

TURUN YLIOPISTO
MERENKULKUALAN KOULUTUS- JA TUTKIMUSKESKUS

THE CENTRE FOR MARITIME STUDIES
UNIVERSITY OF TURKU

2009

TRAFFIC FLOWS IN FINNISH GULF OF FINLAND PORTS

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EUROPEAN UNION
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CENTRAL BALTIC
INTERREG IV A
PROGRAMME
2007-2013

ABSTRACT

Finland is very dependent on import of most raw materials needed in several industries, since there is no self-sufficiency within any important sector. Because of the location of Finland, Finnish import and export by maritime transport is by far the most important transport mode. Finland is very dependent on maritime transport: 75% of import was transported by ship in 2008. In export the share of ship transports was even higher, 89%. 14% of import was carried in trains and 6% by road. Rail traffic is important especially in trade with Russia and truck traffic is used in industry's transports but particularly in distributing consumer goods. From the security of supply point of view, the essential industries are technology, forest and chemical industries, food supply and domestic trade. Important raw materials needed in Finland are raw timber, metals and minerals, chemicals and energy products, and they are to a great extent imported.

This report is a part of STOCA-project that concentrates on traffic flows in Gulf of Finland and includes 12 ports, 3 inland ports (Lake Saimaa) and 3 check points to Russia. This study shows that the ports in the Gulf of Finland area have a major role especially in importing consumer goods that is part of general cargo import network. Technology industry transports have been concentrated in the Gulf of Bothnia area, and in forest industry transports for example in Kotka, Rauma, Loviisa and Hanko. In crude oil imports only ports used in Finland are Porvoo and Naantali. Porvoo and Hamina are also important chemical ports that serve for example plastics and other chemical industries. There are also questions of ownership and its impact on security of supply within different sectors. For example, vessels and mines are increasingly foreign-owned, and in 2008 only 31% of foreign trade transports was carried in Finnish vessels.

CONTENTS

1 INTRODUCTION.....	3
1.1 General.....	3
1.2 Aims of the study.....	3
1.3 Structure of the report.....	4
2 BACKGROUND.....	4
2.1 Import, export and trade partners.....	5
2.2 Infrastructure.....	7
2.2.1 Sea transport.....	8
2.2.2 Rail transport.....	9
2.2.3 Road transport.....	10
2.2.4 Inland waterway transport (the Saimaa Canal).....	11
2.3 Finnish ports.....	11
3 TRANSIT TRAFFIC.....	16
3.1 General.....	16
3.2 Transit via Finland.....	16
4 TRAFFIC FLOWS.....	18
4.1 Security of supply.....	18
4.2 Critical production and infrastructure.....	18
4.3 Important sectors and traffic flows.....	19
4.4 Energy sources.....	20
4.4.1 Oil and gas.....	20
4.4.2 Coal.....	21
4.4.3 Uranium.....	22
4.4.4 Routes for energy products.....	23
4.5 Food production.....	24
4.6 Technology industry.....	25
4.6.1 Aluminium.....	26
4.6.2 Steel.....	26
4.6.3 Routes for metals and crude minerals.....	27
4.7 Forest industry.....	28
4.7.1 Timber.....	28
4.7.2 Fillers and coating pigments, chemicals.....	29
4.7.3 Routes for forest industry raw materials and exports.....	29

4.8 Chemical industry	31
4.8.1 Basic chemical industry	32
4.8.2 Plastic industry	33
4.8.3 Rubber industry	34
4.8.4 Fertilizers.....	34
4.8.5 Health care and pharmaceutical industry	35
4.8.6 Routes for chemical industry raw materials	35
4.9 Mining industry.....	36
4.9.1 Metallic and industrial minerals.....	37
4.9.2. Strategic metals and minerals.....	38
4.9.3 Routes for minerals	39
4.10 Constructing and maintenance.....	40
4.11 Trade (consumption).....	40
4.11.1 Routes for consumer goods	41
5 CONCLUSIONS	41
SOURCES	43

1 INTRODUCTION

1.1 General

This report concentrates on the present traffic flows transported through selected Finnish ports in the area of the Gulf of Finland. Traffic flows are studied from the point of view of security of supply and also from the point of view of the central industrial sectors in Finland. These sectors are technology industry, forest industry, chemical industry, energy production, food production and supply, and domestic trade and consumption. In the analysis of the traffic flows the import of raw materials is emphasized, because certain raw materials are essential for the security of supply in Finland and also for biggest export industries. Finland is very dependent on imported raw materials, since there is no self-sufficiency within any industrial sector. Important raw materials include for instance timber, metals, ores and concentrates and chemicals.

Maritime transport is the most important transport mode in Finland, based on the location of the country. 75% of Finnish import was transported by ship in 2008. In export the share of ship transports was even higher, 89%. 14% of import was carried in trains and 6% by road. This study includes 12 ports, 3 inland ports (in the Lake Saimaa area) and 3 check points in the Russian border.

This report has been written as a part (University of Turku, Centre for Maritime Studies, Work Package 2) of the research project STOCA (Study of cargo flows in the Gulf of Finland in emergency situations) managed by the Kotka Maritime Research Centre. The STOCA-project is funded by the European Union and the financing comes from the European Regional Development Fund, The Central Baltic INTERREG IV A Programme 2007–2013, the Regional Council of Southwest Finland, the Estonian Maritime Academy and the National Emergency Supply Agency. In this study the official statistics provided by Finnish Maritime Administration are used, as well as the statistics from the Finnish Customs and Statistics Finland.

The publication reflects the authors views and the Managing Authority cannot be held liable for the information published by the project partners.

1.2 Aims of the study

The aim of this study is to analyse the present traffic flows and their contents (the main focus is on dry cargo) shipped to Finnish ports in the Gulf of Finland, i.e. harbours and transportation through the Saimaa Canal. In addition, Imatra, Nuijamaa and Vaalimaa check points (border crossing stations to Russia) will be included. The Finnish ports included are Naantali, Turku, Hanko, Koverhar, Inkoo, Taalintehdas, Kantvik, Helsinki, Porvoo, Loviisa, Kotka, Hamina, Imatra, Joutseno and Lappeenranta. Ports of Imatra, Joutseno and Lappeenranta are inland ports that are accessed via the Saimaa Canal. The other ports are located in the coast of the Gulf of Finland.

In this study, the research questions are:

- 1) What are the most important industrial sectors in Finland from the point of view of security of supply?
- 2) What raw materials do these sectors need?
- 3) What are the shares of different transport modes in transport, especially in import?
- 4) Through which ports are raw materials imported?

1.3 Structure of the report

This report is divided in three main chapters. The first part consists of the presentation of the study area, which includes economic factors, information of Finnish infrastructure, import and export as well as different transport modes used in Finnish import and export. Also Finnish ports included in this study are presented, for example different cargo types and main products handled in these ports. The following chapter concentrates on transit traffic to and from Russia, and chapter 4 describes traffic flows through Finnish ports situated in the Gulf of Finland area. In chapter 4 security of supply is discussed and the most important industrial sectors from the point of view of security of supply are also presented, as well as raw materials that are needed within these industries. Also other ports that are not situated in the Gulf of Finland area are taken into account when their share in import or export of central raw materials or products is substantial. This means basically certain ports in the Gulf of Bothnia area. Finally, the conclusions of the study are presented.

2 BACKGROUND

The development of GDP of Finland in 1998–2008 is shown in Figure 2.1.

The most important industries in Finland are technology industry, forest industry and chemical industry. Until recently the growth has been remarkable especially in technology industry. On the other hand there have been few foreign investments in Finland and the high technology industry has recently also moved its functions and production abroad. (Sundberg 2009)

The logistical system and infrastructure in Finland have been developed in terms of the heavy basic industry. This industry is controlled by a couple of “big actors” whose decisions may affect the whole logistical structure. Transition from agricultural to industrial society has been quicker than in other Western countries, due to e.g. big structural changes and war reparations, which affected industrial development and internal migration. The share of industrial production of GDP is still bigger than in Western countries in general. Agriculture and industry are still diminishing, and service needs more labour. (Loghu2 – Työryhmäraportti 2008)

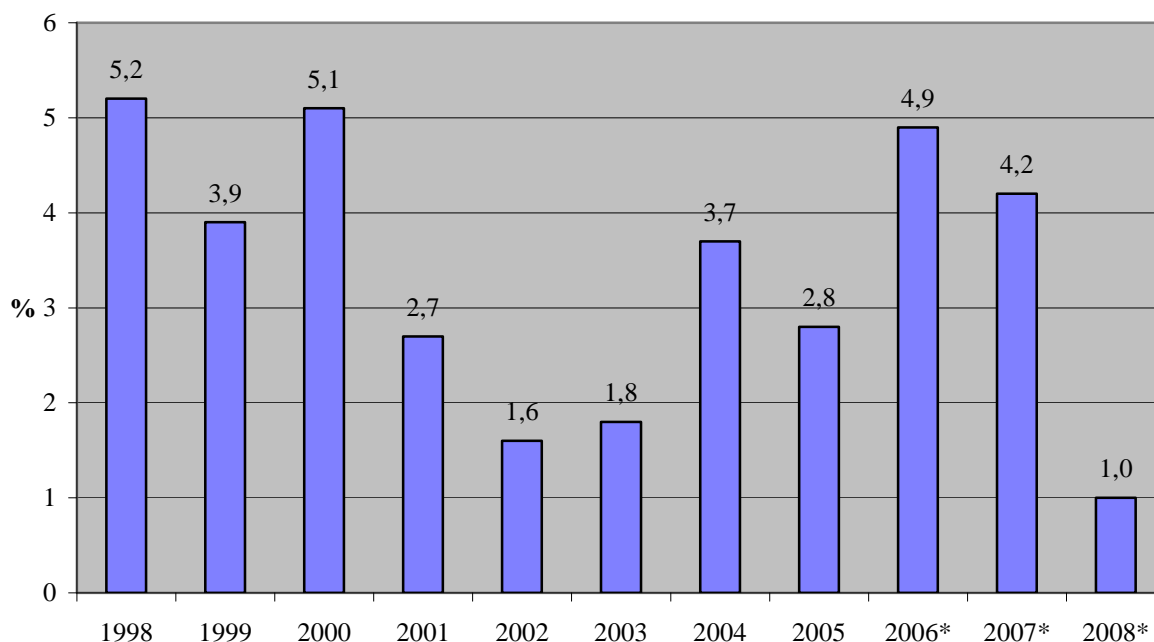


Figure 2.1. The development of GDP of Finland, 1998–2008. (Tilastokeskus 2009) (* preliminary data)

The share of primary production of GDP was 3.0% in 2008. Industry had a share of 31.6% and services 65.4% (Tilastokeskus 2009).

2.1 Import, export and trade partners

According to Sundberg (2009) the main export commodity groups are manufactured goods, raw materials, fuels and lubricants, chemicals and chemical products. Manufactured goods are the most important commodity group both in sea and land transport. Import consists mainly of raw materials and fuels and lubricants. Raw materials are imported both by sea and land. However, in rail and road transport raw materials are by far the biggest import group (in tons). The share of road transport in import transports will diminish in the future if the import of Russian raw timber decreases. Fuels and lubricants are imported by ships and by rail and manufactured goods mostly by sea. (Sundberg 2009)

Around half of import goes to manufacturing industries' needs, and over 40% to wholesale and retail trade. Import inputs are significant especially in technology industry and chemical industry (Table 2.1). The import of forest industry is big in tons, but small in value. (Sundberg 2009).

Table 2.1. Imports by industries (TOL2008). (National Board of Customs 2009a)

	mln. e	%
Agriculture, forestry and fishing	54	0,1
Mining and quarrying	101	0,2
Manufacturing	30 805	49,4

Manufacture of food products, beverages and tobacco	1 401	2,2
Manufacture of textiles, clothes, leather and leather products	429	0,7
Forest industry	2 157	3,5
Chemical industry	10 956	17,6
Manufacture of other non-metallic mineral products	507	0,8
Manufacture of metal and metal products	5 230	8,4
Electric and electronics industry	6 007	9,6
Manufacture of machinery and equipment	2 690	4,3
Manufacture of transport equipment	1 075	1,7
Other manufacturing	354	0,6
Wholesale and retail trade	26 456	42,4
Other industries, incl. Industry unknown	4 985	8,0
Total imports	62 402	
Trade balance	+3 178	

The biggest exporter is technology industry, which has experienced strong growth after the recession in the 1990s'. Forest industry has been steady in the 2000s' but its share of export is expected to decrease. Chemical industry has grown slightly. Especially in paper and metal industry export is very concentrated: half of the value of Finnish export consists of the export of 21 biggest export companies, whereas import is more dispersed. (Sundberg 2009)

Metals industry (branch of technology industry) is the most export-intensive industrial sector. Export comprised 80% of its revenue/turnover in 2007. In pulp and paper production the share was 75%. Import inputs are significant especially in technology industry and chemical industry. The import of forest industry is big in tons, but small in value. (Sundberg 2009) The share of manufacturing in export is over 85% (Table 2.2).

