ICE-C
Germanischer Lloyd	E4	E3	E2	E1	E
Korean Register of Shipping	ISS	IS1	IS2	IS3	IS4
Lloyd's Register of Shipping	1AS	1A	1B	1C	1D
Nippon Kaiji Kyokai	I*A Super*	I*A*	I*B*	I*C*	I*D*
Registro Italiano Navale	IAS	IA	IB	IC	ID

6.7.3 Escort Towing Capacity

The need for escort towing in tanker transport routes has been recognised by experts, and a recommendation by HELCOM has been made (HELCOM, 2004b). This has been done to carry out an evaluation on the need of escort services for laden oil and chemical tankers on voyages to and from oil and chemical ports, terminals, and off-shore loading places (Figure 40). The evaluation should be carried out prior to July 1 2005 by the governments of the HELCOM countries bound to the main terminals and on/offshore loading places in their territory or in waters under their jurisdiction.

Figure 40. New escort tug boat Ahti assisting DAT-ship Tempera on her way to Sköldvik oil terminal. MT Tempera is built in 2002 and has 1A Super Ice Class.

The need for both escort towing and emergency towing capacity with adequate fire fighting devices has been much discussed with the experts on the maritime safety in the Baltic. There is now a HELCOM recommendation on the adequate emergency capacity (HELCOM, 2003b). At this moment, there are only few shipping operators that use escort tug boats, in the textbook definition of escort. The conventional tug boat used for harbour maneuvers is not capable of escorting or emergency towing. Escort tug boats have more power and better rudder arrangements than conventional tugs, and so can maintain assistance even in difficult weather and at a higher speed. An escort tug can offer first aid to the tanker and prevent it from going onshore in the case of black-out situation. This is the main reason the Finnish oil company Fortum uses escort tugs when assisting oil tankers to its refineries.

Experts have also recommended additional safety measures for tankers: they can be fitted with emergency tow packages that can easily be deployed to a tug in the event of power or rudder failure (Steiner, 2004). These should consist of adequate tow wire and pick-up line and buoy.

6.7.4 Pilotage

The need for compulsory pilotage has been discussed several times in connection with the Baltic Sea, and especially with the Danish Straits. HELCOM established a special Expert Working Group (EWG) on Pilotage, which had its first meeting on May 5–6, 2003 in Helsinki. The last meeting was held this year in Poland, resulting in a report on the need to and possibility of establishing compulsory pilotage within special high risk areas (HELCOM, 2004d).

The Pilot EWG identified a total of ten high-risk areas around the Baltic Sea. The Gulf of Finland as a whole was recognised as a high-risk area, however, it was divided into two blocks: the Russian territorial zone, and the rest of the gulf up to the Hankoniemi Peninsula, Figure 41.

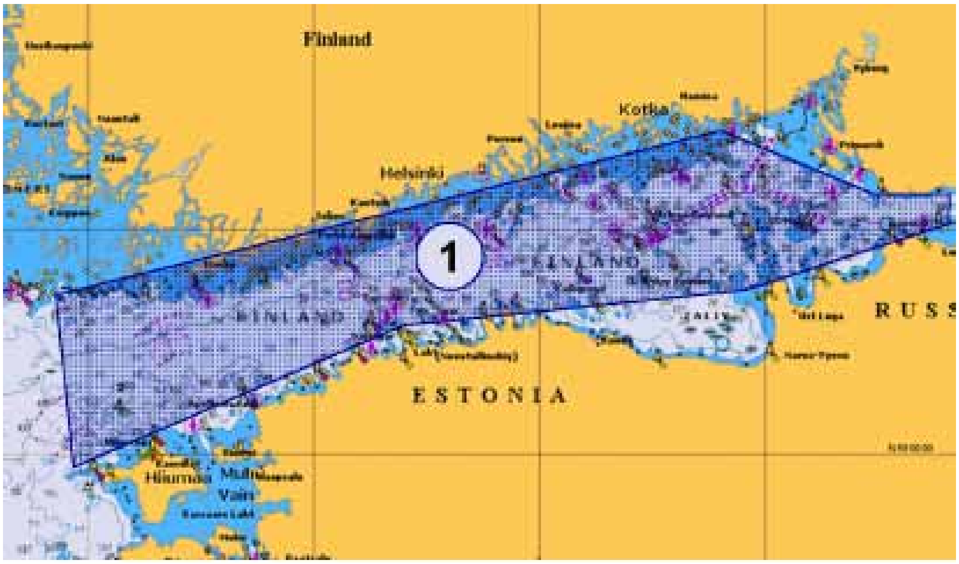

Figure 41. The high-risk area of Gulf of Finland as defined in the HELCOM Pilotage EWG's report (HELCOM, 2004d).

The criteria defining some area as high-risk included statistical information about accidents and near misses, the nature of the sea area including data on water depths, fairway dimensioning, traffic intensity, risk of pollution and the consequences of pollution.

In the Gulf of Finland area, the primary parameters defining the area as high-risk are dense traffic including large oil tankers and the existence of severe ice conditions during winter. However, several safety measures have been implemented in the area, such as national VTS services and the GOFREP service. The use of pilots is considered here as mandatory for certain ships when entering ports, but compulsory deep-sea pilotage is not considered necessary for ships navigating through the Gulf of Finland.

The pilotage EWG recommended, however, that a formal safety analysis should be made, especially concerning the eastern part of the gulf waters where the risk of pollution due to collision or grounding (taking into consideration dangerous and pollutant cargo and the amount of bunker oil) is very high.

6.7.5 Automatic Identification System (AIS)

A requirement for ships to carry automatic identification systems (AISs) was adopted by IMO in 2000. AIS transponders automatically provide information about the ship to other ships and to the coastal authorities. Information, including a ship's identity, type, position, course, speed, navigational status and other safety-related information can also be received from similarly-fitted ships and data exchanged with shore-based facilities. AIS must be fitted aboard all ships of 300 gross tonnage and upwards engaged in international voyages, cargo ships of 500 gross tonnage and upwards, and passenger ships irrespective of size built on or after July 1, 2002.

The requirement also applies to ships engaged in international voyages constructed before July 1, 2002, according to the following timetable:

- passenger ships, not later than July 1, 2003
- tankers, not later than the first survey for safety equipment on or after July 1, 2003
- ships, other than passenger ships and tankers, of 50,000 gross tonnage and upwards, not later than July 1, 2004.

Other ships between 300 and 50,000 GT will be required to fit AIS before the first safety equipment survey after July 1, 2004 or by December 31, 2004, whichever occurs earlier.

After the extraordinary ministerial meeting in September 2001, an EWG for establishing national, land-based monitoring systems for ships, based on AIS signals, was established by HELCOM. The basic goal has been to provide AIS data for all the HELCOM countries and to ensure all the contacting parties should have their AIS coverage ready for operation before July 1, 2005. The AIS system is currently operating in five Baltic Sea states, while the other sea states are at the phase of completing their national systems (HELCOM, 2004c).

