Transport and the Environment 2012
Maritime Transport is Faced with Tightening Environmental Demands

Maritime transport, its safety, and environmental impacts are regulated globally at the International Maritime Organization (IMO). Today also the EU has a significant role concerning regulation of environmental issues within its maritime areas.

Governments are responsible for actual and comprehensive implementation of the United Nations 1982 Convention on the Law of the Sea (UNCLOS) and IMO regulations. This is to ensure that each vessel is properly adjusted according to its purpose, fulfilling human safety and marine environment standards as well as utilizing competent personnel. This regulation aims to improve maritime safety and protection of the marine environment. Supervision of this regulation happens via Flag State Control. When acting to prevent, reduce, or control pollution of the marine environment, States refrain from transferring, directly or indirectly, environmental damage or hazards from one area to another or transforming one type of pollution into another (UNCLOS art. 195).

In the future, the importance and impact of environmental issues will increase even more. Impact on shipping costs is expected to be considerable. While the IMO’s sulphur decision will enter into force on 1 January 2015, ship owners have to consider and choose the best available option for their current fleet to be available to operate on the SECA-area after that. They have to be able to consider which is the most appropriate and cost efficient option for their business. One ship owner may decide to use more expensive, low-sulphur fuel whereas another will consider installing a scrubber in its vessels.

Apart from the sulphur decision, other environmental issues will affect maritime transport in the coming years. Nitrogen abatement methods may come into force for new vessels in 2016. Within the framework of general regulations, greenhouse gases from ships need to be reduced so that maritime transport is responsible for its own emission reductions. Regulations concerning treatment of ballast water will soon enter into force as soon as the IMO’s resolution has been ratified by a required number of states. In addition, at least in the Baltic Sea area discussion is ongoing concerning the possible prohibition to discharge cargo washing water on sea. In that case the only option would be to discharge cargo washing water in port.

In the future, maritime transport is required to be even more environmental friendly and for its part, be responsible for minimizing emissions into air and water. These regulations need to be enforced globally, to avoid regional inequality. It is important that regulatory decisions are made in the IMO, to maintain global stability and reach extensive effects of maritime environmental measures.

Regional regulations may even have a negative effect on targets of environmental protection, which is surely not the intended aim or goal. Too narrow environmental restrictions may cause “carbon leaking”. It may lead to an unhealthy balance between transport modes and transport mode shift, which may result in even worse environmental impacts.

Helsinki 15 May 2012
Mr. Markku Mylly, Managing Director, the Finnish Port Association Chairman of the Executive Committee of SPC Finland

Contents

SPC Finland’s publication, Transport and the Environment 2012, is an extensive review on the environmental aspects of transport with emphasis on maritime transport and freight transport. The publication covers the environmental impacts of transport and the means to reduce them, presenting also the recent environmental legislation related to transport. With this publication, SPC Finland provides information for the current transport-related environmental discussion and for decision-making of various stakeholders. The publication is available both in English and Finnish on the website shortsea.fi.
The Environment in EU Transport Policies

In recent years, environmental issues have gained more and more importance in EU common transport policy. The environment is explicitly included in the main EU strategies and transport-related legislation. There is a link between economic growth and transport emissions: emissions from transport declined in 2009, mainly due to the effects of the economic recession. The EU aims to change this correlation so that the emissions would not increase during periods of economic growth.

Europe 2020

The Europe 2020 strategy aims at smart, sustainable and inclusive growth. It includes five objectives on employment, innovation, education, social inclusion and climate change / energy to be reached by 2020. The reduction targets in the field of climate change and energy are:

- to reduce greenhouse gases (GHGs) by 20% compared to 1990
- to improve energy efficiency by 20%
- to increase the use of renewal energies so that they total 20% of the final consumption of energy

One of Europe 2020 strategy’s flagship initiatives is a resource-efficient Europe. It supports the shift towards a low-carbon economy to achieve sustainable growth. To reach these objectives, improved logistics and optimised production processes are required.

http://ec.europa.eu/europe2020/index_en.htm

Transport White Paper 2011 - Roadmap to a Single European Transport Area

In the field of transport, Transport White Paper 2011 covers the aims of Europe 2020 strategy and extends its goals further to 2050. The main issue is a competitive and resource-efficient transport system. The White Paper presents a comprehensive transport strategy which aims to increase mobility and simultaneously reduce emissions. Transport enables economic growth, but at the same time it must be sustainable and efficient. Transport has become cleaner, but as a consequence of increased volumes it remains a major source of local noise and air pollution. Transport emissions released into the air have decreased relative to the total amount of freight transport carried.

Transport White Paper 2011 requires that greenhouse gases (GHGs) also need to be reduced from the transport sector. EU transport relies on oil and oil products for 96% of its energy needs.

Transport White Paper defines a strategy for improving the efficiency of the transport sector. It includes

- the introduction of advanced traffic management systems in all modes
- infrastructure investment and the creation of a Single European Transport Area to promote multimodal transport
- smart pricing
- efficiency standards for all vehicles across all modes as well as other measures to promote vehicle innovation

New technologies and concepts – such as green transport corridors for freight – will be an important key to lower transport emissions. Transport must use less and cleaner energy, more successfully exploit the modern infrastructure, and thus reduce its negative impact on the environment.

Co-modality, i.e. the efficient use of different modes both on their own and in combination, will result in an optimal utilization of resources, including energy. Promotion of short sea shipping and the Motorways of the Sea as well other more environmentally friendly and energy saving modes will contribute to increased energy efficiency.


Trans-European Transport Networks TEN-T

Trans-European Transport Network, TEN-T aims for a more sustainable EU transport system. The network covers all transport modes, motorways of the sea and intelligent transport. Connections between various modes of transport as well as ports, airports and railway-road terminals and the connecting routes between them will be improved. The infrastructure will be multimodal. The proposal for new guidelines for the TEN-T network was presented in 2011. The network will consist of a core network and a comprehensive network. Environmentally friendlier transport consists of the promotion of cleaner transport modes, high-speed broadband connections, and facilitating the use of renewable energy, in line with the Europe 2020 Strategy. The priorities of TEN-T financing contain investments in environmental technologies.

http://ec.europa.eu/transport/infrastructure/index_en.htm
http://tentea.ec.europa.eu/
Global Acts against Climate Change

A total of 195 countries have ratified the United Nations Framework Convention on Climate Change 1992, which aims to limit the increase of temperature by voluntary means. Conversely, the Kyoto Protocol is legally binding for developed countries to reduce their greenhouse gas emissions. The Kyoto Protocol’s first commitment period is 2008-2012. Negotiations on the second commitment period are ongoing. Altogether, 191 of the UN Convention parties have also signed and ratified the Kyoto Protocol. The United States has not ratified the Protocol. Finland has ratified the treaty and thereby has a legal obligation to reduce emissions.