Table 2.2. Exports by industries (TOL2008). (National Board of Customs 2009a)

	mln. e	%
Agriculture, forestry and fishing	45	0,1
Mining and quarrying	197	0,3
Manufacturing	55 909	85,3
Manufacture of food products, beverages and tobacco	1 059	1,6
Manufacture of textiles, clothes, leather and leather products	477	0,7
Forest industry	11 221	17,1
Chemical industry	9 220	14,1
Manufacture of other non-metallic mineral products	801	1,2
Manufacture of metal and metal products	7 742	11,8
Electric and electronics industry	12 919	19,7
Manufacture of machinery and equipment	9 356	14,3
Manufacture of transport equipment	2 607	4,0
Other manufacturing	509	0,8
Wholesale and retail trade	7 005	10,7
Other industries, incl. Industry unknown	2 424	3,7
Total exports	65 580	
Trade balance	+3 178	

Biggest trade partners are Germany, Russia and Sweden. In 2008 the biggest trade partner both in export and import was Russia. In export Russia's share was 11,6%, Sweden's 10,1% and Germany's 10%. In import Russia had a share of 16,3%, Germany 14,1% and Sweden 10,1%. (Tullihallitus 2009a) The value of import was 62,4 billion euros; export was 65,6 billion euros in 2008 (Tullihallitus 2009b).

2.2 Infrastructure

On the global level, trade transport system consists of maritime transport completed with coastal, inland waterway, road, railway and air transport and infrastructure. (Loghu2 – Työryhmäraportti 2008).

Growing vessel sizes will lead to concentration to fewer big ports. Transport, storage and distribution system and important companies from the security of supply point of view are also concentrating in regions where population, age structure and purchasing power development create a sustainable basis for operation. The majority of the global logistical system is now in the ownership of global actors that have invested for example in terminal infrastructure in ports. That means that there is a need to prepare for decisions that are made over a short period of time and from global viewpoints. The transfer of industrial production abroad will increase import of goods and change transport needs. The important transport systems include import and export systems that serve industry, distribution systems that serve population and logistics services used by production that is directed for domestic consumption. (Loghu2 – Työryhmäraportti 2008)

In Finland export and import have become differentiated in terms of transport equipment and ports. For example, basic industry export and domestic trade import are usually transported through different ports and by different transport modes and units. Nevertheless, this division is not definite and for example some industrial traffic flows pass also through domestic trade import ports in containers and trailers. Port operators have usually specialized in certain commodities because of their natural hinterland and customers, which affects also their cargo handling systems and which is meant to improve productivity. Specialization may on the other hand also decrease the substitution possibilities between ports. Transport modes and equipment are expected to differentiate/specialize further within different industries. (Loghu2 –Työryhmäraportti 2008) On the other hand, there are also ports that can handle several different cargo types, so-called general ports (Sundberg 2009). Heavy industry has tended to concentrate near the ports because of location reasons. Domestic trade import nodes are also concentrated close to ports, e.g. in Turku and Helsinki, as well as certain industries that are branching out abroad. (Loghu2 –Työryhmäraportti 2008) The share of unit load transports is increasing for example in paper and sawn wood, metals and metal products and general cargo transports. (Sundberg 2009)

Technical Research Centre of Finland (VTT) has divided the main logistical network of Finland in six parts: general cargo import, domestic trade collection and distribution

network, container export network, bulk export network, raw material import network and transit traffic network. (Sundberg 2009)

2.2.1 Sea transport

More than 80% of the foreign trade of Finland is transported by sea and Finland is very dependent on maritime transport. Both in 2007 and 2008 foreign sea transports have exceeded 100 million tons. Foreign trade transports were 94 million tons in 2008. Only 31% of foreign trade transports were carried in Finnish ships, in export only 20%. (Sundberg 2009) 89% of Finnish exports were transported by sea in 2008 (Figure 2.2). In import the share was 75% (Figure 2.3).

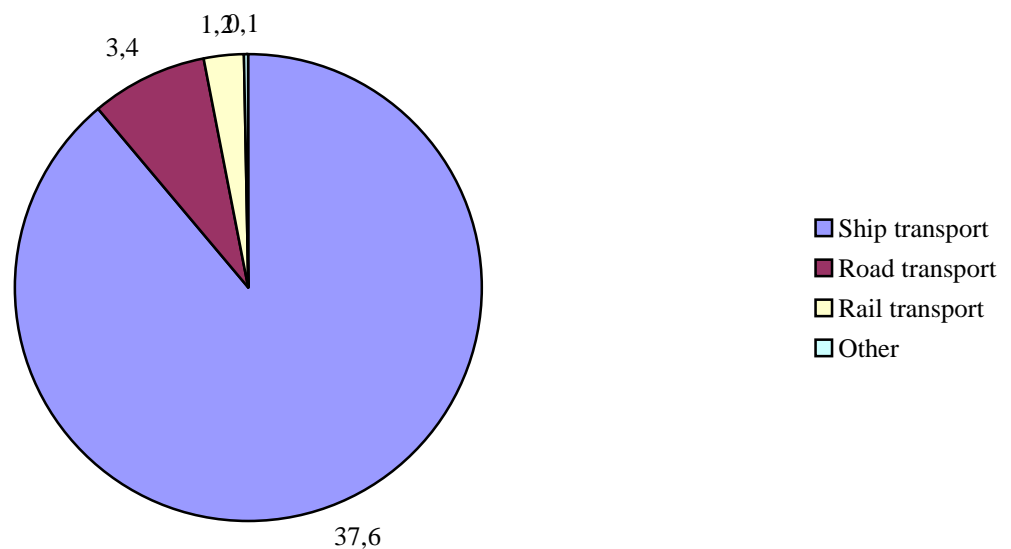


Figure 2.2. Export by transport mode in 2008 (million tons). (National Board of Customs 2009b)

In sea transport challenges are the shallowness of the Danish straits that restricts ship size, and ice conditions in the Gulf of Finland. To the ports of Kotka, Porvoo, Tahkoluoto in Pori and in the future also Naantali it is possible to navigate with vessels that can go through the Danish straits. Nevertheless, there are good and frequent liner connections from Finland to Europe. (Sundberg 2009)

In Finland there are more than 50 ports. The biggest ports are connected also to railway network in addition to road connections. Ports vary also regarding other infrastructure, which is linked to cargo handled in the port and transport modes used. Some ports are specialized and others are general ports. Ports can also be import- or export-oriented (or in balance) and have different ownership statuses, extension possibilities and investment plans. In this study the present traffic flows through fifteen Finnish ports are analysed.

The ports included are Naantali, Turku, Hanko, Koverhar, Inkoo, Taalintehdas, Kantvik, Helsinki, Porvoo, Loviisa, Kotka, Hamina, Imatra, Joutseno and Lappeenranta. Imatra, Joutseno and Lappeenranta are inland ports that are accessed via the Saimaa Canal. The other ports are located in the coast of the Gulf of Finland. In addition, Imatra, Nuijamaa and Vaalimaa check points (border crossing stations to Russia) have been included.

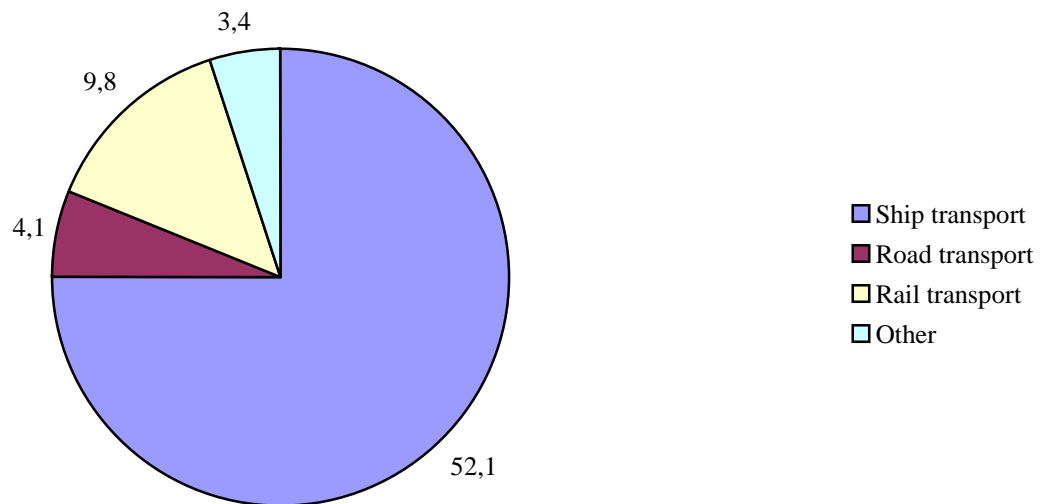


Figure 2.3. Import by transport mode in 2008 (million tons). (National Board of Customs 2009b)

2.2.2 Rail transport

In Finland the rail gauge is the same as in Russia. Because of that, the Finnish railway network has a straight connection to Russian and Eastern European railways as well as to Far East through the Trans Siberian railway. There are four checkpoints at the border: Vainikkala in Lappeenranta, Imatrankoski, Niirala in Tohmajärvi and Vartius in Kuhmo. General cargo is transported to Russia mainly through Kouvola and Vainikkala. The other cargoes are transported mainly through Niirala. In the port of Turku there is the only train ferry connection between Finland and Sweden. In the domestic traffic the main route goes from Helsinki to Tampere and Oulu. The products that are carried by rail are mostly forestry exports like paper and sawn timber, and raw materials for forestry industry, like pulp and raw timber. There are two main sorting yards, in Tampere and Kouvola. Through Tampere also metal industry products and chemicals, gases and liquid fuels are transported. (Sundberg 2009) Raw timber is imported from Russia through all four checkpoints: Vainikkala, Imatrankoski, Niirala and Vartius. The

network has been opened for competition, but so far only one railway operator is using the railway network. (Iikkanen 2007) There is also a container train connection available between Helsinki and Moscow. The domestic container rail traffic consists mainly of transferring empty containers between ports (Mäkelä 2009).

The share of rail transport in Finnish import was almost 10 million tons (14%) in 2008 (Figure 2.3) and 80% of import transported by rail was of Russian origin (National Board of Customs 2009b). More than 60% of the total volume of rail transports consists of transports of forest industry raw materials or of transports of finished forestry products. Chemical industry and technology industry have both a share of about 20% of rail transports. (Sundberg 2009)

Measured in tons, the heaviest traffic is found in the main line, in Eastern traffic in Vainikkala, Imatrankoski, Niirala and Vartius border crossing points and also tracks used by forest industry exports to the ports of Kymenlaakso and Rauma (Iikkanen 2007). Rail transport between Finland and Russia is run through checkpoints in Vainikkala and Imatrankoski. In Vainikkala there is also passenger traffic. (Iikkanen et al. 2005)

2.2.3 Road transport

In Finland road transport by trucks and trailers is a common transport mode because of the extent of the country and the flexibility of road traffic. The transit traffic to Russia leaves Finnish ports by road and it consists mainly of consumer goods. Road transit uses mostly Vaalimaa and Nuijamaa checkpoints in border crossing. In the domestic road traffic containers have not been very common. In the Baltic Sea area ro-ro traffic is common and trucks and trailers are carried by ferries e.g. to EU countries. (Sundberg 2009)

The most important truck traffic freighter is industry. Traffic includes both raw materials and finished products transports. Other important freighters in road traffic are trade and construction. Truck traffic is used especially in transporting daily consumer goods. (Sundberg 2009)

The sufficient capacity of road connections to ports and borders is fundamental for the development and function of production and foreign trade. In the capital region there is a strong logistical centre of retail and wholesale trade, which is linked with the port of Vuosaari. The traffic of the new Vuosaari harbour may nevertheless be hindered by capacity problems in Helsinki ring roads. However, raw materials and forest industry exports are mostly transported via other ports, so they don't usually pass through the capital region. (Halla 2008)

2.2.4 Inland waterway transport (the Saimaa Canal)

The largest, most continuous and most navigable inland waterway in Finland is Vuoksi waterway, i.e. the Saimaa Lake area. The Saimaa Lake area is connected with the Gulf of Finland through the Saimaa Canal. (Merenkululaitos. Saimaan kanava)

The Saimaa Canal leads from the Russian port Vysotsk to Lake Saimaa from where ships can go forward to many inland ports. The canal is closed in winter and the traffic season lasts usually 9.5 months. Along the canal there are eight locks. (Kuronen et al. 2008) The whole length of the canal is 42.5 km half of which is in the area that has been rented from Russia. Finland has rented the canal area from Russia and the current rental agreement will end in 2013. In September 2008 Finland and Russia agreed to sign a new rental agreement for the next 50 years in 2009. (Sikiö & Salanne 2008)

The deep-water channel starts from Vyborg Bay from the Brusnitchnoe lock and extends via Lappeenranta to Joensuu and Siilinjärvi. The length of the deep-water channel network is 772 km and the depth is 4.2–4.35 m. That means that the maximum load for a ship is 2 500 tons. The small ship size has its constraints; for example containerization will be restricted. The freight traffic through the canal has exceeded 2 million tons every year in the 2000's. Through the Saimaa Canal mostly forestry products are exported and timber and minerals imported. The Saimaa Canal has growth potential e.g. in biofuel transports and raw mineral transports depending on possible mining plans. Inland navigation is competitive especially in low-priced bulk and raw timber transports. (Sikiö & Salanne 2008)

In this study the following Finnish inland ports are included: Imatra, Lappeenranta and Joutseno.