The AIS data is distributed to the national AIS server through the HELCOM AIS server located in Denmark. The new system will also provide traffic statistics for HELCOM for various risk or traffic analyses. The AIS information can also be used in:

- establishing a traffic separation scheme between Sweden and Bornholm (see routeing below)
- determining areas the require pilotage
- determining areas of near misses
- determining areas that require aids to navigation, and
- determining requirements for survey.

AIS is definitely one of the most promising new tools for improving safety in the Baltic Sea area. It will also be a great tool for the FSA-type analyses. Therefore it is recommended here that AIS-based statistical tool for traffic and risk analysis is developed. There are already other, ongoing pilot studies developing AIS-based applications such as the Safety@Sea-project covering the North Sea (HELCOM, 2004c), the AIS pilot study to locate oil spills and to determine the size and the depth of oil pollution, and VTT's intelligent software-development. This latter is for predicting critical shipping movements on specific critical routes or crossings and giving early warning messages to VTS operators or the crews of the ships. Here perhaps the most challenging task is how to include the human-machine interaction to the system under development.

6.7.6 Routeing

The latest routeing measures concerning the Gulf of Finland have been 1.) new deep water route to Primorsk oil terminal in Russia adopted by IMO Sub-Committee on safety of Navigation at its 47th session and 2.) GOFREP system. The GOFREP system is a mandatory ship reporting system that will in future be further developed into a Vessel Traffic Management and Information Service (VTMIS). One necessary element for the VTMIS, a shared database between Finland, Estonia and Russia, already exists.

At this very moment, routeing measures are being planned in the southern parts of the Baltic Sea. The sea area between Sweden and Bornholm is one of the critical areas under survey. The HELCOM routeing EWG is currently studying the proper routeing actions with the aid of risk analyses and AIS images. There are other risk areas identified in the southern Baltic for possible routeing measures. New routeing measures for deep draft tankers have also been studied in the case of the island of Gotland: new surveys have found shallow embankments westbound from the current traffic separation scheme.

6.7.7 Surveillance and oil-combating

The early warning of illegal oil discharges and accidental oil spills requires good trilateral-based co-operation on monitoring and surveillance. In the whole Baltic Sea area, a three-tier approach has been proposed by HELCOM's Response Group when elaborating and reviewing recommendations in the response field (HELCOM, 2003c):

- Tier 1: minimum national response capacity is required according to the size of the response area
- Tier 2: sub-regional response arrangements and
- Tier 3: establishment of an overall HELCOM response capacity for the whole Baltic Sea area.

The first Tier does not cover the density of traffic, sensitivity of the area or expected "statistical oil spill risk". However, these issues should be taken into account when the locations of the oil recovery fleet and shore-based clean-up depots are designed. Tier 2 provides a good possibility for concrete co-operation in the GOF area, getting the full HELCOM support, as stated in Tier 3. Together with the message of Tier 3 and HELCOM's recommendation 23/2 on the co-operation and assistance to Estonia, Latvia, Lithuania and Russia (in the field of combating marine pollution incidents) this gives a starting point for the development of national facilities for combating oil and for conducting aerial surveillance in accordance with the following items (HELCOM, 2002):

- implementation of the national contingency plans – especially in the field of combating pollution incidents caused by harmful substances – as well as in the field of aerial surveillance
- education and training of administrative personnel, on-scene commanders, staff operators, field and maintenance personnel

- research and development in the field of, e.g., risk assessment, modelling and environmental mapping, combating and aerial surveillance techniques and equipment

- the status concerning to this recommendation will be checked during the 28th meeting of the Helsinki Commission in 2007, and to propose new revisions of the recommendation 23/2, as appropriate.

6.7.8 Other means to improve safety

The Copenhagen Declaration identified a set of measures to be fulfilled so as to improve safety in the Baltic Sea area. Those actions that also have an impact on the Gulf of Finland area are:

- Resurveying of major shipping routes and ports. This work has been done in the Russian territorial area, and is in progress both in Finland and Estonia.

- Electronic navigational charts (ENC); ENC will cover major shipping routes and ports, also including the secondary shipping routes and ports by the end of 2004.

- Electronic Chart Display (ECDIS); to use ECDIS display as equivalent to paper chart and to request parties to have ECDIS onboard deep draft tankers, chemical and gas carriers (HELCOM, 2001).

6.8 Current research and activities in EU

6.8.1 POP&C

The three-year, EU-funded research project entitled "POP&C; Pollution Prevention and Control – safe transportation of hazardous goods by tankers", was launched in January 2004. The research project, led by Intertanko (International Tanker Owners) is focused on three main items, which are:

- developing a methodology by which tanker owners can calculate the spill risk posed by their ships

- developing and provide advice on ways to reduce these risks, and
- advising tanker crews on how to mitigate pollution damage once a spill has occurred.

The first phase of the project studies past oil tanker accidents. The idea is to go through the "lessons learned" and to find out the key factors that caused the damage or/and the failures. This first stage will include tankers of more or less 100,000 dwt, that is near the Aframax size. However, it is expected that the project will be expanded in the future to include a full range of ship sizes.

The second phase will focus on ways in which tanker owners can improve safety. Finally, the third phase of the project will investigate and recommend a variety of pollution prevention and protection methods that can be used by tanker crews in the event of a spill.

POP&C project website is available at http://www.pop-c.org/.

6.8.2 ARCOP

The main target of the newly set-up Arctic Operational Platform Project (ARCOP) is the efficient and safe movement of oil and gas from the western sector of the Arctic region to consumers in Europe. A research and development project was launched in 2002 between the EU and Russia. There are a number of alternative routes for conveying oil and gas from Russia to the European market: direct pipelines, shipments across the Baltic Sea, and direct carriage by ships along the western part of the Northern Sea Route. The ARCOP project aims to develop an alternative that will make use of the Northern Sea Route.

The environmental safety of shipping has lately become an issue in sea transport. Critical assessment of environmental safety is one of the priorities of the ARCOP project. ARCOP also aims to map out and give recommendations for the legislative basis to be applied. Russia’s arctic natural resources of and their access to the world market are vital elements of Russia's development potential.

Open and critical discussions, to be conducted at the seminars organised during the ARCOP project, will be an integral part of the project. A total of 21 organisations from five EU Member States (Finland, German, Great Britain, The Netherlands, and Italy) as well as from Norway and Russia participate in the project. ARCOP is led by Kvaerner Masa-Yards. The project will run for three years and its costs amount to € 5.23 million, of which € 3.02 million is aid from the EU (ARCOP, 2004).

6.8.3 Baltic Oil Spill Safety (BOSS)

A new EU-funded project aimed at improving the detection of and reaction to oil spills in the Baltic Sea has been launched recently under the Tacis Programme. The two-year project has a total budget of € 2 million. The State Marine Pollution Control, Salvage and Rescue Administration of the Russian Federation (MPCSRA) will implement it primarily in St. Petersburg, with assistance from European and Russian experts. The consortium is led by COWI A/S (Denmark), in co-operation with Carl Bro A/S (Denmark), VTT Industrial Systems (Finland) and the Finnish Environmental Institute (SYKE).