In 2010, governments agreed at the Cancun Climate Change conference that global temperature increase must be limited to below two degrees Celsius.

http://unfccc.int
www.eea.europa.eu/themes/climate/intro
www.ymparisto.fi/ilmasto

IMO Regulates Maritime Transport

Maritime transport is global and much regulated at the international level. The International Maritime Organization (IMO) is a specialised agency of the United Nations responsible for improving maritime safety and preventing pollution from ships. The IMO currently has 170 member states and three associate members. The main task of the IMO is to develop and maintain a regulatory framework for shipping. This includes maritime safety, environmental and legal issues, security and efficiency of shipping and technical cooperation within the industry.

In addition to the member states, a number of non-governmental international organizations share a consultative status provided by the IMO. Intergovernmental organisations have signed cooperation agreements with the IMO and have been given observer status at IMO meetings.

A convention that has been adopted in the IMO comes into effect when it has been ratified by reference to a certain number of member states and shipping tonnage. The member states of the IMO are responsible for the actual national implementation of IMO regulations. When an IMO member state accepts an IMO Convention, it simultaneously agrees to make it a part of its own national law. It has to be noted that implementation standards are different from one country to another. Implementation standards are improved via port state control.

IMO conventions and their annexes are extensive, and they need to be frequently changed and revised. The IMO’s Marine Environment Protection Committee (MEPC) and sub-committee on Bulk Liquids and Gases (BLG) carry out the technical work to update existing environmental legislation and the development of new regulations. This work is carried out at meetings attended by maritime experts from member governments, together with those from interested intergovernmental and nongovernmental organisations.

To make changes easier, the conventions can be amended with a procedure based on tacit acceptance. This means that an amendment shall come into effect at a particular time, unless objections to the amendment are received before that date from a specified number of Parties. For example, revisions to the MARPOL Annex VI, including so-called new sulphur regulations, were adopted in October 2008 and entered into force 1 July 2010.

<table>
<thead>
<tr>
<th>Annexes of MARPOL 73/78, International Convention for the Prevention of Pollution from Ships</th>
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<tbody>
<tr>
<td>Annex I: Prevention of pollution by oil 1983, 151 states / 99 % of world tonnage</td>
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<tr>
<td>Annex II: Control of pollution by noxious liquid substances 1983, 151 states / 99 % of world tonnage</td>
</tr>
<tr>
<td>Annex III: Prevention of pollution by harmful substances in packed form 1992, 136 states / 96 % of world tonnage</td>
</tr>
<tr>
<td>Annex IV: Prevention of pollution by sewage from ships 2003, 129 states / 87 % of world tonnage</td>
</tr>
<tr>
<td>Annex V: Prevention of pollution by garbage from ships 1988, 143 states / 97 % of world tonnage</td>
</tr>
<tr>
<td>Annex VI: Prevention of Air pollution from ships 2005, 68 states / 91 % of tonnage</td>
</tr>
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Annexes of the MARPOL 73/78 Convention. The years when the annexes have entered into force, the number of nations that have ratified the annexes and their share of world tonnage as of February 2012
www.imo.org
The Helsinki Commission - HELCOM


The Headquarters of the Helsinki Commission, the HELCOM Secretariat, is located in Helsinki, Finland. The chairmanship of the Helsinki Commission rotates between the Contracting Parties every two years. Helsinki Convention parties are the governments of Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden, and the European Community. HELCOM’s recommendations have to be executed with national laws in the member countries. Since the beginning of the 1980s, HELCOM has approved some 200 recommendations to protect the marine environment of the Baltic Sea.

www.helcom.fi

Relationship between IMO, EU, HELCOM and the Finnish National Law

IMO’s regulations are legally binding for all shipping companies at a global scale. Increasingly, EU introduces IMO regulations as part of EU law. EU legal acts include regulations, which are directly legally binding, and directives which must be included into the national laws. Within the Baltic Sea region, HELCOM recommendations are binding for its member countries, which have to execute them in their national laws. For example, Finnish legislation on maritime environmental protection is based mainly on MARPOL-convention and Helsinki 1992 Convention on the Protection of the Marine Environment of the Baltic Sea Area. In addition, the European Union sets its own regulations and directives concerning maritime transport in EU member states. In Finland, the regulation is based on the Act and Decree on the Prevention of Pollution from Ships.

www.trafi.fi/merenkulku

Supervision of International Maritime Regulations

The compliance with international law and regulations is supervised via Port State Control. It is a system of harmonised inspection procedures designed to target substandard ships. There are several international port state control agreements. The Paris Memorandum of Understanding (MOU) on port state control covers Europe and the North Atlantic. The MOU members inspect foreign ships, which visit their ports to ensure that they meet IMO standards. Finland has been a member of the Paris MOU since 1982 and is responsible for inspections in the Finnish ports.

http://www.trafi.fi/en/maritime/inspections_and_approvals
Transport-Related Environmental Impacts

The most important direct environmental impacts caused by transport are emissions released into the air and water as well as noise and trembling. Transport also incurs indirect impacts such as spatial requirements and landscape fragmentation. The main cause for transport emissions is the use of combustion engines. The quantity of emissions relates directly to the amount of fuel used as well as the consumption of energy.

**Transport Emissions Into Air**
- carbon dioxide ($CO_2$)
- nitrogen oxides ($NO_x$)
- sulphur oxides ($SO_x$)
- particles (PM)
- carbon monoxide (CO)
- hydrocarbon (HC)

**Climate Change**
The main causes of climate change are greenhouse gases (GHGs). Carbon dioxide ($CO_2$) is the most common greenhouse gas responsible for the global warming caused by human beings. EU transport is almost completely dependent on fossil fuels, which represent one of the main sources of $CO_2$.

Climate change exerts consequences on economic and natural systems in addition to human health, including
- rising temperatures
- shifting rainfall patterns
- melting glaciers and snow
- rising global mean sea level
- more frequent and intense extreme weather events

Rail – Environment-Related Regulations

Regulations concerning railways have been formulated until recently on the national level. The EU’s regulatory role in transport and environment sectors has been strengthened in the 21st century. The EU has introduced four railway packages to improve the working conditions within the European railway sector. Finland is also committed to the international COTIF Convention (1999) on Railway Transport. There is an agreement on “connecting railway traffic” between Finland and Russia, as well as an agreement on the maintenance of the connecting track between Finland and Sweden.

As part of the Finnish Transport Agency, the Rail Administration has an environmental strategy for 2009-2013. It covers the environmental impacts to:
- climate and energy
- trembling
- noise
- materials
- railtrack surroundings
- soil
- groundwater

**Road – Environment-Related Regulations**

Road transport regulations aim at increasing road safety and reducing environmental damage. Road transport legislation is still partly covered at the national level. EU legislation regulates the technological requirements of vehicles which affect environmental impacts of road transport during operation.

Climate Change

The main causes of climate change are greenhouse gases (GHGs). Carbon dioxide ($CO_2$) is the most common greenhouse gas responsible for the global warming caused by human beings. EU transport is almost completely dependent on fossil fuels, which represent one of the main sources of $CO_2$.