2.3 Finnish ports

Naantali

The port of Naantali is situated in the South-western Finland and it is a municipally-owned port. It is an industrial port that has formerly been known as a liquid and dry bulk port but during the last ten years it has also become a nationally significant unit load port. The oil refinery of Neste Oil is also situated in Naantali. The port is import-oriented. The most important import groups are crude oil, general cargo and coal and coke, and the main export groups are general cargo and oil products. There is an important connection to Sweden by ro-ro and ropax ships, which covers half of all Finnish-Swedish trailer traffic. In 2008 the international traffic was 7 million tons and the total traffic exceeded 8.7 million tons. (Port of Naantali)

Neste Oil's refinery at Naantali refines a range of major products for use in traffic and transport, agriculture, industry and heating. The annual processing capacity is 3 million

tons. Gasoline and middle distillates (kerosene, diesel fuel, and heating oil) make up a high proportion of output, together with bitumen and solvents. (Neste Oil. Naantali refinery)

Turku

The port of Turku is situated in the South-western Finland. It is a west-oriented port and handles mostly general cargo, both import and export. In import other groups are metals and metal products and oil products and chemicals. Besides general cargo, metal products and sawn timber are exported. The port of Turku serves also passenger traffic. The only train ferry port in Finland is in Turku. (Port of Turku) Train ferry connection is important in metals exports to Nordic Countries and Western Europe (Iikkanen 2007). After Helsinki, the port of Turku is the next biggest general cargo and unit load port in Finland (Posti et al. 2009). In 2008 the international traffic through Turku was about 3.2 million tons and the total traffic about 3.4 million tons (FMA 2009).

Hanko

The Port of Hanko is the southernmost port in Finland and it has good connections to Central Europe, Russia and everywhere in Finland. It is a communally owned port, which is specialized in car transit to Russia. In export the most important product is paper, but other cargoes are handled as well, for example general cargo. (Kuronen et al. 2008) The trailer and container traffic is expected to increase in the future. (Auto- ja kuljetusalalehti 2/2008). On the other hand, with the current infrastructure and operations models the port may have capacity problems in the future. Extension possibilities are restricted because of the location of the port (near the Hanko city) and because of environmental reasons: sea areas around Hanko are protected (Kivari et al. 2007).

In 2008 the total traffic through the port of Hanko was 3.7 million tons, which consisted almost completely of international traffic (FMA 2009).

Koverhar

The Port of Koverhar is located in Hanko and its owner is the steel company Ovako Wire Ltd. The port serves to small extent also other industries in the area. The port is import-oriented: most of the traffic is imports of raw materials. (Kuronen et al. 2008) Main imports are coal and coke and ores and concentrates. Export consists of metals and metal manufactures. The total traffic in 2008 was 1 378 000 tons (FMA 2009).

Inkoo

The Port of Inkoo is a privately owned public port and it is situated in Southern Finland, 60 km from Helsinki by road. The Port Company is called Inkoo Shipping Ltd and it is

owned by industrial companies. The port is specialized in handling and storing dry bulk, for example coal, crushed stone and limestone. It is an import-oriented port. (Kuronen et al. 2008) In 2008 the total traffic was 1 782 000 tons, of which the share of international traffic was 1 749 000 tons (FMA 2009). In recent years, the port has expanded its storages and there are also plans to build a new dock. (Port of Inkoo)

Taalintehdas

In 2008 the total traffic in Taalintehdas was 259 000 tons and it consisted of export of metals and metal manufactures (FMA 2009). Ovako Wire steel production plant is located in Taalintehdas.

Kantvik

The Port of Kantvik is situated in Kirkkonummi. There are two separate ports within a distance of 500 metres: Eteläsatama (Southern port) and Pohjoissatama (Northern port). Eteläsatama is owned by the city of Helsinki, whereas the owner of Pohjoissatama is Danisco Sugar Ltd. In Kantvik coal and coke and crude minerals are imported and ores and concentrates exported. Pohjoissatama is handling raw sugar and in Eteläsatama main cargoes are coal, gypsum and cement. The port serves mainly local industrial companies. (Kuronen et al. 2008) In 2008 the total traffic was 877 000 tons and international traffic 855 000 tons (FMA 2009).

Helsinki

The Port of Helsinki is the largest general port for import and export in Finland. It is also the biggest passenger port in Finland. The new port in Vuosaari is concentrated in container and ro-ro traffic and the main passenger terminals are situated in Etelä- and Länsisatama. The import of coal is concentrated at Sompasaari berth. The port of Vuosaari serves primarily consumer goods transports. Industrial products, raw materials and forestry products are also transhipped in Vuosaari. (Kuronen et al. 2008) The strengths of Vuosaari are direct connections to the entire Finnish road and railway network, airport and logistics centres, the balance between imports and exports and good connections to the ports in Northern and Western Europe. The port of Helsinki operates as an administrator according to the landlord principle. (Port of Helsinki - Vuosaari Harbour 2009) International traffic through the port of Helsinki was 11.7 million tons in 2008 and other dry cargo (general cargo) was the most important cargo type (FMA 2009).

Porvoo

The Port of Sköldvik in Porvoo is an oil port, and it handles most petroleum product transshipments in Finland. It is also the biggest port in Finland when measured in tons. In

2008 the total traffic in Sköldvik was over 21 million tons (FMA 2009). The Port of Sköldvik is part of the Neste Oil Ltd Porvoo refinery. The refinery produces about 150 different oil products and components for traffic and transport, industry and energy generation. The capacity of the refinery is approximately 12 million tons of crude oil annually (Neste Oil – Porvoo refinery). The Porvoo refinery produces also bio diesel. A substantial share of the production goes to the domestic markets and a part is exported mainly to Europe and North America. Other industrial feed materials, like gases and chemicals are also transported in Sköldvik. Plastics raw material producers Borealis Polymers Ltd. and Styrochem Finland Ltd. are situated in the industrial area and are also served by the port of Sköldvik. (Kuronen et al. 2008)

Loviisa

The Port of Loviisa is a communally owned port. In 2008 main cargoes in import were coal and coke and crude minerals. Sawn wood and cereals were exported. The port is export-oriented, and the international traffic in 2008 was 977 000 tons (FMA 2009). In the future, it could be possible that the port could also be used in transit traffic to/from Russia. The port has a good location, and there is a road connection to route E-18 and also a railway connection to the port, but on the other hand, the railway is in the need of improvement. (Kuronen et al. 2008)

Kotka

The Port of Kotka is a municipally owned limited company. The port is divided to three separate port areas: Mussalo, Hietanen and Kantasatama. Import consists of general cargo, timber, metals and metal products and minerals, and in export main cargoes are forestry products (paper, sawn wood, pulp) and chemicals. Also fertilizers and general cargo are exported. Transporting Russian transit cargoes has also an important role in the Port of Kotka. The depth of Mussalo fairway is 15.3 metres and in Orregrund-Kotka fairway the depth is 10 metres. (Kuronen et al. 2008) Kotka has a strong position as an export port in the Finnish wood-processing industry, since the forest industry company Stora Enso has focused its traffic flows from Eastern and Southern Finland to Kotka. (LogVAS 2007).

In total volumes Kotka is the third biggest port in Finland but in transit transport it is the biggest port. Mussalo is the biggest container port in Finland (1 million TEU/year). Hietanen is used as a car terminal and ro-ro port. Traffic in Kantasatama consists of lo-lo, ro-ro and ropax traffic as well as passenger traffic. In 2008, the total volume of foreign trade handled in the port(s) of Kotka was about 11.2 million tons of which 3.4 million tons was transit traffic to/from Russia. The share of Kotka of total Russian transit traffic in Finland was about 40%. (Posti et al. 2009)

Hamina

The Port of Hamina is situated in South-Eastern Finland, only at 35 kilometres distance from the Russian border. It is also an important transit traffic port. In 2008 the port was the 9th biggest port in total volumes and in transit traffic it was the third biggest port in Finland. In year 2007, the share of transit traffic was 29 % in international traffic. Main cargoes in import include general cargo in containers and liquid bulk: chemicals and oil products. In export the most important product groups are forestry products and chemicals. The port is a municipally owned private company and it is situated near the town of Hamina. The main investment projects in the near future include the deepening of waterway and the expansion of the container terminal by 2010, which will enable the handling of 1 million TEU annually. After the deepening of the fairway, the port cargo capacity can increase with even 50 %. (Port of Hamina 2009) The fairway leading to the port will be righted and deepened to 12 metres, beginning in August 2009. The new fairway will be in use in 2011. The project is realized by Finnish Maritime Administration (fairway) and Haminan Satama Oy (port area). The deepening of the fairway is important especially for the functioning of the oil port. After the deepening of fairway also Panamax-size ships can be used in transport. (Finnish Maritime Administration 2009) The liquid terminal is specialized in the storage and handling of liquids, and as a liquid bulk port Hamina is the third biggest liquid port in Finland (Port of Hamina 2009). In 2008 the amount of international traffic in the Port of Hamina was 3.8 million tons (FMA 2009).

Imatra/Vuoksi

The port of Imatra/Vuoksi is an inland port as well as the ports of Joutseno and Lappeenranta. These ports are situated along the Saimaa Canal. The port of Imatra/Vuoksi is owned by the forest industry company Stora Enso Oyj. (Sikiö & Salanne 2008) Timber is imported and forestry products exported. In 2008 total traffic through the port was 670 000 tons, and the share of international traffic was 573 000 tons (FMA 2009).

Joutseno

In the port of Joutseno timber and crude minerals are imported. In 2008 the total traffic was 264 000 tons all of which was import and international traffic (FMA 2009). There is three forest industry ports in Joutseno: Honkalahti, Sahanranta and Pulp, owned by Honkalahden satama Oy, Stora Enso Timber and Botnia Oyj (respectively). (Sikiö & Salanne 2008) Timber imports from Russia are vital for these production plants (Halla 2008).

Lappeenranta (Mustola)

The port of Mustola is a municipal port owned totally by the City Of Lappeenranta. It is situated along the Saimaa Canal 75 km from the Gulf of Finland and it is the biggest inland port in Finland. The Finnish Maritime Administration takes care of the maintenance and improvement of Finland's waterway network, including the Saimaa Canal. Total traffic through Mustola was 660 000 tons in 2008, of which 387 000 tons

were international traffic. Timber, coal and coke, crude minerals, ores and concentrates are imported and crude minerals, timber and wood pulp exported (FMA 2009).