The project is aimed at enhancing international co-operation on the prevention and treatment of oil spills in the Baltic Sea, with the purpose of averting or minimising ecological damage through boosting early reaction capacity to spills which result from oil operations or accidents. It has six principal targets:

1. Feasibility study for a joint coordination and information centre.
2. Risk assessment of possible ship transportation routes and an evaluation of the issues concerning the reduction of marine/ship-related accidents.
3. Review, analysis and evaluation of the existing control and reaction systems in the different Baltic countries.
4. Elaboration of a manual of harmonised methods through which the monitoring of oil spill pollution could be achieved.
5. Elaboration of a manual of rules and procedures for monitoring and treating oil spills in Russian ports.
6. An inventory of existing oil spill response and monitoring equipment.

A cleaner Baltic Sea will benefit the whole region. As part of the wider efforts to preserve nature and improve the quality of life in St. Petersburg and Kaliningrad, the project will promote this knowledge throughout those agencies and administrations of the Russian Federation responsible for oil monitoring and response systems. The implementation of the project will also contribute to increasing stocks of fish, shellfish and other marine organisms, which in-turn will profit fishing fleets, local communities and the local coastal industry.

6.8.4 The Northern Dimension

The Northern Dimension in the external and cross-border policies of the European Union covers the Baltic Sea region, Arctic Sea region and North West Russia. It addresses the specific challenges of those regions and aims to increase co-operation between the EU member states and Russia. The Northern Dimension was implemented within the framework of the Europe Agreements with the Baltic States, the Partnership and Co-operation Agreement with Russia and the European Economic Area regulations. The areas for co-operation under the Northern Dimension are the environment, nuclear safety, energy co-operation, Kaliningrad, infrastructure, business co-operation, Justice and Home Affairs, social development and others. The Northern Dimension operates via those EU financial instruments available for the region: Phare, Tacis and Interreg. The Northern Dimension aims to use these financing instruments for projects, which provide added value.

The Northern Dimension aims at addressing the special regional development challenges of northern Europe. These include harsh climatic conditions, long distances, particularly wide living standard disparities, environmental challenges including problems with nuclear waste and waste water management, as well as insufficient transport and border crossing facilities. The Northern Dimension aims to intensify cross border co-operation between the EU and its neighbouring countries and regions in northern Europe. It aims to create security and stability in the region, as well as building a safe, clean and accessible environment for all people in the north.

With the enlargement of the Union to Poland and the Baltic States the importance of the Northern Dimension increased. The Baltic Sea is surrounded by EU Member States and Russia, and the EU's common border with Russia was extended (European Commission, 2004).

6.8.5 Natura 2000

European Union network for the protection of European fauna and flora, the NATURA 2000 network, includes several marine and coastal areas in the Baltic Sea. With the accession of Estonia to the EU, the marine expansion of the

Natura 2000 network may have implications for oil terminal developments and fairway planning in major parts of the Gulf of Finland.

The European Union Nature conservation policy is based on three main pieces of legislation – the Birds directive, the Habitats directive, and the CITES regulation. Its priorities are to create the European ecological network (of special areas of conservation), NATURA 2000, and to integrate nature protection requirements into other EU policies such as agriculture, regional development and transport. Of special relevance are areas classified under article 4 of Directive 79/409/EEC on the conservation of wild birds (Special Protection Areas).

6.9 Other related activities

6.9.1 Arctic Council

On September 19, 1996, Canada, Denmark (including Greenland and Faroe Islands), Finland, Iceland, Norway, the Russian Federation, Sweden and the United States signed the declaration establishing the Arctic Council, a high-level forum designed to identify priorities for regional co-operation in relation to environmental and sustainable development in the Arctic. Organisations representing Arctic indigenous communities are also included as Permanent Participants in the Arctic Council. The Arctic Council is building upon and carrying forward work undertaken within the Arctic Environmental Protection Strategy (AEPS) adopted by the eight Arctic States in Rovaniemi, Finland 1991 (Arctic Council, 2004).

The expert work of the Arctic Council is carried out in five working groups (Figure 42): the Arctic Monitoring and Assessment Program (AMAP), Conservation of Arctic Flora and Fauna (CAFF), Emergency Prevention, Preparedness and Response (EPPR), Protection of the Arctic Marine Environment (PAME), and Sustainable Development Working Group (SDWG). In addition the Arctic Council has special initiatives such as Arctic Council Action Plan to Eliminate Pollution of the Arctic (ACAP) and Arctic Climate Impact Assessment (ACIA).

Figure 42. Structure of the Arctic Council and its subsidiary groups.

In the Baltic Sea area it is the Northern part of the Gulf of Bothnia, which is defined as part of the Arctic zone. However, even if the "tight" definition of the "Arctic" does not include the Gulf of Finland's environment, there are a lot of environmental similarities, which may give guidance for the evaluation of the environmental impact of oil transportation. Especially the AMAP, PAME and EPPR groups have a lot of written documents and on-going activities, which offer valid tools for use in the Northern Baltic area. Guidelines for Environmental Impact Assessment in the Arctic was published 1997. EPPR has published guidance on the Environmental Risk Analyses of Arctic Activities (Arctic Council, 2004), which together with the FSA procedure adopted by IMO could provide an optimal tool for risk analyses of the Gulf of Finland. The EPPR Working Group has also developed a number of tools including a Circumpolar Map of Resources at Risk from Oil Spills in the Arctic, a Field Guide for Oil Spill Response in Arctic Waters, and Source Control Management approaches for selected facilities. Furthermore, PAME is updating its Arctic Offshore Oil and Gas Guidelines (1997) and will publish Arctic Council Guidelines for Transfer of Refined Oil and Oil Products in Arctic Waters by the end of 2004. Arctic Marine Strategic Plan will be adopted by the Arctic Council at the Ministerial Meeting November 2004 and Plan will direct the work of the Arctic Council working groups relating to marine issues.

Over the past 10 years, the AMAP Working Group has conducted two major assessments of the state of pollution in the Arctic, the second of which, Arctic Pollution 2002, was issued in October 2002. Currently AMAP is preparing an assessment of Potential Impacts of Oil and Gas Activities in the Arctic to be published at the Ministerial Meeting in 2006. The comprehensive assessment evaluates social and economic consequences and environmental and human health impacts or effects associated with oil and gas activities in the Arctic.

6.9.2 Baltic 21

Baltic 21 is a regional multi-stakeholder process for sustainable development initiated in 1996 by the Prime Ministers from the eleven member states of the Council of the Baltic Sea States (CBSS). Baltic 21 members are the CBSS member states, the European Commission, intergovernmental organisations, international financial institutions, international subregional, city and business community networks and other international non-governmental networks.

Baltic 21 – an Agenda 21 for the Baltic Sea Region – reviewed progress towards sustainable development in the Baltic Sea Region in its latest five year assessment. Baltic 21 has published a wide range of sector reports and periodic reports on the sustainable development (Baltic 21, 2004). The maritime development of the Gulf of Finland, however, has not yet been recognised. The focus of the Baltic 21 Action Programme in the transport sector includes the development of regional strategies to support sustainable sea transport. The goal with regards to sustainable transportation in the Baltic Sea Region consists of two main components:

- to minimise the environmental effects and to protect the human health and the environment, in particular the sensitive ecosystems of the region

- to retain the ability of transport to serve the economic and social development of the Baltic Sea Region.