Climate change exerts consequences on economic and natural systems in addition to human health, including
- rising temperatures
- shifting rainfall patterns
- melting glaciers and snow
- rising global mean sea level
- more frequent and intense extreme weather events
Freight and passenger transport is responsible for approximately one-quarter of the EU’s greenhouse gas emissions. It is the second largest greenhouse gas-emitting sector after energy. Also in Finland, traffic accounts for about 20% of domestic greenhouse gas emissions.

www.eea.europa.eu/themes/climate/intro
www.trafi.fi/ymparisto/liikenteen_ymparistovaikutukset

Black Carbon

Another major GHG contributor is black carbon (BC), which forms as a result of the incomplete combustion of fossil fuels, biofuels, and biomass. One of the primary sources of black carbon is diesel engine emissions. Black carbon causes global warming, because it is strongly light-absorbing and warms the air. When deposited on snow and ice, BC reduces albedo and accelerates the melting of these areas. BC remains in the atmosphere for only a few weeks, so reducing its emissions would immediately decelerate the rate of warming, particularly in the Arctic. In transport, BC emissions can be reduced by retrofitting diesel vehicles with filters in order to capture BC, and by switching fuel (e.g. from diesel to natural gas in buses).

www.imo.org/MediaCentre/PressBriefings/Pages/43%20MEPC62ENDS.aspx
www.c2es.org/global-warming-basics/blackcarbon-factsheet

Reduction of Greenhouse Gases

GHG reduction targets have been set on the global level with international Climate Change Conventions. The EU has set reduction targets as part of the Climate and Energy Package legislation, but these have been different from the Kyoto Protocol in their scope, coverage of sectors and base year. Recently, the European Commission has translated its targets into the Kyoto rules. Europe’s targeted 60% CO₂ reduction by 2050, in comparison with 1990, would require the consumption of oil in the transport sector to decline by approximately 70%.

www.eea.europa.eu/themes/transport/intro

GHG reduction targets at global and EU level as well as in particular at the transport sector are presented in the table below.

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<tr>
<th>International GHG reduction targets</th>
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<tbody>
<tr>
<td>Global reduction, all sectors</td>
<td>50% from 1990 levels</td>
<td>by 2050</td>
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<tr>
<td>EU reduction, all sectors</td>
<td>80-95% (below 1990 levels)</td>
<td>by 2050</td>
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<th>EU targets; Transport white paper 2011</th>
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<tbody>
<tr>
<td>Transport</td>
<td>at least 60% (with respect to 1990)</td>
<td>by 2050</td>
</tr>
<tr>
<td>Maritime transport</td>
<td>40-50% (2005 level)</td>
<td>by 2050</td>
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<tr>
<th>EU targets; Europe 2020 strategy</th>
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<tbody>
<tr>
<td>EU reduction, all sectors</td>
<td>by 20% compared to 1990</td>
<td>by 2020</td>
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Currently, there is no international regulation of greenhouse gas emissions incurred by shipping. Negotiations have been ongoing for several years in the IMO and United Nations Framework Convention on Climate Change (UNFCCC). The EU has considered taking action to include transport emissions into the existing EU reduction commitment of GHGs. Consultation by the European Commission (2012) aims to identify possible measures to reduce greenhouse gas emissions caused by shipping.

Transport Noise

Transport noise disturbs people possibly more than any other environmental distraction. It can affect people in both physiological and psychological ways in their daily life. Recent research shows that problems exist at lower noise levels than was previously thought. Road, rail and air traffic noise exert the greatest impact. The effects of noise are enhanced when they interact with other environmental causes of stress, such as air pollution and chemicals. Environmental Noise Directive provides a common basis for tackling problems caused by noise pollution across the European Union. Its main aim is to avoid, prevent or reduce the harmful effects of noise exposure.

www.eea.europa.eu/themes/noise/intro

Environmental Impacts of Maritime Transport

Emissions into Air

Energy production by fuel combustion causes the release of emissions into the air. Ships need energy for propulsion, to run loading or unloading equipment on board, and for heating or cooling cargo and accommodation cabins. Energy needs vary between ship types. For example, ice-strengthened ships burn more fuel year-round because of their strong hull construction and requirement for higher engine power, compared to ships sailing only in open waters.

The energy needed in ships is produced mainly by diesel engines. Four-stroke engines are used as main engines in ro-ro and passenger vessels, but also as auxiliary engines to produce energy for other needs than propulsion. In large cargo vessels, the main engines are, in general, two-stroke engines. The combustion process of the diesel engines produces compounds that in large amounts have undesired environmental impacts. The most common of these compounds are carbon dioxide ($CO_2$), nitrogen oxides ($NO_x$) and sulphur oxides ($SO_x$). Nitrogen oxides cause eutrophication and sulphur oxides acidification. Fourth common compound is particles (PM) which are harmful for human health, as they cause for instance cardiovascular diseases.

Carbon Dioxide

The diesel engines used in ships have high energy efficiency; therefore, carbon dioxide ($CO_2$) emissions are lower compared to other types of engines. Their efficiency is also high considering the amount of cargo transported by ships. Annual total carbon dioxide emissions from maritime transport in the Baltic Sea reached approximately 19.5 million tonnes in 2010, whereas carbon dioxide emissions from road transport in Finland alone constituted approximately 12 million tonnes.

CO$_2$ emissions of international shipping totalled approximately 2.7% of global CO$_2$ emissions in 2007. The share of the Baltic Sea was approximately 0.06% of global CO$_2$ emissions. Greenhouse emissions from shipping currently comprise approximately 900 million tonnes (3%) per year globally. They are expected to more than double by 2050 if no additional action is taken, because world trade is constantly increasing.

http://lipasto.vtt.fi/indexe.htm
www.imo.org/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Default.aspx
www.imo.org/blast/blastDataHelper.asp?data_id=27795&filename=GHGStudyFINAL.pdf
Energy Efficiency Design Index (EEDI)

The Energy Efficiency Design Index (EEDI) for new ships is, according to the IMO, the most important technical measure to influence the energy efficiency of a ship. It promotes the use of more energy-efficient and thus less polluting equipment and engines. EEDI is calculated for every new ship during the planning phase. The index consists of the amount of carbon dioxide produced by the ship’s engines related to the amount of cargo that the ship transports. The smaller the EEDI number is, the more energy-efficient is the ship design. Special characteristics of ice-strengthened ships, according to the Finnish-Swedish ice-classification rules, are taken into account when new regulations are applied to them. This prevents unequal treatment, compared to ships sailing in open waters only. Ships cannot operate in icy waters without higher engine power and ice-strengthening.