The maximum vessel size in the canal is: length 82.5 m, beam 12.6 m and draught 4.35 m. The port has direct railway and highway connections to Russia, Helsinki and Joensuu and to international airport. The distance to the Russian border and Nuijamaa border crossing station is 20 km. Customs services are available at the port. The port has 7 berths. (Lappeenranta Mustola Harbour)

In Lappeenranta there is also ports belonging to forest industry companies: the port of Kaukas and the port of Kaukas sawmill owned by UPM Kymmene Oyj, and the port of Metsä-Saimaa, which is owned by Metsäliitto. (Sikiö & Salanne 2008)

3 TRANSIT TRAFFIC

3.1 General

Transit traffic means freight traffic between two countries via a third country. Transit goods are only passing through the third country; they are not bought or paid duty for in the transit country, and they are also not counted as export in the transit country. (Widgren et al. 2000)

There are many reasons for the development of the transit traffic between the EU and Russia. After the collapse of the Soviet Union the only ports belonging to Russia in the Baltic Sea area are located in the Eastern parts of the Gulf of Finland and in Kaliningrad. Moreover, those locations have disadvantages: in the Eastern part of the Gulf of Finland ice conditions can be difficult in winter and Kaliningrad is situated apart from the Russian “mainland” so that transportations have to pass through Lithuania and Belarus. Transit traffic has also developed as a consequence of the lack of port capacity in Russia. The strong growth in the Russian economy and in its foreign trade has also increased transit traffic volumes. (Lautso et al. 2005) The import to Russia has grown more than export, which has also increased transit traffic in Finland. (Posti et al. 2009)

3.2 Transit via Finland

The reasons for the development of Finland as a transit country have been its location next to Russia and more than 1200 km of common border, the same rail gauge used in railway traffic, the long experience of connecting rail traffic between the two countries, wagons that become available (empty) from the Finnish import and advanced port operations. (Salanne & Saarto 1998) During the latest years containers used in transit traffic have replaced wagons in export and port operations have developed further, for example regarding value added services. (Ruutikainen & Tapaninen 2007)

In 2008 the total volume of Finnish transit transport was 8.4 million tons. The most important commodity groups were general cargo, ores and concentrates and metal scrap, chemicals, and metals and metal products including cars. During the latest years, especially forest industry products have been losing their share of transit transport volume. At the same time, the shares of metalliferous ores and cars have increased. (Posti et al. 2008)

Transit traffic has a significant importance for Finland and particularly for South-Eastern Finland. Its advantages are much bigger than disadvantages. Kotka, Hamina and Hanko are important Finnish transit ports. Kotka and Hamina are situated near the Russian border, whereas Hanko has a long tradition as a car import port. Transit is also important for the security of supply of logistics because it helps the ports maintain traffic and infrastructure that could otherwise (without import) be unprofitable. (Loghu2 - Työryhmäraportti)

The main transit route in Finland passes through Turku, Hanko, Helsinki, Kotka and Hamina to St. Petersburg and Moscow. In Finland Pan-European transport corridor 9 consists of E-18 route eastwards from Helsinki and of the railway connection between Helsinki, St. Petersburg and Moscow (and further to Far East). There is also connection with Pan-European transport corridors 1 and 2 for example to Baltic Countries and Germany. Also the ports of Nordic Triangle, Poland and Europe are accessible by Baltic Sea Motorways. (Lautso et al. 2005)

In transportation of valuable goods from EU the route via Finland is most used (Lautso et al. 2005). Transit traffic via Finland made up 13% of the value of Russian import in 2008 (Posti et al 2009). Transit traffic leaves Finnish ports mainly by roads. Rail traffic is quite insignificant, but in the future container transports in trains are expected to increase (Posti et al. 2009).

Westbound transit includes mainly ores and concentrates and chemicals and it is transported usually by rail to Finnish ports and further to countries of destination. (Posti et al. 2009)

Checkpoints

Vaalimaa checkpoint belongs to municipality of Virolahti. The distances from Vaalimaa border crossing station are: 187 km to Helsinki, 203 km to St. Petersburg and 803 km to Moscow. The main E-18 route from Helsinki to St. Petersburg passes through Vaalimaa. Important South-eastern transit ports of Kotka and Hamina are also located nearby. (Vaalimaa.fi)

Vaalimaa is the most important and busiest checkpoint between Finland and Russia. The share of road transit traffic volumes was 2.3 million tons in 2008 of total 3.8 million tons. (Posti et al. 2009) The checkpoint is used in international road traffic. The frontier station in the Russian side is situated in Torfyanovka. (Finlex 1994)

Nuijamaa checkpoint is located in Lappeenranta, and in the Russian side frontier station is in Brusnitchnoe. In Nuijamaa the border can be crossed by road or by water, along the Saimaa Canal. (Finlex 1994) Road transit volumes through Nuijamaa were 0.8 million tons in 2008 (Posti et al. 2008). In Lappeenranta there is also a border crossing station for railway traffic, in Vainikkala (Lappeenranta.fi). The international border crossing point in Imatra was opened in 2002. (Imatran kaupunki) In 2008 road transit volumes in Imatra were 0.7 million tons (Posti et al. 2009)

4 TRAFFIC FLOWS

4.1 Security of supply

According to National Emergency Supply Agency, “security of supply means the capacity to maintain the basic social activities and infrastructures that are indispensable for safeguarding the population's living conditions, maintaining a functioning society, and sustaining the material preconditions for upholding national defence in case of serious disturbances and in emergency situations.” Therefore security of supply means not only access to (raw) materials, but also the reliable functioning of essential technical and logistical systems in the society. (National Emergency Supply Agency 2009a)

Security of supply means that the normal economic activity is tried to uphold also during disturbances or even under emergency situations. This is done by analysing the possible threats and risks that may endanger the national economy, and by creating means and measures so that the vulnerable sectors and activities in the society could be safeguarded in any conditions. The public administration and the business world are co-operating in security of supply issues. Emergency preparedness covers the entire national economy and reaches all its branches, including certain plants producing goods and services that are necessary for securing supply. Various sectors of public administration are also prepared to take the necessary measures under emergency conditions. The development of these activities is supported, guided, and co-ordinated by the National Emergency Supply Agency. (National Emergency Supply Agency 2009a)

Security of supply of logistics means the capacity of the logistical system to provide different sectors with transport, storage and distribution services. Logistical system includes actors, resources used by actors and infrastructure (e.g. routes, solid structures, electricity and information and telecommunication technology networks). Present-day societies are even under normal circumstances prone to disturbances in highly optimized logistical systems, and because of that logistical systems are also more and more dependent on other factors like energy, ICT or the functioning of infrastructure. (Loghu2 – Johdon raportti 2007)

4.2 Critical production and infrastructure

”According to the Government's Decision on Safeguarding the Security of Supply of

21st August 2008 (Finnish Statute Book 539/2008) the objective is to reach such a degree of preparation that the population's capacity to make a living, to carry out necessary social activities and to achieve the material preconditions for an effective national defence are not endangered (basic security of supply level). In addition to traditional threats, the risks of terrorism and of the use of nuclear, biological and chemical substances (NBCs) shall be taken into account.” (National Emergency Supply Agency 2009b)

The objectives of NESAs are safeguarding critical infrastructure and critical production. Critical infrastructure includes the following: energy transmission and distribution, communication network, transport and logistics, water supply and other municipal services and constructing and maintenance. As critical production the following are mentioned: food supply, energy production, healthcare, production for national defence purposes and operational preconditions of export industry. (National Emergency Supply Agency 2009b)

Security of supply sectors defined by NESAs are food production, energy, health care, critical basic production, financing, information society and transport logistics. There is also Department of critical production that includes functions from several sectors. The objective of Department of critical production is to safeguard operational preconditions for primary production, food production industry, trade and critical industrial production. From the security of supply point of view critical industrial production includes food production, technology industry, forest industry, chemical industry, plastic and rubber industry, construction industry and clothing industry. Also health care and water supply and sewerage are included in Department of critical production.

Department of critical production also maintains stockpiles of certain food supplies (grain, animal feed, fertilizers), critical industrial raw materials and medicines and hospital supplies, and certain explosives. Energy products are not included in Department of critical production stockpiles. (Huoltovarmuuskeskus 2009a)

NESA has collected and maintains lists of companies and production plants that are critical for security of supply. Those companies are important in securing basic functions in society or in rescue operations, in defence industry or in strategic export industry. (Huoltovarmuuskeskus 2009c)

4.3 Important sectors and traffic flows

In Finland the most important imported raw materials are metals, minerals, chemicals and fuels needed by forest, metal and chemical industries. Many of these raw materials are also critical in producing other raw materials and for example in high technology industry. A Natural Resource Strategy for Finland emphasizes the need of developing the material cycle within the national economy in order to reduce the consequent burdens on the environment and to create more added value. There is also a need to reduce dependency on imported natural resources, enhance the security of supply, and at

the same time ensure that critical raw materials remain available also from international markets. (Sitra 2009)

If measured in weight, half of Finnish import comes from Russia, and it consists almost entirely of raw materials. In Finland Russian-originated wood, ores, scrap metals and crude oil and chemicals are processed and exported to Europe and other export markets, transported mainly by sea. Metal processing is dependent on metal scrap and oil refining on crude oil. In addition, many processes in chemical industry need chemicals that are imported from Russia. The security of supply in raw materials is an important question here, as the forest industry example (timber supply) has shown. (Karvonen et al. 2008)

Sundberg (2009) has researched the structure of Finnish trade and industry from the point of view of transportation. Important sectors there include trade (consumption), forest industry, technology industry, chemical industry, mining industry and food industry.

Next, selected sectors are presented as well as essential raw materials needed in these sectors. Also some important actors operating within these industries are presented. Sectors include critical industrial production sectors of NESA complemented with trade and mining industry (from Sundberg). The chosen sectors are: energy sources, food production, technology industry, forest industry, chemical industry, mining industry, constructing and maintenance, trade and national defence. Information of actors is mostly based on Internet sites of actors and industries, and the Sundberg report.

4.4 Energy sources

4.4.1 Oil and gas

Crude oil imports to Finland were almost 12 million tons in 2008. Oil and oil products imports were altogether almost 17 million tons. The export of oil products was 6.5 million tons, so oil is refined to a great extent for domestic use. The most important country of origin is Russia: almost 10 million tons of crude oil (and 2 million tons gas oil). From Norway 1.2 million tons of crude oil was imported in 2008. (Ölly- ja kaasualan keskusliitto)

Oil products are used in traffic (47%), as raw materials and lubricants (20%), as energy source for industry (14%), in heating (10%) and in agriculture, forestry and constructing (9%) (Figure 4.1). (Ölly- ja kaasualan keskusliitto)

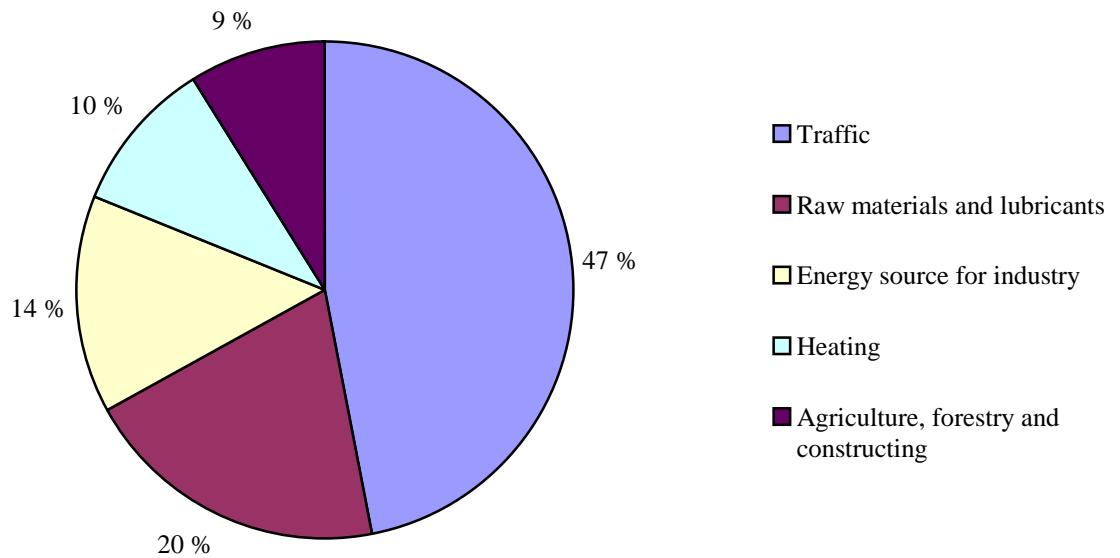


Figure 4.1. Consumption of oil products in 2008. (Ölly- ja kaasualan keskusliitto)

Oil is also an important raw material especially in chemical industry, where it is needed for example in the production of plastics and (synthetic) rubber. Gas is used in energy production but also as a raw material in chemical industry.

4.4.2 Coal

Coal is used in electricity and heat production. In addition, it is needed in various industrial processes, for example in the production of iron and steel and cement. It is also used as a raw material in chemical industry, for example in producing different chemicals, synthetic rubber and medicines. Coal serves also as a reserve fuel in power plants that use bio fuels and peat. Coal reserves are large and distributed in every continent. More than 70 countries have coal deposits. The biggest coal reserves are situated in the USA, Russia, China and India. The annual coal consumption in Finland is 5–7 million tons. (Energiateollisuus ry & Hiilitieto ry 2009). In electricity production the share of coal is almost 10% (Figure 4.2).