Thus it might be recommended that the Baltic 21 Secretariat consider a special pilot or lighthouse project on sustainable maritime transport in the Gulf of Finland, in which environmental risks could be identified and available risk handling options would be found. Here the new co-operative instruments would require the development of new legal framework and to strengthen the investors' ability to develop the preventive measures against accidents.

6.9.3 The International Oil Pollution Compensation Funds (IOPC Funds)

IOPC Funds are part of an international regime of liability and compensation for oil pollution damage caused by oil spills from tankers. Under the regime the owners of a tanker are liable to pay compensation up to a certain limit for oil pollution damage following an escape of persistent oil from their ship. If that amount does not cover all the admissible claims, further compensation is available from the IOPC 1992 Fund if the damage occurs in a state, which is a Member of that Fund (IOPC, 2004).

There are at present two IOPC Funds: the 1971 Fund and the 1992 Fund. These two intergovernmental organisations were established at different times (1971 and 1992), have different maximum amounts of compensation, and had different member states. The membership of the 1992 Fund is increasing. Due to a number of denunciations of the 1971 Fund Convention, this Convention ceased to be in force on May 24, 2002 and the 1971 Fund therefore has no member states. The 1971 Fund will continue to deal with a number of incidents, which occurred in 1971 Fund Member States before that date. The two organisations have a joint Secretariat, based in London.

Additional compensation is likely to be available in future for victims of oil pollution from oil tanker accidents, following the adoption of a Protocol establishing an International Oil Pollution Compensation Supplementary Fund. The Protocol was adopted by a Diplomatic Conference held at the Headquarters of the International Maritime Organization (IMO) in London in May 2003.

The aim of the Supplementary Fund is to supplement the compensation available under the 1992 Civil Liability and Fund Conventions with an additional third tier of compensation. Membership of the Supplementary Fund is optional and any state that is a member of the 1992 Fund may join the Supplementary Fund.

The total amount of compensation payable for any one incident will be 750 million Special Drawing Rights (SDR) (US$ 1102 million), including the amount payable under the existing Civil Liability and Fund Conventions.

The Protocol will enter into force three months after it has been ratified by at least eight states that have received a combined total of 450 million tons of contributing oil in a calendar year. The Supplementary Fund will only pay compensation for pollution damage in states that are members of the Supplementary Fund for incidents that occur after the Protocol has entered into force. Thus far there are three States which have ratified the Supplementary Fund Protocol, Denmark, Finland and Norway.

Finland and Russian Federation are participating in both the 1992 Protocol to the Civil Liability Convention and 1992 Protocol to the Fund Convention. Estonia is party to the 1992 Protocol to the Civil Liability Convention but not the 1992 Protocol to the Fund Convention.

6.9.4 Espoo Convention

The Convention on Environmental Impact Assessment in a Transboundary Context was made in Espoo, Finland on February 25, 1991. The Convention entered into the force in September 1997, and is focused on the prevention, reduction and control of significant adverse transboundary environmental impacts from proposed activities. Proposed activities have been listed in the Convention's Appendix 1 with the notification the parties should inform all the affected parties on the proposed activities and possible consequences. Thus relevant information on the proposed activity should contain data on the environmental impact assessment procedure used, and time schedules of the realisation processes.

In the context of the Gulf of Finland oil transportations, both the new oil terminals and refinery proposals or the area should be reviewed and handled according to the Espoo Convention. The new oil pipelines and major terminal and port rehabilitation works should also considered for review by means of the Convention.

Thus far Russia has not yet ratified the Convention. Finland ratified the Convention in 1995 and Estonia in 2001. Due to the fact there are a lot of new terminal development plans and port construction proposals it is recommended to continue future co-operation in the spirit of the Convention as has already been done with positive results. The new Russian terminal and refinery proposals have caused a lot of confusion among the general public in the area. Speculations have been made on the risks of oil spills, inadequate oil spill countermeasures and inadequate environmental impact procedures related to the new terminals. It has also been hard work for the environmental authority and experts to get information on the new facilities and expected environmental impacts. Lessons learned, however, have proved the design and preventive measures have been conducted in a good manner and with the local participation of the individuals. Due to the simple fact that all accidental releases will in any event meet the neighbourhood nations of the area, the information mechanisms should be in condition. The Espoo Convention should provide a valuable tool for this purpose.

7. Discussion

The Gulf of Finland is a relatively narrow bay that stretches from east to west over more than 400 km. The entrance of the gulf between Estonia and Finland is 75 km wide, while the width in the most eastern part, the Neva Bay, is only 15 km. The Baltic Sea marine ecosystem is very vulnerable to pollution due to the slow rate of natural cleansing and low salinity levels.

In addition to the land-based inputs as the main source of pollution there exist an increasing number of activities at sea. Maritime transportation figures are growing, and especially oil transportation along the Gulf of Finland waters. Even if some of the environmental observations show encouraging results on the certain improvements made, enormous threats still exist. Eutrophication will pose a significant threat for the aquatic life for a long time. New risks could be identified due to the aquaculture and offshore activities, including pipelines and cables as well as extraction of marine sediments and fairway maintenance works of the new terminals.

The Baltic Sea is a European inland sea and an important fairway between the European Union and Russia. The financial importance of this is significant. The strong economic development of trade in the Baltic Sea area is also reflected in the development of shipping. Consequently, when economies strengthen and trade increases, it is important that shipping and the transport system in general are not restricted by various barriers, bottlenecks and certain institutional differences. Trade development, however, is leaning towards general standards with harmonised tools and legislation.

Shipping on the Gulf of Finland has grown significantly over the past few years. Especially the east/westbound traffic is growing constantly as new harbours are being established and old ones renewed in Russia. Another heavy traffic route is between Helsinki and Tallinn, where passenger vessels carry some six million passengers a year.

The oil transportation in the Gulf of Finland amounted to 40 million tonnes in 2000. Three years ago it was projected that the annual oil transportation in the Gulf of Finland would increase up to 150 million tons by the year 2010. With the latest information about Russian port development plans, this estimation has now been updated to a figure of 190 million tons for 2010. 100 million tons would seem to be reached already in 2004. Nobody knows for sure how large the volumes of oil transported along the Baltic Sea in the future would be. It is quite sure, however, that the Baltic Sea oil transportation capacity will soon be stabilised based on the EU's energy needs. Oil will be exported through other routes too, and locally certain fluctuations in the Baltic Sea area will be expected. For example, the Ventspil oil terminal is expected to be taken into use in the future, although the Transneft pipeline to the terminal has recently been closed due to the competition of market shares.

In three years time, the total number of ship calls will have more than doubled in the main oil harbours in the Gulf of Finland. Some good development can be noticed in tanker vessels that visited Sköldvik, Primorsk, St. Petersburg and Tallinn in May 2004. New vessels have been taken in use, as the average age of the tankers has not increased. Tankers' age development has a positive effect on vessels' structure as well. There is no knowledge about single hull vessels visiting these harbours in the period in question and the share of double-hulled tankers has grown distinctively. These are all good signs of an increase in safety consciousness in oil transportation.