New EEDI regulations were accepted in July 2011 and will be in effect as of January 2013. EEDI is mandatory for new ships, and the regulations will be applied to merchant ships over 400 GT. The ship types included are oil and gas tankers, bulk carriers, general cargo and container ships. The IMO is developing EEDI for ro-ro and ro-pax ships as well. BIMCO has compiled an EEDI Calculator for the calculation of the EEDI index for new ships. This is the first time when regulations influencing GHG emissions are mandatory for a whole international industry sector or transport mode.

www.bimco.org/en/Products/EEDI.aspx

Ship Energy Efficiency Management Plan (SEEMP) and Energy Efficiency Operational Index (EEOI)

The Ship Energy Efficiency Management Plan (SEEMP) establishes a mechanism for operators to improve the energy efficiency of ships in a cost-effective manner. It was adopted as amendment to MARPOL Annex VI in 2011 and it will be in effect 2013 for all ships over 400 GT in operation. SEEMP provides best practices for each individual ship, including voyage planning, speed and power optimisation, optimised ship handling, improved fleet management, cargo handling and energy management. Altogether, the objective of SEEMP is to optimise ship performance.

The use of EEOI is voluntary and is meant to enable operators to measure the energy efficiency of a ship in operation. This index is expressed in CO₂ per ton mile, which indicates the efficiency of a specific ship. EEOI is ship type specific and enables comparisons between similar ships. The aim of these technical and operational regulations is to increase the energy efficiency of ships, in order to reduce fuel consumption and carbon dioxide emissions.


Slow Steaming

Slow steaming means lowering the cruising speed. Slow steaming has not yet been studied or utilized considerably, but it is widely acknowledged that it has potential in reducing ship emissions. It has been estimated that an emission reduction of even 30% could be achievable without the need for retrofitting. An international agreement on a global measure would be the best way of implementing speed limits for shipping. An obligatory speed limit would reduce CO₂ emissions from shipping, especially in coastal and port areas – but also in the Arctic, where important climate benefits could be obtained by reducing black carbon deposition.

On the other hand, the current situation of global shipping relies on the oversupply of vessels caused by the recession. This situation may change along with economic growth, causing the rise of the number of vessels in same fairways, thereby causing threats for safety at sea. However, at the moment Maersk Line has positive experience in slow steaming, despite the extra vessels needed to maintain service frequency. Over the last one and a half years, slow steaming has reduced the company’s CO₂ emissions by about 7% per container moved. Their goal is to reduce CO₂ emissions by 25% by 2020.

http://cedelft.eu/publicatie/regulated_slow_steaming_in_maritime_transport/1224
www.maersk.com/AboutMaersk/News/Pages/20100901-145240.aspx
Market Based Methods to Reduce CO₂ of Shipping

The financial instruments to control the greenhouse gas emissions are discussed within the IMO, as it is realized that current technical and operational measures are not efficient enough to meet the planned reduction quotas. The main proposals are emission trade, bunker charge and a model based on the energy efficiency of a ship. Maritime transport is currently not included in the emission trade. In bunker charging, the payments would be saved into a GHG fund within the IMO. Regulating emissions from ships is challenging in terms of the emission trading system, since the shipping industry is international and regulations should not disturb free competition. Another issue is the allocation of emission allowances. International contracts are important in the field of maritime transport to avoid carbon-leaking and the out-flagging of vessels.

www.trafi.fi/ymparisto/liikenteen_verotus_ja_taloudellinen_ohjaus
www.varustamosaatio.fi/asiakirjat/Merenkulun_taloudelliset_ohjauskeinot.pdf

Sulphur Oxides

Sulphur dioxide (SO₂) is harmful to both ecosystems and human health. It is formed in the combustion processes of energy production. Sulphur oxide emissions from marine transport are considerable. All the sulphur in fuel is converted into sulphur oxides when the fuel is burnt. The most straightforward method of restricting sulphur emissions is to use low-sulphur fuel as effectively as possible.

Limiting Sulphur Content in Fuels

The maximum allowed sulphur content in fuel is defined in MARPOL Annex VI. In 2012, the global limit has been lowered from 4.5% to 3.5% of sulphur in fuel. Further reduction to 0.5% will be introduced in 2020. A five-year extension period has been proposed in the event that no fuel on the market can fill these criteria by 2020. Emission control areas have stricter sulphur limits. The Baltic Sea, English Channel and North Sea are defined as Sulphur Emission Control Areas (SECA), where the content of sulphur in fuel is currently only 1%. In this SECA area, the sulphur limit will be 0.1% as of 2015. In EU ports for vessels staying over two hours and inland waterways, the limit is 0.1% as of 2010. On 15 July 2011, the European Commission published a proposal for an amendment to Directive 1999/32/EC, the ‘sulphur directive’.

Another Emission Control Area is the North American ECA with regard to SO₂, NOₓ and fine particulate matter as of 1 August 2012. It will cover the Pacific coast, Atlantic/Gulf coast and the eight main Hawaiian Islands. It extends up to 200 nautical miles from coasts. The third ECA will be the United States Caribbean Sea, which comes into effect on 1 January 2014.

International Fuel Standards (MARPOL Annex VI)

<table>
<thead>
<tr>
<th>Year</th>
<th>Emission Control Area –ECA</th>
<th>Global</th>
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<tbody>
<tr>
<td>Until July 2010</td>
<td>Baltic Sea and the North Sea SECA (incl. the English Channel)</td>
<td>4.5%</td>
</tr>
<tr>
<td>July 2010</td>
<td>North American ECA (1 August 2012)</td>
<td>4.5%</td>
</tr>
<tr>
<td>1 January 2012</td>
<td>1%</td>
<td>3.5%</td>
</tr>
<tr>
<td>1 January 2015</td>
<td>0.1%</td>
<td></td>
</tr>
<tr>
<td>1 January 2020</td>
<td>0.1%</td>
<td>0.5%</td>
</tr>
<tr>
<td>1 January 2025</td>
<td>Subject to a fuel availability study by 2018, may be extended to 2025.</td>
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The Sulphur Emission Control Area (SECA)
Countries with water only in SECA
Countries with part of the coast in SECA
Countries without coast in SECA
Sulphur content in fuel – ECA and global limits

Environmental technology is an efficient way to reduce energy consumption and emissions. However, the new technology requires piloting before extensive adaptation.

Nitrogen Oxides

Nitrogen is a nutrient which contributes to the eutrophication processes in water systems. It also degrades air quality and creates harmful ozone to the troposphere and causes health problems. The nitrogen which ends up in the Baltic Sea originates primarily from the river basins as surface run-off and as atmospheric deposition directly onto the body of water. As with other emissions into air, the amount of NO\textsubscript{X} emissions is likely to increase in the near future as a consequence of growing traffic volumes.

Sulphur Abatement Technologies

Ship owners have identified three main options which could be used to adapt to the new sulphur regulations: the use of marine gas oil (MGO) instead of heavy fuel oil and the use of scrubbers and use of alternative fuels such as LNG or biofuels.