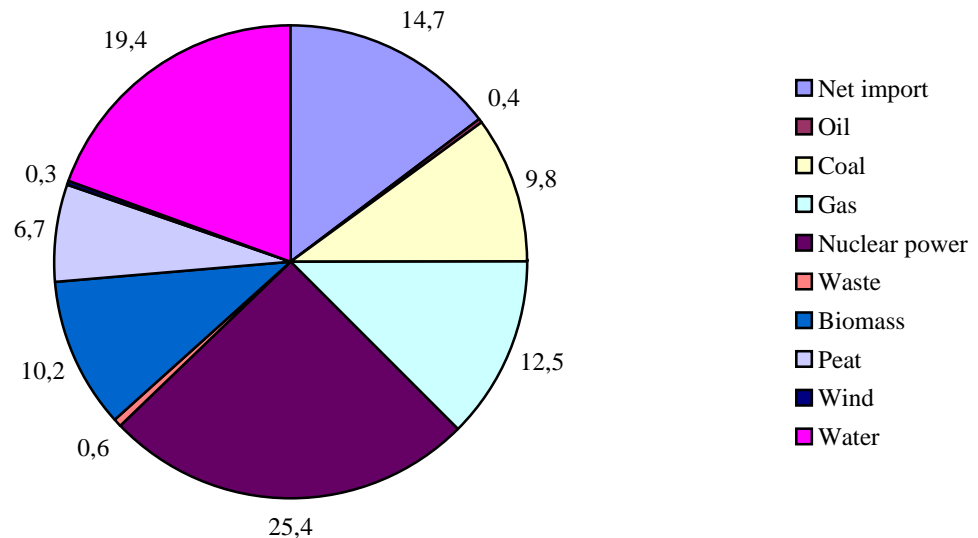


Figure 4.2. Supply of electricity in 2008. (Energiatiedot 2009)

In energy production the biggest coal users in Finland are Pohjolan Voima (power plants in Kristiinankaupunki and Tahkoluoto), Fortum (Inkoo, Meri-Pori, Naantali, Espoo) and Helsingin Energia (Hanasaari and Salmisaari), in industry metal processing company Rautaruukki (Hiilitieto.fi).

4.4.3 Uranium

The most important uranium producers are Canada (29% in 2004), Australia (22%), South Africa, Namibia and Niger (altogether 18%), Kazakhstan, Uzbekistan and Ukraine (altogether 14%) and Russia (8%). About half of uranium is made of natural uranium (ore) and the rest comes from old storages, reprocessing used nuclear fuel or from nuclear weapons. In Finland the bedrock/rock foundation has similarities with Canadian and Australian bedrocks, which suggests that uranium could be extracted also in Finland. At present there are nevertheless no commercially exploitable uranium deposits in Finland; all known deposits are small and their uranium contents are too low. Rising prices will on the other hand enable the mining of deposits of lower quality. The only uranium mine in the EU area is located in Rozna, the Czech Republic, but the mine is running out of ore. (Geologian tutkimuskeskus 2008). Olkiluoto nuclear power plant is owned by Teollisuuden Voima Oyj (TVO) and the owner of Loviisa plant is Fortum Oy. In electricity production the share of nuclear power is $\frac{1}{4}$ (Figure 4.2).

4.4.4 Routes for energy products

Most of crude oil is imported by sea: 10.6 million tons arrived to the ports of Porvoo and Naantali in 2008 (Table 4.1). In addition to maritime transport, some oil is imported from Russia also by rail. Oil is carried in Russian tank wagons through the checkpoint in Vainikkala. (Iikkanen 2007) Oil products are imported especially to Porvoo (69%) (Table 4.2).

Table 4.1. Imports of crude oil to Finnish ports in 2008. (FMA 2009)

Port	Import (1000t)	Share of import (%)
Porvoo	7 943	75
Naantali	2 651	25
Total (Finland)	10 594	100

Table 4.2. Import of oil products in 2008 (FMA 2009).

Port	Oil products (1000t)	Share of import (%)
Porvoo	2726	69
Naantali	161	4
Hamina	238	6
Helsinki	155	4
Kotka	13	0
Turku	91	2
Inkoo	8	0
GoF* ports	3392	85
Other ports	601	15
Total (Finland)	3993	100

*The Gulf of Finland

Approximately half of coal used in Finland is imported from Russia. In steel production quality requirements are higher than in energy production, and coal needed in steel industry is mainly of Australian and American origin. Other significant countries of origin are South Africa, Indonesia, China, Colombia and Poland. (Hiilitieto.fi) In Gulf of Finland area, coal (and coke) is imported through the ports of Helsinki, Naantali, Inkoo, Koverhar, Loviisa, Kotka and Lappeenranta (Figure 4.3). Coal is also imported by train from Russia. Other significant coal ports include Pori, Raahe, Kristiinankaupunki, Vaasa, Pietarsaari, Tornio and Oulu, and these ports are located in the Gulf of Bothnia area.

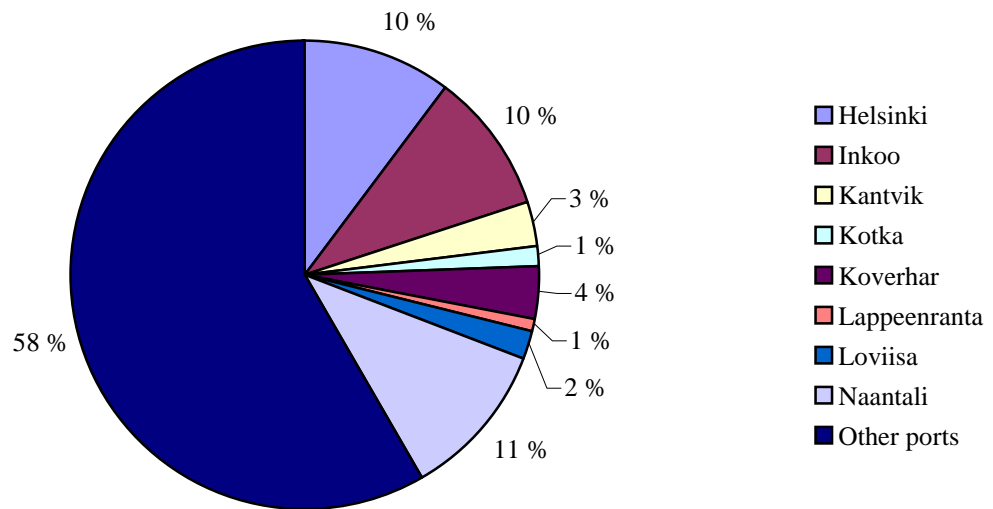


Figure 4.3. Import of coal and coke to Finnish ports in 2008 (FMA 2009).

Nuclear fuel is transported to Olkiluoto from European fuel production plants (Germany, Sweden, Spain) by sea and road and to Loviisa power plant from Russia by rail and road, or from Spain (Energiateollisuus 2006).

4.5 Food production

Food supply is one of the branches of critical production defined by the National Emergency Supply Agency. It shares interdependencies with other “basic sectors”, like energy, health care, critical industry, logistics and infrastructure. Food supply system consists of input industry, primary production, secondary production and functions of trade. The production chain is long, interdependent and vulnerable. Even though raw materials used in secondary production are mostly domestic, the importance of certain critical imported inputs is fundamental for the whole chain. (Elintarvikehuoltoja tukevan varmuusvarastoinnin arviointi 2009)

In food production industry 85% of raw materials are domestically produced. Its production covers 81% of Finnish food market and it has a dominating market position. It serves other food industry, wholesale trade, store chains, retail trade, institutional kitchens and consumers. The Finnish food industry has also expanded its market area to neighbouring countries. It is the fourth biggest industry after metal (technology), forest and chemical industries. In 2008 the value of export was 1.4 billion euros, and the value of import 3.3 billion euros. (Elintarviketeollisuusliitto)

Nevertheless, the primary production and food industry in Finland suffers from profitability problems even though security of supply has been strong and stockpiles adequate. Recent price fluctuations and changes in agricultural policies and farming subsidies in European union have further increased uncertainty about the future. (Huoltovarmuuskeskus 2009b) Moreover, it has to be taken into account that agriculture is dependent on the use of pesticides, fertilizers and animal feed and that their raw materials are to a great extent imported, which means that primary production cannot really be self-sufficient.

In primary production self-sufficiency (and surpluses) is attained in grain (except rye), potato, eggs, meat (except beef) and dairy products. Finland is self-sufficient also in seed grain, seed potato and grass crops. Nevertheless, many inputs needed in agricultural production are import-dependent. For example pesticides are completely imported, mainly from EU: Germany, UK, France, Denmark, Belgium and Sweden, and also from USA. In fertilizers the domestic industrial production capacity is good but many raw materials are imported. Most critical are nitrogenous fertilizers whose production requires imported ammonia. Imported raw materials are needed also for the production of potassium chloride and sulphuric acid, but on the other hand, phosphorus raw materials are mined sufficiently in Finland. (Elintarvikehuolto tukevan varmuusvarastoinnin arviointi 2009)

Considering animal feed, grain is mostly domestic (excluding sugar beet) but sources of extra protein (e.g. soybeans) have to be imported. In agricultural machinery and device maintenance imported components and spare parts are needed, which requires also functioning logistics. In secondary production there are interdependencies between energy supply, raw material supply, information systems, outsourced supporting services, water supply and sewerage and logistics. Food industry is also dependent on imported chemicals and raw materials for packages. (Elintarvikehuolto tukevan varmuusvarastoinnin arviointi 2009)

Cereals have been stockpiled for the need of one year. There are also stockpiles of seeds, sugar, plant breeding materials, pesticides, fertilizers and protein sources for animal feed. Import fuels are stockpiled for the need of 5 months. (Elintarvikehuolto tukevan varmuusvarastoinnin arviointi 2009)

In the ranking of biggest companies in *Talouselämä* magazine, HK-Scan, Valio, Atria, Fazer and Alko are placed in top100. Other important food production companies are Raisio, Vaasan&Vaasan, Sinebrychoff, Lännen Tehtaat, Saarioinen, Paulig and Arla Ingman (*Talouselämä*. Suurimmat yhtiöt). Important exporters in food industry are Valio, Raisio, Danisco Sweeteners, HK-Scan and Lännen Tehtaat (*Talouselämä*. Suurimmat viejät).

4.6 Technology industry

The share of technology industry of Finnish export is 60%. Technology industry is divided in four branches: electronics and electrotechnical industry, mechanical

engineering, metals industry and information technology industries (The Federation of Finnish Technology Industries 2009). Technology industry needs metals, minerals, concentrates, metal scrap and fuels. Most of these are imported even though Finland has also own mineral deposits and production, both in metal minerals and industrial minerals. The most common metals in earth's crust are aluminium and iron. They are also widely used in technology industry.

The biggest exporters in technology industry are Outokumpu, Metso, Wärtsilä and ABB. Outokumpu is one of the leading stainless steel producers in the world. Metso and Wärtsilä are mechanical engineering companies; Metso produces for example paper machines and Wärtsilä engines. ABB belongs to electronics and electrotechnical industry and produces for example automation technology products. (Sundberg 2009)

In addition to Outokumpu, important actors in metals industry include Boliden, Componenta, Kuusakoski, Luvata, Ovako, Rautaruukki, Sacotec and Outotec. These companies manufacture and process for example steel and copper products, refined steel, zinc and nickel. In electronics and electrotechnical industry important companies are ABB, Elcoteq, Ensto, Nokia, Nokia Siemens Networks, Perlos, Planmeca, Polar Elektro, Suunto, Vacon, Vaisala and VTI Technologies. Important mechanical engineering companies include STX Europe (former Aker Yards), Cargotec, Finn-Power, Fiskars, Kone, Konecranes, Metso, Patria, Pemamek, Ponsse, Valtra, and Wärtsilä. More than 90% of production consists of machinery and equipment designed directly for client industries, especially for forest, offshore and mining industry. (Sundberg 2009; Teknologiateollisuus)

4.6.1 Aluminium

Aluminium is a fundamental material for technology industry. Aluminium has been utilized only for about 100 years and during that time the production has increased exponentially. Nowadays aluminium is produced more than all other non-ferrous metals altogether. The chief ore of aluminium is bauxite that contains aluminium an average of 25%. Bauxite reserves are situated near the equator. All aluminium used in Finland is either imported or recycled. As a material aluminium is fully re-usable and recycling is technically and economically profitable. Aluminium is needed especially in construction and traffic, in transport and vehicle industry, packaging industry, electrical equipment industry (electrotechnics) and engineering industry. (Teknologiateollisuus 2009)

4.6.2 Steel

Steel is an iron-based metal and its coal content varies between 0–2%. There are several hundreds of different steel types depending on needed properties and uses. Steel is often alloyed, for example with silicon, manganese, chromium, nickel, molybdenum etc. It is the most important production material in the world. (Metallien jalostuksen yleiskuva 2005)

Steel is an essential material everywhere in modern society. It is also the most recycled material in the world: it is recycled more than all other materials altogether. Steel can be used several times without weakening of its quality. Recycling saves materials and energy, but due to the growth of demand, also the production of steel from ore is necessary. Finland is a net importer of recycled steel, because in Finland there is not enough steel scrap available for recycling and re-use. Steel is used in construction, infrastructure, machinery and equipment, households and metal products, means of transport etc. (Haikka 2007)

Sweden and Russia are important iron concentrate and scrap sources for iron and steel production (Geologian tutkimuskeskus 2009a).