The analyses also showed that the double hull vessels' share in Aframax and Suezmax tankers has been increasing at single hull's expense. These types of crude carriers form a back bone of the oil tankers visiting the terminals of the Gulf of Finland, thus the structural development has been advantageous. On the other hand, there are still a lot of smaller single hull tankers in use, and the new phase-out regulations of IMO may cause a temporary lack of transportation capacity within that size class.

Last year, Russia overrode Saudi Arabia and moved up to number one oil producer in the world with its 420 million tons production. The increase of the market price of the oil also put more pressure to the Russian plans to get more oil into the world markets. The special focus has been directed to overseas (US) and Far East markets, due to the fact that EU's energy demand will not alone be enough to fulfill the production increase. There have been speculations how this increase of the oil production can be transported to the market due to the fact the transport capacity is currently 100% fully booked. There are technical limitations, economical and political limitations that support the Murmansk oil pipeline and terminal constructions. Murmansk transportation route offers a lot of benefits compared to the Baltic transportation route. Thus after the proposed terminal and the pipeline have been completed, the new complex may decrease the volume of Baltic oil transportation. The expected decrement would be significant especially during the winter time, when the Gulf of Finland is ice-covered but the Murmansk waters are free of ice.

Russian Federation's Ministry of Transport published a Port Development Plan in July, 2004. According to Ministry's prognosis, Russian maritime transport would increase up to annual handling of 520 Mtons by 2010. Total handling of Russian ports was 286 Mtons in 2003. The most intensive development is seen in north-western Russia, including the Gulf of Finland. Crude oil and oil products will be the main cargoes shipped from this area. The Ministry announced two development projects for present year: construction of infrastructure for Ust-Luga multipurpose harbour and purchase of two new icebreakers to ensure winter traffic in Primorsk and Vysotsk. Building the icebreakers should start no later than 2005 in order to have them operating in 2007. (Russian Ministry of Transport, 2004)

Estonian oil transit is based on the railroad transportations to the terminals. Russian oil companies have also increased the railway transportations, partly due to the lack of pipeline infrastructure available for their purposes and partly to find out other delivery chains not to be linked to the governmental Transneft company. The pricing policy of the Russian railway company and the high market price for oil has made the railway transport mode profitable enough. However, larger changes in the market price or political crises may alter the situation and benefit the pipeline transportations in a long run. Other large players such as OPEC or Saudi Arabia may also influence on the future development in a significant manner.

Due to the characteristics of the Gulf of Finland there are no so-called easy winters. During a severe winter, the amount of ice is large and the extent of the ice cover is large. Then the distances traveled in ice become long and probability of encountering large ridges become bigger. In a severe winter all harbours in the Gulf of Finland are surrounded with ice. In milder winters not all harbours become icebound, and especially the southern shores stay open. In milder winters the winds push ice towards the east and therefore the fairways to the eastern harbours are covered with ice every winter, and the vessels have to sail through heavily ridged ice fields. Vessels navigating in a compressive ice field might get stuck and get ice damage to the hull.

The icebreaking co-operation in the Gulf of Finland is still in the development stage. New bi- and tri-lateral agreements are required to ensure both the safety of winter navigation and the uninterrupted transportation. The good co-operation in the Gulf of Bothnia between Finland and Sweden, may offer a sound basis for the potential service level of the Gulf of Finland. Due to the fact all the three nations surrounding the Gulf of Finland have their own traffic and icebreaking cultures, a harmonisation process with the development of joint operational procedures should take place.

It is also certain that without any improvement in the icebreaking capacity of the Gulf of Finland, another severe winter may cause significant difficulties for the traffic and even to violate safety significantly. The winter navigation can be seen as an essential part of the EU Corridor plans, which is, in turn, an essential part of the multimodal logistical chain. In a new situation, when larger volumes of Russian oil will be transported to the EU, it is a challenge for both the producer and the client to ensure energy demand, and also to do so in a sustainable manner. Russian Ministry of Transport has also defined the north-west territory as the priority area of the port and maritime development, where the special emphasis has been directed to the smooth and reliable oil export. Here the conclusion has also been made to get more icebreaking capacity for the Gulf of Finland.

Although much new tanker capacity is being constructed, an analysis of the tanker supply shows that there is only a handful of large ice-strengthened crude oil tankers available on the market and with increasing transport demand, more of such vessels are needed in order to guarantee efficient, reliable and safe transport of oil through the Gulf of Finland.

The Marine Environment Protection Committee of the International Maritime Organization (IMO) decided on April 2, 2004 to designate the Baltic Sea a particularly sensitive sea area (PSSA). The Baltic Sea marine ecosystem is very vulnerable to pollution due to the slow rate of natural cleansing and low salinity levels. The Baltic Sea and especially the Gulf of Finland would not bear an accident like *Erika* or *Prestige* – neither environmentally nor economically. Oil spills caused by tanker incidents result in catastrophic environmental damage and are almost always the subject of lengthy and potentially embarrassing media attention.

Mainly for the above mentioned reasons, an agreement was made in Extraordinary HELCOM Ministerial Meeting in Copenhagen in 2001 to improve the maritime safety in the Baltic Sea. A lot of new initiatives have been made, some of them leading to new HELCOM recommendations. Corresponding forum for the monitoring of the Gulf of Finland water quality and preventing antropogenic impacts has been working trilaterally in the frames of the Gulf of Finland Environmental Co-operation since 1996.

Even if the oil-combating preparedness in the Gulf of Finland area is on a sufficient level, there is a lack of large oil recovery vessels for the open water conditions, and the lack of adequate oil recovery capacity for winter conditions. Together with the required improvement of the mechanical recovery capacity a joint aerial reconnaissance system should be created for the Gulf of Finland area. This kind of new service, coupled with the GOFREP service, would effectively decrease illegal oil discharges and give more valuable time as an early warning system if an accidental oil spill will endanger sensitive coastal areas. The development of the joint service may need the preparation of the trilateral MoU to guarantee the establishment of such a system.

Intensive oil transportation will increase the risk of alien species being introduced into the Gulf of Finland waters. Large tankers carry huge amounts of ballast water, which will be pumped out into the terminal waters. Already now the Eastern part of the Gulf of Finland is acknowledged as one of the high-risk areas for the new alien species. IMO has recently adopted a new ballast water management convention, which after general acceptance by the marine community will come into the force somewhere between in 2015 and 2018. A lot of new research and innovation is required to control the situation in the Gulf of Finland and in the whole Baltic Sea. The new PSSA status might here offer new possibilities, and together with the HELCOM co-operation will find new ways to protect the environment.

8. Recommendations

Due to the fact that maritime transport, and especially the oil transportation, is increasing dynamically, the most important task would be the identification of environmental risks and then to proceed systematically to ways to decrease hazards and negative impacts on nature.