Different kind of scrubbers
Closed loop, fresh water scrubber
Sea water scrubber
Hybrid scrubber
Dry scrubber

Scrubbers can be installed in existing vessels as retrofit. According to studies conducted by the Finnish shipping industry, it is estimated that scrubbers are technically and economically reasonable to install in 30-40% of the existing fleet. The first vessel which has piloted a commercial closed loop scrubber is Containerships VII. With these means, there would be a radical decrease in SO\textsubscript{X} emissions. However, there are also considerable additional costs due to the high fuel costs or because of the installation of scrubbing technology in ships. There are several estimates of the costs of new sulphur regulations for the industry.

Regulations Restrict Nitrogen Oxide Emissions

During the last few years, the harmfulness of exhaust emissions originating from transport by land and sea has been given special consideration. Legislation has been developed to restrict the quantity of air emissions originating from newly built vessels. Some provisions also affect old ship engines.

Technical development and the quantity of emissions of marine diesel engines are regulated by IMO MARPOL Annex VI and its technical code. It includes the Tier standards (Tier I, Tier II and Tier III), which define emission levels for marine diesel engines installed on ships after a certain construction year. The IMO accepted new stricter regulations for nitrogen oxide emissions in 2008 for new as well as some of the old diesel engines. This emission standard, Tier III, requires a designation of a sea area as an Emission Control Area.
The Three-tier IMO Emission Standards

The three-tier programme will reduce the emissions of new engines and, through adaptation, the emissions of old engines. The three-tier system comprises the nitrogen emission limits described in the figure. Engines must pass tests with maximum NO\textsubscript{x} emission limit given in g/kWh (n = crankshaft rpm).

North American ECA regarding SO\textsubscript{X}, NO\textsubscript{X} and PM will be in effect from 1 August 2012. HELCOM Annual Meeting 2012 decided to propose to establish a Nitrogen Emission Control Area (NECA) also in the Baltic Sea area. The status of Nitrogen Emission Control Area is included in the HELCOM Baltic Sea Action Plan.

Nitrogen Emission Control Area at the Baltic Sea would mean that Tier III standards for new ship engines installed in 2016 or after would come into effect in the area. Tier III standard requires 80% NO\textsubscript{X} abatement compared to Tier I, which challenges the technology available today. Introducing the Baltic Sea as NECA and enforcement of Tier III standards would halve the NO\textsubscript{X} emissions of shipping by 2040. The possibility of a NECA in the North Sea as well has been investigated.

There are specific technical methods to reduce the NO\textsubscript{X} emissions of marine diesel engines. Selective Catalytic Reduction (SCR) and gas engines are at the moment capable means to comply with Tier III emission limits. SCR is an exhaust gas after-treatment technology. It has to be installed separately for each engine of a ship and needs urea to work. The NO\textsubscript{X} abatement capability of SCR is more than 80%.
Gas engine and fuel conversion are methods that in principle mean the use of liquefied natural gas (LNG) as fuel. A regular diesel engine can be modified to enable the use of natural gas as a fuel. The use of natural gas decreases NO\textsubscript{x} emissions by approximately 89% compared to a regular diesel engine.

Various technical methods could be used in combination to fulfil the Tier III limits.

Methods in marine diesel engines
- Gas engine technologies
- SCR - Selective Catalytic Reduction

Other potential developments
- High pressure turbocharger (TC) sys. (2-stage)
- Low NO\textsubscript{x} combustion tuning
- Exhaust Gas Recirculation valve (EGR) system
- Charge air humidification
- Water Fuel Emulsion
- Direct Water Injection
- Non-thermal plasma

Liquefied Natural Gas – LNG – as an Alternative Fuel

LNG is a natural gas which has been converted into liquid form. Use of LNG would reduce nitrogen oxides by 89% and carbon dioxides by 20-30%, compared to a regular diesel engine. LNG does not produce sulphur oxide emissions or particles at all.

The use of LNG is possible in engines planned for that purpose, but it is also possible to modify a regular diesel engine to enable it to use natural gas as a fuel. These dual fuel engines can use regular heavy fuel oil and/or diesel. Dual fuel engines have already been found to be efficient in LNG tankers, which can use their cargo as fuel and are therefore not dependent on the availability of natural gas at ports. However, retrofitting LNG is not considered cost–efficient, and its use will probably become general in new vessels in the future. Because the LNG bunkering infrastructure is still mostly lacking in the Baltic Sea area, the liner traffic could be the first to make use of LNG. There are several development projects and ongoing feasibility studies on the establishment of LNG infrastructure.

LNG is used by several Norwegian vessels. The Finnish shipping company Viking Line has ordered a new passenger ferry vessel which will use liquefied natural gas (LNG) as its fuel.
Ships’ Discharges into Water

Black and Grey Waters

Black and grey waters are formed on every ship. Black water is mostly the sewage from toilets. It can cause oxygen depletion and obvious visual pollution. Mainly, matters which pollute the sea originate in land. However, waste waters from vessels become a particular concern when considering large passenger vessels or ferries.

Grey waters originate from showers and washbasins. There is no international regulation in force concerning grey waters from ships.

Discharging sewage into the sea is regulated in MARPOL Annex IV, revised in 2008. New passenger vessels are obliged as of the year 2016, and all passenger vessels from 2018 onwards, to treat their sewage when they are in Special Areas. For example, the Baltic Sea was designated in 2011 as a status of a Special Area.

The regulation will come into force if the reception facilities for sewage are sufficient in passenger ports in the Baltic Sea area. The Annex IV requires ships to be equipped with either a sewage treatment plant or a sewage comminuting and disinfecting system or a sewage holding tank. The Annex IV also includes a model International Sewage Pollution Prevention Certificate to be issued by national shipping administrations to ships under their jurisdiction.

In general, a vessel is allowed to discharge sewage if it has an approved sewage treatment plant in operation, or it is discharging comminuted and disinfected sewage into the sea at a distance of more than three nautical miles from the nearest shore and untreated sewage at a distance of more than 12 nautical miles from land.

Even before this regulation, the passenger ferry vessels, which operate between Finland, Sweden and Estonia, have discharged all their waste waters into the port reception facilities. In this case, the waste water is handled in the best possible manner at municipal sewage treatment plants.

www.imo.org/OurWork/Environment/PollutionPrevention/Sewage/Pages/Default.aspx

The Baltic Sea is an IMO Special Area

The Baltic Sea area has been designated as a Particularly Sensitive Sea Area (PSSA) by the IMO since 2005. At a PSSA area, specific measures can be used to control maritime activities such as routing measures, the strict application of MARPOL discharge, and the equipment requirements for ships.

www.imo.org/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-%28MARPOL%29.aspx

Oily Waste Waters

Oily waste waters include, for example, oily bilge water and the waste resulting from the engine maintenance activities. Bilge water is water that accumulates on the bottom of the engine room of a ship. Two to three cubic meters of oily bilge water can accumulate daily, but it normally contains only a small amount of oil. Hence, equipment for separating oil from water is usually found on larger ships. After the separating process, the water can be discharged into the sea. The water discharged into the sea may contain a maximum of 15 parts per million of oil. Oily waste waters produced on board are collected in a separate tank which can be emptied in ports under the no-special-fee system.