4.6.3 Routes for metals and crude minerals

From the point of view of maritime transportation the Finnish metal industry is more important to the ports in the Gulf of Bothnia than to the ports in the Gulf of Finland. (Kuronen et al. 2008) The most important ports importing metals and metal manufactures were Hanko, Kotka, Helsinki and Turku. Import was concentrated to GoF ports (Table 4.3). Other ports included for example Pohjankuru and Rauma. In export Helsinki (11%), Koverhar (10%) and Taalintehdas (8%) were the biggest GoF ports (Table 4.4), and the share of GoF ports was 40%. Raahe (20% of all exports) and Tornio were the biggest export ports outside the GoF area, and also Lappohja, Pori and Kokkola were significant ports in export. In import of raw materials, ores and concentrates, Koverhar is the second biggest port in Finland, but in top5 there are no other GoF ports. (Sundberg 2009)

Table 4.3. Import of metals and metal manufactures in 2008 (FMA 2009).

Import	Metals and metal manufactures (1000t)	Share of import (%)
Hamina	180	6
Hanko	831	27
Helsinki	452	14
Inkoo	2	0
Kantvik	9	0
Kotka	652	20
Koverhar	5	0
Loviisa	36	1
Turku	429	13
GoF	2596	81
Other ports	591	19
Total (Finland)	3187	100

Table 4.4. Export of metals and metal manufactures in 2008 (FMA 2009).

Port	Metals and metal manufactures (1000t)	Share of export (%)
Naantali	3	0
Hamina	68	2

Hanko	97	3
Helsinki	340	11
Inkoo	1	0
Kotka	76	2
Koverhar	301	10
Loviisa	2	0
Taalintehdas	259	8
Turku	128	4
GoF	1275	40
Other ports	1848	60
Total (Finland)	3123	100

4.7 Forest industry

Forest industry is usually divided in two branches: pulp and paper industry (chemical forest industry) and wood product industry (mechanical wood processing). In export the biggest and most important product groups are paper and sawn wood. (Sundberg 2009). Import consists mainly of raw materials like timber, fillers and coating pigments.

Forest industry is seen as a regressive industrial sector, even though it will still have importance within the economy and export of Finland quite long in the future. According to Halla (2008), the share of forest industry in export is about 20% and its relative importance is bigger than anywhere else in the world. Nevertheless, demand for paper has not been growing anymore with the growth of GDP and forest industry is experiencing overcapacity and a structural change. (Halla 2008)

The most important forest industry companies UPM-Kymmene, Stora Enso and Metsäliitto belong also to the biggest exporters in Finland. (Sundberg 2009)

4.7.1 Timber

The Finnish forest industry is depending on timber import from Russia. Import of timber has been about 20 million cubic metres annually of which almost 80% has been of Russian origin. Russia is nevertheless now in the process of phasing in export duties for timber in order to encourage investments in Russian forest industry. Full export duties would make timber import from Russia to Finland unprofitable. Negotiations between the EU and Russia to solve the dispute are underway; it has also been linked to prolonged Russian WTO membership negotiations. If export duties will hinder timber import from Russia 15 million cubic metres could be got from Finland, which is however the theoretical maximum, but import from other countries should also be increased. (Halla 2008)

4.7.2 Fillers and coating pigments, chemicals

In paper production different fillers and coating materials i.e. so-called pigments are needed. These pigments make up about 20% of the mass of paper produced in Finland. The Finnish paper industry has specialized in such types of paper (magazine papers, copying paper, fine paper...) whose production requires use of pigments. This makes the Finnish paper industry very dependent on imported pigments. (Lahti-Nuuttila, 2000, cit. Paperiteollisuus – Toimialan tilanne ja tulevaisuuden haasteet 2006). A significant part of fillers and coating pigments are imported by sea (Sundberg 2009).

Fillers include for example calcium carbonate (lime), kaolinite, and talc. Kaolinite and talc are also used as coating pigments. Especially talc but also some of calcium carbonate is extracted in Finland, but kaolinite has to be imported.

4.7.3 Routes for forest industry raw materials and exports

The most important ports for forest industry in Finland are Kotka and Rauma both in export and import. The next important group consists of Hamina, Kemi, and Oulu. Helsinki and Hanko are also significant ports in export (Halla 2008). Kotka and Loviisa are the most important export ports for sawn wood (Table 4.5). In the Gulf of Bothnia area significant sawn wood export ports in 2008 were Kaskinen, Pietarsaari, Pori and Rahja. The Saimaa Canal has been an important timber import area for Russian timber. (Halla 2008) For raw timber imports, the most important port in the Gulf of Finland area is Kotka (Table 4.6). The second biggest timber import port in Finland in 2008 was Rauma (24%).

Table 4.5. Sawn wood exports in 2008. (FMA 2009)

Port	Sawn wood (1000t)	Share of exports (%)
Hamina	208	6
Hanko	248	8
Helsinki	287	9
Kotka	628	19
Loviisa	463	14
Turku	106	3
GoF	1940	59
Other ports	1344	41
Total Finland	3284	100

Table 4.6. Import of timber to Finnish ports. (FMA 2009)

Import	Timber (1000t)	Share of imports (%)
Hamina	28	0
Helsinki	1	0
Imatra	275	4
Inkoo	1	0

Joutseno	168	3
Kotka	1557	26
Lappeenranta	212	3
Turku	1	0
GoF	2243	36
Other ports	3893	64
Total Finland	6136	100

Fillers are imported by sea for example from USA. Trains carry paper products to ports and bring kaolinite as return cargo to production plants of chemical forest industry. (Iikkanen 2007) Different companies have concentrated their export in certain ports. Stora Enso Oyj exports paper produced in Eastern Finland through the port of Kotka, and paper produced in Northern Finland to Oulu and Kemi. UPM-Kymmene Oyj uses the port of Rauma in exporting paper from Western and Northern factories and the port of Hamina in Eastern Finland transport. M-Real Oyj uses mainly the ports of Hanko and Helsinki. (Iikkanen 2007)

The port of Kotka had a substantial share in paper and paperboard exports in 2008 (Figure 4.4), and other important ports in the GoF area were Hanko, Hamina and Helsinki. Other ports include Rauma (31%), Oulu (8%) and Kemi (7%).

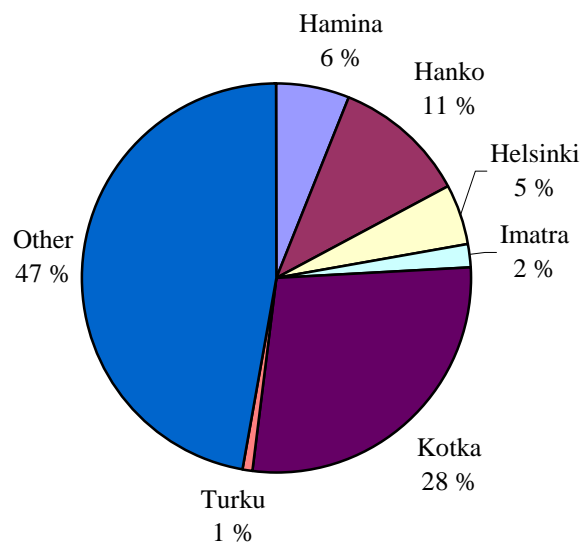


Figure 4.4. Export of paper and paperboard in 2008 (FMA 2009).

The Mussalo Bulk Terminal is currently one of the most important import ports in Finland for fillers used in the Finnish paper industry. Substantial part of kaolinite and lime imports to South-Eastern Finland is handled there. (Port of Kotka) In the port of

Hamina the yearly amounts of kaolinite imports have been 110 000 tons. There has been one ship transport in 1–2 weeks. From the port kaolinite is transported to clients by trucks. (Haminan sataman ympäristölupa 2005) Hamina is also an important chemical port, and from the point of view of forest industry, important are for example sodium hydroxide (lye) imports for pulp industry (Kemira 2009).

4.8 Chemical industry

Chemical industry is one of the three biggest industries in Finland. It is a wide-ranging industry that includes the so-called basic chemical industry as well as different specialized branches. In Finland the most important clients of chemical industry are forest industry, traffic, and electronics and electrotechnical industry, but products are made also directly for consumers. A substantial part of production is exported (44% of production) or used in the production of export goods (with direct export almost $\frac{3}{4}$ of production). Import consists of raw materials and special products. The most important branches are linked to forest industry, agriculture, constructing, electronics industry, food production, environmental products and biotechnics. Products include for instance pulp and paper industry chemicals, oil products, fuels and lubricants, plastic raw materials, packaging materials, paints, plastic pipe systems and insulating materials. (Chemind.fi – ala numeroin) Production is based for the most part on imported raw materials but domestic forest and mineral resources are also used. (Sundberg 2009) The most important raw material is crude oil and other oil and gas products.

Measured in gross value of production and value of export, chemical industry is the 3rd biggest industry in Finland. The gross value of production was 19.1 billion euros in 2008. Its share of industrial production was 15%. Oil products are the biggest product group with the share of 44% of the gross value. Basic chemicals make up 29% of the gross value of production. The share of plastic products is 13%, medicines 6%, rubber products 4%, paints and varnishes 3%, and detergents and cosmetics 1%. (Chemind.fi) In export the most important products are pigments, polyethylene and polypropylene, medicines and plastic products. Import products include medicines, resins, raw materials for plastics and other basic chemicals. (Riistama et al. 2003)

Measured in value, the most important export products are titanium dioxide, medicines, polypropylene, polyethylene, phenol, carboxy-methyl cellulose and plastic products. In import crude oil is the most important individual raw material. 1/3 of import consists of basic chemicals. Other product groups are medicines and oil products. The most important import countries are Russia (2 162 million € in 2008), Germany (1 418 million €) and Sweden (1 066 million €). (Chemind.fi) The total import was almost 11 billion € in 2008 (Table 2.1), and export 9.2 billion € (Table 2.2).