It would be very important for the authorities in the area to perform a comprehensive risk analysis on oil transportation and the risk of oil spills. The most promising type of the risk assessment is the Formal Safety Analysis (FSA) sort of approach, modified to take into consideration environmental values. Thus the assessment should identify potential causes, sources, locations, the size and types of oil that may be spilled, potential risk handling options, cost-benefit analyses and recommendations that will allow the authorities and stakeholders to use the preventive resources in the best available manner. An important part of this risk analyses would be the evaluation of winter conditions and the co-operation with the GOFREP service.

Previously an FSA study was made in connection of the GOFREP service. However, this work concerned only the international waters of the Gulf of Finland where the only risk handling option was the service itself. Thus the risks were defined more or less as collisions only. Now the groundings and the territorial waters of Finland, Estonia and Russia should also be included with the available risk handling options.

Thus far Russia has not yet ratified the Espoo Convention. Finland ratified the Convention in 1995 and Estonia in 2001. Due to the fact there are a lot of new terminal development plans and port construction proposals it is recommended to continue future co-operation in the spirit of the Convention as has already been done with positive results. In the context of the Gulf of Finland oil transportations, both the new oil terminals and refinery proposals for the area should be reviewed and handled according to the Espoo Convention.

It is also recommended that the Baltic 21 secretariat should consider a special pilot project on the sustainable maritime transport in the Gulf of Finland, including the development of a new legal framework and the strengthening of investors' eagerness to develop preventive measures against accidents.

HELCOM is encouraging the parties to improve the sub-regional co-operation, which would be especially important in the Gulf of Finland area. The signing of a Marine oil and pollution co-operation agreement between Estonia and Russia, followed by the elaboration of a tri-lateral oil spill response action plan for the Gulf of Finland is considered important here. Another very important action would be the preparation of trilateral Memorandum of Understanding to improve the aerial surveillance of the area and to develop countermeasures against illegal oil spills.

Other recommendations related to the oil spill response capacity are the implementation of the national contingency plans, plus the education and training of various groups of personnel related to the oil-combating and rescue services.

One important task to be developed in the Gulf of Finland is winter navigation, or the co-operation with the icebreaker assistance. There are a set of new telematic tools and modern solutions available to promote the joint service and to make the marine logistic chain more profitable and safe. The winter of 2002/2003 showed the lack of icebreaking capacity in Russian and Estonian territorial waters. The increasing traffic volumes and especially large tankers will need more assistance in the future, where only the increased icebreaking capacity and better co-operation can solve the problem.

A lot of initiatives to improve the maritime safety are going on around the Baltic Sea. One very promising development would be the AIS service where new tools to analyse the statistics is required. These tools could help the VTS operators to define hot spots, to identify a critical situation before it would be too late (i.e., to make warnings etc). The identification of ships and their cargoes would also help the initial procedures of the countermeasures in hazardous situations.

There are also a lot of technical items to be developed. All the oil terminals should have harmonised wind and weather limits for tankers, where the possible use of escort towing has been clarified.

Finally when analysing all the accidents and the background reasons leading to the accidents, many experts state that 80% of the accidents are due to human factors. Thus the human/machine interface will be the most fruitful item to be developed if the main focus is to be a safer environment and safer shipping. The Gulf of Finland is surrounded by three different nations that have their own languages and cultures. Ships sail along the Gulf of Finland waters with mixed crews, they have tight schedules and sometimes have not even had any particular training for the special features of the local environment. There are also a lot of electronics onboard, and electrical failures or misunderstandings can lead to critical situations. Therefore much new research and development work is required for a better understanding of this area and to create better operational procedures.

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Appendix A: Conversion table and abbreviations

Conversion table

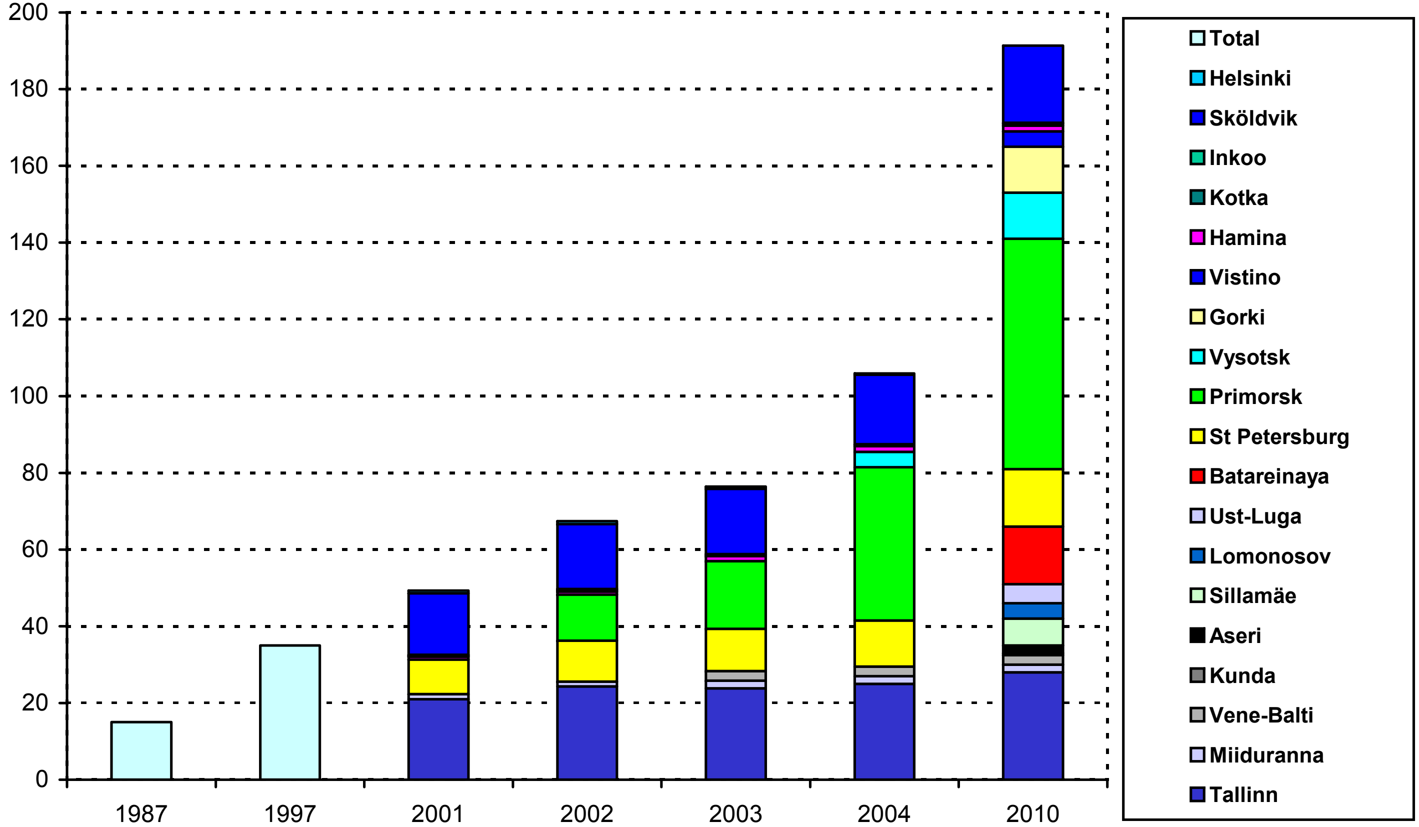
1 ton	= 1 metric tons
	= 1 000 kilograms
1 barrel	= 42 US gallons
	= 0.159 m^3 = 159 l
1 barrel of crude oil	= approx. 0.135 tons
1 ton of crude oil	= approx. 7.5 barrels
1 barrel of crude oil <u>per day</u>	= approx. 50 tons of crude oil <u>per year</u>

Abbreviations

m	thousand*
M	million
bbl	barrel
mbbl/d	thousand barrels per day
Mbbl/d	million barrels per day
Mton/y	million tons per year

*To avoid misunderstandings, abbreviation for thousand is not used in this publication.