MARPOL Annex I regulates pollution by oil from operational measures as well as from accidental discharges. The 1992 amendments to Annex I made it mandatory for new oil tankers to have double hulls. The regulations of Annex II contain discharge criteria and measures for the control of pollution by noxious liquid substances carried in bulk.

www.imo.org/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-%28MARPOL%29.aspx
The International Convention for the Control and Management of Ship Ballast Water and Sediments (IMO’s BWM Convention 2004) will enter into force when it has been ratified by 30 states which represent at least 35% of the world’s merchant fleet. As of April 2012, it has been ratified by 33 states representing 26% of the world’s tonnage.

All ships over 400 GT will have to implement a Ballast Water and Sediments Management Plan. All ships will have to carry a Ballast Water Record Book and carry out ballast water management procedures observing a given standard. Existing ships will be required to do the same, but after a phase-in period.


Ballast Water

Ballast water is used to maintain the navigability of the vessel when it sails without cargo. Larger vessels take a huge amount of ballast water, which can cause a negative impact on the environment where it ends up. Ballast water contains plants, animals and bacteria, which are carried to new habitats and then create threats to the local ecosystem. These invasive species may be hazardous to the endogenous species, since they may pose the threat of disease and the creation of a novel situation in the competition for living space and nourishment. As a result, endogenous species may even disappear from a certain area. Invasive species may also cause significant losses in terms of coastline power plants, fishery and maritime transport.

The threat caused by invasive species is even greater than that of hazardous substances. Invasive species breed and spread, whereas chemicals eventually dissolve in the sea. Chemicals can be restricted by regulations or, in some cases, replaced. The invasion of newcomers is difficult to prevent, but it can be limited by legally forcing vessels to use technical methods to reduce the risk caused by ballast tank waters.
Solid Wastes

Garbage from ships can be just as deadly to marine life as oil or chemicals. Synthetic materials such as plastic wrappings and other items may drift at sea for dozens of years, finally piling up on shore areas. Not all waste in the seas originates from ships – a considerable proportion originates on land, carried along rivers or simply dumped into the water. It is, therefore, difficult to estimate the actual quantity of waste discharged from ships.

Ship-borne (solid) waste is generally easy to sort. Specific types of waste are produced in specific parts of the vessel or as a result of the overall operation of the ship. The solid waste from ships is similar in nature to normal domestic waste: the most common waste types are bio waste, packing materials, glass, paper and metal waste. Hazardous wastes such as fluorescent lamps, batteries, paints and solvents are mainly generated as a result of maintenance operations.

Regulations for Waste from Ships

MARPOL Annex V regulates all kinds of solid waste: food, domestic and operational waste that is generated during the normal operation of the vessel.

Annex V completely prohibits the disposal of plastics anywhere into the sea, and severely restricts discharges of other garbage from ships into coastal waters and Special Areas. These are areas which have particular problems because of heavy maritime traffic or low water exchange caused by the land-locked nature of the sea concerned. One of the special areas under Annex V is the Baltic Sea. The Annex also obliges Governments to ensure the provision of reception facilities at ports and terminals for the reception of garbage.

Amendments made to Annex V in 2011 will forbid the discharge of waste in all sea areas. The amendments are expected to enter into force on 1 January 2013. There are some exceptions: the discharges permitted in certain circumstances include food wastes, cargo residues and water used for washing decks and external surfaces containing cleaning agents or additives which are not harmful to the marine environment.

www.imo.org/OurWork/Environment/PollutionPrevention/Garbage/Pages/Default.aspx
www.imo.org/MediaCentre/PressBriefings/Pages/43%20MEPC62ENDS.aspx
Cargo Hold Washing Water

Cargo residues and washing water that includes cargo residues from cargo hold are regulated in MARPOL Annex V. According to the revised draft of Annex V, ships are allowed to discharge cargo hold washing waters containing non-harmful cargo residues en route at no less than 12 nautical miles from the nearest land, if there are no adequate reception facilities in port. Adequate port reception facilities would be essential so that ships could be washed between unloading and loading in the port. Harmful cargo residue needs to be left at reception facilities in port.

Recycling of Ships

Almost all of the materials and equipment of a ship are reused at the end of the ship’s lifetime. Steel is reprocessed and generators are reused ashore. Producing new steel from recycled steel requires only one third of the energy used for steel production from raw materials. Properly handled, ship recycling is, without question, a green industry.

However, working practices and environmental standards in the yards often leave much to be desired. While ultimate responsibility for conditions in the yards has to lie with the countries in which they are situated, other stakeholders must be encouraged to contribute towards minimising potential problems.

There are many stakeholders in the recycling process, including administrations of ship building and maritime equipment supplying countries, flag, port and recycling states, as well as intergovernmental organisations and commercial bodies such as ship owners, builders, repairers and recycling yards.

Regulations on Ship Recycling

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal entered into force in 1992. Basel Convention regulates international movement of hazardous waste. Ships which will be scrapped are waste, and some of these vessels may be classified as hazardous. Hazardous vessels originating from the EU can be scrapped only in OECD countries. The Basel Convention presented the idea of a Green Passport for Ships – an inventory of all materials potentially hazardous to human health or the environment. EU regulation on shipments of waste enforces the Basel Convention in the EU.

www.basel.int

IMO’s Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships was adopted in 2009. It needs to be ratified by at least 15 states representing 40% of world merchant shipping tonnage and a significant number of recycling countries in order to enter into force. The convention confirms a monitoring and enforcement system which covers the whole life cycle of a ship, from planning and building to operations and recycling. The use of hazardous materials in shipbuilding is restricted. Ships which will be recycled will have to carry on the inventory of hazardous materials. The convention applies to vessels over 500 GT and to recycling facilities for the vessels.

In March 2012, the European Commission proposed stricter rules on ship breaking. The aim is to implement the Hong Kong International Convention earlier with the adoption of the EU regulation. The European Commission has adopted an EU strategy for better ship dismantling in 2008.

http://ec.europa.eu/environment/waste/ships/index.htm
www.imo.org/OurWork/Environment/ShipRecycling/Pages/Default.aspx
Ports and the Environment

Ports are important nodes in the transport chain. They have their own environmental requirements to fulfill and they also provide environment-related services for shipping companies. Ports are obligated to organise proper reception facilities for the waste produced on board. Ports and ships must have a waste management plan. A no-special-fee payment system has been developed for receiving solid waste and sewage in the Baltic Sea area. Under this system, the cost of reception, handling or disposal of ship-generated wastes, originating from the normal operation of a ship, is included in the harbour fee or otherwise charged to the ship, irrespective of whether these wastes are delivered or not. Vessels operating in a regular liner service can be exempted from the fee if they are able to present an alternative way of handling waste. In practice, this means that the vessel has a contract with a private waste-handling company.

The no-special-fee-system is described in the HELCOM Recommendation 19/8 and was also partly adopted in EU Directive 2000/59/EC: Port facilities for ship-generated waste and cargo residues. The directive is currently under review. A consultation period was arranged in 2011. The Commission has noted that the current system is not optimal and that not all ship-generated wastes and residues from ships calling at EU ports are actually collected. The directive allows member states to implement it with a wide variety of fee systems.