80% of all companies have been registered in the capital region and Tampere and Turku. In Porvoo there is also a significant chemical industry concentration. (Suomen ympäristö 49/2006; Sundberg 2009)

4.8.1 Basic chemical industry

Basic chemicals include for example gases, acids and fertilizers. Raw materials and semi-finished products are transported by rail for example from Russia. (Iikkanen et al. 2007) Basic industrial chemicals include sulphuric acid, nitric acid, phosphoric acid, potassium sulphate, calcium chloride and aluminium sulphate. Sulphuric acid is made of sulphur dioxide (mineral concentrates or pyrite) or sulphur. It has various uses, for example in fertilizer production, pulp and paper industry and metal industry. Nitric acid is made of ammonia (by Kemira GrowHow) and used mostly in fertilizers. Phosphoric acid is made of domestic apatite (Siilinjärvi) and used in the production of fertilizers and animal feed. Potassium sulphate is made of potassium salt and sulphuric acid and used as a fertilizer raw material. Calcium chloride is made of calcium carbonate and hydrochloric acid. Calcium carbonate (stone) is imported from Gotland. Aluminium sulphate is made of imported aluminium hydroxide and sulphuric acid and used for example in paper industry and water purification. (Riistama et al. 2003)

The most used chemicals are xylene, butyl acetate, isopropyl alcohol, butane, propane and ethanol. In tons oil is the most used material, as well as other oil and gas products (natural gas, fuel oil, diesels). (Suomen ympäristö 49/2006)

Kemira Oyj is an important producer of industrial chemicals, for example paper and pulp chemicals as well as water purification chemicals. Production includes also paints (Tikkurila Oy). Production plants of Kemira Oyj are situated in Pori, Harjavalta, Kokkola, Oulu, Siilinjärvi and Vaasa. Kemira Chemicals Oy (former Finnish Chemicals Oy) has production in Kuusankoski, Äetsä and Joutseno. Eka Chemicals Oy, Norilsk Nickel Harjavalta Oy, OMG Kokkola Chemicals Oy and Tetra Chemicals Europe Oy also produce inorganic basic chemicals. In the production of organic basic chemicals manufacturers are for example Ciba Finland, Finnzymes Forchem, Granula, KemiFine and Kemphos. AGA, Polargas and Woikoski produce industrial gases. In Pori Sachtleben Pigments Oy produces titanium dioxide, pigment for paint and plastics industry. (Sundberg 2009)

Kemira Chemicals Oy produces for example sodium chlorate and lye, hydrochloric acid and other chlorine based chemicals. Kemira Chemicals imports also lye (sodium hydroxide) for pulp industry, e.g. through the port of Hamina. (Kemira 2009)

Basic petrochemicals are ethylene, propylene, butadiene, benzene, toluene, xylenes, methanol, ammonia and synthesis gases. In Porvoo Borealis Polymers produces ethylene, propylene, butadiene and benzene from oil refining by-products. They are used for example as raw materials in plastic production or as solvents. Ammonia and methanol are made of natural gas. Ammonia is not anymore produced in Finland. Also the production of synthesis gases is based on fossil fuels. Other petrochemicals are produced from basic petrochemicals and they include for example formaldehyde, formic acid, phenol and acetone. (Riistama et al. 2003)

4.8.2 Plastic industry

Plastics industry is one of the critical industries defined by NESÄ (Huoltovarmuuskeskus 2009a). It is also one of the strong fields of know-how in Finnish chemical industry. In addition to common plastics, plastic industry products reach also paper, paint, glue and textile industry and mechanical wood processing as well as water purification. (Riistama et al. 2003) Plastics are needed in all spheres and in all vital functions in society. Plastics are mostly by-products of petrochemical industry; they are made of residual hydrocarbons of fuel production. Globally only 4% of all consumed oil is used in plastics production. Plastics can be made also of other hydrocarbons, for example hydrocarbons developed in biological processes. (Muoviteollisuus 2008.)

In Finland about 600 000 tons of plastics are used annually in manufacturing of different plastics products. The most common plastics, so-called commodity plastics are polyethylene (PE), polypropylene (PP), polystyrene (PS) and polyvinyl chloride (PVC) whose usage is about 80% of the total usage of plastics. All these plastics are produced in Finland except PVC. So-called technical and special plastics are mostly imported. (Muoviteollisuus ry 2008.) Half of the plastic raw material is produced in Finland and half is imported (Riistama et al. 2003). Main ports for raw material imports are Hamina and Porvoo.

Approximately half of plastics are used in the production of plastic films and food packages. 25% goes to the production of construction materials, e.g. plastic pipes, and about 10% to technical plastics components of electronics and machine industry (mechanical engineering). The remaining 15% of plastics are used in the production of other various plastic products, for example vehicle parts, hospital equipment, housewares etc (Figure 4.5).

Plastics industry has suffered from fast price changes in international market during the last years. Especially the price development of crude oil affects at least the prices of commodity plastics. (Muoviteollisuus 2008.)

In Finland plastics raw materials are produced for example by Borealis Polymers, StyroChem Finland, and Ashland Finland, all of which are foreign-owned. Plastic processing companies include Huhtamäki, Uponor, Wihuri, KWH, Rani Plast and Suominen. (Sundberg 2009)

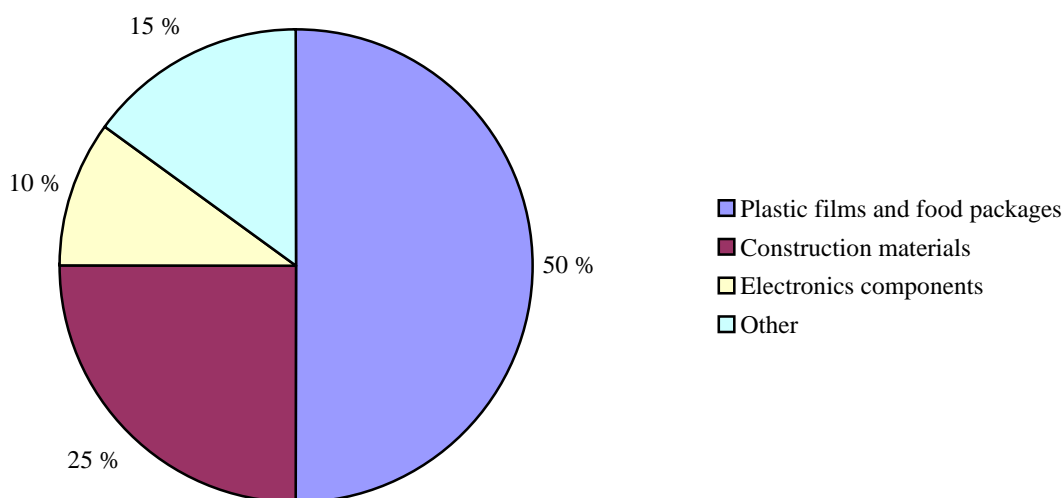


Figure 4.5. Consumption of plastics (Muoviteollisuus 2008).

4.8.3 Rubber industry

Rubber products are made of natural rubber, synthetic rubber or so-called thermoplastic elastomers. The production zones of natural rubber are situated in Southeast Asia, Central and South America and Africa. Rubber can also be produced synthetically from oil. Most used synthetic type is SBR, styrene-butadiene-rubber. Regarding their properties, thermoplastic elastomers are placed between rubbers and (thermoplastic) plastics. (Kumiteollisuus ry. 2007)

In the Finnish rubber industry rubber products have been classified in tyres, technical rubber products and rubber footwear. Almost all raw materials are imported, and two-thirds of production is exported. The most important client is vehicle industry. (Kumiteollisuus ry. 2007) 40–60% of rubber mass consists of blend components and additives, for example fillers like soot and silica sand, almost all of which are imported. (Riistama et al. 2003)

Important companies in rubber industry are Nokian Renkaat Oyj, Metso Minerals Finland Oy (e.g. conveyor belts), Reka Kumi Oy (e.g. vehicle industry products) and Stowe Woodward Finland Oy (Sundberg 2009).

4.8.4 Fertilizers

Ammonia

Ammonia is an important raw material in fertilizer production. Approximately 75–80% of ammonia is used in fertilizers. Other uses include the production of fibres, plastics, explosives and animal feed. Ammonia is needed also for example in refrigeration devices of food production. (Kemian työsuojeleuvottelukunta 2002) Ammonia is imported for example from Russia through Vainikkala and Niirala checkpoints, in Russian tank wagons. In case of possible supply breaks industry has its own wagon reserves that can be used in transporting ammonia imported by sea. (Iikkanen 2007)

Yara (Kemira GrowHow) has four production plants in Finland: Uusikaupunki, Harjavalta, Kokkola and Siilinjärvi (Kemphos Oy). It produces mineral fertilizers and nitrates and owns also the mine in Siilinjärvi, which is the only phosphorus mine in Western Europe. (Sundberg 2009)

4.8.5 Health care and pharmaceutical industry

In health care sector an essential problem is the dependence on imported medicines and equipment. The National Emergency Supply Agency is securing the supply of basic equipment in crisis situations by keeping stockpiles. (Huoltovarmuuskeskus 2009b) In addition, pharmaceutical industry and importers have an obligation to stockpile medicines and preparations. Nowadays less than 20% of medicines consumed in Finland are domestically produced. The structural change in pharmaceutical industry has led to a situation where many products that are important from the security of supply point of view are not anymore produced in Finland. These products include infusion liquids, penicillin and vaccines. (Sosiaali- ja terveystieteiden ministeriö 2004)

In 2008 almost 85 % of imported medicines came from EU countries and almost 7% from Switzerland (Lääketeollisuus). Tamro and Oriola-KD are the main distributors of pharmaceutical products in Finland.

4.8.6 Routes for chemical industry raw materials

Transports of chemicals are important especially to the ports of Hamina, Kotka and Sköldvik. (Kuronen et al. 2008) Hamina and Porvoo were the most important chemical ports in GoF area in 2008 (Table 4.7) and their import consists for example of raw materials for local producers of plastics and forest industry chemicals. The ports located in the Gulf of Bothnia area had a substantial share in chemical imports, the most important ports being Oulu (25%), Pori, Kokkola and Rauma. Chemicals are imported also by rail from Russia, e.g. ammonia.

Table 4.7. Import of chemicals (FMA 2009).

Import	Chemicals (1000t)	Share of imports (%)
Porvoo	369	13
Naantali	34	1
Hamina	410	14
Hanko	74	3
Helsinki	20	1

Inkoo	13	0
Kotka	97	3
Turku	66	2
GoF	1083	37
Other ports	1866	63
Total (Finland)	2949	100

Chemicals handled in the port of Hamina include e.g. benzene, styrene, phenol and formaldehyde. In the port area there are storages and chemical factories, for example plastics industry plants producing chemicals for paper industry (Dow Suomi Oy, BASF Oy) and formaline and glue production (Dynea). (Haminan sataman ympäristölupa 2005). Also oil products are handled and stored, and the lubricant factory of Suomen Petrooli Oy produces lubricants for Teboil (Lukoil). Oil products and raw materials for lubricant production are bought from domestic refiner (Neste Oil Oyj) and from international markets. (Teboil-konsernin vuosikertomus 2007). Satatankki Oy (Baltic Tank Oy) imports and stores plastics raw materials and solvents (styrene, vinyl acetate, butylacrylate, methyl methacrylate) (Satatankin ympäristölupa 2000). Hexion Chemicals (former Dynoresin Oy) stores sodium hydroxide (caustic soda) and also methanol and phenol. (Haminan sataman ympäristölupa 2005)

Neste Oil imported a total of 15.7 million tons of crude oil and other feedstocks into Finland in 2008. Some 81% of this was sourced from Russia and other countries of the former Soviet Union, and the remainder primarily from the North Sea. Other feedstocks mainly comprised middle distillates, gas oil, fuel oil, gasoline components, and LPG. The majority of imported volumes were delivered by sea, 86%, and the remainder by rail, 14%. (Neste Oil – Annual Report 2008)

4.9 Mining industry

Mining industry produces raw materials, mostly semi-finished products, for various other industries, like metals industry, mechanical engineering, constructing and chemical industry. Industry is very dependent on imported metals and most minerals. Export exceeds import only in fertilizers and stone products. (Sundberg 2009)

In mining industry only Outokumpu and Yara (Kemphos Oy) have processing plants in Finland. The most important mining companies are presented in table 4.8. Industrial minerals are extracted also by SMA Saxo Mineral Oy, Paroc Oy Ab, Juan Dolomiittikalkki Oy and Karl Forsström AB.

Table 4.8. Quarrying of ores and metallic minerals in 2007. (Ministry of employment and the economy 2007; Sundberg 2009).

Mine	Location	Minerals	Owner	Ore 1 000 t
Metallic ores				
Pyhäsalmi	Pyhäjärvi	Cu, Zn, S, Ag, Au	Pyhäsalmi Mine Oy	1 377
Kemi	Keminmaa	Cr	Outokumpu Chrome Oy	1 205

Pahtavaara	Sodankylä	Au	Scan Mining Oy	465
Hitura	Nivala	Ni, Cu	Outokumpu Mining Oy 5	556
Orivesi	Orivesi	Au	Polar Mining	69
Suurikuusikko	Kittilä	Au	Agnico-Eagle AB	0
Pampalo	Ilomantsi	Au	Endomines Oy	0
Särkiniemi	Leppävirta	Ni	Finn Nickel Oy	61
Carbonate minerals				
Ihalainen	Lappeenranta	Lime, wollastonite	Nordkalk Oyj	1 499
Tytyri	Lohja	Lime	Nordkalk Oyj	259
Limberg-Skräbböle	Parainen	Lime	Nordkalk Oyj	1 824
Other industrial minerals				
Kinahmi	Nilsjä	Quartz	SP Minerals Oy	207
Siilinjärvi	Siilinjärvi	Apatite	Kemphos	9 801
Pehmytkivi	Polvijärvi	Talc, Ni	Mondo Minerals Oy	484
Lahnaslampi	Sotkamo	Talc, Ni	Mondo Minerals Oy	714

4.9.1 Metallic and industrial minerals

Metallic minerals mined in Finland include e.g. copper, zinc, chromium, nickel and gold. Metallic mineral mines are situated mostly in Northern Ostrobothnia and Lapland. Ores are refined for steel, electrical, electronics and information technology industries. Industrial minerals are extracted mostly in Southern and Eastern Finland. Industrial minerals include apatite (raw material of phosphate), limestone (chalkstone), talc, feldspar and quartz. Apatite is used e.g. in fertilizer production and talc in paper industry. Limestone has various uses, for example in steel industry, production of cement, paper industry and in environmental care. (Selonen 2004)

From the 1980s quarrying of metallic ores in Finland started to decrease significantly. In the 2000s the amount of metallic ores extracted every year has been around 3.5 million tons. At the same time quarrying of industrial minerals has increased considerably, and in 2007 11.9 million tons of industrial minerals were extracted. The amount of metallic ores is going to increase again after the opening of Talvivaara nickel mine in Sotkamo. Production of concentrates is quite small except in nickel and chromium. (Sundberg 2009)

Finland is the biggest talc producer in Europe and the 4th biggest globally. 75% of talc is used in paper industry as fillers and coating materials and in deresination. 20% is used in paint production and the rest in plastics and ceramic industry. Talc is used also in the making of rubber, medicines, cosmetics and fertilizers. The most important imported minerals not produced in Finland these days are kaolinite used in paper and ceramic industry and ilmenite that is used in the production of titanium dioxide. Titanium dioxide is a raw material of paint industry. (Geologian tutkimuskeskus 2009b).