Appendix B: Oil transportation in the Gulf of Finland – Oil transportation in years 1987–2003 and estimated development for 2004 and 2010



Appendix C: Major oil export outlets used by Russia – 2002–2010, Mbbl/d

EXPORT OUTLET	2002		2005		2010	
	Capacity	Use	Capacity	Use	Capacity	Use
Eastern Europe (pipelines)	1.28	1.03	1.44	1.09	1.98	1.55
Druzhba	1.28	1.03	1.34	1.00	1.68	1.31
Adria (Croatia)	-	-	0.1	0.09	0.30	0.24
Black Sea (ports/terminals)	1.95	0.95	2.60	1.53	2.95	1.66
Novorossiysk	0.85	0.78	1.15	1.05	1.20	1.10
Tuapse	0.18	0.10	0.18	0.16	0.18	0.16
South Ozereyevka (CPC)	0.48	0.01	0.83	0.08	1.13	0.16
Odessa (Ukraine)	0.26	0.06	0.26	0.08	0.26	0.08
Pivdenne (Ukraine)	0.18	-	0.18	0.16	0.18	0.16
Baltic Sea (ports)	0.72	0.48	1.36	0.98	1.64	1.23
Primorsk	0.24	0.22	0.84	0.70	0.84	0.70
Ventspils (Latvia)	0.32	0.15	0.36	0.16	0.36	0.16
Butinge (Lithuania)	0.16	0.11	0.16	0.12	0.28	0.23
Sköldvik (Finland)	-	-	-	-	0.16	0.14
Barents Sea (ports/terminals)	0.02	0.01	0.20	0.18	1.00	0.80
Far East	0.08	0.04	0.72	0.63	1.04	0.94
Central Asia (Kazakhstan–China)	-	-	-	-	0.60	0.20
TOTAL	4.05	2.51	6.32	4.41	9.21	6.38

Source: CPBS/PetroMarket, July 2003.

Appendix D: True nationality of open-registry fleets as of 1 January 2003

Country or territory of domicile	Panama			Liberia			Bahamas			Malta			Cyprus		
	No. of vessels	000 dwt	%	No. of vessels	000 dwt	%	No. of vessels	000 dwt	%	No. of vessels	000 dwt	%	No. of vessels	000 dwt	%
Greece	514	20 000	11	145	9 555	12	164	8 752	18	594	28 909	68	562	23 302	65
Japan	1 785	78 250	42	109	5 221	7	37	654	1	2	78	0	21	304	1
Norway	88	2 942	2	104	7 482	10	273	10 675	22	42	857	2	27	264	1
China	243	8 197	4	59	2 885	4	5	213	0	15	235	1	12	217	1
United States	142	3 125	2	111	4 821	6	173	10 120	20	8	466	1	3	10	0
Germany	23	833	0	433	13 062	17	18	1 076	2	45	789	2	224	4 432	12
Hong Kong (China)	180	14 510	8	47	4031	5	7	366	1	5	449	1	3	177	0
Republic of Korea	295	15 205	8	6	530	1	1	17	0	2	18	0	3	98	0
Taiwan Province of China	294	11 263	6	30	1 144	1	0	0	0	0	0	0	0	0	0
Singapore	72	1 988	1	12	809	1	13	1 051	2	0	0	0	1	30	0
United Kingdom	39	969	1	15	672	1	108	1 352	3	3	52	0	5	20	0
Denmark	19	424	0	6	214	0	50	567	1	3	13	0	0	0	0
Russian Federation	16	81	0	69	4 943	6	5	18	0	92	997	2	76	1313	4
Italy	5	301	0	9	577	1	12	501	1	32	1 013	2	0	0	0
Saudi Arabia	8	641	0	20	5 817	8	13	2 974	6	1	1	0	0	0	0
India	8	111	0	7	518	1	1	12	0	2	53	0	6	100	0
Turkey	3	21	0	3	141	0	3	16	0	85	728	2	0	0	0
Netherlands	24	323	0	9	115	0	45	1 833	4	8	40	0	24	189	1
Iran, Islamic Rep. of	0	0	0	0	0	0	0	0	0	0	0	0	3	225	1
Switzerland	107	3 606	2	14	348	0	1	82	0	53	1 096	3	4	54	0
Sweden	3	16	0	10	959	1	14	692	1	0	0	0	6	24	0
Malaysia	15	111	0	0	0	0	15	92	0	0	0	0	0	0	0
Brazil	11	1 057	1	10	979	1	0	0	0	0	0	0	0	0	0
Belgium	6	553	0	7	798	1	11	125	0	3	86	0	2	9	0
France	8	587	0	3	69	0	29	676	1	0	0	0	2	26	0
Canada	3	33	0	7	238	0	12	413	1	9	34	0	7	314	1
Philippines	17	509	0	0	0	0	0	0	0	0	0	0	2	24	0
Indonesia	45	404	0	1	79	0	2	82	0	0	0	0	0	0	0
Spain	49	313	0	1	95	0	4	536	1	0	0	0	6	130	0
Kuwait	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monaco	18	841	0	14	632	1	30	660	1	11	215	1	0	0	0
Australia	6	186	0	3	392	1	7	191	0	2	64	0	0	0	0
Cyprus	5	592	0	2	191	0	2	280	1	3	16	0	30	824	2
Croatia	2	2	0	10	604	1	1	44	0	9	441	1	2	12	0
Chile	15	515	0	11	492	1	1	51	0	0	0	0	0	0	0
Subtotal	4 068	168 508	90	1287	68 413	89	1 057	44 122	89	1 029	36 649	86	1 031	32 097	89
Others	2 520	17 892	10	393	8 603	11	378	5 478	11	403	5 960	14	304	3 932	11
Total	6 588	186 400	100	1680	77 016	100	1 435	49 600	100	1 432	42 609	100	1 335	36 029	100

Source: Compiled by the UNCTAD secretariat on the basis of data supplied by Lloyd's Register – Fairplay.