Ports Offer Environment-Related Discounts

Ships pay a port fee every time they call at a port. Some ports give discounts to ships which employ more environmentally friendly techniques and practices. These environmentally differentiated port dues are in use in certain Swedish and Finnish ports. The increase in the use of environmentally differentiated port and fairway dues has resulted in investments in environmental friendly technology and the use of low-sulphur fuels in ships.

Baltic Sea Challenge is an initiative of the Finnish cities of Turku and Helsinki to improve the state of the local waters as well as of the entire Baltic Sea. By their own commitment the cities also want to show initiative and reduce their own loading to waters. Already 172 organisations have committed to the Challenge.

http://www.itamerihaaste.net/in_english/the_challenge

Another initiative into which many private and public bodies have joined is Baltic Sea Action Group (BSAG).

www.bsag.fi/en/Pages/default.aspx

Environmentally Differentiated Fairway Dues

The Swedish fairway due system is an example of a method in which certain reductions can be offered to ships that create less NOx and SOx emissions. The reduction can be achieved gradually on the basis of the less nitrogen oxides per kilowatt-hour the ship produces or the less the fuel contains sulphur. This environmentally differentiated fairway due system acts as an incentive to ship owners to choose whichever emission reduction techniques they prefer.

In Finland, fairway dues are currently based on the ice class and net tonnage of a vessel. HELCOM has given a recommendation and proposed a structure on environment-related fairway dues to its member countries (HELCOM Recommendation 28E/13).

www.sjofartsverket.se/Om-oss/Avgifter--taxor/Farledsavgifter

Onshore Power Supply

Ships need energy also in the ports while loading and unloading. The sulphur content of fuel in EU ports is restricted to 0.1% for vessels staying over two hours. To enable emission restriction requirements, some ports provide Onshore Power Supply for vessels. Electricity generated onshore replaces energy from the vessels’ diesel auxiliary engine. The use of onshore electricity improves air quality in ports. It reduces not only sulphur but other emissions into air. It also reduces ship-generated noise in ports which are often situated in sites that are densely populated. In Finland, onshore power supply for passenger ferry vessels will be introduced at the Port of Helsinki South Harbour.

http://wpci.iaphworldports.org/index.html

In the field of environment, the European Maritime Safety Agency’s (EMSA) role is to provide technical assistance to the European Commission and the EU member states, regarding implementation, monitoring, development, and evolution of relevant EU and international legislation. The three main areas of work currently include different aspect of air pollution from ships, ballast water management and the reception and handling of ship’ waste.

www.emsa.europa.eu
Safe Shipping Protects Marine Environment
GOFREP

The growth in the volume of sea traffic increases the risk of marine accidents. GOFREP (Gulf of Finland Reporting) is a mandatory reporting system which is in use in the Gulf of Finland. GOFREP is approved by the IMO. Every vessel of over 300 gross tons has an obligation to report its planned route and any potentially hazardous cargo, either when entering the area or leaving a port within it. Vessels shall submit a Full Report on departure from a port in the Gulf of Finland or at the latest upon entry into the reporting area. Vessels are urged to update their AIS information before entering the Gulf of Finland, since most of the information given in the Full Report can be gathered directly from the AIS information. Additional information may be reported by other means (email, phone, VHF, fax). The report is to be delivered to a responsible traffic control centre in Tallinn, Helsinki or St. Petersburg.

http://portal.liikennevirasto.fi/sivu/www/e/professionals/vts/gofrep

The aims of GOFREP are
• to improve maritime safety in the area;
• to increase the protection of the marine environment;
• to monitor compliance with the International regulations for preventing collisions at sea (COLREGS) in the area.

Vessel traffic in the area is monitored by means of radar and the AIS system. Other maritime areas are also interested in implementing similar systems.

AIS (Automatic Identification System)

AIS is an automatic tracking system. The information is used by Vessel traffic services (VTS) for identifying and locating vessels. In Finland the vessel traffic services (VTS services) are operated by the Finnish Transport Agency. AIS improves the safety of sea traffic. The use of AIS is obligatory for vessels over 300 gross tons. The AIS transmitter sends information on the location, direction and speed of the vessel at intervals of a few seconds to other ships in the nearby area as well as to national officials.

http://portal.liikennevirasto.fi/sivu/www/e/professionals/vts/vts

Transport of dangerous goods

Some goods transported by sea require special attention because of their hazardous nature. A set of provisions has been created for this purpose: The IMDG (International Maritime Dangerous Goods) code was introduced by the IMO in 1965 and is developed continuously to cover new products and changing regulations.
Environmental Impacts of Railway Transport

Emissions from rail transport operations depend on whether diesel or electrically powered locomotives are used. Direct emissions from railway transport are lower when electrically powered locomotives are used. Railway companies can choose various sources of electricity, which exerts an indirect impact on emissions. The main environmental impact of rail is noise, which is caused by rail-wheel interaction.

The environmental commitments of Finnish railway company VR include halving CO\textsubscript{2} emissions by the end of 2012. Energy efficiency has been enhanced in accordance with the requirements of the EU’s Directive on Energy End Use Efficiency and Energy Services.

www.vr-konserni.fi/fin/index/ymparisto.html

Environmental Impacts of Road Transport

In Finland, industrial plants and population are sparsely located and transport flows are thin. Thus, effective transport connections are vital for both industry and households. In most areas, road transport is the most important, and in many cases it is the only mode of transport available. As the result of the large area, long distances and few inhabitants, the transport performance /vehicle mileage per inhabitant in Finland is 1.5-4-fold compared to the other EU countries. Transport- and logistics-based costs compose a large share of the total outlay for goods, so transportation which is as economical as possible is required. Nevertheless, the energy efficiency of Finnish road transport is high according to international comparisons.

Energy efficiency is an important means to reduce both transportation costs and the environmental impacts of road transportation. For example, energy efficiency can be improved by operating suitable vehicles and training drivers to use energy-efficient driving techniques. Economic development exerts extremely great impact in the energy efficiency of road transport and its CO\textsubscript{2} emissions.

In addition to energy consumption, the most significant environmental burdens from road transport currently are emissions to the air and noise. About one-fifth of Finland’s total carbon dioxide emissions are generated by road traffic. The share of road traffic on particles and nitrogen oxides is even larger.

http://lipasto.vtt.fi/lliisa/lliisa10.htm

Euro Standards

Road vehicle emissions are separately controlled via Euro standards for light and heavy duty vehicles. Currently, the legislation in force for heavy-duty vehicles is Euro V. Euro VI is entering into force 2013 - 2014. In addition, there is a non-binding standard called Enhanced Environmentally-friendly Vehicle (EEV).