There are several mining projects underway, and it is estimated that 2–4 new mines will be started during the next ten years, depending on world economy and minerals' price developments. Rising prices would increase bulk transports, but on the other hand,

global recession is affecting also mining industry. One of the projects is a lithium mine project in Länttä, Kaustinen/Ullava. Traditionally lithium has been used in glass and ceramic industry, lubricants and greases and in the production of aluminium and synthetic rubber. Nowadays one of the fastest growing uses for lithium is in battery industry, especially rechargeable lithium-ion batteries. The production in Länttä is planned to start in the beginning of 2010. (Sundberg 2009; Keliber Oy)

In 2008 Talvivaara nickel mine in Sotkamo and Suurikuusikko gold mine in Kittilä started production (Minapolis 2009). The other mining plans include gold mines in Raahe (Laivakangas), Huittinen (Jokisivu) and Ilomantsi (Pampalo), nickel and platinum group metals mine in Keivitsa, Sokli phosphorus mine in Savukoski and iron mine in Kolari. (Kaivannaisteollisuus 2009)

4.9.2. Strategic metals and minerals

Strategic metal is “a metal that is essential for industry and national security, but for which a nation has little or no domestic supply. The ores of strategic metals are often referred to as strategic minerals.” (Intelligence & Security Encyclopedia 2004) The definition for strategic metals and minerals has been varying, but “minerals that are vital for defence, for the aerospace industry, for energy supplies, and for transport have at particular times been listed as of strategic importance”. For example the development of atomic energy increased the importance of sources of uranium, thorium and zirconium. The global distribution of strategic minerals is not regular and they are often concentrated in a small number of localities. (Morteani & Wilcock 2000)

European Union is to a great extent dependent on imported minerals and metals. Some of strategic metals are completely imported. The so-called new strategic metals are e.g. cobalt, niobium, rhenium, gallium, germanium, indium, lithium, titanium, tantalum, platinum group metals and so-called rare earth elements. There are still unexploited mineral deposits in Europe, and the value of deposits situated in the depth of 500–1000 m is estimated to be 100 billion euro. (Verkkouutiset 14.05.2009)

In terms of national security strategic metals have traditionally comprised iron, copper, nickel, cobalt, aluminium, lead and uranium. In addition, oil as a raw material and as energy source has a great importance in national defence. (Juntunen 2007)

Some of strategic metals can also be called hightech metals, which refers to their use in the restriction of environmental emissions and in new energy solutions, car and aeroplane industry, information technology and consumer electronics. The supply of rare earth elements is particularly critical because they are produced only in China. Hightech metals include lithium, indium, gallium, germanium, niobium, tantalum, titanium and rare earth elements. The Geological Survey of Finland is investigating the potential deposits of hightech metals in Finland. (Geologian tutkimuskeskus 2009c)

4.9.3 Routes for minerals

5.8 million tons of ores and concentrates were imported by sea in 2008. The export by sea was 1.6 million tons. In import of ores and concentrates the ports of Gulf of Finland have minor importance; only 16% of ores and concentrates was transported through these ports in 2008. The port of Koverhar had the largest share of import of ores and concentrates in the GoF area (Table 4.9). Other important ores and concentrates import ports in Finland are Raahe, Pori, Kokkola and Tornio, and Raahe had the share of 52% of imports in 2008. In export the biggest ports were Kokkola and Pori (FMA 2009).

Table 4.9. Import of ores and concentrates in 2008 (FMA 2009).

Port	Ores and concentrates (1000t)	Share of imports (%)
Helsinki	20	0
Kotka	147	3
Koverhar	786	13
Lappeenranta	5	0
GoF	958	16
Other ports	4868	84
Total (Finland)	5826	100

Also crude minerals and cement imports are transported mainly through other ports (Table 4.10), the most important Gulf of Finland ports being Kotka (9% of imports), Inkoo (8%) and Kantvik (5%). Significant crude minerals and cement import ports not located in the GoF area are Rauma (11%), Raahe, Kokkola, Parainen, Pori and Tornio. (FMA 2009)

Table 4.10. Import of crude minerals and cement in 2008 (FMA 2009).

Port	Crude minerals and cement (1000t)	Share of imports (%)
Naantali	156	3
Hamina	6	0
Hanko	3	0
Helsinki	24	0
Inkoo	500	8
Joutseno	96	2
Kantvik	320	5
Kotka	544	9
Koverhar	27	0
Lappeenranta	45	1
Loviisa	115	2
Turku	49	1
GoF	1885	31
Other ports	4096	69

Total (Finland)	5981	100
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4.10 Constructing and maintenance

In constructing and maintenance industrial minerals are needed for example in the production of concrete, cement, gypsum, glass and ceramic products and lime (Tilastokeskus 2008). Constructing industry includes following branches: house building, infrastructure building, surface finishing, and the production of constructing materials and products (Rakennusteollisuus). In constructing materials from mining, technology and chemical industry are needed. For example minerals, steel and bitumen (by-product from oil refining) are materials needed in constructing. The activity in construction sector affects for example mining of limestone, which is needed as a raw material in cement (Geologian tutkimuskeskus).

4.11 Trade (consumption)

Domestic trade includes retail and wholesale trade and can be further divided by product range to daily consumer goods, “specialized shop trade” and technical trade (Kaupan liitto 2009).

The biggest general cargo import ports in Finland are Helsinki, Naantali, Turku, Hanko, Rauma and Hamina. The general cargo import network includes also the most of domestic trade import. Large logistical centres serving retail trade are situated in Helsinki and Turku region, near the leading import ports and significant population centres. The ports of these regions have also good liner traffic connections, which is essential for trade. (Sundberg 2009; Loghu2 – Työryhmäraportti 2008)

In import container traffic is increasing, but ro-ro -traffic has still an important position in Baltic Sea Region’s internal trade and in trade with Central Europe. (Karvonen et al. 2008).

In Finland the three biggest retailing conglomerates, S-Ryhmä, Kesko and Suomen Lähikauppa Oy (former Tradeka), have together the share of 85% in daily consumer goods retail markets. Trade is chained and supply and logistics functions are also centred. The largest logistics and distribution centres are situated near big population agglomerations as well as near significant general cargo import ports, mainly the port of Helsinki but also Turku. The supply and logistics of S-ryhmä are handled by Inex Partners whose logistics centre is situated in Kilo, Espoo. Inex Partners has also special goods logistics centre in Vantaa (Hakkila) and 13 terminals around the country. (S-ryhmän hankinnan ja logistiikan toimialakatsaus) Keslog offers logistics services for Kesko. The central warehouse is in Vantaa (Hakkila) and a regional centre in Turku. In addition, there are transport terminals in Tampere, Kuopio, Oulu, Jyväskylä, Mikkeli, Kouvola, Seinäjoki, Pori and Kajaani. Kesko is also building a new logistics centre in Kerava, in Kerava Cargo Center (Kerca) area. The centre is meant for special goods (but not for food products) and it is planned to be ready in 2011. From Kerca area there is a direct railway connection to the main railway and to the port of Vuosaari. (Sundberg

2009; Taloussanomat 08.01.2009) Tuko Logistics is the logistics company used and partly owned by Suomen Lähikauppa Oy. It has also its distribution centre in Kerava. (Sundberg 2009)

4.11.1 Routes for consumer goods

Import of consumer goods is part of general cargo import network. The most important port is the port of Helsinki that has the share of 41% of all general cargo imported to Finnish ports (Figure 4.6). Gulf of Finland ports' share is altogether 94%, which means that Finland is supplied from the South (coast). Other significant ports are Kotka (18%), Naantali (13%) and Turku (10%).

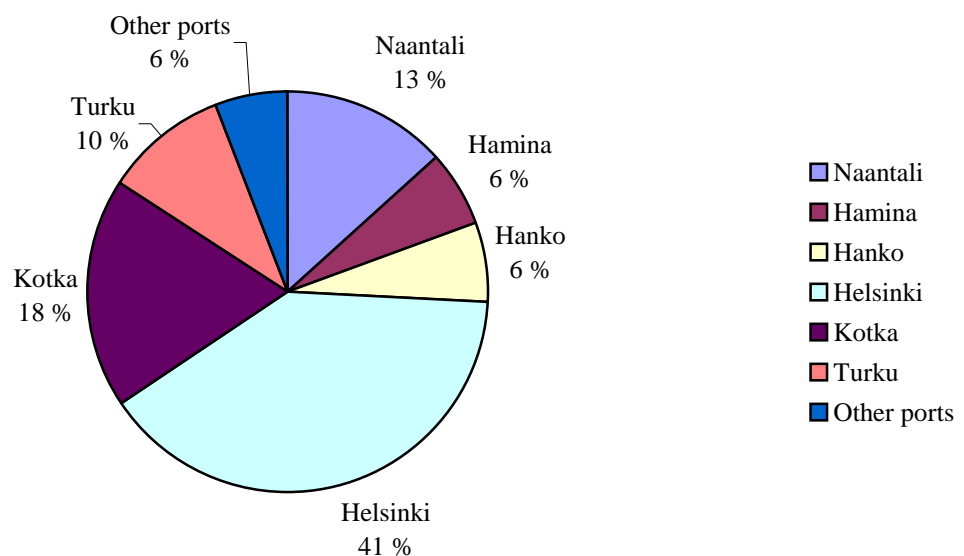


Figure 4.6. The most important general cargo import ports in Finland in 2008 (FMA 2009).

5 CONCLUSIONS

Finland is very dependent on import of most raw materials needed in several industries, since there is no self-sufficiency within any important sector. Because of the location of Finland, import and export by maritime transport is by far the most important transport mode. Rail traffic has a central role especially in trade with Russia, for example in raw material imports. Road traffic is significant in consumer goods transports and distribution. In land traffic and in Eastern traffic Kouvola is an important logistical centre and its importance is expected to grow in the future. The main sectors from the security of supply point of view are trade and food supply, energy, technology industry, forest industry and chemical industry. In food production raw materials are mostly

domestically produced but primary and secondary production are still depending on imported inputs, for example pesticides and chemicals needed in food production industry. In mining industry there are plans of opening new mines, which could enhance supply of ores. Mining plans are nevertheless depending on world economy and minerals' price developments. In addition, there are questions of ownership and its impact on security of supply within different sectors. For example, vessels and mines are increasingly foreign-owned. Most industries have also interdependencies with each other, and for example chemical industry is essential for forest and technology industries.

The ports in the Gulf of Finland have a considerable importance in general cargo imports. Consumer goods are part of general goods import network, and the most important ports handling general cargo are Helsinki, Kotka, Naantali and Turku. Large logistical centres serving retail trade have been concentrated in Helsinki and Turku region, near the leading import ports and significant population centres. The ports of these regions have also good liner traffic connections with the Continent of Europe and Sweden, which is essential for trade. In Finland the three biggest retailing conglomerates have together the share of 85% in daily consumer goods retail markets. In import container traffic is increasing, but ro-ro -traffic has still an important position in Baltic Sea Region's internal trade and in trade with Central Europe.

The ports of Hamina and Porvoo are essential chemical ports and they are serving to a great extent local plastics and other chemical industries. Oil transports have been concentrated to Porvoo and Naantali, and no other Finnish port is importing crude oil. In technology industry, the Gulf of Bothnia is considered to be more important than the Gulf of Finland. Forest industry transports have also been concentrated to certain ports, for example to Kotka and Rauma, and have local importance for example in smaller inland ports of Saimaa.

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