Bermuda			Six minor open registries			Subtotal			Total foreign flag fleet		Country or territory of domicile
No. of vessels	000 dwt	%	No. of vessels	000 dwt	%	No. of vessels	000 dwt	%	No. of vessels	000 dwt	
1	15	0	170	4 235	17	2 150	94 768	22	2 345	105 011	**Greece**
0	0	0	27	734	3	1 981	85 242	20	2 163	90 924	**Japan**
2	2	0	57	614	2	593	22 836	5	819	30 959	**Norway**
0	0	0	115	1 589	6	449	13 335	3	704	21 623	**China**
13	154	2	145	1 246	5	595	19 941	5	870	31 536	**United States**
1	22	0	840	6 698	26	1 584	26 912	6	1 925	33 518	**Germany**
4	593	9	20	402	2	266	20 529	5	334	24 527	**Hong Kong (China)**
0	0	0	4	11	0	311	15 879	4	364	16 634	**Republic of Korea**
0	0	0	4	16	0	328	12 423	3	395	16 015	**Taiwan Province of China**
0	0	0	5	59	0	103	3 937	1	257	6 765	**Singapore**
39	3 184	47	40	228	1	249	6 476	2	383	10 226	**United Kingdom**
4	49	1	16	53	0	98	1 319	0	333	7 971	**Denmark**
0	0	0	20	80	0	278	7 431	2	380	7 816	**Russian Federation**
0	0	0	28	562	2	86	2 954	1	119	3 887	**Italy**
0	0	0	4	34	0	46	9 467	2	69	10 087	**Saudi Arabia**
0	0	0	9	83	0	33	877	0	41	1 133	**India**
0	0	0	15	154	1	109	1 060	0	137	1 685	**Turkey**
0	0	0	43	149	1	153	2 648	1	208	3 156	**Netherlands**
0	0	0	0	0	0	3	225	0	4	230	**Iran, Islamic Republic of**
1	3	0	22	426	2	202	5 615	1	225	6 310	**Switzerland**
9	1 730	25	18	171	1	60	3 591	1	162	5 468	**Sweden**
0	0	0	0	0	0	30	203	0	52	799	**Malaysia**
0	0	0	0	0	0	21	2 037	0	22	2 039	**Brazil**
0	0	0	42	1 730	7	71	3 303	1	128	6 008	**Belgium**
0	0	0	27	715	3	69	2 073	0	101	3 039	**France**
14	405	6	6	304	1	58	1 742	0	110	3 355	**Canada**
0	0	0	1	11	0	20	544	0	31	751	**Philippines**
1	2	0	2	31	0	51	598	0	91	1 089	**Indonesia**
0	0	0	2	10	0	62	1 084	0	263	4 147	**Spain**
0	0	0	0	0	0	0	0	0	0	0	**Kuwait**
0	0	0	9	58	0	82	2 406	1	103	3 134	**Monaco**
2	134	2	3	11	0	23	978	0	40	1 410	**Australia**
0	0	0	4	19	0	46	1 922	0	38	1 970	**Cyprus**
0	0	0	15	114	0	39	1 217	0	39	1 217	**Croatia**
0	0	0	0	0	0	27	1 058	0	34	1 365	**Chile**
91	6 293	92	1 713	20 547	80	10 276	376 628	89	13 289	465 804	**Subtotal**
26	519	8	839	5 043	20	4 863	47 428	11	1 290	20 546	**Others**
117	6 812	100	2 552	25 590	100	15 139	424 056	100	14 579	486 350	**Total**

Appendix E: Selected major oil spills

Position	Shipname	Year	Location	Spill Size (tonnes)
1	Atlantic Empress	1979	Off Tobago, West Indies	287,000
2	ABT Summer	1991	700 nautical miles off Angola	260,000
3	Castillo de Bellver	1983	Off Saldanha Bay, South Africa	252,000
4	Amoco Cadiz	1978	Off Brittany, France	223,000
5	Haven	1991	Genoa, Italy	144,000
6	Odyssey	1988	700 nautical miles off Nova Scotia, Canada	132,000
7	Torrey Canyon	1967	Scilly Isles, UK	119,000
8	Sea Star	1972	Gulf of Oman	115,000
9	Irenes Serenade	1980	Navarino Bay, Greece	100,000
10	Urquiola	1976	La Coruna, Spain	100,000
11	Hawaiian Patriot	1977	300 nautical miles off Honolulu	95,000
12	Independenta	1979	Bosphorus, Turkey	95,000
13	Jakob Maersk	1975	Oporto, Portugal	88,000
14	Braer	1993	Shetland Islands, UK	85,000
15	Khark 5	1989	120 nautical miles off Atlantic coast of Morocco	80,000
16	Prestige*	2002	Off the Spanish coast	77,000*
17	Aegean Sea	1992	La Coruna, Spain	74,000
18	Sea Empress	1996	Milford Haven, UK	72,000
19	Katina P	1992	Off Maputo, Mozambique	72,000
35	Exxon Valdez	1989	Prince William Sound, Alaska, USA	37,000

* For the purposes of this publication, the amount spilt by the Prestige includes all oil lost to the environment and that which remains in the sunken tanker sections i.e. 77,000 tonnes. This figure will be updated pending further information. This is consistent with the approach adopted in previous incidents. (ITOPF, 2004)

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Title

Oil transportation and terminal development in the Gulf of Finland

Abstract

Over the last decade maritime transport in the Gulf of Finland area has changed significantly. The disintegration of the Soviet Union forced Russia to start developing its own Baltic ports and terminals and to find new routes to export its oil. The Baltic States have enjoyed a remarkable economic boom, especially regarding new port and terminal development and oil transportation.

Due to the fact the Gulf of Finland is a sensitive brackish water area with a unique nature and environment, there has been a growing concern with accidental oil spills and various negative impacts caused by the maritime transport. Previous large-scale accidents elsewhere may have been the driving forces behind both the publicity and the calls from experts for new requirements to improve maritime safety and develop preventive measures against future accidents.

This report, commissioned by the Finnish Ministry of the Environment is an updated report of the earlier study on the Gulf of Finland's oil transport, published in 1999. The rapid changes in the oil business, new terminals and enlarging transport figures were the driving forces for updating this work. The report contains statistics on oil transport, terminal development, and it presents future development scenarios up to 2010. Much emphasis has been placed on safety-related activities and recommendation; therefore current activities to improve the safety and/or develop better oil spillage-combating measures have also been analysed and discussed.

Keywords
maritime safety, oil transport, Gulf of Finland, Baltic Sea, maritime transport, terminal development, environment, sea accidents, port development, oil harbours

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VTT PUBLICATIONS 547 Oil transportation and terminal development in the Gulf of Finland Hänninen & Rytkönen

Over the last decade maritime transport in the Gulf of Finland area has changed significantly. Russia is now the largest oil producer in the world. Two new oil ports have been opened and there are plans for more new oil ports on the Russian coasts of the Baltic Sea. Also, the Baltic States have enjoyed a remarkable economic boom, especially regarding new port and terminal development and oil transportation.

As traffic volumes on the Gulf of Finland continue to rise, the risk of accidents is also increasing accordingly. Due to the fact the Gulf of Finland is a sensitive brackish water area with a unique nature and environment, there has been a growing concern with accidental oil spills and various negative impacts caused by the maritime transport.

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