Euro emission standards set for road vehicles by the EU restrict carbon monoxide (CO) emissions, particulate matter (PM), nitrogen oxides (NO\textsubscript{X}), and hydrocarbon (HC). Vehicle-specific carbon dioxide emissions (CO\textsubscript{2}) are not yet restricted. Carbon dioxide emissions correlate with fuel consumption, and if the fuel consumption grows, for example, due to new vehicles being heavier than old ones, carbon dioxide emissions grow as well.

http://ec.europa.eu/environment/air/transport/road.htm
http://lipasto.vtt.fi/yllikopaastot/ukke.htm
The Goods Transport and Logistics Energy Efficiency Agreement

In Finland, energy efficiency has been increased by means of voluntary energy efficiency agreements in different sectors. The goods transport and logistics energy efficiency agreement is valid during the years 2008-2016. The agreement is under the supervision of the Ministry of Transport and Communications. The contracting parties are Finnish Transport and Logistics SKAL, Association of Logistics Enterprises of Finland and VR-Group Ltd. The objective by 2016 is to achieve energy-saving totalling 9% compared to average consumption over the years 2001-2005. This agreement is part of the Finnish Climate and Energy Strategy (2008). Another objective of the contracting parties is to promote the energy audit of the transport chain developed by Motiva.

Road transport companies report on their use of energy to the EMISTRA data system. The energy efficiency of railway traffic is followed by a calculation system, RAILI, which is a sub-model of LIPASTO.

In 2008, Finnish Transport and Logistics – SKAL made two decisions to reduce the environmental burden of road traffic: it launched the Litre Per Day Energy Efficiency Club for its members and also signed an Energy Efficiency Agreement for goods haulage and logistics. The former gives practical tips to its members on how to make environmental protection measures as a part of the daily operating format, and the latter encourages businesses in the industry to implement voluntary energy conservation measures.

PIHI is a follow-up system which helps to improve the energy efficiency of transport companies.

www.energiatehokkuussopimukset.fi/en/about_the_agreements/

www.litrapaivassa.fi/
Supportive Instruments

Market-based Instruments to Encourage Environmental Innovations

Economic instruments are one of the means to encourage environmental innovation in the field of transport. The OECD and the EEA have created a joint database which contains information on the use of economic instruments. The database includes environmentally related taxes and charges and environmentally motivated subsidies. It also outlines voluntary policy approaches such as environmental agreements negotiated with industry, and public programs in which firms can volunteer to participate.


Environmental Aid Scheme for Finnish Vessels

In 2011, the European Commission has approved the Finnish aid scheme for vessels that aims at environmental protection. Under the Government Decree, the Finnish Ministry of Transport and Communications supported innovations of Finnish shipping companies Viking Line Abp and Gaiamare Ltd for their vessel investments improving the level of environmental protection. The projects receiving aid involve major environmental innovations. The Viking Line passenger vessel will use liquefied natural gas (LNG) as its fuel, and the new Gaiamare freight vessel will use liquid bio oil. The Gaiamare vessel will also be equipped with an oil recovery system to respond to possible accidents.


Norwegian NOX Fund

The NOX Fund in Norway was established by fifteen business organisations. Reducing NOX emissions is the primary objective of the environmental agreement signed between these organisations and the Ministry of the Environment. Payments that are assigned to the fund replace the governmental NOX tax for participating enterprises. In maritime transport, the NOX tax concerns vessels of all nationalities, with the exemption of vessels in international traffic or vessels which operate directly between Norway and foreign ports. There are over 500 affiliated enterprises, which are entitled to exemption from fiscal NOX tax. The participant enterprises can apply for financial support for measures aiming at decreasing NOX emissions. Support is granted both for investment costs and operating costs with respect to the measures designed to reduce NOX emissions.

www.nho.no/the-nox-fund/category477.html

Intelligent Transport

Intelligent transport could reduce greenhouse gas emissions by applying different kinds of solutions and techniques. Information Communications Technology (ICT) solutions enable the use of optimisation of transport routes, the tracking of transport and cargoes, utilisation of electronic documents, and calculations of emissions with ICT software and simulation models.

In addition, the following means were identified in the SMART 2020 report.

- optimization of logistics network
- intermodal shift (commercial)
- optimisation of collection / delivery itinerary planning
- optimisation of route planning
- eco-driving
- reduction in ground fuel consumption
- maximisation of ship load factor
- optimisation of ship operations
- minimisation of packaging

www.gesi.org/LinkClick.aspx?fileticket=tbpSWRTHUoY%3d&tabid=60
Calculation and Comparison of Emissions

Emission calculations are used to obtain information on the quantity of emissions, increasingly for economic reasons as well. The estimation is difficult, because calculations need to consider various vehicles, the amount of cargo transported, and different kinds of conditions. There is no calculation method which would cover the entire transport chain or which would be generally accepted.

The European Committee for Standardization (CEN) is preparing a Methodology for calculation and declaration on energy consumptions and GHG emissions in transport services (goods and passenger transport).

The EU-financed project, Carbon footprint of freight transport (COFRET), aims at creating a method to calculate the carbon footprint from the perspective of companies. This would also contain terminal operations not included in the standard prepared by CEN.

www.cen.eu/cen/pages/default.aspx
www.cofret-project.eu/

LIPASTO – Traffic Emissions

In Finland, traffic exhaust emissions and energy consumption are calculated using a system called LIPASTO, developed by the VTT Technical Research Centre of Finland. LIPASTO is a traffic emission inventory. It includes sub-models for road, rail, air and waterborne traffic as well as for working machines. Unit emission factors are calculated for vehicles and working machines that apply to vehicle emissions per transported mass or passenger and distance unit. The quantity of emissions is calculated during the operation of vehicles. Emissions are measured in mass units and allocated to each passenger or tonne of freight transported over one kilometre (g/tonne kilometre, g/passenger kilometre). The calculations are updated yearly. The system covers emissions from 1980 to 2010 and a forecast until 2030.

MEERI is a sub-system which calculates the emissions of maritime transport in Finland’s national waters. For waterborne transport, emissions and energy consumption are estimated for the various vessels typically utilised in Finnish waterborne traffic.

LIISA is developed for calculating road traffic exhaust emissions. In particular, area-wise calculations and scenarios can be performed by the LIISA system to forecast road traffic emission loading in the future.

The amount of exhaust gas emissions and energy consumption originated from railway traffic are calculated by a LIPASTO sub-model called RAILI. Calculations are based on the traffic data from both railroad division and marshalling yard.

lipasto.vtt.fi/indexe.htm
The aim of SPC Finland is to promote shortsea shipping and inter-modal transport. International transport solutions that combine shortsea shipping with rail, road, and inland waterways are at the focus of SPC Finland’s activities.

SPC Finland
• works as a neutral channel of influence
• brings together different transport modes, operators in the transport chain, and authorities
• provides up-to-date information on the transport sector via newsletters, reports, and events
• informs on EU transport related programmes and funding opportunities

SPC Finland is a national centre and part of the University of Turku Centre for Maritime Studies unit in Pori. It is a member of the European Shortsea Network.